

Paper 1

Risk Factors for Academic and Behavioral Problems at the Beginning of School

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2000

Introduction

The beginning of school—kindergarten and first grade—is a critical period marked by a change in children’s environment at a time when their cognitive and social capabilities also are changing. A child’s readiness for school is an example of the connection between impressions of developmental processes and societal decisions about the optimal timing of entry into formal school environments (Barth and Parke 1993). Children’s academic and social trajectories are formed in the early stages of public schooling. In first grade, as Entwisle has noted (Entwisle et al. 1987), children’s work begins to be seriously evaluated in a comparative framework by teachers and classmates.

What kinds of important problems are identified during these early school years? Such problems fall into three arenas: (1) academic competence (e.g., impaired academic achievement marked by grade retention, low scores on early measures of scholastic performance, and identification of need for special education), (2) behavioral competence (e.g., behavioral problems that require intervention outside of the regular school class), and (3) social competence (e.g., problems with understanding complex social systems of classroom and school and difficulties negotiating new social relationships with teachers and peers).

What are the consequences of success or problems in these arenas? Improved academic performance and behavioral and social success early in school increase the likelihood that children will later be productive citizens, as measured by increased independence and social confidence, less reliance on social services, and higher earnings. On the other hand, poor performance in the beginning of school may imperil children, labeling them delayed learners and placing them into school tracking programs (e.g., within class ability grouping, retention in grade, or special education), decreasing the likelihood of positive social exchange and peer support, and emphasizing low expectations of parents and teachers for children’s academic performance (Entwisle 1995). Children who are not successful early in school have greater problems with later behavioral, emotional, academic, and social development. For example, children who repeat a grade are at greater risk for several specific behavioral disorders, such as attention deficit hyperactivity disorder, obsessive compulsive disorder, over-anxious disorder, and major depressive disorder (Velez, Johnson, and Cohen 1989). Grade retention also predicts school dropouts and rapid, repeat adolescent pregnancies (Linares et al. 1991). Furthermore, children who demonstrate low scores on early measures of school achievement, verbal IQ, and verbal ability are at risk for delinquent and antisocial behavior (Yoshikawa 1995).

Educational, medical, child protection, and behavioral health institutions play multiple roles in the identification, evaluation, and treatment of at-risk children and their families. A primary goal is to intervene with children whose identified risk factors predispose them to disrupted learning. For example, it has been suggested that participation in a preschool enrichment program can increase school success and, consequently, decrease delinquency (Weikart and

Schweinhart 1991). Numerous intervention studies have been formulated on the premise that positive changes in school success may be followed by decreased antisocial behavior, while a difficult progression in the first years of school marks the beginning of a cascade of problems.

It is important to recognize the debate about whether or what aspects of school success are related to negative long-term outcomes. For example, it has been found that children with early reading difficulties have increased rates of conduct problems up to the age of 16 years. However, at least one study concludes that, when due allowance is made for potentially confounding factors (especially early conduct problems) and for factors correlated with these problems, it is unlikely that reading difficulties in early childhood directly relate to later adolescent conduct problems (Fergusson, Horwood, and Lynskey 1997). These results were true across various age and gender subgroups of the sample.

It also is important to understand the developmental competencies that characterize typical kindergartners and first graders and, concurrently, the cognitive, social, and behavioral demands that typify the early school experience. Such understanding will allow us to examine when the mismatch between individual developmental competency and environmental context puts a child at risk for getting off track in school. Levine and colleagues have proposed a theoretical model that highlights the interactions between neurodevelopmental functions and academic skills. At any point in time, a child lives with a “balance sheet” of strengths, adequacies, variations, and problems in neurodevelopmental functioning that may or may not be well suited to academic expectations (Levine et al. 1997). Table 1 summarizes this model as it applies to kindergartners and first graders. These constructs reflect lower order, higher order, and language-based as well as social cognitive functions.

Beyond basic neurodevelopmental functions, children’s competency also seems to depend on social skills and emotion regulation capacities. During the first years of school, children begin to seek social acceptance, discover and emulate role models, reconcile personal and family beliefs with disparate values of others, explore autonomy, deal with targeted fears, and refine self-awareness (Levine 1999). Emerging emotional regulatory capacities during this transitional period include reinforcing, reciprocal, and collaborative behaviors; conflict resolution (without resorting to aggression); and the accurate conveyance and interpretation of one’s own feelings as well as others’ feelings (Levine 1999). Furthermore, children at this age are developing a sense of industry and productivity, which can promote a positive self-concept and sense of competence (Dworkin 1989). While these assumptions about socioemotional competence ring true, relatively few studies have examined early school outcomes such as self-concept, motivation, social competence, and family and peer relationships (Barnett and Escobar 1989).

The scientific bases for our understanding of risk and protective factors related to early school failure and success are found in the literature of multiple disciplines, including developmental psychology and psychopathology, child psychiatry, education, and behavioral and developmental pediatrics. Risk factors are those characteristics or variables that, when present in a disorder-free individual, indicate a greater likelihood that this individual, rather than someone

selected at random from the disorder-free population, will subsequently develop that disorder (Garmezy 1994; Werner 1992). Such risk factors will predict problematic outcomes, but may or may not be causally related to the onset or maintenance of problems. A typology of risk factors guided by and tied to social, clinical, and policy concerns (Kraemer et al. 1997) proposes that to show a characteristic as a risk factor requires a demonstration that the risk factor temporally precedes the adverse outcome and is correlated with it. A characteristic that cannot be shown to precede the outcome but is related to it is called a “correlate,” not a risk factor. By definition, identified risk factors for a difficult transition into school are variables that predict early school failure, and may be causally related to the onset or continuation of emotional, social, and academic difficulties in school.¹

A major problem in the past literature is that correlates often are reported as “risk factors,” and sometimes even as causal factors. To a great extent this has happened because of the emphasis in the past on cross-sectional or retrospective studies, neither of which can establish temporal precedence. Consequently, some of what are reported as risk factors for early school failure may be the symptoms or the outcomes of school failure, not risk factors at all. In Kraemer’s typology of risk, she states that the term “risk factor” deserves greater specification (Kraemer et al. 1997). A risk factor may be a “fixed marker,” that is, one that cannot be demonstrated to change. A risk factor may be a “variable marker,” that is, one that can be demonstrated to change, but when changed, does not alter the probability of the outcome. Finally, a risk factor may be a “causal risk factor,” that is, one that can be changed and, when changed, does alter the risk of the outcome. For example, a mother’s not having graduated from high school is a risk factor for a child being labeled with a handicapped educational status in 1st grade (Finkelstein and Ramey 1980). However, awarding a diploma to a mother at the birth of her child ultimately will not change her child’s educational trajectory; therefore, maternal possession of a high-school diploma is a variable marker for the child. Belonging to a disadvantaged minority group also is a risk factor for low academic achievement (Reynolds, Weissberg, and Kaspro 1992), but such membership cannot be changed and, therefore, minority status is a fixed marker. Lack of access to resources and inadequate parenting skills are correlated both with absence of maternal diploma and with minority group membership, and are themselves risk factors for low IQ. Providing high-quality childcare to infants and education to the mothers has been demonstrated to increase children’s IQs (see IHDP intervention studies, Berlin et al. 1998). So, poor resources and poor parenting skills can be considered causal risk factors. As a result, in targeting future interventions to prevent low IQ and to promote academic competence in early school years, one might want to target the babies of mothers without a high-school diploma in disadvantaged minority groups (variable and fixed markers) for intervention, but the intervention itself should seek to change poor access to resources and parenting skills (causal risk factors).

Further, it is unlikely that any outcome in the arena of early school success or problems is the result of one and only one factor. Research focused on this arena must consider the issues around multiple risk factors. A transactional framework suggests there are several coexisting ecological levels (macrosystem

= cultural beliefs; exosystem = aspects of community; microsystem = family setting in which the child lives; ontogeny = within-individual factors) that contribute to a child's maladaptive or adaptive developmental outcome (Sameroff and Chandler 1975). In accord with this transactional model, risk factors present at one ecological level influence outcomes in surrounding levels, thereby determining the extent of risk posed to the individual (Cicchetti and Toth 1998). Therefore, a comprehensive approach to ascertain the combined effects of multiple risk factors and/or mechanisms by which such combined risk may have contributed to early school failure or success may be more fruitful than efforts to identify bivariate associations between one risk factor and one outcome.

Considerations of associations between variables point to yet another problem in the past literature: statistical significance is not sufficient to establish the clinical or policy impact of a risk factor (Kraemer et al. 1997). Many risk factors have been shown to be "statistically significant" when the sample size is large, but then never prove to have any clinical or policy significance. Some estimation of potency is needed, a measure of effect size that is interpretable in terms of clinical and policy significance (Kraemer et al., in review). In past literature, if a potency measure was selected (often the odds ratio or risk ratio), such selection was made in the absence of considerations of the nature of the population, outcome, or consequences of false positive and negative identification of children at risk. Overall, there has been limited attention in the literature on early school problems to the issue of potency of risk factors.

As noted above, the understanding of causal linkages among multiple risk factors and school requires that these relations be studied using longitudinal methodologies that assess family and child functioning prior to school entrance and continue to do so in the context of the school setting. Such research is relatively uncommon (Barth and Parke 1993; Cowan et al. 1993) and, despite the interdisciplinary interest in early grade failure, few large studies have investigated the social, emotional, cognitive, and health factors associated with this outcome. In one large study (Byrd and Weitzman 1994), interviews with parents of 9,996 children aged 7 to 17 who participated in the Child Health Supplement to the 1988 National Health Interview Survey were analyzed. The study revealed that, nationally, 7.6 percent of children repeat kindergarten or first grade. Factors independently associated with increased risk of grade retention were poverty, male gender, low maternal education, deafness, speech defects, low birth weight, enuresis, and exposure to household smoking. Behavior problems at the time of interview also seemed to be associated with prior early retention. High maternal education and residence with both biological parents at age 6 years appeared to be protective factors and were independently associated with a decreased risk of retention. While this study was strengthened by the size of the sample, most of the relations among the factors identified were correlative; again, longitudinal study is required to help ascertain whether such factors are causal risk factors.

Parallel to the advances in theoretical models and increasing precision in risk-factor terminology and research, Luthar has advocated for greater precision in the use of terms to label protective factors (Luthar 1993; Luthar, Cicchetti,

and Becker, in press). She suggests that attributes with direct ameliorative effects—operating in both high and low-risk conditions— should be labeled “protective.” Further, attributes conferring stability in competence despite increasing risk could be labeled “protective-stabilizing”; attributes conferring augmentation of competence could be labeled “protective-enhancing”; and attributes conferring advantages, although less under high-stress conditions, would be labeled “protective but reactive.” Scientific understanding of protective factors is substantially grounded in the exploration of child, family, and social environmental factors implicated in the concept of resilience, defined as “. . . a dynamic process encompassing positive adaptation within the context of significant adversity” (Luthar et al., in press).

Intervention programs are the vehicles by which our assumptions about risk and protective factors can be tested; they can elucidate the relation between intervention and a change in school performance. When specific risk factors have been identified for a given outcome, intervening, or experimentally manipulating the risk factor, allows the investigator/clinician/educator to prevent the onset of the condition, to decrease morbidity, or to effect a more benign course for the problem and its associated outcomes. The causal nature of the risk factor may then be demonstrated through intervention effect sizes. Greater knowledge of effects of specific risk factors on problematic school entry can allow the development of more effective preventive or treatment interventions, and lead to better understanding of the etiology of early behavioral and academic frailty. Thus, intervention studies based on knowledge about putative risk factors represent the current “gold standard” for establishing causal relationships between risk and outcome. Unfortunately, as the following review will indicate, there are not many of these studies in the literature.

This scientific review is a companion to “Resource Guide to Selected Federal Policies Affecting Children’s Social and Emotional Development and Their Readiness for School,” a paper by Doreen Cavanaugh, John Lippitt, and Otrude Moyo. In that paper, the authors discuss selected federal policies that purportedly address the factors identified in the following review, putting children at risk for problematic academic and socioemotional outcomes during the early years of school. Cavanaugh and colleagues present and discuss 23 policies, representing domains of child health, early childhood care and education, family and child welfare, socioeconomic status, and child nutrition.

Basic neuroscience research is expanding our understanding of the plasticity of a child’s developing brain. Concurrently, our national attention increasingly has been turned to the needs of children (e.g., the White House Conference on Mental Health, congressional attention to the problems of youth violence, and so on). To use our national resources effectively, it is critical that we link these areas of basic science and policy-making. An adequate understanding of the scientific literature on risk is important for building more evidence-based policies with the potential to affect thousands of children. Thus, a review of the scientific literature vis-à-vis federal policies is necessary and timely.

Methods

OVID Medline and Internet GratefulMed literature searches were completed, using search terms of “school entry,” “kindergarten,” “transition to school,” “risk,” “predictor,” and “intervention.” The search included articles published between 1986 and 1998, and was limited by age (child), document (journal articles plus review, theoretical, and commentary articles), and language (published in English). Utilizing these terms and limits, more than 500 articles were identified (see Table 2). This collection was supplemented with articles on pregnancy, cocaine, and alcohol that were identified using Biomed (a University of California search system). Within these articles, there were a number of identified risk (or protective) factors that were concluded to be related to the transition into elementary school, expressed as problems or competencies during kindergarten and first grade.² As in Sameroff’s transactional model (Sameroff and Chandler 1975), such risk factors were conceived of at multiple levels; for example, individual ontogeny, microsystem (family, school, and peers), exosystem (neighborhood, socioeconomic status), and macrosystem (cultural beliefs and values).

There has been confusion in much of the extant literature about what are risk factors, including what are merely correlates, what are fixed and variable markers (informative but not a reasonable basis for structuring targeted interventions), and what are causal risk factors, which are vital to address in interventions. Risk factors may be found to be “statistically significant” but have no demonstrated clinical or policy value. In short, the field is still in its infancy, requiring much future thought and development.

However, the past and current literature is the best source of information to guide future research. To summarize and understand the scientific basis for our understanding of early school problems and risk, we examined those studies that satisfied the following minimal requirements of excellence:

1. Careful definition and sampling of a population free of the disorder at baseline
2. A longitudinal, prospective design
3. Definition and measurement of the putative risk factors at the baseline
4. Definition and measurement of outcomes at follow-up
5. Use of analytic strategies to establish statistically significant correlations between risk factors and outcomes

Studies satisfying these minimal requirements are listed in Table 3; if an article addressed risk processes or mechanisms of risk, that fact also is noted. Additional review and theoretical papers that addressed the issue of risk as related to early school failures or successes are listed in Table 4.

For each identified risk factor, we sought to identify intervention studies that addressed the relation between the risk factor and outcomes by attempting to change the level of risk. A second set of searches yielded articles concerning interventions designed to address the effects of recognized risk factors. For an in-

tervention study to be included in this summary, it needed to specifically address those outcomes for children in kindergarten and first grade, listed in Table 3 (e.g., early academic failure, grade retention, significant behavioral problems, and so forth). These searches focused on identifying original research (see Table 5); however, several review articles also were included (see Table 6). As noted previously, we considered a longitudinal design imperative for delineating causal relations among early risk factors, targeted or indicated interventions, and later outcomes.

In this review, we also noted if additional research or policy implications have been suggested by current studies of risk factors for difficult school transitions. Connections to policy-making may include (1) noting the ways in which policies are informed by research; (2) establishing whether there are certain levels or arenas of risk that have been well considered by policy-makers et al. that have not; and (3) identifying risk factors that deserve (by virtue of the breadth or intensity of their impact or by their malleability) additional consideration in the policy arena.

Results

Risk Factor Research

Risk and protective factors that affect *early* school success have been addressed to some degree in review papers published within the past 15 years (see table 4, e.g., Brier 1995; Lukeman and Melvin 1993; McLoyd 1998). While many of these reviews focused on school achievement and performance (e.g., Casey and Evans 1993; Ornstein et al. 1991; Richardson, Koller, and Katz 1986), fewer have addressed socioemotional outcomes (e.g., Lukeman and Melvin 1993; McLoyd 1998). Empirical papers describing particular risk and protective factors at various ecological levels are summarized below.

Individual Ontogeny

Low Birth Weight and Neurodevelopmental Delay (treated in most studies as a fixed marker).³ Research shows that children with an extremely low birth weight as babies have a higher incidence of behavior problems at school entry and poorer cognitive performance (McCormick et al. 1998; McCormick et al. 1993), as well as increased incidence of learning disabilities and academic difficulties (Hack et al. 1992). Having a very low birth weight or an extremely low birth weight places a child at risk for behavior problems, cognitive deficits, and school problems (enrollment in special education) at ages 7 to 8 years (Horwood, Mogridge, and Darlow 1998). However, heavier low birth weight babies do experience some catch-up and, by age 8, have nearly age-appropriate performance (McCarton, Wallace, and Bennett 1996). Additionally, prematurity has been demonstrated to be a risk factor for school problems or failure later in life (8 to 18 years) and for developmental problems at ages 2 and 5 years (Cohen 1995).

Abnormal neurodevelopment (as identified by a nurse during history-taking when a child is 4 years of age or by a school physician at the time of school entry) places children at risk for increased school behavioral problems (Cadman et al. 1988) and for higher rates of learning difficulties (Bax and Whitmore 1987) at the end of kindergarten or first grade. In one study, clumsy children who failed a standardized motor test battery at school entry were at increased risk for poor writing and delayed motor performance at age 8 (Roussounis, Gaussen, and Stratton 1987). Another study found that children with low scores in kindergarten for right-handed coordination and overall graphesthesia on the Missouri Kindergarten Inventory of Developmental Skills displayed persistent soft signs at follow-up in first grade and were at greater risk for academic problems (Blondis, Snow, and Accardo 1990).

Other Medical Problems (fixed marker). Pregnancy problems, including maternal medical and emotional problems, have been identified as risk factors for offspring behavior problems in childhood and adolescence (Cohen et al. 1989). Research has also identified low neonatal thyroxine levels as a correlated indicator of neurological dysfunction at age 5 and of school failure at age 9 (Den Ouden et al. 1996). It also has been shown that neonatal hypothyroidism results

in increased grade retention, lower IQ at ages 4 and 7, and increased fine motor and coordination problems (Rochiccioli 1992). These findings suggest there may be very specific risk factors predicting developmental delays and consequent school failure. While such risk factors are unlikely to explain all neurological dysfunction or school failures, they nonetheless may mark a specific group of children at higher risk.

Psychophysiological Markers of Risk (variable markers). In a search for psychophysiological markers of risk, several studies show that slowed capacity to recognize and match a visual pattern (Complex Reaction Time, CRT) at age 7 correlates with problems in psychomotor and language development as well as with increased symptoms of aggression, hyperactivity, withdrawal, and an increased likelihood of school failure (Frisk 1991). These studies suggest that CRT is a biological marker that may identify, early in the school experience, children at higher risk for behavioral symptoms that contribute to school failure.

In a cross-sectional study, Porges and colleagues have suggested that heart rate variability is a sensitive psychophysiological index of mental effort and attentional processing in slightly older school age children (Suess, Porges, and Plude 1994). High baseline levels of heart rate variability are correlated with better performance on the first 3-minute block of a continuous performance task. While conclusions about causality cannot be drawn from this study, the findings suggest that heart rate variability might be useful as an indicator of attentional capacity, an individual trait that is increasingly critical as school-based education proceeds.

