Multiple risk factors in the development of externalizing behavior problems: Group and individual differences

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Abstract

The aim of this study was to test whether individual risk factors as well as the number of risk factors (cumulative risk) predicted children's externalizing behaviors over middle childhood. A sample of 466 European American and 100 African American boys and girls from a broad range of socioeconomic levels was followed from age 5 to 10 years. Twenty risk variables from four domains (child, sociocultural, parenting, and peer-related) were measured using in-home interviews at the beginning of the study, and annual assessments of externalizing behaviors were conducted. Consistent with past research, individual differences in externalizing behavior problems were stable over time and were related to individual risk factors as well as the number of risk factors present. Particular risks accounted for 36% to 45% of the variance, and the number of risks present (cumulative risk status) accounted for 19% to 32% of the variance, in externalizing outcomes. Cumulative risk was related to subsequent externalizing even after initial levels of externalizing had been statistically controlled. All four domains of risk variables made significant unique contributions to this statistical prediction, and there were multiple clusters of risks that led to similar outcomes. There was also evidence that this prediction was moderated by ethnic group status, most of the prediction of externalizing being found for European American children. However, this moderation effect varied depending on the predictor and outcome variables included in the model.

Externalizing behavior problems in childhood include hostile and aggressive physical behavior toward others, impulsivity and hyperactivity, and noncompliance with adult and peer limit setting (McMahon, 1994). The presence of these behaviors has been linked to academic underachievement, conduct and attention-deficit disorders, immature and unrewarding social relationships with peers and adults, delinquency during childhood and adolescence, and criminality and other forms of antisocial psychopathology in adulthood (Farmer, 1995; Hinshaw, 1992; Parker & Asher, 1987). Externalizing problems are stable (year-to-year correlations are usually in the .5 range) in both clinical and population samples, even for young children (Achenbach, Howell, Quay, & Conners, 1991; Pianta & Caldwell, 1990; Verhulst et al., 1993; Verhulst & Van der Ende, 1992), and clinical manifestations of these behaviors such as conduct disorder are very difficult to treat successfully (Kazdin, 1995). The aim of this study was to test the role of multiple risk factors in the development of externalizing behavior

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problems in middle childhood, and to explore possible ethnic and gender group differences in these developmental processes.

Risk and Externalizing Problems

Risk factors are aspects of the child and his or her environment that are associated with poor outcomes (Garmezy & Rutter, 1983; Werner, 1995). Numerous risk factors for externalizing problems that have been identified in past research can be represented by four broad domains that serve as the focus of this study: aspects of the child, sociocultural factors, parenting and caregiving experiences, and peer-group experiences.

Child risk factors include adverse temperament (i.e., hyperactivity, resistance to external control, irritability; see Rothbart & Bates, 1997; Rubin, Coplan, Fox, & Calkins, 1995; Schaughency & Fagot, 1993), medical problems in childhood (Lavigne & Faier–Routman, 1992), and being male (Huselid & Cooper, 1994; Zahn–Waxler, 1993). These child risks are generally endogenous factors that influence the child's behavior across situations and over time. There are also likely genetic risks (O'Connor, Deater–Deckard, Fulker, Rutter, & Plomin, in press), although this is not a focus of the current phenotypic study of environmental risk factors.

Sociocultural risks include poverty (Huston, McLoyd, & Coll, 1994), adverse family structural characteristics (e.g., living in a single-mother home; Achenbach et al., 1991; Duncan, Brooks–Gunn, & Klebanov, 1994), the young age of the mother and lack of planfulness of the pregnancy (Williams, Anderson, McGee, & Silva, 1990), the presence of stressful life events (Abidin, Jenkins, & McGaughey, 1992), and parental stress and social isolation (Deater–Deckard, in press; Hashima & Amato, 1994; Leadbeater & Bishop, 1994).

Parenting and caregiving have also been linked to externalizing problems in middle childhood. Salient risks from this domain include conflict and violence within the home—for example, between parents (Abidin et al., 1992; McCloskey, Figueredo, & Koss, 1995; Shaw & Emery, 1988; Westerman & Schonholtz, 1993)—as well as outside the home (Guerra, Huesmann, Tolan, Van Acker, & Eron, 1995), and harsh parental discipline and physical abuse (Dodge, Pettit, & Bates, 1994; Fisher & Fagot, 1993; Patterson, Reid, & Dishion, 1992). Other risks include the extensiveness of nonparental childcare (Bates, Marvinney, Kelly, Dodge, Bennett, & Pettit, 1994), the absence of father involvement in childrearing (Phares, 1993), and parents' positive attitudes about aggressive behavior in their children (Dodge, Pettit, & Bates, 1994).

Lastly, children's *peer experiences* in the neighborhood, at daycare, and in school have been shown to be particularly important factors in the development of externalizing problems. Instability in peer relationships and social rejection by peers have been implicated in the etiology of antisocial behaviors (Hymel, Rubin, Rowden, & LeMare, 1990; Parker & Asher, 1987).