Cognitive Deficits (causal risk factor). Many papers confirm that cognitive ability or IQ accounts for a large proportion of the variance in academic competence and achievement (Finkelman, Ferrarese, and Garmezy 1989; Pellegrini et al. 1987). Other reviews have examined in depth the contributions of cognitive factors to academic outcome, particularly when cognitive skills are affected by injury or illness, such as head injury (Dennis et al. 1998), chronic illness (Nokes 1996), epilepsy (Strang 1990), leukemia (Brown and Madan-Swain 1993), severe malnutrition (Grantham-McGregor 1995), prematurity (Wolke 1998), and neurofibromatosis (North et al. 1997). We do not attempt to readdress these large areas of research in this review. However, in our examination of those risk factors that reflect emotional, behavioral, and social domains and impact behavioral and social success in early school, we did consider those realms of research where cognitive ability is considered in conjunction with emotional state.

For example, affectively depressed children show evidence of functional cognitive impairment, with mild declines in verbal performance IQ over time (Kovacs and Goldston 1991). Depressed young children appear to be less socially adept than nondepressed peers; however, depression does not consistently impair social-cognitive abilities. Further, cognitive capacity allows a child to recognize and interpret emotion. Dennis and colleagues have established that understanding an emotion narrative involves recognition of affective valence and establishing an explicit mental representation of emotional states. In turn, this representation provides a mechanism that particularizes emotion and modulates its display, which then allows emotional expression to be modified

according to particular context. This understanding can be confused when cognitive processes are impaired, as in a head injury (Dennis et al. 1998).

There are studies of older children and adolescents that address the relation between cognitive deficits and poor school outcomes, both behavioral and academic (Brier 1995). These studies have shown that low levels of intelligence are related to delinquency, with IQ scores among delinquents an average of 8 points lower than the general population. Children with lower levels of intelligence, especially lower levels of verbal skills, are more likely to experience school failure, and/or to exhibit antisocial behaviors. Both poor verbal skills and antisocial behaviors are linked to lack of school success. These children also may have negative school attitudes, lowered self-expectations, and decreased chances of recognizing the relations between achievement in school and later success in life, further increasing the likelihood of poor academic achievement.

Not surprisingly, cognitive disabilities requiring special education during preschool appear to make the transition to kindergarten or alternative elementary school placement more difficult. In a theoretical paper, Fowler and colleagues suggest that this may be, in part, because children with disabilities lack the independence and survival skills required for elementary school. Fowler also suggests that the families of these children experience significantly more stress by the school transition than do families of able children (Fowler, Schwartz, and Atwater 1991). More specifically, in the domain of communication and language, Fazio and colleagues (Fazio, Naremore, and Connell 1996) demonstrate that language impairment leads to poor academic and language performance in school, although, in their study, the effects of poverty confounded this finding. The authors suggest that identifying language-impaired children for remedial help would be another way to allay school failure. Furthermore, there is strong evidence of high comorbidity of communication problems (speech, hearing, cognition) and emotional/behavioral difficulties in some young children; this may indirectly impact on early school success (Prizant, Wetherby, and Roberts 1993). Such evidence argues for establishing functional linkages between the behavioral health care system and those identifying and addressing communication disorders (speech/hearing/language specialists, health care providers, hospitals, clinics, preschools, schools, etc.). Nonfragmented services are warranted, in order to establish more comprehensive assessment and treatment planning practices.

Temperament and Personality Dimensions (fixed markers). Cross-sectional studies suggest that difficult temperament appears to increase risk for antisocial behavior and school failure (Brier 1995) and that easy temperament is a protective factor for behavior problems (Jackson and Frick 1998). With characteristics such as high activity level, inflexibility, impersistence, distractibility, and low attention, difficult temperament increases the probability that a child fails to adhere to classroom rules and follow academic instruction. These characteristics suggest a large overlap between difficult temperament and attention deficit hyperactivity disorder and, according to some authors (Hinshaw 1992), there is an overlap of more than fifty percent between attention deficit disorders and underachievement.

Tremblay and colleagues' study of French-Canadian boys of low socioeconomic status (SES) examined the correlations between the personality dimensions of im-

pulsivity, anxiety, and reward dependence and delinquency (Tremblay et al. 1994). Teachers rated boys on personality scales at kindergarten age, and the boys themselves reported their delinquency between the ages of 11 and 13. Tremblay and colleagues found that low SES boys with high impulsivity, low anxiety, and low reward dependence are most at risk for antisocial behavior and have the highest rates of self-reported delinquency.

In a study of sons of substance-abusing and normal fathers, it was found that (1) sons' IQ and positive temperament each partially mediate the effects of paternal substance abuse on sons' reading achievement scores and (2) that sons' positive temperament mediate the relations between family dysfunction and their reading achievement scores (Blackson 1995). As reading achievement is pivotal to academic success and school failure is associated with early age substance use, the author concludes that it is important to identify processes that promote academic success.

Many studies have concentrated on the effects of risk factors on adolescent school failure and antisocial behavior (Farrington 1989; White et al. 1994). Some studies show the relations between early childhood experience and later negative adolescent outcome with respect to low-level intelligence, negative school attitude, harmful peer influences, poor parenting techniques, and difficult temperament (see review by Brier, 1995). It is likely that indications of potential for school failure and antisocial behavior are evident during school entry age. More research is required to elucidate the effect of such risk factors on children during their transition into elementary school.

Aber and colleagues have proposed that effectance motivation, which is the intrinsic desire to deal competently with one's environment, is an important factor related to children's ability to adapt to school, frequently a first major out-of-home environment (Aber et al. 1989). In another study, inner-city Head Start children score higher on measures of effectance motivation than do their inner-city, non-Head Start counterparts; however, their levels are lower than those of the middle-class children (Malakoff, Underhill, and Zigler 1998).

Early Behavior and Adjustment Problems (causal risk factors). Research shows that mothers' high ratings of hyperactivity and externalizing behaviors for their 3-year-old children, predict adjustment difficulties at home, in school, and with peers at ages 6 and 9 (Campbell and Ewing 1990; Campbell et al. 1986). This research provides evidence of mothers' abilities to identify their children's problem behaviors. It also suggests a useful marker of risk for school failure. In a prospective study, Schwartz and colleagues investigated the predictive association between early behavior problems (internalizing, externalizing, hyperactivity-impulsiveness, immaturity-dependency) and later victimization in the peer group (Schwartz et al. 1999). Teacher ratings of the behavioral adjustment of 389 kindergartners and first-grade children (approximate ages 5 to 6 years) were obtained using standardized behavior problem checklists. These ratings predict peer nomination scores for victimization, obtained three years later, even after the prediction associated with concurrent behavior problems was statistically controlled. Further analyses suggested that the relation between early behavior problems and later victimization is mediated by peer rejection and

moderated by children's dyadic friendships. Behavioral problems appear to play an important role in determining victimization within the peer group, although the relevant pathways are complex and influenced by other aspects of children's social adjustment.

Age at School Entry (causal risk factor). Fowler found that boys' late birthdays (younger age) were associated with early grade failure (Fowler and Cross 1986); further risk was conferred by poor visual-motor integration, decreased maternal education, and positive family history of learning problems. In this study, protective factors seemed to be maternal education and lack of family learning problems. Similarly, Jones (1990) found that the proportions of students failing to meet standards on a reading achievement test in grades 1, 2, 3, and 6 are higher for younger, male, African-American, and "lunch-assisted" students than for older, female, non-African-American, and full-paying students. In contrast, Morrison, Griffith, and Alberts found that the age of a child at school entry (younger or older compared to other same-grade peers) was not a good predictor of risk for school failure, after controls for background variables were applied (Morrison, Griffith, and Alberts 1997). Additional research is required to account for contradictions in the conclusions of these studies.

Summary of Protective Factors. With the exception of "easy" temperament, which has been noted to be a protective factor related to the emergence of later behavior problems (Jackson and Frick 1998), few protective factors were specifically noted at the level of individual ontogeny.

Microsystems— Family and Peers

Family Composition (fixed markers). According to the U.S. Census Bureau, more than 50 percent of marriages end in divorce in the United States, and many of these divorces affect school-aged children. While children's responses to the change in family structure and lifestyle vary dramatically, studies show that divorce is associated with behavioral problems that may negatively influence success in school. Divorce also adds significant variance to socioeconomic predictors of cognitive-social competence and adaptive behaviors at school entry (Guidubaldi and Perry 1984).

School-aged children also experience parental remarriage. While some studies indicate protective effects, others show remarriage to be a risk factor when comparing step families to intact families. Pagani and colleagues (Pagani et al. 1997) conducted a longitudinal study in Quebec that followed children from 6 through 12 years of age. They found that divorce and remarriage are associated with higher levels of anxiety, aggression, hyperactivity, disobedience, and deviant behavior. Children who experienced parental divorce before the age of 9 were more anxious at age 12 than children from intact families. Children whose parents divorced before age 8 were more aggressive, and those whose parents divorced before age 6 were more disobedient and defiant. Hyperactivity was noticed only among children whose parents divorced prior to age 8. Pagani and colleagues also noted that remarriage seemed to have a protective effect regarding hyperactivity, especially during early childhood. Neither divorce nor remarriage appeared

to affect prosocial behavior. Marital status and family composition, then, may be an important factor in school success or failure. Future studies of family composition, as contributing to risk status, also should consider other moderating socioeconomic variables such as employment or educational status.

Low Level of Maternal Education (fixed marker). Lower levels of maternal education predict children's early grade failure, including a lack of reading and math achievement (Fowler and Cross 1986). Similarly, a lack of maternal education has been demonstrated to be a stronger predictor of handicapped status at school entry than the child's own behavior from birth to 3 years (Kochanek, Kabacoff, and Lipsitt 1990). Information available on birth certificates, including maternal level of education, can be used as an effective predictor of a child's need for special education services at public school entry (Ramey et al. 1978; Finkelstein and Ramey 1980). High maternal education and residence with both parents at age 6 decreases a child's risk of repeating kindergarten or first grade (Byrd, Weitzman, and Auinger 1997).

Parental Substance Abuse (treated in most studies as a fixed marker). Numerous studies have focused on the effects of maternal substance abuse during pregnancy as well as the influence of childhood exposure to addicted parents in the home environment. Most studies point to the adverse effect of parental substance abuse on the cognitive, physical (intrauterine growth retardation and low birth weight), and social development of young children (for bibliography, see Coles, Russell, and Schuetze 1995). Smoking during pregnancy, for example, is generally noted for its negative physical health consequences for infants. Other studies demonstrate that children exposed prenatally to maternal smoking have behavior problems at the age of school entry (McGee and Stanton 1994) as well as impulsivity and poor performance on a series of memory tests (Fried, Watkinson, and Gray 1992). Maternal alcohol consumption during pregnancy is associated with intrauterine growth retardation and low birth weight, which affects later cognitive and social development; a small percentage of children born to heavy drinkers suffer from fetal alcohol syndrome (FAS) (Streissguth et al. 1994). A study in West Berlin found that only 30 percent of teenagers with FAS had normal-range IQ scores and by the end of school, 55 percent had attended schools for the mentally handicapped (Spohr, Willms, and Steinhausen 1994). Alcohol-exposed children also have been found to have behavioral and social difficulties, such as trouble cooperating, paying attention, and problems with impulsivity and impersistence.

Studies of prenatal exposure to other drugs, such as cocaine, heroin, and amphetamines, also highlight problems in behavioral and cognitive development. Some studies suggest that children exposed to cocaine *in utero* have delayed mental development; for example, Bender's study showed that exposed children experience early language and nonverbal development problems throughout preschool years (Bender et al. 1995). In contrast, other studies show that prenatal exposure to cocaine does not affect intellectual ability or academic achievement, but teachers report children had difficulty sustaining attention (Richardson, Conroy, and Day 1996). Van Baar found that methadone, heroin, and polydrug exposure results in lower general intelligence and language tests

around school entry age (van Baar and de Graaff 1994). Further, children exposed to cocaine, heroin, and methadone are more active, have more behavior problems, and show less ego resilience, according to parent and teacher ratings at age of school entry (van Baar et al. 1994). At ages 4 and 8 years, children exposed prenatally to amphetamines are more aggressive and show poorer social adjustment (Eriksson and Zetterstrom 1994).

Because of related risk factors such as lower socioeconomic status, lower maternal age and increased parity, poor maternal nutrition and health (including HIV positivity and syphilis), and irregular or nonexistent prenatal care and increased genetic susceptibility, it is difficult to attribute developmental problems solely to *in utero* drug exposure. In addition, social problems such as financial and housing uncertainties and disturbed relations with families may have consequences for the child. Any of these confounding factors may enhance or sometimes mask the effects of maternal substance abuse. Still, parental substance abuse is a risk associated with adverse effects on cognitive, physical, and social development in children. Because exposed preschool children show signs of developmental delay (mostly in the areas of cognitive and social growth and maturity), their transition into school often is difficult. Children with lower levels of intelligence and other cognitive difficulties are at an increased risk for school failure; those with more behavior problems are also at risk and may have difficulty meeting the new demands of the classroom setting.

Problematic Maternal Relationship History (variable marker). In a prospective, longitudinal study by Pianta and colleagues, two groups of disadvantaged mothers and children were formed based on the stability of the mothers' primary social relationships (Pianta, Egeland, and Hyatt 1986). While chaotic relationship history goes hand in hand with environmental disorganization, lack of support, economic disadvantage, and stress, maternal relationship history appears to have value as a summary indicator or variable marker of risk status. Membership in the group of mothers with self-reported chaotic (that is, numerous and unstable) relationships predict maternal behavioral ratings for their 5^{1/2}-year-old sons of hyperactivity, depression, and delinquency. Membership in this group also predicts teacher ratings of aggressiveness, inattentiveness, and self-destructiveness.

Parental Psychopathology (causal risk factor). Researchers are beginning to collect information about the behavioral adjustment of young school-aged children of postnatally depressed mothers. Gross demonstrated that preschool children of depressed mothers have significantly more behavior problems and lower social competence than do children of nondepressed mothers (Gross et al. 1995), while Greenberg showed that maternal depression (among other environmental and behavioral risk factors) during a child's kindergarten year is predictive of child behavior and school achievement problems in first grade (Greenberg et al. 1999). In another longitudinal study, 5-year-old children of a community sample of postnatally depressed and well women were investigated through teacher-respondent questionnaires concerning the children's adjustment in the context of school after the children had finished their first term (Sinclair and Murray 1998). SES and child gender have the most powerful influ-

ence on adjustment; however, postnatal and recent maternal depression contribute additional predictive power for low SES boys.

Poor Parenting Practices (causal risk factor). Evidence shows that effective parents adjust their parenting behaviors in accordance with their developing child's needs. In one study, high rates of positive parent interaction with their children was a protective factor for their children's academic success (marked by math and reading achievement, conversation, vocabulary skill, and block design at age 6 years) (Coates and Lewis 1984). Furthermore, effective parental supervision has a protective effect and is a positive socializing factor that enhances prosocial behavior. In one study, the coping reactions of parents of 58 children exhibiting signs of maladjustment on entering elementary school and changes in adjustment to school were evaluated during the first two school years (Elizur 1986). The relationship between coping and adjustment was evaluated by measuring both synchronous and cross-lagged correlations. As the children's adjustment worsened during the first grade, mothers increased their coping activity, but their efforts did not contribute to an improved adjustment. An adaptive and cohesive family pattern, related to a subsequent improvement in adjustment to school, was composed of variables measuring fathers' coping activities, mothers' positive attempts to stimulate the fathers' coping behaviors, parental support of the children, and their cooperation in coordinating coping strategies.

In contrast, poor parenting techniques and harmful peer influences increase the risk of adverse developmental outcomes. Parents who are harsh, disengaged, provide inconsistent guidelines, and are unable to monitor their children's behavior are more likely to have children with a heightened risk for antisocial behavior (Brier 1995). In a study examining the effects of parenting styles, McFadyen-Ketchum found that mothers who used high levels of coercion and nonaffection with their preschool-aged sons were more likely to have boys with high and increasing aggression in kindergarten. Their daughters, on the other hand, showed high but decreasing aggression in kindergarten (McFadyen-Ketchum et al. 1996). Besides pointing to gender differences, this study provides information about the effects of parenting style on child aggression, an individual characteristic that seems to be a factor in determining school success or failure. In addition, Jacobvitz found that mothers who use intrusive, seductive, or overstimulating styles of care have children who are more likely to have hyperactivity and distractibility problems at school entry at ages 5 to 6 years (Jacobvitz et al. 1987). Egeland also found that intrusive parenting observed during mother-child feeding and play interactions at 6 months predicted academic social, emotional, and behavior problems in first and second grade (Egeland, Pianta, and O'Brien 1993). Finally, Cowan and colleagues (Cowan et al. 1994) have found that ineffective parenting, identified by low warmth and structuring, in the preschool period predicted shy behavior and low academic achievement in kindergarten.

Maltreatment (treated in most studies as a fixed marker). Increased concerns for the welfare and development of maltreated children are shaping new avenues for research. One such area of study has included the effects of maltreatment on a child's academic performance. In their discussion of this research arena, Eckenrode and colleagues noted that children who are maltreated

have higher rates of school problems than children who are not maltreated, including lower test scores in math and English, lower IQ scores, lower child-perceived social acceptance, increased absence from class, and more grade repetitions (Eckenrode et al. 1995). In general, much attention has been paid to the maltreatment of infants and preschoolers (Wodarski et al. 1990). Studies that have focused on academic performance as an outcome have primarily included older school-aged children and adolescents (Eckenrode et al. 1995; Kurtz et al. 1993; Kendall-Tackett and Eckenrode 1996; Wodarski et al. 1990). Additional research is necessary to establish the specific relations between maltreatment and success or failure in young school-aged children's management of the transition into elementary school. In addition, studies with a longitudinal design and with appropriate comparison groups also are necessary (Wodarski et al. 1990).

Insecure Attachment (variable marker). A few studies have explored the impact of early attachment relationships on later school success. In one study, insecurely attached kindergarten boys showed more problem behaviors, had more difficulties with peer relations, and were liked less by peers and teachers in first grade (Cohn 1990). In general, kindergartners who were securely attached in infancy performed better on IQ tests than did children who were insecurely attached as infants (van Ijzendoorn and van Vliet-Vissers 1988). This global finding was qualified in another study that demonstrated that day care appears to have a negative effect for secure children but has a positive influence for insecure children. For the secure group, children in day care are more negative and avoidant at 42 months, and they are more externalizing and aggressive in kindergarten compared to the home-reared group. In contrast, children in day care who were insecurely attached are less withdrawn. Overall, children in day care are rated higher on externalizing behavior in kindergarten than home-reared children, but no differences are found in the later school years (Egeland and Hiester 1995).

Difficulties with Peer Relationships (causal risk factor). Friendship affects children's development and adjustment. In addition to family members and teachers, friends have socializing influences that, according to Hartup (Hartup 1996), provide support for contextual emotional and cognitive learning and development. Friendships are models for later relationships. One recent study of kindergarten students who had best friends looked at several friendship processes and their effect on transition into elementary school, relationship outcomes, and adjustment outcomes (Ladd, Kochenderfer, and Coleman 1996). Ladd and colleagues found that lower levels of conflict and higher levels of validation and exclusivity result in more satisfactory and stable relationships; validation, in particular, is related to children's positive self-perception at school as well as positive perception of peer support. In contrast, conflict is a risk factor for poor school adjustment and decreasing school involvement, especially for boys. In another study, Ladd demonstrated that children who gain friends throughout kindergarten gain achievement as well; the fewer friends and more peer rejection a child has may negatively influence a child's perception of school, school attitude, and school achievement (Ladd 1990). Overall, friendship characteristics can have an adverse or positive effect on children's development and experience in early school environments.

Summary of Protective Factors. Jackson and Frick (Jackson and Frick 1998) have investigated the association between negative life events and protective factors in predicting the adaptive, emotional, and behavioral functioning of 140 school-age children. While this study did not examine 5 to 7-year outcomes, it did report that protective mechanisms in 8-year-olds could be considered in three categories: disposition characteristics (higher IQ, SES, and easier temperament), family environment (higher levels of positive relationships), and social support. Thus, for girls, as negative life events increased, social support and internal perceptions of control acted as protective factors to reduce exhibited internalizing behavior. A high level of maternal education has been established as protective in terms of the prediction of early grade retention (Byrd and Weitzman 1994). Further, it has been noted that residence with both parents (Byrd, Weitzman, and Auinger 1997) and parental remarriage after divorce (Pagani et al. 1997) seem to be protective effects. In addition, for children who begin to show patterns of maladjustment at school entry, cooperative parental coping yields a subsequent improvement in behavioral adjustment to school (Elizur 1986). Outside of the family, experience in day care appears to have a positive influence for insecurely attached children, with such children demonstrating fewer withdrawn behaviors in kindergarten (Egeland and Hiester 1995). In normally developing kindergartners, children with a larger number of classroom friends at school entry gain in school performance and develop more favorable school perceptions.

Microsystems— Day Care and School

Nonmaternal Care (variable marker). In a longitudinal study of nonmaternal care, Belsky (1999) found that more time in nonmaternal care during infancy and early childhood predicted more mother- and father-reported externalizing problems at age 5. However, the effects of nonmaternal care on externalizing problems became insignificant once observed parenting was controlled, thereby providing further evidence of the mediational effects of parenting. Degree of nonmaternal care also predicts more negative adjustment of affective-cognitive functioning at age 5 (including social problem solving); this effect was somewhat attenuated after controlling for parenting skills.

Characteristics of Kindergarten and First-Grade Classes (variable marker). In a large cross-sectional study of first-grade classes in the Netherlands (n = 1162), van den Oord (1999) examined children's psychosocial adjustment at school. School and classroom characteristics were considered as predictors, including sociodemographic characteristics, school facilities, class organization (e.g., class size, number of parent-teacher meetings during the year), and teacher-related variables. Social network indices (e.g., contact between pupils) also were considered as predictors. The author of this study found that positive interpersonal relations among students is related to fewer teacher-reported behavior problems and increases in children's feelings of well-being at school. No measures of psychosocial adjustment at school are predicted by school and classroom characteristics.

Relationships with Grade Teachers (causal risk factor). Ladd and his colleagues examined kindergartners' behavioral and social orientations (Birch and Ladd 1998). They found that early behavioral orientations are related to teacher-child relationship quality in a few specific ways. First, there are unique associations between children's early antisocial behavior and features of their first-grade teacher-child relationships (i.e., negative correlations with closeness, positive correlations with teacher-child conflict, and positive correlations with child dependency). Second, prosocial behavior is generally related to positive aspects of children's first-grade teacher-child relationships. Last, conflict in the teacher-child relationship predicts decreasing prosocial behavior as children adjust to first grade.

Further, Pianta, Steinberg, and Rollins (1995) established that, within a group of children at risk for retention in kindergarten, first grade, or second grade, those children with whom teachers shared a warm relationship, and with whom teachers could openly communicate about personal matters, are not retained. This finding corroborated conclusions from a number of studies suggesting that positive relationships with teachers are associated with better than expected or improved outcomes for both risk and nonrisk samples (e.g., Garnezy 1994; Pedersen, Faucher, and Eaton 1978; Werner and Smith 1980).

Summary of Protective Factors. Ladd and his colleagues have investigated the linkages between relational supports and children's school adjustment. For example, they have noted that boys whose parents tended to initiate peer contacts during preschool became better liked by peers, were more prosocial, and less withdrawn in kindergarten (Ladd and Hart 1992). Further, children with greater preschool experience tended to receive higher ratings from kindergarten teachers for academic behaviors and readiness (Ladd 1990). However, we were unable to find any studies that addressed these possible protective factors in children at risk for problems in early school years. Pianta's study of children at risk for early grade retention demonstrates that a child's warm and open relationship with his or her teacher is a protective factor and is associated with improved academic outcome (Pianta, Steinberg, and Rollins 1995).

Exosystems— Neighborhood, Community, and Socioeconomic Status

Immigrant Status (fixed marker). James has demonstrated that immigrant status is a predictor of increased risk of school failure as well as of psychosocial problems, drug use, and other risk-taking behaviors (James 1997). A wide range of factors may influence this finding, including language facility, degree of acculturation, level of socioeconomic status, level of family education, and/or family support.

Minority Status (fixed marker). Ethnicity, poverty, gender, and household composition have all been associated with indices of school-based competence among children. Being a male with minority ethnic status and being raised in single-parent, low-income homes is associated with higher rates of childhood behavior problems (Rutter 1983) and, except for gender, with lower academic achievement in the first two years of school (Alexander and Entwisle 1988). Be-

cause these risk factors are known to be interrelated, the assessment of the predictive value of any one factor, for example, minority status, must consider the effects of the others. In one large cross-sectional study of 868 black and white elementary school children, results showed that, although ethnicity is a strong predictor of academic achievement test scores, income and gender are better overall predictors of children's competence in conduct and peer relations domains than were ethnicity or household composition (i.e., single parent) (Patterson and Narrett 1990).

Low SES (treated as a fixed marker). Family SES and early language development are positively related to later language development, academic achievement, and school success. Children from higher SES families are exposed to a greater vocabulary in the home environment and have more early language experiences than children from lower SES families. This early advantage for children from high SES families continues into grade school (Walker et al. 1994). Thus, higher SES may be viewed as a factor that enhances school success.

Conversely, lower SES has a potentially negative effect on school achievement. In particular, persistent poverty has more detrimental effects on IQ, school achievement, and social-emotional functioning than does transient poverty, although children in both groups generally do worse than children who have never been poor (McLoyd 1998). Poverty negatively impacts school success, and the conditions of family poverty (e.g., long-term versus episodic) may be an important determinant for identifying children at risk. Infants and young children who live in poverty suffer higher levels of prematurity, infant mortality and morbidity, and subsequent developmental delay, behavioral problems, and inadequate preparation for school (Schorr 1988). One study shows that parental welfare status can be a significant predictor of poor school performance for girls (aged 6 to 11 years) and psychiatric disorder in boys (aged 6 to 11 years) (Offord, Boyle, and Jones 1987).

Dodge and colleagues also examined the observed relation between early socioeconomic status and later child behavior problems (Dodge, Pettit, and Bates 1994). A sample of 585 children ($n = 51$ from the lowest socioeconomic class) was followed from preschool to grade 3. Low socioeconomic status assessed in preschool significantly predicts teacher-rated externalizing problems and peer-rated aggressive behavior in kindergarten and grades 1, 2, and 3. Also, low socioeconomic status is significantly correlated with eight negative factors in the child's socialization and social context, including harsh discipline, lack of maternal warmth, exposure to aggressive adult models, maternal aggressive values, family life stressors, mother's lack of social support, peer group instability, and lack of cognitive stimulation. These factors, in turn, significantly predict teacher-rated externalizing problems and peer-nominated aggression and account for more than half of the total effect of socioeconomic status on these outcomes. These findings suggest that part of the effect of socioeconomic status on children's aggressive development may be mediated by status-related socializing experiences.

In a 10-year longitudinal study, Walker et al. (1994) found that early differences in family SES, child language production, and IQ were related to out-

comes in early elementary school. Differences in parenting behaviors (i.e., time, attention, talking) are associated with differences in child productive vocabulary between 7 to 36 months of age, and child IQ, favoring higher SES parents. Lower SES children were exposed less often than higher SES children to diverse vocabulary through their parents' attention and talking, and they were prohibited from talking more often. Further SES-related differences in child language prior to school are predictive of subsequent verbal ability, receptive and spoken language, and academic achievement assessed on standardized tests in kindergarten through grade 3. When combined with a composite SES indicator, early child language production significantly increases the variance accounted for in the prediction of elementary language and academic competencies in each subsequent year in elementary school.

Summary of Protective Factors. Protective effects of higher SES in reducing teacher- and peer-rated aggressive behavior in early school years has been documented; these may be mediated by status-related socializing experiences (Dodge, Pettit, and Bates 1994).

Macrosystems

Macrosystem issues might include overarching values about education, literacy, school success, or the level of community, state, or federal investment in pre-school care and education. Our review of the literature did not reveal any scientific studies addressing these issues as possible risk factors for problems in early school years.

Intervention Research

The employment of longitudinal study designs helps us establish the causal nature of certain risk factors. The evaluation of the effectiveness of interventions addressing these risk factors allows us to then substantiate the potency of the risk and also gives added weight to its consideration as a causal risk factor. When specific risk factors for early school problems are identified, an investigator can attempt to prevent the onset of school problems, to decrease the frequency or extent of academic or behavioral problems in school, or to effect a more benign course for school problems by an experimental intervention. An effective intervention represents a provisional adjustment of the identified risk, thus validating the risk factor as causal. Greater knowledge of effects of specific risk factors on problematic school entry should allow the development of more effective preventive or treatment interventions and lead to better understanding of the etiology of early behavioral and academic frailty. Ultimately, those effective interventions that are evidence-based are the ones that federal agencies may want states to consider and adopt.

Interventions can be designed at universal, selective (targeted), or indicated levels, with enormous social and ethical differences and policy implications (Gordon 1983). Bronfenbrenner suggests that these are the levels at which interventions operate within the "ecology of childhood" (Bronfenbrenner 1974). Our literature review focuses on interventions directed toward groups defined by risk; therefore, all noted interventions operate at the selective (targeted) level.

Several recently published review papers and texts also have addressed intervention studies in the specific arenas of low birth weight (Dudley et al. 1993; McCormick et al. 1998) and social disadvantage (Karoly et al. 1998; Yoshikawa, 1995).

Most of the interventions we reviewed were designed to address a specific “primary” risk factor, with some interventions also considering related or multiple risk factors. Thus, we chose to organize and summarize intervention research findings by primary risk factor.

Individual Ontogeny

Neurodevelopmental Delay, Low Birth Weight, and Other Medical Problems.

Certain interventions for low birth weight infants can increase school-related performance and reduce parent perception of behavior problems (McCormick et al. 1993; Berlin et al. 1998). Studies of the Infant Health and Development (IHDP) Project demonstrate the effectiveness of such intervention (Ramey 1998; McCormick et al. 1998). At the Miami site of the IHDP, Hollomom and Scott (1998) reported academic success at age 9, as demonstrated through achievement tests and reduced special education placement, for low birth weight and preterm children who had participated in pediatric follow-up visits and center-based developmental intervention and whose parents attended support groups.

In a randomized control trial, sensory integrative therapy and perceptual motor training was used as an intervention for clumsiness (Roussounis, Gausson, and Stratton 1987). Although there were significant gains in motor planning abilities in the treated group, there were no accompanying group improvements in functional skills associated with school performance. Thus, the intervention in the Roussounis study demonstrated positive change but did not affect the targeted outcome, school performance.

Kellam et al. (1998) have examined the influences of the classroom context on the course and malleability of aggressive behavior from entrance into first grade through the transition into middle school. At the start of first grade, nineteen public elementary schools and teachers were randomly assigned to intervention or control conditions, where one intervention was directed at reducing aggressive, disruptive behavior. Children were followed through sixth grade, where middle school teachers rated their aggressive behavior. The more aggressive first-grade boys who were in higher aggressive first-grade classrooms were at markedly increased risk for disruptive behavior in middle school. In first grade, boys already were behaving more aggressively than girls. The preventive intervention reduced aggressive behavior among the more aggressive boys, apparently by lowering levels of general classroom aggression. Established findings linking SES with behavior problems were echoed in this study: first-grade boys' poverty level was associated with higher risk of being more aggressive and disruptive in first grade, and thereby increased their vulnerability to classroom level of aggression.

Microsystems— Family and Peers

Quality of Mother-Child Attachment. As noted earlier, Egeland et al. (Egeland and Hiester 1995) found that the experience of day care (as opposed to rearing at home) has a generally negative effect for securely attached children but a generally positive effect for insecurely attached children. While additional research is needed in this specific area, this finding suggests that a resource such as day care may be used in a targeted manner for children demonstrating risk factors in the realm of attachment relationships.

Maltreatment. The Kempe Early Education Project Serving Abused Families (KEEPSAFE) (Oates et al. 1995) used the model of a therapeutic preschool (combined with home-visit care) to target psychological and educational development of physically and sexually abused children. Data from a very small sample (24 children between 1985 and 1988) suggests that most children who experienced the KEEPSAFE intervention made developmental improvement over the three preschool years as measured by the McCarthy Scales of Children's Abilities and the Peabody Picture Vocabulary Test.

Exosystems— Neighborhood, Community, and Socioeconomic Status

Minority Status. Weikart recently reported that the High/Scope Perry Active Learning Preschool Study intervention, which began in 1962 for black children ages 3 to 4 and low in SES, greatly increased the chance of obtaining social responsibility, good economic status, marriage, and good educational performance by age 27 (Weikart 1998). Additionally, in a pilot community-based intervention program (Project CHILD—Community Health Initiatives Against Learning Difficulties), preschoolers (ages 4 to 6 years) from Latino and African-American families were screened for developmental and educational difficulties by a pediatrician and a psychoeducational specialist before school entry and assessed from preschool day care through the school entry transition two years later. Several psychosocial and medical stressors (such as witnessing a death, homelessness, and familial violence) were identified as having diminishing effects on skills gained through preschool academic programs. In addition, parental empowerment and involvement was identified as a key component of successful preschool intervention and contributed to sustained academic achievement (Tuakli-Williams and Carrillo 1995).

Disadvantaged Status. There have been a number of programs targeted to overcome the cognitive, emotional, and resource limitations that may characterize the environments of disadvantaged children during the first several years of life. The short- and long-term positive effects of preschooling, particularly in disadvantaged populations, have been measured (see review, Barnett 1995). Protective short-term influences include an increase in IQ test scores by approximately 5 points. Long-term effects include decreased referral for special education, decreased grade retention (through the end of high school), increased parent satisfaction with children's early school performance, and increased maternal aspirations for their children's occupations (compared to the children's own aspirations).

Supported by the RAND Corporation, Karoly et al. (1998) very recently examined a set of nine programs that represented attempts by government agencies

or other organizations to improve health and development, educational attainment, and economic well-being of disadvantaged children. Of these, six (Early Training Project; Perry Preschool; Houston Parent-Child Development Center—PCDC; Syracuse Family Development Research Program—FRDP; Project Carolina Approach to Responsive Education—CARE; and Infant Health and Development Project—IHDP) collected information about program effects when participating children were 5, 6, and/or 7 years of age, corresponding to kindergarten and first grade levels. In this information, favorable effects seemed to dominate. The programs led to the following advantages for program participants relative to those in control groups: (a) gains in emotional or cognitive development for the child, in the short run, and (b) improvements in educational process and outcomes for the child (decreased frequency of placement in special education class). The size of this advantage for several programs was substantial in the Early Training Project (home visits and preschool program), Perry Preschool (home visits and preschool program), and IHDP (home visits and center-based educational day care).

The Carolina Abecedarian Project. This was an experimental preschool and school-age educational intervention for children from low-income families. At follow-up, 4 to 7 years after the intervention ceased, grade failure rate decreased and intellectual development and academic achievement were most positive for those children who participated in both preschool and school-age programs, supporting evidence that later scholastic achievement and benefits are proportional to duration of treatment received (Campbell 1994; Horacek et al. 1987)

Project CARE. Based on studies and initiatives of the Carolina Abecedarian Project, Project CARE was developed during the 1970s for children at risk for developmental difficulties because of low family SES or little family education. Wasik reported a longitudinal comparison of two intervention strategies of Project CARE: the Child Development Center Program (a day care program addressing cognitive and social development) and the Family Education Program (a home-based child development and parent support program). Findings after 6 months of intervention showed greater child improvement on measures of development (Bayley Scales of Infant Development and the McCarthy Scales of Children's Abilities at later ages) and IQ (Stanford-Binet) for participants taking part in both the family educational program and the day care program. These results help illustrate the benefits and importance of combining parent support programs and child preschool education to improve child outcomes (Wasik et al. 1990).

The High/Scope Perry Preschool Study (Weikart 1998). This education preschool intervention program was begun in 1962 for disadvantaged African-American children ages 3 to 4 years. One of the many studies that have characterized and supported the intervention followed the children through early adulthood (age 27) and determined a \$7.16 return (in cost-benefit analysis) for every dollar originally invested in the preschool program; these adults showed improved social responsibility as well as educational achievement. In the High/Scope Curriculum Comparison study, Weikart compared outcomes at age 23 among children who had taken part in a highly intensive educational program

versus children from a program focused on building individual choice and initiative. This study showed that children from the intensive academic program were significantly less socially responsible at age 23, suggesting that high-quality, early intervention that includes a focus on the child's independent decision-making has long-term benefits that extend into early adult years.

The Mother-Child Home Program (MCHP) (Madden, O'Hara, and Levenstein 1984). Designed for low-income families, this preschool intervention focused on mother-child interaction and later child behavior and academic benefits. The program consisted of 46 home visits, twice a week for two years. Three years later, no significant effects on scholastic achievement, IQ, or teacher-rated school adjustment were found.

Head Start. A small but well-designed study investigated the sustained effects, into kindergarten and first grade, for Project Head Start. Lee et al. (1990) executed a longitudinal follow-up comparison of disadvantaged children attending Head Start, no preschool, and other preschool programs. Participation in generic Head Start programs was compared to both no preschool and other preschool experience for disadvantaged children in two American cities in 1969 and 1970. Incorporating pretest/posttest and comparison group information, the study had advantages over other Head Start impact studies. Both preprogram background and cognitive differences were controlled in a covariance analysis design, using dependent measures in the cognitive, verbal, and social domains. Children who attended Head Start maintained educationally substantive gains in general cognitive/analytic ability, especially when compared to children without preschool experience. However, these effects were not as large as those found immediately following the Head Start intervention. Findings suggested an effect of preschool rather than of Head Start per se. Initial findings of greater effectiveness of Head Start for children of below average initial ability were reduced but not reversed. The diminution of effects over time, especially for low-ability children, may reflect differences in quality of subsequent schooling or home environment.

The Child Parent Center (CPC) Program (Reynolds et al. 1996). This Chicago-based, multisite program utilized a structured half-day care for low-income, mostly black preschoolers to promote school readiness, competence, and academic achievement. Parental involvement and school readiness were rated by teachers at school entry (after preschool) and later at entry to sixth grade (age 12). At follow-up, preschool program participants had significantly higher academic achievement in reading and math as well as less grade retention. In addition, teacher ratings of parent involvement and cognitive readiness in kindergarten significantly mediated the preschool intervention effects. Teacher ratings of school adjustment, school mobility, and grade retention also contributed to the transmission of effects.

Macrosystems

Our review of the literature did not reveal any empirical articles or reviews addressing this arena of cultural beliefs and values as a possible target for intervention studies.

Discussion

A number of critical questions are raised in this examination of peer-reviewed research on risk and protective factors for early school problems and success. First, are there adequate numbers of studies that meet minimal criteria for scientific excellence and how does our understanding of risk factor mechanisms and processes measure up? Second, what proportion of identified risk factors are “causal risk factors” and therefore malleable through appropriate interventions? Third, how have we understood and addressed the complexities of multiple risk factors? Fourth, where are we in terms of identifying protective factors? Finally, have we adequately tested proposed risk factors via intervention studies?

Studies Meeting Criteria for Scientific Excellence

Forty-eight risk-factor and 16 intervention studies, represented in peer-reviewed manuscripts published between 1980 and 1999, were found to meet our minimal criteria for excellence. To review, these criteria included the following:

- A longitudinal, prospective design
- Careful definition and sampling of a population free of the disorder at baseline
- Definition and measurement of the putative risk factors at the baseline
- Definition and measurement of outcomes at follow-up
- Use of analytic strategies to establish statistically significant correlations between risk factors and outcomes

Of these 64 studies, 34 risk studies and 12 intervention studies focused on single risk factors, while the remainder (14 and 4, respectively) considered multiple risk factors. Single-risk-factor studies were predominantly in the Individual Ontogeny domain. Studies focused on multiple risk factors tended to consider fixed markers (e.g., gender, ethnicity, SES) in conjunction with other risk factors.

To be able to better characterize the current state of the literature, after completing our review, we considered several additional criteria of scientific excellence (see Table 7).

These additional criteria represent critical issues, including clarifying descriptions of the target population, moving beyond the simple identification of risk factors to the consideration of risk processes and mechanisms of action, and establishing the potency of risk factors and interventions with measures of effect size interpretable in terms of clinical and policy significance. Far fewer studies met these criteria. Thus, while prospective longitudinal design and careful sampling strengthened most of the studies, many of the risk-factor investigations focused on fixed and variable markers and fewer focused on causal risk factors.

Further, while statistical analyses conducted for the intervention studies yielded evidence of statistical significance between intervention groups and comparison groups, attempts to document practical or clinical significance were

noted in a relatively small proportion of the articles reviewed. The report of a statistically significant result must be accompanied by enough information about the size of its effect to permit evaluation of its clinical significance. Clinical significance can be addressed in several ways (Kraemer 1992). A simple and common way to measure effect size is the standardized mean difference between participant response in intervention and comparison groups (difference between group means divided by the standard deviation of the response in the comparison group). Measured in this manner, an effect size is thought to be small (around .2), moderate (around .5), and large (around .8) (Cohen 1977). Consideration of effect sizes allows us to sort out the relative impact of different risk factors on a given outcome, controlling for other risk factors. Odds ratios also represent a standard by which clinical significance is expressed;⁴ for a small effect size, the minimal value is 1.38; for a moderate effect size, the minimal value is 2.23; and for a large effect size, it is 3.62 (Kraemer 1992). Of the six studies we reviewed that used odds ratios, three reported odds ratios greater than 2.2.

Another potentially valuable addition to this literature would be to use an epidemiological approach and estimate population attributable risk—the proportion of cases that would be prevented if an intervention were 100 percent effective in eliminating the risk factor (Eaton, Badawi, and Melton 1995). However large the effect of a specific risk factor, its practical effect may be small if only a small proportion of the population is exposed to such risk. Conversely, removing a risk factor of small effect size may be valuable if it affects a large number of children. Population attributable risk estimates would be valuable for policy-makers. These risk estimates could be used to estimate the effectiveness of a given intervention program and to compare various intervention strategies.

Causal Risk Factors

Of the reviewed studies addressing risk factors, 27 percent focused on causal risk factors. Of the reviewed studies addressing interventions, 69 percent considered the mechanisms by which the risk factor(s) was hypothesized to operate, and 0 percent utilized targeted or selective interventions that impacted causal risk factors. As noted by Luthar et al. (1997) and other researchers (Masten, Best, and Garmezzy 1990; Rutter 1990), the focus of empirical work needs to continue to move forward from simply identifying risk and protective factors to understanding risk and protective processes. Attention to underlying mechanisms is critical for designing and implementing appropriate intervention strategies.

Thus, for example, there are multiple mechanisms that may explain the collection of findings confirming the family's influence on children's adaptation to school. Children's school adjustment is affected by dyadic relationships that include the child (i.e., parent-child and sibling-child). The availability, quality, and style of familial interactions may directly influence the child's development. Family relationships that do not directly include the child (e.g., marital relationships) may also powerfully influence children by their impact on the dyadic family relationships that do involve the child as well as by affecting the child via observational learning. Social systems outside the family (e.g., SES, parental employment, and work conditions) can also produce stresses that impact family processes and thus affect the child.

At the ages of 5 to 7 years, school becomes a major context for children's social development. Barth and Parke (1993) suggest that a number of factors related to the child's social experiences in school have a direct impact on early school success. Possible mechanisms of action may include the fact that, compared to families, schools provide less personalized attention, more heterogeneous beliefs and values, more formal evaluation, and more same-aged playmates. In school, a child experiences dyadic relationships with teachers and peers, experiences interactions with the classroom system (e.g., including rules and norms for classroom behavior, teacher management), and must cope with the larger school institution, all of which contribute to the development of a general attitude toward school and toward educational and social institutions.

Similarly, children's social competencies and relationships with peers have an effect on their transition into elementary school. Ladd, Kochenderfer, and Coleman (1996) postulate that the dynamic features of classroom friendships, including degree of validation and conflict, provide various psychological benefits and costs for children that, in turn, impact their early school adjustment.

Taken together, the transition into school likely plays a critical role in the incubation of preexisting risk and protective factors in the child as well as in the development of new ones. The larger social networks and the new adult-child and institution-child relationships add considerable methodological and conceptual complexity to the study of risk, but there can be little doubt of the importance of considering these school-related factors in developing more complete models of risk development, expression, and protection.

Multiple Risk Factors

As noted above, studies included in this review focused on multiple risk factors in 28 percent of cases. Not only do children experience multiple risk factors, but they may be exposed to these risk factors at varying levels of risk and vulnerability over the course of their lives, raising the possibility that risk might compound over time or that the effects of optimal targeted interventions might fluctuate with child age.

Studies have demonstrated that both individual risk factors and the number of risk factors (cumulative risk) predict children's behavior problems. For example, in a study of the predictors of externalizing behavior, 20 risk variables from four domains (child, sociocultural, parenting, and peer-related) were measured, via in-home interviews and parent reports of child externalizing behaviors (Deater-Deckard et al. 1998). Particular risk factors accounted for 36 percent to 45 percent of the variance in externalizing symptoms, and the number of risk factors present (cumulative risk status) accounted for 19 percent to 32 percent of the variance in externalizing outcomes. It is important that cumulative risk was related to subsequent externalizing even after initial levels of externalizing had been statistically controlled. Moreover, risk variables in all four of the measured domains made significant, unique contributions to this statistical prediction, and there were multiple clusters of risks that led to similar outcomes.

Other models of multiple risk factors contrast with such findings of cumulative risk. For example the Gordon and Jens model (1988) conceives of risk as additive across areas at any given time, but not cumulative over time. It provides for (1) assessment of risk status at several times during early development, (2) assessment of risk in several areas at each time, (3) differential weighting of risk in each area depending on the time of measurement, and (4) consideration of the fact that individuals move in and out of risk at various times.

Multiple risk factors may also operate in causal chains (Kazdin and Kraemer 1997), one causal risk factor leading to another, with the ultimate result being problematic outcomes—behavioral, social, and academic—in early school. The term “mediator risk factor” has been suggested (Baron and Kenny 1986; Kraemer et al. 1997) as a way of modeling such causal chains. A mediator risk factor (e.g., harsh discipline) explains how an earlier risk factor (e.g., low SES) works to produce a negative outcome (e.g., behavioral problems in kindergarten through third grade; see Dodge, Pettit, and Bates 1994). The term “moderator risk factor” has been suggested (Baron and Kenny 1986; Kraemer et al. 1997) for a risk factor, such as male gender, that identifies on whom another risk factor (e.g., an insecure attachment relationship; see Cohn 1990) operates. Identification of such causal chains is important in understanding the process by which problems or disorders are generated. In the literature we reviewed, temporal precedence of one risk factor to another (essential to establishing which risk factor mediates or moderates which) is rarely addressed.

The fact that we can identify multiple risk factors at multiple levels suggests that interventions may need to address those multiple levels—modifying parenting strategies, increasing maternal education and improving mental health, supplementing family financial resources, and even improving the school and neighborhood milieu. The most effective use of the significant resources required to address multiple risk factors also will depend on an increased understanding of the duration and importance of one risk factor compared to another.

Protective Factors

Where are we in terms of identifying protective factors, either broadly construed or by subtype (e.g., “protective-stabilizing,” “protective-enhancing,” “protective but reactive”)? Unfortunately, there has been far less attention to protective factors that reduce susceptibility to disorder and problems than to risk factors. Much of the research effort in this arena has focused on toddlers (Sroufe, Egeland, and Kreutzer 1990; Werner and Smith 1980) and older children/adolescents (Jackson and Frick 1998; Luthar 1991; Luthar 1993; O’Dougherty-Wright et al. 1997; Werner 1994) and, with some notable exceptions (Birch and Ladd 1997; Lothman and Pianta 1993; Egeland and Hiester 1995), has not specifically considered early school success or failure as an outcome. Nonetheless, it is useful to consider Werner’s conclusions about protective factors in the Kauai Longitudinal Study (Werner 1994). Prenatal and perinatal complications for a 1955 cohort of Hawaiian neonates (of whom 54 percent

were economically disadvantaged) were related to impairment of physical and psychological development *only* when combined with chronic poverty, family discord, or and/or parental mental illness. Children who were raised in middle-class homes, in a stable family environment, and by a mother who had finished high school showed few if any lasting effects of stress in utero later in life. In addition, active participation in school activities and identification of a favorite teacher as a role model also served as protective factors (Werner 1997). Werner and colleagues assessed this cohort at ages 1, 2, 10, 18, and 32 years; however, one might expect that the effects of such protective factors would also have been apparent at ages 5 to 7 years.

The limited work that has addressed protective factors related to early school success suggests that parents are a potentially critical socializing agent who can serve as a protective shield for the at-risk youngster. Key parenting skills include rule-setting, rule-monitoring, consistency, and positive emotional tone of communications. Belsky further has postulated that day-to-day experiences in the classroom and on the playground also may be protective in nature, resulting in some children performing better than would otherwise be expected (Belsky and MacKinnon 1994). The work of Ladd and colleagues (Birch and Ladd 1997; Ladd and Hart 1992; Ladd 1990), which focuses on the linkages between relational supports and children's school adjustment, is highly relevant; however, it has not yet been applied to groups of at-risk children.

More research on protective factors is clearly necessary. We need to recognize that such research will engender some of the same conceptual and policy issues outlined earlier for risk research (e.g., many putative protective factors are not amenable to intervention). In addition, there are difficult methodological issues that will need to be solved for research on protective factors to be more definitive (e.g., the inherent interactions between risk factors and protective factors). Nonetheless, identifying protective factors represents a most promising avenue for more fully understanding the mechanisms by which risk translates and fails to translate into disorder and can suggest important and potentially effective interventions that emphasize quite different approaches than those based solely on consideration of risk.

Intervention Studies

It is apparent that low birth weight, low IQ, early behavioral and peer relationship problems, and low SES are risk factors for academic and behavioral problems during the first two years of school. In support of these risk factors, we can draw on both basic risk-factor research as well as intervention research. In addition, lack of maternal education, prenatal exposure to addictive substances, and problematic parenting practices are good candidates for identification as risk factors for difficult school entry. In these cases, there is reasonably solid basic behavioral research evidence. However, our review did not reveal any studies that both measured early academic success and attempted to mount parent-based interventions with high- and low-risk groups defined by these dimensions.

Given our focus on risk factors and the identification of groups of children who are at greater risk for difficulties in adapting to school, the use of targeted or selective interventions continues to represent a logical strategy. For example, prior to kindergarten entrance, it may be useful to identify children who are prone to maladaptive behavioral dispositions, such as aggression, and involve them in targeted interventions designed to promote prosocial, adaptive behaviors such as pursuing positive contacts with peers. However, we also could pursue more universal interventions designed to help all families provide children with important formative experiences in school settings, for example, arranging for children to attend preschool and to develop neighborhood friendships with peers before entering elementary school. Further, in planning peer composition of new classrooms, school administrators may wish to consider grouping children so as to maximize contact with prior friends (Rutter 1990).

Directions for Future Risk Factor and Intervention Research

We need a greater knowledge and understanding of risk factors and processes that utilize established definitions of risk factors as fixed markers, variable markers, or causal risk factors if we are to move forward with effective prevention or treatment interventions. In child health fields, past investigation of risk for poor school adaptation has led to much discussion and theorization of causation, prevention, and/or intervention techniques. Theory now should lead us to begin rigorous empirical investigation of causal relationships among risk factors and outcomes.

Future research should focus on and address the following:

Risk factor research design and methodology

- Emphasize longitudinal methods. Cross-sectional and retrospective designs cannot help us draw causal comparisons and establish relations among risk factors; these causal comparisons are necessary for developing prevention and treatment solutions. Studies must always include *carefully selected* control/contrast groups, documenting intervention compliance where applicable, and establishing blind assessment approaches free of observer bias.
- With an emphasis on longitudinal methods, be aware of the limitations of inferring causality for longitudinal designs (much has happened before the longitudinal research starts, so multiple processes may already be under way).
- Examine the viability of using more proximal measures of risk over more distal ones, which might enable shorter term longitudinal studies to be fruitful.
- Look carefully for nonlinear findings—increasing risk may not always yield increasingly bad outcomes.
- Interweave risk-factor and intervention studies. Intervention research can elucidate and inform our understanding of risk-factor mechanisms if studies are creatively designed to show dose/response relationships and use randomized controlled designs longitudinally. This will, in turn, provide a basis for clinical intervention and provide empirical groundwork for policy-making.
- Replicate model intervention programs on a larger scale.
- Consider the issue of random assignment in intervention studies. What are the obstacles to this research design in the natural environment?

Multiple and confounding risks

- Assess causal chains (mediating risk factors) and alternate possibilities (moderating risk factors) with an examination of how risk-outcome processes work, identifying “branch points” for possible interventions.
- Develop more creative study designs to investigate relative expression and importance of multiple and coexisting risk factors.
- Rethink our organization of possible risk factors. Consider including more specific studies of biological risk factors in conjunction with behavioral and

social risk factors, including gene loci, specific gene products (biochemical responses), plus specific central and peripheral nervous system functions.

- Consider the problems of confounding designation of risk and outcome variables. For example, poor school performance is a risk factor for later negative outcomes, but it also is a negative outcome that might result from risks such as poor childhood nutrition or early maltreatment.

Exploration of known risk factors

- Examine the issue of “critical periods.” Are there times when children are particularly vulnerable or invulnerable to the effects of certain risk factors?
- Many putative risk factors change gradually over time (e.g., the income part of SES). How do these changes get considered in models of risk outcomes?
- In some populations putative risk factors change suddenly over time (e.g., refugee populations who sometimes undergo sharp changes in profession, status, income, etc.). How do these changes get considered in models of risk outcomes?
- Address missing risk factor research. A recent review of the research in early childhood programs suggests that the early childhood years present a special opportunity to intervene in multiple domains of risk and to prepare children for school and life (Gomby et al. 1995). However, most of the research to date has focused on a small subset of single risk factors (e.g., low birth weight and low SES). Few intervention studies have addressed family factors such as social competence, family functioning, child-parent interactions, or family involvement. In addition, basic behavioral research on the interplay among cognition, emotion, and behavior would benefit from an increased focus on the developmental period encompassing 5-, 6-, and 7-year olds; such research then could inform a translational process that would bring the basic research efforts into the applied educational and therapeutic arenas.
- Continue our consideration of diverse populations. With risk factors that have been well-established, such as SES and ethnic diversity, we need to work toward a better understanding of how that risk is conveyed. We also need to increase the diversity of our risk research in terms of specific risk factors (e.g., low birth weight as a risk factor is arguably overrepresented in the literature), ethnic groups (e.g., Native Americans at risk for depression, suicide, and poor academic achievement have been understudied), and family types (e.g., children of teen parents are a rapidly growing population).
- Consider variation in outcomes *within* groups defined by strong fixed and variable risk factors (e.g., SES, ethnicity). Explore further how “resiliency” fits within this area of scientific work.

Risk factor relevance and interpretation of outcomes

- Draw conclusions and connections between risk and outcome. We need to organize and aggregate outcome conclusions more precisely, keeping in mind the possibility of co-morbidity and multiple manifestations of single problems or disorders.

- Multiple outcomes (and perhaps nonlinear relations with multiple risk factors) should be investigated. Risk factors that increase the likelihood of difficult school transitions are also associated with early substance abuse, teenage motherhood, and chronic delinquency. In another example, it appears that children in single-parent homes are at greater risk for problems with school entry as well as psychopathology, including boys' increased risk for conduct disorder, and both girls' and boys' increased risk for obsessive compulsive disorder (Velez, Johnson, and Cohen 1989).
- Establish hypotheses for processes and mechanisms of risk, keeping in mind the differences between indicators (fixed and variable markers) and risk processes. Many risk factors of interest in the literature (gender, ethnicity) are by definition fixed markers. However, so far there have been only limited efforts to distinguish between variable markers and causal risk factors.
- Clinical significance can be established only when the targeted intervention demonstrates ability to impact a causal risk factor and to decrease risk. Studies demonstrating a statistically significant efficacy of an intervention or statistically significant risk depend only on having a sample size large enough to detect whatever size of effect there is, plus adequate measurement, design, and analyses. The principles for establishing clinical or practical significance are based on consideration of factors such as need, cost, and availability of resources. A key question is whether the effect of an intervention is strong enough to warrant the investment of resources necessary to implement it. As Kraemer suggests,

To safeguard, not merely the credibility of scientific research, but the direction and rapidity of progress, as well as to enhance the impact of well-done studies on medical and social policy, it is essential that strategies be exploited to separate the issue of "statistical significance" from that of clinical and practical significance, and to clarify both. (Kraemer 1992, p. 535)

- Policy-makers should encourage their scientific colleagues to utilize strategies to facilitate judgments about the viability and desirability of intervention programs for targeted populations.
- Expand our understanding of protective factors with regard to risk.

Implications for Policy

The final step in considering this general area of applied science is determining whether there is a conceptual framework that facilitates the translation of research findings in risk/protective factor research and intervention research to the policy arena. Identifying and understanding the links between research findings and large-scale public programs and policy is challenging (see paper by Cavanaugh et al., in this report), because researchers and policy-makers operate within different professional contexts, with different demands, vocabulary, communication styles, and measures of success. Researchers establish the basic or clinical science underpinnings as well as assess the needs for new services, the quality and outcomes of existing services, and the reasons implemented interventions succeed or fail. Policy-makers provide new dollars or shift allocations of existing dollars among programs, and influence effectiveness of programs by setting outcome expectations and procedural requirements.

The findings of this review suggest that the need for preventive interventions for the families of children at increased risk for educational problems likely will require changes in social and healthcare policy. It appears that services are frequently designed restrictively, attending only to the individual with the problem, while the larger needs of the family systems, offspring, and the functioning of involved adults seems neglected. Cumulative risk data imply that different services may be required to address multiproblem families. Policy-makers need to consider attempting to increase the effectiveness of intervention programs by delivering more extensive, repeated, and/or longer lasting services.

Evidence indicates that a number of markers and predictors of school problems, many of which are detectable during early infancy, may be valuable to policy-makers in determining how to maximize the effectiveness of finite resource allocation. Experience with child and family social services suggests that this research is unfamiliar to most policy-makers and to those responsible for program/policy implementation. As a result, their efforts to target problems may be based more on anecdotal information, intuition, current salience, or past experience. Identifying and synthesizing available research in this area, followed by broad dissemination and promotion of findings, could catalyze additional efforts to improve and better coordinate our nation's response to the risk of school failure.

Conclusions and Major Lessons Learned

We have learned several things from this examination of peer-reviewed research on risk and protective factors for early school problems and success. First, with some qualifications, we can conclude that there are a substantial number of studies that meet criteria for scientific excellence. Second, approximately one-third of the reviewed research focuses on causal risk factors, while the remainder focuses on fixed and variable markers. Third, the issue of causality is critical to our design and testing of interventions.

1. We have research studies meeting criteria for scientific excellence

More than 60 studies, represented in peer-reviewed manuscripts published between 1980 and 1999, met minimal criteria for excellence (i.e., longitudinal design; problem-free population sample at baseline; measurement of risk factors at baseline and outcomes at follow-up; statistically significant correlations between risk factors and outcomes). Most of these studies considered large (> 100), well-defined samples. Clearly, there is substantial literature that represents a careful research focus on those social-emotional factors that contribute to difficulties in the transition into the early years of school. Limitations in the extant literature include four areas:

- Primary focus on single risk factors. There is less research on multiple risk factors and incomplete consideration of cumulative risk or causal chains (including mediators and moderators) of risk factors.
- Limited research on protective factors. There has been far less attention to protective factors that reduce susceptibility to disorder and problems than to risk factors that increase disorder. Future research must explore models of resilience and the plausibility that positive relationships with parents, teachers, and peers may serve as protective shields for at-risk children.
- Little consideration of clinical significance in addition to statistical significance. Most studies establish statistical significance; relatively few address clinical meaningfulness. Of the studies in this review that did address clinical importance, only three noted odds ratios > 2.2, indicating at least moderate clinical significance. The principles for establishing clinical or practical significance are based on consideration of factors such as need, cost, and availability of resources. Understanding clinical significance of an intervention allows us to try to address a key question: Is the effect of an intervention strong enough to warrant the investment of resources necessary to implement it?
- Incomplete understanding of mechanisms of risk. Future research needs to move beyond the simple identification of risk factors to the consideration of risk processes and mechanisms of action. We need to know if there are critical periods during which children are particularly vulnerable or invulnerable to assumed risk. Assumptions of linear relations between risk and negative outcomes are probably not always

appropriate—when is a “little” stress or a “little” risk beneficial? Many putative risk factors (e.g., SES) change over time. How do we understand the impact of such change? Most importantly, attention to underlying mechanisms is critical for designing and implementing appropriate intervention strategies.

2. We have begun to define and identify causal risk factors

Of the reviewed studies addressing risk factors, 27 percent focused on causal risk factors—those risk factors that can be changed and, when changed, alter the risk of the outcome. These causal risk factors include cognitive deficits, early behavioral problems, parental psychopathology, problematic parenting practices, and difficulties with peers and teachers. Strikingly, several of these are concerned with lack of success in early important relationships (e.g., with parents, peers, and teachers). The remaining studies focused primarily on fixed markers; that is, risk factors that cannot be demonstrated to change. Membership in ethnic minority and immigrant groups, low socioeconomic strata, and difficult temperament all represent fixed markers associated with academic and behavioral difficulties during early school years.

It is critical to recognize which risk factors represent fixed and variable markers. This knowledge is informative; a fixed marker may suggest opportunities for universal interventions. However, this is not a reasonable basis for structuring targeted interventions, which can most appropriately address and shift causal risk factors. The capacity to distinguish between fixed marker and causal risk factors plays a vital role in designing, implementing, and evaluating appropriate interventions.

3. We can use our knowledge base to systematically design and apply interventions

The fact that we can identify multiple risk factors at multiple levels suggests that interventions may need to address those multiple levels—modifying parenting strategies, increasing maternal education and improving mental health, supplementing family financial resources, and even improving the school and neighborhood milieu. The most effective use of the significant resources required to address multiple risk factors also will depend on an increased understanding of the duration and importance of one risk factor compared to another.

Given our focus on risk factors and the identification of children who are at greater risk for difficulties in adapting to school, the use of targeted or selective interventions to address causal and malleable risk factors continues to represent a logical strategy. Problematic relationships, with parents, teachers, and/or peers, seem likely candidates for causal risk factors. For example, prior to kindergarten entrance, it may be useful to identify children who are prone to maladaptive behavioral dispositions, such as aggression, and involve them in targeted interventions designed to promote prosocial, adaptive behaviors such as pursuing positive contacts with peers. Other causal risk factors, for example, parental use of substances or parental psychopathology, are ripe for consideration for future targeted interventions.

We have begun to interweave risk-factor and intervention studies. Intervention research can elucidate and inform our understanding of risk-factor mechanisms if studies are creatively designed to show dose/response relationships and use randomized controlled designs longitudinally. This will, in turn, provide a basis for clinical intervention and provide empirical groundwork for policy-making.

Notes

- 1 It is important to note, however, that the appearance of one characteristic earlier than another in a longitudinal design does not absolutely establish that the first causes the second. For example, inherent limitations in the sensitivity of our measures and observations cannot eliminate those situations in which both characteristics start at the same time (or even when the purported outcome precedes the putative risk) but develop at different rates. In such instances, the observed sequencing may merely reflect different times to reach the threshold for detection by our measures.
- 2 We note that there are particular subsets of research not included in this review: (1) mental retardation or less severe cognitive impairment and direct effects on early school problems or failure, and (2) chronic disease and its effects on early school problems or failure. The presence of a chronic disease (e.g., diabetes mellitus, seizure disorders, asthma, and sensory deficits) may affect school performance directly or indirectly via medication effects, absenteeism, self-esteem, or motivational problems.
- 3 Low birth weight is an individual characteristic that is manipulable and, if low birth weight is addressed directly through interventions (i.e., by treating preterm labor and delaying delivery), it could be conceived of as a causal risk factor. However, most interventions treat low birth weight as a marker of an at-risk population group.
- 4 Odds ratio is defined as $\frac{pc(1-pt)}{(1-pc)pt}$, where pc = comparison response and pt = intervention or treatment response.

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Appendix: Tables

Table 1. Neurodevelopmental Constructs for Preschool, Kindergarten, Grade One*

Regulation

Attention Controls

- Need for activity modulation
- Demand for concentration in group settings
- Call for delays in gratification
- Requirement to conform to routines
- Need for bottom-up processing (as in reading)
- Demand for attention to detail

Organization

Temporal-Sequential Ordering

- Need to assimilate basic time and seriation concepts/ time vocabulary
- Exposure to multistep instructional inputs
- Initial ordering of alphabetical, numerical, and phonological seriation
- Assimilation of routines and schedules

Spatial Ordering

- Demand for visual discriminatory abilities (e.g., shape and symbol distinctions)
- Stress on visual-motor integration
- Requirement for appreciation of visual boundaries (lines on paper, spaces between words)

Interpretation and Implementation

Language Functions

- Expectation for vocabulary growth spurt
- Need for accurate articulation, intelligibility
- Call for keen phonological awareness and manipulation
- Demand for literate (noncolloquial) language use and comprehension
- Introduction of specialized vocabulary

Neuromotor Functions

- Stress on eye-hand coordination and fine motor praxis
- Initial awareness of gross motor efficacy
- Requirement for controlled fine motor stabilization (e.g., pencil grip, scissors)
- Need for nonvisual finger localization functions

Social Cognitive Functions

- Need to emerge for parallel play
- Compliance with adult supervision in play
- Initial challenge of sharing and conflict resolution
- Beginning differentiation of peer and adult interaction rules

Preservation

Memory Capacities

- Call for deliberate paired associate learning (e.g., grapheme, phoneme)
- Introduction of abstract, symbolic visual memory
- Frequent use of episodic memory

Sophistication

Higher Order Cognitive Functions

- Strong reliance on sensory data and perception
- Need for empirical discovery (awareness) of concepts
- Initial encounters with abstract symbols
- Experience with trial-and-error hypotheses
- Classification skills

*Extracted from Levine, *All Kinds of Minds*, 1997.

Table 2. Risk for Difficult Entry into School: Literature Search and Review Records

Terms	Database Searched	N articles	Limitation	N limitation articles	Deleted: any abstract not representing children 0–9 (n = #left)	Deleted: any abstract not including school success or failure (n = #left)
1. Risk + school entry [or MeSH school]	NLM Medline	96	English, Child (0–18), Year 1980–1999, plus...	70		
			... Review	1	0	
			... Predictor	4	3	2
			... Longitudinal	13	9	2
			... Intervention	2	2	0
2. Protective + school entry [or MeSH school]	NLM Medline	8	English, Child (0–18), Year 1980–1999, plus...	6		
			... Review	0		
			... Predictor	0		
			... Longitudinal	1	1	1
			... Intervention	0		
3. Risk + school entry [or MeSH school]	OVID Medline	301	Journal Article, English, Child (0–18), Year 1981–1999, plus...	186		
			... Review	12	4	0
			... Predictor	6	3	1
			... Longitudinal, longitudinal studies	24	14	1
			... Intervention, early intervention (education), intervention studies	25	14	0
			... Review	12	4	0
4. Protective + school entry [or MeSH school]	OVID Medline	17	Journal Article, English, Child (0–18), Year 1981–1999, plus...	9		
			... Review	1	1	1
			... Predictor	0		
			... Longitudinal, longitudinal studies	2	2	1
			... Intervention, early intervention (education), intervention studies	2	2	0
5. Risk + special education	NLM Medline	310	English, Child (0–18), Year 1980–1999, plus...	242		
			... Review	20	18	9
			... Predictor	5	4	2
			... Longitudinal	20	16	7
			... Intervention	58	52	30

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Table 2. Risk for Difficult Entry into School: Literature Search and Review Records (continued)

Terms	Database Searched	N articles	Limitation	N limitation articles	Deleted: any abstract not representing children 0-9 (n = #left)	Deleted: any abstract not including school success or failure (n = #left)
6. Protective + special education	NLM Medline	13	English, Child (0-18), Year 1980-1999, plus...	6		
			... Review	1	1	0
			... Predictor	0		
			... Longitudinal	1	1	1
			... Intervention	1	1	0
7. Risk + special education	OVID Medline	51	Journal article, English, Child (0-18), Year 1981-1999, plus...	47		
			... Review	3	3	0
			... Predictor	0		
			... Longitudinal, longitudinal studies	11	9	5
			... Intervention, early intervention (education), intervention studies	9	7	4
8. Protective + special education	OVID Medline	2	Journal article, English, Child (0-18), Year 1981-1999, plus...	1	1	1
			... Review	0		
			... Predictor	0		
			... Longitudinal, longitudinal studies	0		
			... Intervention, early intervention (education), intervention studies	0		
9. Risk + kindergarten	NLM Medline	109	English, Child (0-18), Year 1980-1999, plus...	86		
			... Review	4	4	0
			... Predictor	5	5	3
			... Longitudinal	22	21	5
			... Intervention	6	6	3
10. Protective + kindergarten	NLM Medline	6	English, Child (0-18), Year 1980-1999, plus...	5		
			... Review	0		
			... Predictor	0		
			... Longitudinal	1	1	1
			... Intervention	1	1	0

(Continues on next page)

Table 2. Risk for Difficult Entry into School: Literature Search and Review Records (continued)

Terms	Database Searched	N articles	Limitation	N limitation articles	Deleted: any abstract not representing children 0–9 (n = #left)	Deleted: any abstract not including school success or failure (n = #left)
11. Risk + kindergarten; schools, nursery	OVID Medline	140	Journal article, English, Child (0–18), Year 1981–1999, plus...	101		
			... Review	4	4	0
			... Predictor	4	4	3
			... Longitudinal, longitudinal studies	37	36	11
			... Intervention, early intervention (education), intervention studies	8	8	2
12. Protective + kindergarten; schools, nursery	OVID Medline	12	Journal article, English, Child (0–18), Year 1981–1999, plus...	6		
			... Review	0		
			... Predictor	0		
			... Longitudinal, longitudinal studies	2	2	0
			... Intervention, early intervention (education), intervention studies	1	1	0
13. Risk + Transition to school [or MeSH school]	NLM Medline	60	English, Child (0–18), Year 1980–1999, plus...	50		
			... Review	4	0	
			... Predictor	5	0	
			... Longitudinal	12	1	0
			... Intervention	6	3	0
14. Protective + Transition to school [or MeSH school]	NLM Medline	3	English, Child (0–18), Year 1980–1999, plus...	1		
			... Review	0		
			... Predictor	0		
			... Longitudinal	0		
			... Intervention	0		

(Continues on next page)

Table 2. Risk for Difficult Entry into School: Literature Search and Review Records (continued)

Terms	Database Searched	N articles	Limitation	N limitation articles	Deleted: any abstract not representing children 0-9 (n = #left)	Deleted: any abstract not including school success or failure (n = #left)
15. Risk + Transition to school [or MeSH school]	OVID Medline	3	Journal article, English, Child (0-18), Year 1981-1999, plus... ... Review ... Predictor ... Longitudinal, longitudinal studies ... Intervention, early intervention (education), intervention studies	3 0 0 1 0	0	
16. Protective + Transition to school [or MeSH school]	OVID Medline	0	Journal article, English, Child (0-18), Year 1981-1999, plus... ... Review ... Predictor ... Longitudinal, longitudinal studies ... Intervention, early intervention (education), intervention studies	0 0 0 0 0		

Overview/Summary Page

Tier 1: search terms

Tier 2: search limitations

Tier 3: search terms

Risk + school entry
Protective + school entry

Risk + special education
Protective + special education

Risk + kindergarten
Protective + kindergarten

Risk + transition (to) school
Protective + transition (to) school

Journal Article
English
Child (0-18)
Year 1980(1) - 1999

Review
Predictor
Longitudinal
Intervention

Terms examined in two databases: NLM Medline Internet Grateful Med & OVID Medline

Table 3
Risk for Difficult Entry into School – Specific Papers

Citation	Bax and Whitmore 1987
Sample/Population	351 English children entering school, age 5 (283 later at age 7, 230 at age 10).
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Neurodevelopmental abnormalities.
Proposed Mechanism of Risk	Children at age 5 with neurodevelopmental abnormalities are particularly susceptible to learning difficulties when they're older, perhaps due to a broad, over-all neurological dysfunction instead of being simply of below-average cognitive ability.
Predictors	Neurodevelopmental scores of abnormality and doctor's clinical opinions at school entry.
Outcomes	Health and educational outcomes at age 10 (reading, learning, and behavior difficulties); poor academic achievement at age 7.
Evidence of Statistical Significance and Statistical Model	77% of children with a high neurodevelopmental score (high abnormality) at age 5 were referred to school psychologist by age 10.
Evidence of Clinical Significance	None.
Citation	Bender et al. 1995
Sample/Population	60 low SES mothers and 74 children (4–6 years old) in San Francisco.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Prenatal or postnatal environmental exposure to mother's crack-cocaine use.
Proposed Mechanism of Risk	In utero exposure adds to postnatal environmental deprivations.
Predictors	Time of prenatal exposure to cocaine.
Outcomes	Poor expressive language, visual motor drawing, and neurological gross motor performance.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.

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Key to abbreviations

ADD	attention deficit disorder	DDST	Denver Developmental Screening Test	OR	odds ratio
ANCOVA	analysis of covariance	ELBW	extremely low birth weight	RISC	Risk Index of School Capability
ANOVA	analysis of variance	FH	family history	SD	standard deviation
CBCL	Child Behavior Checklist	LBW	low birth weight	SES	socioeconomic status
CI	confidence interval	LD	learning disability	VLBW	very low birth weight
CNS	central nervous system	MANOVA	multiple analysis of variance	WISC	Wechsler Intelligence Scale for Children
CRT	complex reaction time			WRAT	Wide-Range Achievement Test

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Blondis, Snow, and Accardo 1990
Sample/Population	67 first-graders from Missouri.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Academic problems.
Proposed Mechanism of Risk	None proposed.
Predictors	Low scores on Missouri Kindergarten Inventory of Developmental Skills: poor right-handed coordination, overall graphesthesia, associated movements left.
Outcomes	Persistent neurological soft signs.
Evidence of Statistical Significance and Statistical Model	Means, standard deviations, and ANOVAs.
Evidence of Clinical Significance	None.
Citation	*Byrd and Weitzman 1994
Sample/Population	9,996 US children (7–17 years at follow-up).
Study Design	Survey.
Risk/Protective Factor Identified	Risk factors: Poverty, male gender, low maternal education, deafness, speech defects, LBW, enuresis, exposure to household smoking. Protective factors: high maternal education, residence with both parents at age 6.
Proposed Mechanism of Risk	Not proposed.
Predictors	Evidence of risk/protective factors on survey.
Outcomes	History of repeating kindergarten or 1st grade.
Evidence of Statistical Significance and Statistical Model	Chi square, logistic regression.
Evidence of Clinical Significance	Odds ratios for risk factors 1.4 to 1.7 Odds ratios for protective factors 0.6 and 0.7.
Citation	Cadman et al. 1988
Sample/Population	1999 children at age 5 (kindergarten), follow-up at age 7 (2nd grade).
Study Design	Prospective longitudinal (3-year).
Risk/Protective Factor Identified	Preschool scores on the Denver Developmental Screening Test (DDST).
Proposed Mechanism of Risk	None proposed.
Predictors	Teacher-rated learning problems in kindergarten, preschool scores on DDST.
Outcomes	Learning problems in 2nd grade (Gates-MacGinitie reading test).
Evidence of Statistical Significance and Statistical Model	Logistic regression model.
Evidence of Clinical Significance	None.

* Protective factors considered

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Campbell and Ewing 1990
Sample/Population	32 hard-to-manage preschoolers and 22 controls, age 9 at follow-up.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Hard-to-manage behaviors before school entry.
Proposed Mechanism of Risk	None proposed.
Predictors	Clinically significant behavior problems at school entry, age 6.
Outcomes	Externalizing disorders at age 9.
Evidence of Statistical Significance and Statistical Model	Multiple regression.
Evidence of Clinical Significance	67% of the hard-to-manage group from kindergarten met DSM-III criteria for an externalizing disorder at age 9.
Citation	Campbell et al. 1986
Sample/Population	46 parent-referred children with problem behaviors, 22 controls.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Preschool problem behaviors.
Proposed Mechanism of Risk	None proposed.
Predictors	Maternal ratings of problem behaviors.
Outcomes	Inattention, impulsivity, aggression, or some combination at school entry.
Evidence of Statistical Significance and Statistical Model	ANOVAs.
Evidence of Clinical Significance	1/3 of group met DSM criteria for ADHD at school entry.
Citation	Coates and Lewis 1984
Sample/Population	40 mothers and their 3-month-old infants, follow-up with child at age 6.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Early mother-child interaction.
Proposed Mechanism of Risk	Effective parents adjust their behavior in accordance with developing child’s needs.
Predictors	Frequency and proportion of interaction measures, at age 3 months.
Outcomes	Child’s math and reading achievement, conversation and WISC vocabulary and block design, at age 6.
Evidence of Statistical Significance and Statistical Model	Multiple regression analyses; percentage responsivity measures were best predictors of child performance.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Cohen et al. 1989
Sample/Population	976 families in two upstate New York counties.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Unwanted baby, pregnancy emotional trauma, low birth weight, physical trauma during pregnancy, pregnancy problems, childhood accidents, child major and minor illness.
Proposed Mechanism of Risk	Confounding and intervening mechanisms: SES, children’s problems at time of original interview. Low intelligence, poor child health, family dissolution, and maternal rejection were “potential mechanisms by which early risk is translated into later psychopathology.”
Predictors	Pregnancy problems, child illness/injury, somatic risk, emotional risk.
Outcomes	Behavior disorders.
Evidence of Statistical Significance and Statistical Model	Correlation analyses and regressions; relative risks.
Evidence of Clinical Significance	None.
Citation	Cohen 1995
Sample/Population	105 children born prematurely.
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Premature birth.
Proposed Mechanism of Risk	None proposed.
Predictors	Neonatal neurobehavioral organization, early social stimulation, and social class.
Outcomes	Increased intellectual competence, school achievement, social competence and self perception of cognitive competence at ages 2, 5, 8, 12, 18.
Evidence of Statistical Significance and Statistical Model	Multiple regressions.
Evidence of Clinical Significance	None.
Citation	Cohn 1990
Sample/Population	89 kindergarten through 1st grade children and their mothers.
Study Design	Prospective.
Risk/Protective Factor Identified	Child-mother attachment.
Proposed Mechanism of Risk	None proposed.
Predictors	Child-mother attachment, gender (insecurely attached boys only).
Outcomes	Peer relations, being liked by peers and teachers, behavior problems (e.g., aggression).
Evidence of Statistical Significance and Statistical Model	MANOVA, intercorrelations.
Evidence of Clinical Significance	None.

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Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Den Ouden et al. 1996
Sample/Population	717 preterm and/or VLBW infants born in 1983 in the Netherlands.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Hypothyroximia.
Proposed Mechanism of Risk	Direct effect of hypothyroximia on brain maturation.
Predictors	Thyroxine levels in first week of life.
Outcomes	14% of survivors had handicapping disabilities at age 5; at age 9, 27% had grade retention, 18% required special education.
Evidence of Statistical Significance and Statistical Model	Multivariate logistic regression.
Evidence of Clinical Significance	School failure at age 9 significantly related to thyroxine levels in 1st week of life; 30% increase in odds for neurologic dysfunction with early thyroxine levels 1 SD lower.
Citation	Dodge, Pettit, and Bates 1994
Sample/Population	585 children followed from preschool to grade 3.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Low SES in early childhood.
Proposed Mechanism of Risk	Low SES mediated by status-related socializing experiences.
Predictors	Preschool SES.
Outcomes	Behavior problems (teacher-rated externalizing and peer-rated aggressive behaviors) in grades K–3.
Evidence of Statistical Significance and Statistical Model	Correlations, hierarchical regression and structural equations analyses.
Evidence of Clinical Significance	None.
Citation	Egeland, Pianta, and O’Brien 1993
Sample/Population	37 “high-risk” children; 145 comparison children.
Study Design	Longitudinal .
Risk/Protective Factor Identified	“high risk” = intrusive maternal interactions with child in feeding and play at 6 months old.
Proposed Mechanism of Risk	Intrusive caregiving at 6 months may have adverse effects in 1st, 2nd, and 3rd grades where the child may have difficulty adapting self-control and interactions, interest, and involvement with teachers and peers.
Predictors	Intrusive maternal interactions with child at 6 months, male gender.
Outcomes	Academic problems (measured by Peabody Individual Achievement Test), social (teacher-rated problems), emotional (teacher-rated problems), and behavioral (measured with the CBCL) in first and second grade.
Evidence of Statistical Significance and Statistical Model	MANCOVA, then ANCOVA – findings were still robust after covarying for maternal IQ, stressful family life events, and maternal affective behavior.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Elizur 1986
Sample/Population	58 first grade children exhibiting signs of maladjustment and their parents .
Study Design	Prospective.
Risk/Protective Factor Identified	Father’s coping, mother’s coping, parental support of children, parents’ cooperation in coordinating coping strategies.
Proposed Mechanism of Risk	None proposed.
Predictors	Parental coping; signs of child distress at school entry.
Outcomes	Child’s adjustment, cohesive family pattern.
Evidence of Statistical Significance and Statistical Model	Synchronous and cross-lagged correlations
Evidence of Clinical Significance	None.
Citation	Fazio, Naremore, and Connell 1996
Sample/Population	34 US children from impoverished environments.
Study Design	Longitudinal 3-year.
Risk/Protective Factor Identified	Poverty.
Proposed Mechanism of Risk	None proposed.
Predictors	Performance on standardized/experimental tests of language development.
Outcomes	Specific language impairment or academic failure.
Evidence of Statistical Significance and Statistical Model	Multi-regression model, chi square, correlations.
Evidence of Clinical Significance	None.
Citation	Finkelstein and Ramey 1980
Sample/Population	921 first grade children from North Carolina.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Race, birth order, weight, maternal age and education (at birth – from birth certificate).
Proposed Mechanism of Risk	None proposed.
Predictors	Scores on measures of intellectual competence and measure of adaptive behavior.
Outcomes	Educational status as “handicapped” or “non-handicapped” in 1st grade (as determined from scores on the Peabody Picture Vocabulary Test and Pupil Rating Scale).
Evidence of Statistical Significance and Statistical Model	Linear classification analysis to predict known outcome.
Evidence of Clinical Significance	None.

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Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	*Fowler and Cross 1986
Sample/Population	210 US preschoolers.
Study Design	Prospective.
Risk/Protective Factor Identified	Developmental, medical, and social factors (family history and education, gender, age). Protective factors: higher maternal education, absence of family history for learning problems.
Proposed Mechanism of Risk	None proposed.
Predictors	0–11 Risk Index of School Capability (RISC) score, physician’s assessment of attention.
Outcomes	Grade failure, poor reading and math scores in 1st and 2nd grades.
Evidence of Statistical Significance and Statistical Model	Linear and logistic regression.
Evidence of Clinical Significance	RISC scale had 98% positive predictive value of successful grade completion and 70% predictive value for failure.
Citation	Fried, Watkinson, and Gray 1992
Sample/Population	126 72-month-old children in Canada.
Study Design	Follow-up.
Risk/Protective Factor Identified	Maternal substance use in pregnancy.
Proposed Mechanism of Risk	Impaired CNS development.
Predictors	Maternal smoking, marihuana, or alcohol use during pregnancy.
Outcomes	Success/failure on vigilance tasks; positive impulsivity or hyperactivity ratings by mother.
Evidence of Statistical Significance and Statistical Model	Discriminant function analysis.
Evidence of Clinical Significance	Prenatal marihuana associated with increased omission errors in vigilance task. Dose-response relationship between prenatal smoking and poorer response inhibition as well as higher error of commission rates.
Citation	Frisk 1991
Sample/Population	113 girls and 102 boys at entry into Swedish schools, age 7.
Study Design	Longitudinal (to grade 3).
Risk/Protective Factor Identified	Poor CNS development.
Proposed Mechanism of Risk	CNS dysfunction.
Predictors	Slow complex reaction time (CRT).
Outcomes	Grade 1, slow CRT boys had poor ratings for gross and fine motoricity, concentration, and language development.
Evidence of Statistical Significance and Statistical Model	Chi square, Fischer’s non-parametric, t-test, correlations.
Evidence of Clinical Significance	None.

* Protective factors considered

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Greenberg et al. 1999.
Sample/Population	337 families from 4 American communities.
Study Design	Longitudinal case-control.
Risk/Protective Factor Identified	Single parent, number of siblings, mother’s age at child’s birth, ethnicity, life stress, marital distress, social support, home environment, parent depression, neighborhood risk.
Proposed Mechanism of Risk	None proposed.
Predictors	Demographics, family psychosocial status, maternal depression, neighborhood quality.
Outcomes	Children’s psychological problems (externalizing/internalizing), children’s social competence, and academic achievement at grade 1.
Evidence of Statistical Significance and Statistical Model	Multiple regression models, least squares regression, path analyses.
Evidence of Clinical Significance	None.
Citation	Gross et al. 1995
Sample/Population	97 preschool-aged children followed 2–3 years.
Study Design	Longitudinal cohort.
Risk/Protective Factor Identified	Maternal depression.
Proposed Mechanism of Risk	Boys’ behaviors may be more aversive to depressed mothers, who may then respond negatively and reinforce difficult behaviors .
Predictors	Maternal depression, gender.
Outcomes	Preschool children’s mental health (social competence and behavior problems).
Evidence of Statistical Significance and Statistical Model	Mean differences, item analyses.
Evidence of Clinical Significance	None.
Citation	Hack et al. 1992
Sample/Population	249 VLBW children in Ohio, 8–9 years old.
Study Design	Longitudinal.
Risk/Protective Factor Identified	VLBW.
Proposed Mechanism of Risk	None proposed.
Predictors	VLBW vs. NBW, SES.
Outcomes	VLBW had significantly lower scores on tests of language, IQ, memory, visual and fine motor skills, and academic achievement; VLBW had more behavior problems (higher CBCL scores).
Evidence of Statistical Significance and Statistical Model	Two-tailed univariate analyses.
Evidence of Clinical Significance	Odds ratios (–1.2 to 4.9).

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Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Horwood, Mogridge, and Darlow 1998
Sample/Population	Two New Zealand birth cohorts: 298 VLBW and 1,092 controls.
Study Design	Longitudinal cohort.
Risk/Protective Factor Identified	VLBW status.
Proposed Mechanism of Risk	A gradient relationship between ELBW, VLBW and NBW children and level of impairment.
Predictors	VLBW status, ELBW status, gender.
Outcomes	Child behavior problems, decreased cognitive ability and poor school achievement (enrollment in special education) at age 7–8.
Evidence of Statistical Significance and Statistical Model	t-tests; chi squares; multiple regression methods for confounding variables.
Evidence of Clinical Significance	Odds ratios 2.1 to 4.4 for behavior problems; 1.7 to 4.9 for poor school achievement, and 2.9 to 6.3 for special education.
Citation	*Jackson and Frick 1998
Sample/Population	140 children aged 8–13.6 years.
Study Design	Cross-sectional.
Risk/Protective Factor Identified	Protective factors: high SES and IQ, easy temperament, positive family relationships and personal growth within family.
Proposed Mechanism of Risk	None proposed.
Predictors	Protective factors and negative life events, gender differences.
Outcomes	Adaptive and non-adaptive behavior (internalizing/externalizing behavior).
Evidence of Statistical Significance and Statistical Model	Regression analyses – negative life events not related to adaptive behavior. Protective factors were predictive of absence of non-adaptive behavior.
Evidence of Clinical Significance	None.
Citation	Jacobvitz et al. 1987
Sample/Population	68 children assessed at ages 6 months, 2, 3, and 5 years.
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Mother-child interactions before kindergarten.
Proposed Mechanism of Risk	None proposed.
Predictors	Maternal intrusive care, seductive behavior and over-stimulation.
Outcomes	Hyperactivity and distractibility at kindergarten (age 5–6).
Evidence of Statistical Significance and Statistical Model	Correlations.
Evidence of Clinical Significance	Distractibility at 42 months and motor immaturity (after birth) were predictive of hyperactivity at kindergarten.

* Protective factors considered

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	James 1997
Sample/Population	Immigrant children and adolescents.
Study Design	Cross-sectional descriptive.
Risk/Protective Factor Identified	Immigration: conflicts and adjustments to new home, school, and society.
Proposed Mechanism of Risk	Psychosocial problems, school failure, drug use, other risk-taking behavior.
Predictors	None.
Outcomes	None.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.
Citation	Jones 1990
Sample/Population	All South Carolina students grades 1, 2, 3, and 6.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Age, race, sex, lunch payment status.
Proposed Mechanism of Risk	None proposed.
Predictors	Age at school entry, gender, ethnicity, lunch-assisted vs. full-paying students.
Outcomes	Reading failure on the Basic Skills Assessment Program reading test.
Evidence of Statistical Significance and Statistical Model	Logistic regression.
Evidence of Clinical Significance	Adjusted odds ratios: risk of failure greatest for younger students when controlled for race, sex, and lunch-paying. Race, sex, lunch-paying = greatest risk overall.
Citation	Kochanek, Kabacoff, and Lipsitt 1990
Sample/Population	268 children (handicapped adolescents at follow-up) and 268 controls.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Environmental factors and child performance data at birth, 4, 8, and 12 months old.
Proposed Mechanism of Risk	None proposed.
Predictors	Maternal education, child performance data at birth, 4, 8, and 12 months old.
Outcomes	Status as handicapped in adolescence, learning and behavior problems.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Ladd, Kochenderfer, and Coleman 1996
Sample/Population	82 kindergarten children.
Study Design	Cross-sectional.
Risk/Protective Factor Identified	Quality of friendships.
Proposed Mechanism of Risk	Making friends establishes support bases and better integration into the academic milieu.
Predictors	Child’s perceptions of friend conflict, exclusivity, validation, aid, self-disclosure.
Outcomes	Perceived conflict associated with school maladjustment for boys, exclusivity associated with lower levels of achievement.
Evidence of Statistical Significance and Statistical Model	Correlation, regression, and factor analyses.
Evidence of Clinical Significance	Validation and aid “forecasted” gains in perceived support and aid predicted improvements in school attitudes.
Citation	Ladd 1990
Sample/Population	125 kindergartners.
Study Design	Prospective, longitudinal.
Risk/Protective Factor Identified	Classroom peer relations.
Proposed Mechanism of Risk	None proposed.
Predictors	Number of friends; peer rejection.
Outcomes	Perception of school, school attitude, school achievement (behavioral).
Evidence of Statistical Significance and Statistical Model	Correlational, regression, and principle components analyses; children who gained friends through year gained achievement as well.
Evidence of Clinical Significance	None.
Citation	Malo and Tremblay 1997
Sample/Population	Boys from low SES environments.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Maternal social position, family SES, paternal alcoholism.
Proposed Mechanism of Risk	None proposed.
Predictors	Low SES, paternal alcoholism.
Outcomes	School placement, among a long list of others.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	McCarton et al. 1997
Sample/Population	336 LBW infants (lighter and heavier) follow-up (at 8 years).
Study Design	Longitudinal.
Risk/Protective Factor Identified	LBW lighter (2000g); LBW heavier (2001–2500g).
Proposed Mechanism of Risk	None proposed.
Predictors	Cognitive functioning, academic achievement, behavior, health at 8 years.
Outcomes	Modestly improved outcomes in heavier LBW infants.
Evidence of Statistical Significance and Statistical Model	ANOVA.
Evidence of Clinical Significance	None.
Citation	McFadyen-Ketchum et al. 1996
Sample/Population	Children followed from kindergarten to third grade (n=585).
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Prekindergarten measure of aggression from CBCL; coercive mother-child interactions and home environment, gender.
Proposed Mechanism of Risk	Mother-child interactions may be more predictive because they are the primary caregivers of young children and spend much more time with their children than fathers.
Predictors	Mother-child interactions of coercion and affection; level of kindergarten aggression predictive of later aggression.
Outcomes	High levels of aggression in kindergarten for both boys and girls with maternal coercion at home. Increase in aggression for boys over time with high maternal coercion and low maternal affection, but not for girls .
Evidence of Statistical Significance and Statistical Model	Pearson Correlations; ANOVAs.
Evidence of Clinical Significance	Teacher ratings of aggression observed to increase or decrease over time.
Citation	McGee and Stanton 1994
Sample/Population	N=765 children from New Zealand, followed from birth to age 18.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Maternal smoking during pregnancy.
Proposed Mechanism of Risk	Association between smoking and maternal reports of behavior problems reflect confounds with maternal mental health.
Predictors	Maternal smoking status during pregnancy.
Outcomes	Maternal rating of child behavior problems at school entry.
Evidence of Statistical Significance and Statistical Model	Regression analyses; maternal rating of problem behaviors at school entry was the only significant finding linked to smoking during pregnancy (both girls and boys).
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Morrison, Griffith, and Alberts 1997
Sample/Population	Kindergartners and 1st graders.
Study Design	“Pre-post” design.
Risk/Protective Factor Identified	Age at school entry.
Proposed Mechanism of Risk	Academic risk.
Predictors	Age was not a good predictor of learning or academic risk.
Outcomes	None.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.
Citation	Offord, Boyle, and Jones 1987
Sample/Population	2643 welfare children, 6–16 years old.
Study Design	Survey (cross-sectional).
Risk/Protective Factor Identified	SES.
Proposed Mechanism of Risk	None proposed.
Predictors	Parental welfare status, gender.
Outcomes	Psychiatric disorder and poor school performance.
Evidence of Statistical Significance and Statistical Model	Logistic regression, chi square.
Evidence of Clinical Significance	Odds ratio for psychiatric disorder 2.02 to 4.12 and for poor school performance 1.68 to 6.54.
Citation	Olsen et al. 1998
Sample/Population	42 8-year old children with history of pre-term delivery plus controls.
Study Design	Birth cohort.
Risk/Protective Factor Identified	Preterm delivery.
Proposed Mechanism of Risk	None proposed.
Predictors	Preterm delivery and poor health at delivery.
Outcomes	Psychological performance, teacher-reported learning disability and neurologic exam at age 8.
Evidence of Statistical Significance and Statistical Model	Non-parametric t-test; correlation coefficients.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	*Pagani et al. 1997
Sample/Population	2,000 school children followed from age 6 to age 12.
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Parent divorce (as risk factor) and remarriage (as protective factor).
Proposed Mechanism of Risk	There may be problems such as internalizing symptoms and impaired school performance that are “vulnerable to family breakdown”.
Predictors	Age of child at parent divorce, parents’ marital status.
Outcomes	Child’s problem behaviors; remarriage had protective effect on hyperactivity.
Evidence of Statistical Significance and Statistical Model	Autoregressive modeling technique.
Evidence of Clinical Significance	None.
Citation	Pianta, Steinberg, and Rollins 1995
Sample/Population	436 children from school entry to grade 2.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Poor student-teacher relationships.
Proposed Mechanism of Risk	None proposed.
Predictors	Student-Teacher Relationship Scale – quality of student-teacher relationship in kindergarten.
Outcomes	Child behavior, adjustment, and competence problems in 2nd grade.
Evidence of Statistical Significance and Statistical Model	Correlations, ANOVA, discriminant function analyses.
Evidence of Clinical Significance	None.
Citation	Reynolds, Weissberg, and Kasprow 1992
Sample/Population	683 U.S. inner-city kindergartners and 1st graders.
Study Design	Longitudinal cohort.
Risk/Protective Factor Identified	Demographics (ethnicity, SES, grade level), family and school factors.
Proposed Mechanism of Risk	Constructive relationship between parent and teacher is a critical element in the family-school relationship (<i>quality</i> of parent school involvement). Quality may reflect “good” parenting, may promote a teacher’s relation with the child, and may provide social support for the family and better school adjustment for family.
Predictors	Quality of parent involvement, exposure to life events, SES in kindergarten.
Outcomes	Early school adjustment: competence behavior, problem behavior, reading achievement, math achievement, and school absences at first grade.
Evidence of Statistical Significance and Statistical Model	Multiple regression.
Evidence of Clinical Significance	None.

* Protective factors considered

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Richardson, Conroy, and Day 1996
Sample/Population	Offspring of 28 cocaine-using pregnant women/mothers and children of 523 non-users.
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Prenatal cocaine exposure.
Proposed Mechanism of Risk	Effects of exposure may result from interaction between exposure (CNS changes) and environmental factors.
Predictors	Cocaine and other substance use/abuse during early pregnancy.
Outcomes	Child deficits in ability to sustain attention on vigilance task at age 6 years.
Evidence of Statistical Significance and Statistical Model	ANCOVA: No significant effects found on growth, intellectual ability, academic achievement or teacher-rated classroom behavior. One significant effect found on attention.
Evidence of Clinical Significance	None.
Citation	Rochiccioli et al. 1992
Sample/Population	58 cases of neonatal hypothyroidism, matched controls.
Study Design	Prospective, screening neonatal.
Risk/Protective Factor Identified	Neonatal hypothyroidism.
Proposed Mechanism of Risk	None proposed.
Predictors	Lower T4 levels at birth.
Outcomes	Increased grade retention, lower IQ.
Evidence of Statistical Significance and Statistical Model	Non parametric analyses.
Evidence of Clinical Significance	None.
Citation	Roussounis, Gausson, and Stratton 1987
Sample/Population	At school entry: 17 “clumsy” children, 17 age- and gender-matched controls.
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Motor coordination problems.
Proposed Mechanism of Risk	None proposed.
Predictors	Failure on standardized Motor Test Battery.
Outcomes	Impaired educational attainment; inferior motor performance.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Schothorst and Van Engeland 1996
Sample/Population	177 children with neonatal problems.
Study Design	Longitudinal prospective follow-up.
Risk/Protective Factor Identified	Preterm birth.
Proposed Mechanism of Risk	None.
Predictors	Preterm birth.
Outcomes	Behavior problems, social and school competence.
Evidence of Statistical Significance and Statistical Model	Multiple regression.
Evidence of Clinical Significance	None.
Citation	Saigal, Szatmari, and Rosenbaum, 1992
Sample/Population	81 ELBW children “at risk” for learning problems at age 5, tested at age 8.
Study Design	Prospective.
Risk/Protective Factor Identified	Birth weight.
Proposed Mechanism of Risk	ELBW population difficult to screen because of already-present risk and developmental limitations in cognition, language, motor and social functioning.
Predictors	ELBW status and “at risk” status at age 5 from Florida Kindergarten Screening Battery.
Outcomes	LD or IQ problems at age 8.
Evidence of Statistical Significance and Statistical Model	Likelihood ratios to test Florida Kindergarten Screening Battery; correlations.
Evidence of Clinical Significance	None.
Citation	Schwartz et al. 1999
Sample/Population	389 kindergarteners and 1st graders.
Study Design	Longitudinal follow-up in 3 years.
Risk/Protective Factor Identified	Early behavior problems.
Proposed Mechanism of Risk	Behavior problems determine victimization mediated by peer rejection, moderated by dyadic friendships.
Predictors	Behavior problems.
Outcomes	Victimization.
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Streissguth et al. 1994
Sample/Population	500 children with Fetal Alcohol Syndrome (FAS).
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	FAS.
Proposed Mechanism of Risk	Cerebellar dysgenesis.
Predictors	Maternal drinking before and during pregnancy.
Outcomes	Child’s problems with IQ, balance, attention/reaction (vigilance task), neurobehavioral problems at age 4.
Evidence of Statistical Significance and Statistical Model	Correlations and measures of covariance.
Evidence of Clinical Significance	None.
Citation	Taylor et al. 1998
Sample/Population	68 VLBW children and 65 controls, age 6.7–6.9 years.
Study Design	Longitudinal.
Risk/Protective Factor Identified	VLBW vs. <750g birth weight.
Proposed Mechanism of Risk	“Effects of biologic risk may diminish with age and are increasingly overshadowed by environmental factors.” Social risk depends partly on biologic risk.
Predictors	Neonatal Risk Index (biologic risk), age, gender and social risk factors.
Outcomes	Cognitive function, neuropsychological abilities, academic achievement, parent and teacher reports of adaptive behavior and school performance.
Evidence of Statistical Significance and Statistical Model	Linear regression.
Evidence of Clinical Significance	Odds ratios 1.72 to 8.61 (95% CI).
Citation	Tremblay et al. 1994
Sample/Population	1,034 boys from Quebec participating in study from kindergarten to 13 years old.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Kindergarten personality.
Proposed Mechanism of Risk	None proposed.
Predictors	Impulsivity, anxiety, reward dependence in kindergarten.
Outcomes	Stable, highly delinquent behavior at age 11–13.
Evidence of Statistical Significance and Statistical Model	Likelihood ratios, logistic regression analyses.
Evidence of Clinical Significance	None.

(Continues on next page)

Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Van Baar and de Graaff 1994
Sample/Population	35 prenatally drug-exposed children and 35 controls, from Amsterdam.
Study Design	Prospective longitudinal.
Risk/Protective Factor Identified	Prenatal exposure to drugs.
Proposed Mechanism of Risk	Children may be less cooperative due to addicted parents' difficulties in adjusting to school hours.
Predictors	Having drug-dependent mother, prenatal exposure to drugs.
Outcomes	Development and cognitive functioning at preschool age.
Evidence of Statistical Significance and Statistical Model	Rank order correlations; ANOVA.
Evidence of Clinical Significance	None.
Citation	Van Ijzendoorn and Van Vliet-Vissers 1988
Sample/Population	77 children (mean age = 24 months).
Study Design	Longitudinal.
Risk/Protective Factor Identified	Attachment problems.
Proposed Mechanism of Risk	None proposed.
Predictors	Secure vs. insecure attachment (secure = highest IQ).
Outcomes	Performance on IQ test (Keiden Diagnostic test).
Evidence of Statistical Significance and Statistical Model	None.
Evidence of Clinical Significance	None.
Citation	Vohr and Garcia Coll 1985
Sample/Population	42 VLBW infants.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Very low birth weight and impaired neurological development.
Proposed Mechanism of Risk	Neurodevelopmental deficits.
Predictors	Scores and classification of neuro-development at age 1.
Outcomes	IQ level, reading age level (WRAT), special education needs at age 7.
Evidence of Statistical Significance and Statistical Model	ANOVA, student's t-test, chi square.
Evidence of Clinical Significance	None.

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Table 3 (continued)
Risk for Difficult Entry into School – Specific Papers

Citation	Walker et al. 1994
Sample/Population	32 children 7 months old, follow-up at 36 months and 10 years old.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	At 7 and 36 months: family SES, intellectual ability (Stanford-Binet) and language ability (cumulative number of different words spoken; mean length of utterance in morphemes).
Proposed Mechanism of Risk	None proposed.
Predictors	SES, IQ, language ability.
Outcomes	Student intellectual ability, language academic achievement.
Evidence of Statistical Significance and Statistical Model	Hierarchical regression.
Evidence of Clinical Significance	None.

Table 4
Risk for Difficult Entry into School – Review Papers

Citation	*Brier 1995
Population Addressed	Children with delinquency and antisocial behavior.
Literature Reviewed, # articles	90.
Aims of article	To investigate risk factors involved with antisocial behavior and poor academic achievement.
Discussion of risk or protective factors	Risk factors included: temperament (hyperactivity, distractibility, rigidity) school attitudes, poor/protective parenting, IQ.
Relevant Outcomes addressed	Delinquency, school failure.
Conclusions and Over-all Message	Risk and protective factors mentioned can be used in a preventive manner against antisocial behavior and school failure.
Future needs, clinical significance	Treatments and interventions need to target these risk/protective factors.
Citation	Casey and Evans 1993
Population Addressed	Preschoolers.
Literature Reviewed, # articles	11.
Aims of article	To address issues, definitions, and the physician’s roles involved in assessing school readiness.
Discussion of risk or protective factors	Demographic, age and clinical factors; medical risks.
Relevant Outcomes addressed	School success/failure – grade retention or failure.
Conclusions and Over-all Message	School readiness should be addressed cautiously (outlines a conservative approach for physicians); retention is not generally recommendable.
Future needs, clinical significance	Need collaborative assessments for school readiness among physician, parents and school staff.
Citation	Cicchetti and Toth 1998
Population Addressed	Children and adolescents with depressive disorders.
Literature Reviewed, # articles	174.
Aims of article	To describe a “depressotypic” developmental organization that may be a precursor to depressive illness.
Discussion of risk or protective factors	A broad set of risk factors, which can contribute to childhood depression, reaches across biology, evolution, and psychology.
Relevant Outcomes addressed	Outcomes of depressive disorders, including “aberrations in cognitive, socio-emotional, representational and biological domains.”
Conclusions and Over-all Message	We must keep in mind the many varying developmental capacities of children as we treat depressive disorders.
Future needs, clinical significance	Preventive interventions for families with history of depression; increase social awareness to decrease social stigma.

* Protective factors considered

(Continues on next page)

Table 4 (continued)
Risk for Difficult Entry into School – Review Papers

Citation	Feagans 1983
Population Addressed	Children with learning disabilities.
Literature Reviewed, # articles	40.
Aims of article	To review the definition, research and treatment of “learning disabilities”.
Discussion of risk or protective factors	Neurological, behavioral, and psychological problems.
Relevant Outcomes addressed	Lower scores on IQ tests, behavior or neurological difficulties, academic problems.
Conclusions and Over-all Message	We need to further define “learning disabilities,” as well as develop new intervention strategies.
Future needs, clinical significance	More recent research involving multivariate statistics can address interaction of cognitive processes.
Citation	Fowler, Schwartz, and Atwater 1991
Population Addressed	Preschoolers in programs with special education.
Literature Reviewed, # articles	48.
Aims of article	To address the transition of preschoolers receiving special education services into kindergarten or alternative placements.
Discussion of risk or protective factors	Disabilities.
Relevant Outcomes addressed	“Positive” transition to school, success in kindergarten.
Conclusions and Over-all Message	Parent, child, teacher and caregiver roles must be well-coordinated to suit individual family needs.
Future needs, clinical significance	Future research needed to evaluate services and quality of transition, in addition to “satisfaction” data.
Citation	*Friedman 1990
Population Addressed	Children with psychiatric disorders.
Literature Reviewed, # articles	28.
Aims of article	To investigate the prevalence of psychiatric disorders in children and adolescents.
Discussion of risk or protective factors	Risk factors: Gender, parent-child attachment, influence of media, living environment and age as risk factors. Protective factors: interpersonal skills, attachment to nondeviant parent, good schools, high social cognitive skills.
Relevant Outcomes addressed	Childhood psychopathology and conduct disorders.
Conclusions and Over-all Message	Conduct and childhood psychiatric disorders are likely to increase given increasing risks.
Future needs, clinical significance	More emphasis on prevention efforts, especially on social, emotional, and economic supports for children and families.

* Protective factors considered

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Key to abbreviations

ELBW	extremely low birth weight	LD	learning disability
LBW	low birth weight	SD	standard deviation
		SES	socioeconomic status
		VLBW	very low birth weight

Table 4 (continued)
Risk for Difficult Entry into School – Review Papers

Citation	Hartup 1996
Population Addressed	Kindergarten – school age children.
Literature Reviewed, # articles	82.
Aims of article	To promote the investigation of quality of childhood friendships and how they affect child development.
Discussion of risk or protective factors	Strong/poor peer relations; friendship vs. non-friendship relations.
Relevant Outcomes addressed	School performance in kindergarten, attitudes toward school; reasoning/academic skills; psychosocial outcomes.
Conclusions and Over-all Message	Process-outcome studies are needed to tell us whether friends engage in better scaffolding than nonfriends.
Future needs, clinical significance	Friendship assessments deserve greater attention, and should include assessment of <i>quality</i> of relationships.
Citation	James 1997
Population Addressed	Immigrant children.
Literature Reviewed, # articles	21.
Aims of article	To address the psychosocial problems that immigrant children face in a new society, home and school.
Discussion of risk or protective factors	Moving/immigrating to a new country and society.
Relevant Outcomes addressed	Reduced ability to communicate and build relationships with friends and teachers; psychosocial problems in school (depression, confusion, stress).
Conclusions and Over-all Message	Schools need to better appreciate and prepare to assist in transition to school for immigrant children, targeting effective methods of stress reduction, “culture shock” reduction, developing positive social skills and school behaviors.
Future needs, clinical significance	Intervention/school-based programs are sorely needed to assist immigrant children in their transition to American society/school.
Citation	Lukeman and Melvin 1993
Population Addressed	Children born preterm.
Literature Reviewed, # articles	95.
Aims of article	To discuss the methodological problems of follow-up studies of preterm and low birth weight infants including selection of cases and controls, choice of outcome measure, and findings interpretations.
Discussion of risk or protective factors	Low birth weight and preterm status; multiparity, severity of neonatal illness, socio-environmental factors.
Relevant Outcomes addressed	Preexisting neurodevelopmental, social, emotional and behavioral problems can be exacerbated at school entry.
Conclusions and Over-all Message	At school entry, we need to be aware of social, cognitive, behavioral and emotional vulnerabilities in children born LBW/preterm, as well as to develop appropriate preschool interventions.
Future needs, clinical significance	It is difficult to predict outcomes in this population; there are many methodological issues to be considered and changed in future follow-up studies.

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Table 4 (continued)
Risk for Difficult Entry into School – Review Papers

Citation	McLoyd 1998
Population Addressed	SES-disadvantaged children.
Literature Reviewed, # articles	201.
Aims of article	To discuss recent research and future needs involving poverty and low SES effects on aspects of child development, such as cognitive functioning, academic success, and socioemotional strengths.
Discussion of risk or protective factors	Low SES, poor home environment and poverty.
Relevant Outcomes addressed	Child development: social skills, cognitive abilities, scholastic success/failure, behavior problems, emotional problems.
Conclusions and Over-all Message	The relation between low SES and poor child development is mediated by environmental and parenting risk factors. These, along with lower academic expectations from teachers, contribute to school failure for children of poverty.
Future needs, clinical significance	Many policy implications to consider: early interventions that would increase family income, as well as positively stimulate child’s cognitive and behavioral development.
Citation	North et al. 1997
Population Addressed	Children with Neurofibromatosis type 1 (NF1).
Literature Reviewed, # articles	57.
Aims of article	To summarize current understandings of learning disabilities (LD) and cognitive deficits in children with NF1; to propose possible pathogenetic mechanisms.
Discussion of risk or protective factors	Children with NF1 are at high risk for LD.
Relevant Outcomes addressed	Lower IQ, Learning disabilities.
Conclusions and Over-all Message	Connection between NF1 and IQ remains controversial, though much has been learned in recent years. Risk of LD is high, and should be addressed with parents similarly to physical complications.
Future needs, clinical significance	Varying reports of trends or correlations between IQ and NF1 in children.
Citation	Ornstein et al. 1991
Population Addressed	Neonates.
Literature Reviewed, # articles	35.
Aims of article	To review neonatal follow-up studies that examine VLBW and ELBW child outcomes at school age; to examine differences in school age outcomes between VLBW and ELBW.
Discussion of risk or protective factors	Low or very low birth weight.
Relevant Outcomes addressed	School performance and cognitive capacity: Increased need for special education or remedial education placement.
Conclusions and Over-all Message	Need more long-term follow-up studies, tracking VLBW and ELBW children through school years in order to fully appreciate new groups of morbidities.
Future needs, clinical significance	Sound methodologies in research are needed to draw sound conclusions and inform new early intervention strategies.

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Table 4 (continued)
Risk for Difficult Entry into School – Review Papers

Citation	Patterson and Narrett 1990
Population Addressed	4–8 year-old oppositional children.
Literature Reviewed, # articles	25.
Aims of article	To discuss development of treatment strategies, measures, and the effectiveness of parent training.
Discussion of risk or protective factors	Oppositional behavior.
Relevant Outcomes addressed	Peer rejection, school failure.
Conclusions and Over-all Message	Need to be able to generalize effects of treatments for lasting results.
Future needs, clinical significance	Careful scrutiny of other psychosocial problems and treatments.
Citation	Richardson, Koller, and Katz 1986
Population Addressed	School-age children.
Literature Reviewed, # articles	37.
Aims of article	To review the literature on evidence that boys do not fare as well in school performance during first few years as girls do.
Discussion of risk or protective factors	Biological and social factors.
Relevant Outcomes addressed	School achievement and performance.
Conclusions and Over-all Message	Adult changes in sex roles may be filtering down to young children.
Future needs, clinical significance	Pediatricians should be aware of differences of school problems between girls and boys, and differences in responses to problems.
Citation	Rutter 1987
Population Addressed	Children.
Literature Reviewed, # articles	105.
Aims of article	To examine the role of cognition and cognitive deficits in the development of psychopathology.
Discussion of risk or protective factors	Biases and distortions in cognitive processing.
Relevant Outcomes addressed	Social and emotional malfunctioning.
Conclusions and Over-all Message	Biases may occur from earlier experiences, temperamental style, or cognitive deficits in information processing.
Future needs, clinical significance	Further study of cognitive processes in development needed to further clinical practices.

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Table 4 (continued)
Risk for Difficult Entry into School – Review Papers

Citation	Sethi and Trend 1996
Population Addressed	Children with special education needs by age 6.
Literature Reviewed, # articles	5.
Aims of article	Reviewed the identification of children with special education needs or evaluations.
Discussion of risk or protective factors	None addressed.
Relevant Outcomes addressed	Special education.
Conclusions and Over-all Message	Identifying children for special education before school-entry (age 6) is an important step in understanding risk and intervention needs.
Future needs, clinical significance	Districts need to address their own unique and sometimes avoidable problems with early identification of intervention/ special education needs.
Citation	Shapiro et al. 1984
Population Addressed	Preschoolers.
Literature Reviewed, # articles	49.
Aims of article	To discuss early detection of the “deviant neurologic substrate” as a risk factor for specific learning disability (SLD) prior to school entry.
Discussion of risk or protective factors	Neurologic exam before school entry instead of later academic underachievement.
Relevant Outcomes addressed	SLD diagnosis.
Conclusions and Over-all Message	Early detection could permit early intervention and assessment/therapy where indicated.
Future needs, clinical significance	Shifting focus from academic achievement to neurodevelopment will enhance detection of SLD before school.
Citation	Vohr and Msall 1997
Population Addressed	Low birth weight infants.
Literature Reviewed, # articles	106.
Aims of article	To investigate the measurement and quality of outcomes for the VLBW child in the context of school and family.
Discussion of risk or protective factors	VLBW, ELBW status.
Relevant Outcomes addressed	Kindergarten readiness, multiple domains of development.
Conclusions and Over-all Message	With increasing survival rates, there is more demand for special education resources for VLBW infants.
Future needs, clinical significance	Vigilant screening and monitoring of VLBW infants needs to continue as efforts are made to optimize positive long-term outcomes.

Table 5
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Citation	Berlin et al. 1998
Sample/ Population	Approx. 1000 infants.
Study Design	Longitudinal, randomized trial of program effectiveness.
Risk/Protective Factor Identified	Low birth weight and premature infants.
Proposed mechanisms for risk-intervention	Intervention effects interacted with degree of low birth weight and family characteristics, esp. maternal education; also, quantity of services received, rate of program delivery and activity level of participation.
Type of Intervention	Infant Health and Development Program (IHDP), includes home visits, center care and parent groups.
Level of Intervention†	Selective.
Outcomes	Higher full scale and verbal IQ and decrease in behavior problems for heavier low birth weight at ages 5 and 8; family development.
Evidence of Clinical or Statistical Significance and Statistical Model	Standard deviation and test scores reported.
Measure of “effectiveness” of intervention	Cumulative risk, logistic regression, p values: decrease in size of intervention effects over time.
Citation	Campbell and Ramey 1994
Sample/ Population	57 randomly assigned children to intervention, 54 controls. (98% African American).
Study Design	Follow-up.
Risk/Protective Factor Identified	Low SES.
Proposed mechanisms for risk-intervention	Achievement and benefits of intervention increase as duration of intervention increases.
Type of Intervention	Carolina Abecedarian Project (1972–1977) – educational preschool and school-age intervention.
Level of Intervention†	Selective.
Outcomes	Intellectual development (WISC-R IQ) and educational achievement through age 12.
Evidence of Clinical or Statistical Significance and Statistical Model	MANOVA and factor analyses; children benefited more the longer they were enrolled in the intervention, and if they started intervention before school entry.
Measure of “effectiveness” of intervention	None .

†Universal = total population; Selective = at-risk populations; Indicated = children developing behavioral and academic problems

Key to abbreviations

ANCOVA	analysis of covariance	IHDL	Infant Health and Development Program
ANOVA	analysis of variance	MANOVA	multiple analysis of variance
CBCL	Child Behavior Checklist	SES	socioeconomic status
		WISC-R	Wechsler Intelligence Scale for Children – Revised

Table 5 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Citation	*Egeland and Hiester 1995
Sample/ Population	34 infants in day care and 52 home-reared, from high-risk impoverished families.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Quality of mother-infant attachment at 12 months and day-care status, day care = protective factor for securely attached infants.
Proposed mechanisms for risk-intervention	Security of attachment may influence later adaptation as well as day-care benefit.
Type of Intervention	Early day-care.
Level of Intervention†	Selective.
Outcomes	Child problem behaviors and adaptation: aggression, externalizing, withdrawn .
Evidence of Clinical or Statistical Significance and Statistical Model	Univariate ANCOVAs; day care had negative affect.
Measure of “effectiveness” of intervention	None.
Citation	Gordon and Jens 1988
Sample/ Population	“High risk” infants.
Study Design	Concept/decision-making model.
Risk/Protective Factor Identified	Risks in many, changing areas throughout early development.
Proposed mechanisms for risk-intervention	None proposed.
Type of Intervention	Risk assessment at several times during development, in several areas, weighing risks, and allowing for individual “movement” in and out of risk intervention.
Level of Intervention†	Selective.
Outcomes	Disorders of development and learning.
Evidence of Clinical or Statistical Significance and Statistical Model	No risk = T < 60 in all areas; mild risk = T score >60 in one area; moderate risk = T scores >60 in two or more areas, or >70 in one area; high risk = T scores >70 in two or more areas or >80 in one area.
Measure of “effectiveness” of intervention	None.

*Protective factors considered

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Table 5 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Citation	Hollomom and Scott 1998
Sample/ Population	299 Low birth weight and preterm infants and normal comparison group.
Study Design	Longitudinal follow-up.
Risk/Protective Factor Identified	Low birth weight, preterm delivery.
Proposed mechanisms for risk-intervention	CNS development.
Type of Intervention	From birth to age 3, pediatric follow-up, home visits, parent support groups, developmental curriculum 25 hrs/week at a center.
Level of Intervention†	Selective.
Outcomes	Academic success via achievement tests and special education placement status.
Evidence of Clinical or Statistical Significance and Statistical Model	One-way variance analyses, chi square.
Measure of “effectiveness” of intervention	Relative risk analyses: non-intervention low birth weight children were 3 times as likely as normal birth weight controls to receive special education services at age 9.
Citation	Horacek et al. 1987
Sample/ Population	N = 90 children identified pre-birth to be “at risk.”
Study Design	Longitudinal, cohort.
Risk/Protective Factor Identified	Risk factor for school failure = maternal education, SES, and social variables pre-birth.
Proposed mechanisms for risk-intervention	None proposed.
Type of Intervention	Carolina Abecedarian Project: educational – degree and timing of preschool and/or school-age academic interventions.
Level of Intervention†	Selective.
Outcomes	School success or failure at kindergarten or grade 3, achievement test scores.
Evidence of Clinical or Statistical Significance and Statistical Model	Spearman rank correlation; grade failure rate decreases and achievement test scores increase as duration and intensity of intervention increases.
Measure of “effectiveness” of intervention	Mantel-Haenszel statistics (preschool intervention had stronger effect).
Citation	*Lee et al. 1990
Sample/ Population	646 black children from New Jersey and Oregon.
Study Design	Longitudinal follow-up study.
Risk/Protective Factor Identified	HeadStart, other preschool or no preschool.
Proposed mechanisms for risk-intervention	None proposed.
Type of Intervention	HeadStart: preschool program for disadvantaged black children.
Level of Intervention†	Selective.

*Protective factors considered

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Table 5 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Outcomes	Cognitive/ analytic ability gains after HeadStart .
Evidence of Clinical or Statistical Significance and Statistical Model	ANCOVA analyses; findings may be a general effect of preschool and not HeadStart in particular.
Measure of “effectiveness” of intervention	None.
Citation	Madden, O’Hara, and Levenstein 1984
Sample/ Population	71 families with children age 21–33 months at program entry, followed for nine years.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Low-income families.
Proposed mechanisms for risk-intervention	Short-term cognitive effects of interaction stimulation probably are not mediated by maternal behavior. Maternal behavior measured as overall verbal interaction or responsiveness may be too simply conceived, and does not appear to have an effect on long-term child cognition.
Type of Intervention	Mother-Child Home Program; to promote cognitively stimulating mother-child interactions as prevention for later school problems.
Level of Intervention†	Selective.
Outcomes	No detectable effects of intervention on first grade teacher ratings of school adjustment and performance. IQ and achievement scores near national norms.
Evidence of Clinical or Statistical Significance and Statistical Model	ANOVAs and ANCOVAs.
Measure of “effectiveness” of intervention	Large program effects found on maternal interaction styles: 51% to 33% greater frequency of desirable behavior.
Citation	McCarton et al. 1997
Sample/ Population	874 children followed-up at age 8.
Study Design	Follow-up of randomized controlled trial.
Risk/Protective Factor Identified	Low birth weight.
Proposed mechanisms for risk-intervention	Heavier low birth weight child may be more capable of adapting to environment because of more developed central nervous system.
Type of Intervention	The Infant Health and Development Program (IHDP).
Level of Intervention†	Selective.
Outcomes	Higher full-scale, performance and verbal IQ, math achievement, and receptive vocabulary scores for heavier low birthweightchildren only.
Evidence of Clinical or Statistical Significance and Statistical Model	T statistics and chi squares for categorical measures; multiple linear regression models for each outcome. Most significant intervention effects seen at age 3 years were not sustained to age 8 years.
Measure of “effectiveness” of intervention	None.

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Table 5 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Citation	McCormick et al. 1998
Sample/ Population	985 infants.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Low birth weight, premature birth.
Proposed mechanisms for risk-intervention	Program-specific mediating variables: maternal-infant interactions, home environment, parent problem solving skills, program participation; nonspecific mediating variables: maternal mental and physical health, family composition, neighborhood environment.
Type of Intervention	High-risk follow-up pediatric care (including developmental and social work surveillance); educational intervention (home visits, center-based care, parent support groups).
Level of Intervention	Selective.
Outcomes	Cognitive (Stanford-Binet IQ) and social-emotional development, number of health conditions (mother reported Morbidity Index), and behavior problems (CBCL 2-3 and Richman-Graham Questionnaire) of child at 12, 24, 36, 60, 96 months .
Evidence of Clinical or Statistical Significance and Statistical Model	T-tests and percentile scores on measures.
Measure of “effectiveness” of intervention	Discussion and comparison of outcome score percentiles.
Citation	Oates et al. 1995
Sample/ Population	24 children attending therapeutic preschool over a three-year period from 1985–1988.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Child abuse.
Proposed mechanisms for risk-intervention	None proposed.
Type of Intervention	KEEPSAFE Project; therapeutic and educational preschool intervention.
Level of Intervention	Selective.
Outcomes	Developmental gains, as measured by the McCarthy Scales of Children’s Abilities and the Peabody Picture Vocabulary Test.
Evidence of Clinical or Statistical Significance and Statistical Model	T-test comparisons, percentiles. 79% of children were placed into public school system after the three year intervention (none were anticipated to be ready for public school).
Measure of “effectiveness” of intervention	None.
Citation	Ramey and Ramey 1998
Sample/ Population	985 low birth weight and premature infants.
Study Design	Randomized controlled trial.
Risk/Protective Factor Identified	Early intervention, low birth weight status.
Proposed mechanisms for risk-intervention	CNS development.
Type of Intervention	Abecedarian project, Project CARE, and Infant Health and Development Program – Multidisciplinary, designed to promote social competence and improve cognitive development in high-risk children.

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Table 5 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Level of Intervention†	Selective.
Outcomes	Cognition, IQ at age 3.
Evidence of Clinical or Statistical Significance and Statistical Model	Mean differences.
Measure of “effectiveness” of intervention	None.
Citation	Reynolds et al. 1996
Sample/ Population	360 low-income minority children.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Low SES, ethnicity.
Proposed mechanisms for risk-intervention	6th grade outcomes mediated by cognitive readiness at school entry and parent involvement in school.
Type of Intervention	Participants of the Chicago Longitudinal Study of Children at Risk, taking part in the Child Parent Center Programs with half-day preschool focusing on school achievement and readiness.
Level of Intervention†	Selective.
Outcomes	Significantly higher reading and math achievement and lower grade retention in sixth grade.
Evidence of Clinical or Statistical Significance and Statistical Model	Latent-variable structural modeling techniques and correlations..
Measure of “effectiveness” of intervention	Latent-variable modeling techniques for estimates of effects.
Citation	Tuakli-Williams and Carrillo 1995
Sample/ Population	100 preschool children aged 4 to 6 years.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Minority status; parental empowerment (as protective: important to success of program); psychosocial stressors (witnessing death, being homeless, familial violence); maltreatment.
Proposed mechanisms for risk-intervention	Stressed preschoolers exhibit emotional difficulties, reduced mood and attention span; stressed parents compound these problems through reduced supervision (borderline neglect), involvement, and poor communication.
Type of Intervention	Project CHILD (Community Health Initiatives Against Learning Difficulties).
Level of Intervention†	Selective.
Outcomes	Psychoeducational and medical outcomes: expressive language delay, sleep problems, shyness, withdrawal, depression.
Evidence of Clinical or Statistical Significance and Statistical Model	None.
Measure of “effectiveness” of intervention	None.

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Table 5 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Specific Studies

Citation	Wasik et al. 1990
Sample/ Population	65 families with children at risk for cognitive difficulties, randomly assigned to 1 of 2 intervention groups or a control group.
Study Design	Longitudinal.
Risk/Protective Factor Identified	Low SES.
Proposed mechanisms for risk-intervention	Increases in scores for the home-based intervention group may be due in part to attendance at other day care.
Type of Intervention	Child Development Center Program (day care addressing cognitive and social development); Family Education Program (home-based care for parents – referrals, problem solving, basic child games using same materials as day care prevention).
Level of Intervention†	Selective.
Outcomes	Cognitive performance measured by Bayley Scales of Infant Development (6, 12, 18 months), Stanford-Binet IQ (24, 36, 48 months) and McCarthy Scales of Children’s Abilities (at 30, 42, 54 months).
Evidence of Clinical or Statistical Significance and Statistical Model	Multivariate repeated-measures test; MANOVA, Tukey’s studentized range test.
Measure of “effectiveness” of intervention	Comparisons of intervention and control group data.
Citation	Weikart 1998
Sample/ Population	123 African-American children.
Study Design	Longitudinal, follow-up.
Risk/Protective Factor Identified	Low SES, ethnicity.
Proposed mechanisms for risk-intervention	None.
Type of Intervention	High/Scope Perry active-learning preschool study intervention at ages 3–4 years (began 1962).
Level of Intervention†	Selective.
Outcomes	Social responsibility, economic status, marriage, educational performance at age 27.
Evidence of Clinical or Statistical Significance and Statistical Model	Cost/benefit analysis.
Measure of “effectiveness” of intervention	None.

Table 6
Interventions That Decrease Risk for Difficult Entry into School – Review Papers

Citation	*Belcher and Shinitzky 1998
Population Addressed	Children from birth to adolescence, at risk for <i>or</i> protected from development of substance abuse or involved in substance abuse prevention programs.
Literature Reviewed, # articles	113.
Aims of article	To review latest studies on risk and protective factors for substance abuse and effectiveness of prevention programs.
Discussion of risk or protective factors	Behavioral, emotional, and environmental factors (affect, genetics, community, family ecology, peer group = risk; positive home, parental support, good teacher relations, self-esteem -concept -control = protective).
Relevant Outcomes addressed	Preschool prevention efficacy.
Conclusions and Over-all Message	Many factors contribute to substance abuse and may be remedied through prevention/intervention programs.
Discussion of Clinical or Statistical Significance / Future needs	Early intervention strategies for preschool and elementary students underrepresented in literature.
Citation	Caplan 1980
Population Addressed	Children with psychiatric problems.
Literature Reviewed, # articles	38.
Aims of article	To present and discuss a model of primary prevention of child psychiatric illness.
Discussion of risk or protective factors	Genetic, biological and psychosocial risk factors, along with mediating variables, place a child along some continuum of risk.
Relevant Outcomes addressed	Mental disorders or mental retardation.
Conclusions and Over-all Message	Intervention and preventive efforts support the elements of Caplan’s model (risk factor, mental disorder, intervening psychological stressors, current psychological competence, influence of social supports).
Discussion of Clinical or Statistical Significance / Future needs	Future interventions and research for children at psychiatric and developmental cognitive risk, crisis risk, and with social support needs.
Citation	Chamberlin 1987
Population Addressed	Children in early intervention programs.
Literature Reviewed, # articles	55.
Aims of article	To describe what have we learned from longitudinal studies (prediction of outcomes, expectations of early intervention programs).
Discussion of risk or protective factors	Before age 3: perinatal stress; then age 3–7: demographics (SES, maternal education, family size).
Relevant Outcomes addressed	IQ scores, school success/failure, neurophysical development, behavior and pre-delinquent acts.
Conclusions and Over-all Message	Studies have been inaccurate in using risk factors to identify or predict later problems or disability in individual children; good evidence for early intervention programs.
Discussion of Clinical or Statistical Significance / Future needs	Emphasize prevention, deliver basic parent education to all families; use community-wide screening/monitoring/referral systems.

*Protective factors considered

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Table 6 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Review Papers

Citation	Dudley et al. 1993
Population Addressed	VLBW infants.
Literature Reviewed, # articles	69.
Aims of article	To review current research on infant-focused, parent-focused and interactional programs; address issues for consulting psychiatrists.
Discussion of risk or protective factors	Premature, VLBW status.
Relevant Outcomes addressed	General child development.
Conclusions and Over-all Message	"the notion of infants at developmental risk needs to be supplemented by that of caregivers at risk . . ."
Discussion of Clinical or Statistical Significance / Future needs	Further investigate developmental outcomes as interventions target parent-child relationships and attachment.
Citation	Guralnick 1998
Population Addressed	Children at risk for mental disabilities.
Literature Reviewed, # articles	118.
Aims of article	To discuss the short- and long-term effects of early intervention, the mechanisms by which early interventions are influential, the relationships between mechanisms and systems of care, and the limits of intervention programs.
Discussion of risk or protective factors	Poverty, prematurity and low birth weight, parenting difficulties, abuse and neglect, prenatal exposure to drugs and alcohol and continuing exposure, hazardous/hostile environment.
Relevant Outcomes addressed	Mental disability.
Conclusions and Over-all Message	Long-term benefits need intensive interventions that span transition periods of child development; we need to further study the relations among child and family factors, program factors that define the interventions, and types of outcomes desired.
Discussion of Clinical or Statistical Significance / Future needs	Short term benefits of early intervention have highly reproducible effect sizes of .5 to .75 SD for children "at risk."
Citation	*Kaufmann and Dodge 1997
Population Addressed	Young children at risk, in need of early intervention.
Literature Reviewed, # articles	113.
Aims of article	To summarize major research on risk and protective factors for mental disorders in young children, identify successful prevention and intervention approaches, provide direction for future field interventions.
Discussion of risk or protective factors	Interventions should reduce risk factors and promote protective factors; should target multiple risk factors simultaneously and span individual, family, and community levels. Should focus on young children.
Relevant Outcomes addressed	Child psychopathology, health, academic success; general development and functioning
Conclusions and Over-all Message	Intervention effectiveness research needs to try to answer the question: "Is this preventive intervention effective for <i>these</i> children, in <i>this</i> family situation, located in <i>these</i> environmental conditions, using <i>these</i> program components?"
Discussion of Clinical or Statistical Significance / Future needs	Need more sophisticated approaches to prevention and early intervention, addressing multiple risk factors and protective factors simultaneously.

*Protective factors considered

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Table 6 (continued)
Interventions That Decrease Risk for Difficult Entry into School – Review Papers

Citation	McCormick et al. 1998
Population Addressed	Children in the Infant Health and Development Program (IHDP) from birth to 8 years old.
Literature Reviewed, # articles	135.
Aims of article	To summarize the data and conclusions published thus far from the IHDP, and report on information gathered at 8 years of age.
Discussion of risk or protective factors	Low birth weight, care-giving, maternal health and education, home environment, (discussion of program specific and non-program specific mediating variables).
Relevant Outcomes addressed	Child’s cognitive development, health at later ages (5–8 years), behaviors and social-emotional development.
Conclusions and Over-all Message	Universal system of intervention may be best, as intervention benefited non-risk population as well.
Discussion of Clinical or Statistical Significance / Future needs	Odds ratios, cumulative risk.
Citation	Ramey and Ramey 1992
Population Addressed	Children from 3 early education intervention programs.
Literature Reviewed, # articles	18 (review of 3 programs).
Aims of article	To present findings addressing which children benefit more than others from early educational interventions and summarize new evidence of long-term benefits. (3 programs summarized: Abecedarian Project, Project CARE, and the IHDP).
Discussion of risk or protective factors	Having mother with low-IQ.
Relevant Outcomes addressed	School outcomes: intellectual measures, readiness and educational progress.
Conclusions and Over-all Message	Children of mothers with low-IQs benefit particularly from early intervention; early intervention benefits increase with intensity and duration of intervention, with new evidence for lasting benefits through early adolescence.
Discussion of Clinical or Statistical Significance / Future needs	Six essentials for early intervention programs are discussed for future program development.

Table 7. Additional Criteria of Excellence

Criteria	Number of risk plus intervention articles meeting criteria
Large, well-defined samples (>100)	31 + 11/64
Considerations of mechanisms of risk	22 + 11/64
Notation of causality (probable causal risk factor)	13 + 0/64 articles represented 7 sets of causal risk factors (cognitive deficits, early behavior problems, age at school entry, parental psychopathology, problematic parenting practices, difficulties with peers, difficulties with teachers)
Statistical indications of at least moderate clinical significance (e.g., Odds ratios > 2.2)	3 + 0/64