The first goal of this study was to test the hypothesis that factors in each of these four domains significantly predict later externalizing problem outcomes. Support for these four domains would be consistent with the evidence reviewed above but would also provide important contributions to the field, given the current study's diverse community samples (i.e., African American and European American boys and girls from three separate communities in two birth cohorts), prospective design (i.e., children are followed from age 5 to age 10 years), and multiple measures of externalizing outcomes (i.e., teacher, parent, and peer reports collected across each of 5 years).

How Do Risk Factors Increment Each Other?

The examination of distinct risk domains ignores the obvious empirical fact that risk factors covary. A second, more novel goal was to examine whether each of these four domains provides unique incremental contributions to the prediction of externalizing outcomes. Few past studies have included measures in all four domains, and few theorists have conceptualized how these domains of risk covary and operate in conjunction with each other (see Biederman et al., 1995; Coulton, Korbin, Su, & Chow, 1995; Liaw & Brooks–Gunn, 1994).

Two competing hypotheses may be offered. The first hypothesis is that risk domains are empirically redundant with each other and that one domain will account for all of the risk. For example, it might be that child risk factors (such as temperament and gender) lead to parenting risk factors (such as harsh discipline) and peer risk factors (such as peer rejection) in a way that renders the parenting and peer domains as empirically superfluous to the prediction of externalizing outcomes. In such a case, the parenting and peer domains would be correlated with externalizing outcomes in bivariate analyses but would not provide any incremental prediction of externalizing outcomes beyond that afforded by child risk factors. Likewise, it might be that sociocultural risk factors (such as poverty and family stress) lead to adverse parenting and peer experiences and that the latter domains provide no increment in predicting externalizing outcomes beyond that afforded by the child's sociocultural context.

The alternate hypothesis is that externalizing behavior problems develop as a result of a multivariate process in which multiple domains of risk factors operate in conjunction with each other to produce externalizing outcomes. According to this hypothesis, the four risk domains will increment each other in predicting outcomes. This increment occurs because of one of two processes: multiple domains of risk are necessary for externalizing problems to develop or externalizing problems can develop through any of several distinct etiologies (a principle known as *equifinality;* see Cicchetti & Rogosch, 1996).

Hierarchical regression analyses are well suited to test these competing hypotheses. In the current study, risk variables within each of the four domains were entered into regression equations as a set, and the significance of the contribution of a set when entered last (after the other three domains were entered) provides a test of the unique contribution of that domain to the prediction of externalizing outcomes. In addition, we have compared particular clusters of risk factors and their prediction of externalizing outcomes.

Cumulative risk

Yet another conceptualization of the development of externalizing problems is the *cumulative risk hypothesis*. This concept is that it is the *number* of risk factors, and not any particular array of risk factors, that is important (Sameroff, Seifer, Baldwin, & Baldwin, 1993). Any risk factor might confound generic stress and specific content. When a second risk factor provides a significant increment in predicting an outcome beyond the prediction made by the first risk factor, it might be that each specific risk factor is crucial to a multivariate process. Alternately, it might be that the second risk factor adds general stress to the child, regardless of the content of that risk factor. It might be the accumulation of stress, operationalized in the number of risk factors present, that makes a child vulnerable to externalizing problems. In their longitudinal study of cumulative risk factors for problems in cognitive development, Sameroff and his colleagues found that the number of risk factors explained additional IQ variance above and beyond variance attributable to individual risk factors.

This cumulative risk hypothesis can be tested by adding the number of risk factors for each child to a hierarchical regression model. If the individual risk factors provide unique increments beyond the number of risks variable, the content of risk must be considered as important to the

process; alternately, if individual risk factors do not provide unique increments beyond the number of risks variable, it may be concluded that the general stress of additional risks, rather than the content of those risks, operates on the developmental process.

Numerous studies have demonstrated the importance of testing these cumulative and multiple risk-factor models (Biederman et al., 1995; Blanz, Schmidt, & Esser, 1991; Jessor, Van Den Bos, Vanderrym, Costa, & Turbin, 1995; Liaw & Brooks–Gunn, 1994; Rutter, Cox, Tupling, Berger, & Yule, 1975; Sameroff, Seifer, Baldwin, & Baldwin, 1993; Sanson, Oberklaid, Pedlow, & Prior, 1991; Shaw & Emery, 1988; Shaw & Vondra, 1993; Shaw, Vondra, Hommerding, Keenan, & Dunn, 1994; Yoshikawa, 1994); however, these studies have not generally teased out cumulative stress versus multiple risk models of development.

Group Differences: Variation within Ethnic and Gender Groups

Much of the research on the development of externalizing problems has focused on European American boys, often using clinical samples, in spite of evidence that ethnic minority children in the United States are disproportionately exposed to environments with more psychosocial risk factors present (Barbarin, 1993; Barbarin & Soler, 1993). Although gender and ethnic status account for only small amounts of the variance in individual differences in externalizing behavior problems (Achenbach et al., 1991; Costello, 1989; Velez, Johnson, & Cohen, 1989), this fact tells us nothing about whether there are *group differences in developmental processes* leading to externalizing behavior problems. This question requires exploring group differences *in the covariation of psychosocial risk and outcome*, and is usually tested as an interaction term (Deater–Deckard & Dodge, 1997).

Regardless of the magnitude, a mean difference in outcome attributable to ethnicity or gender does not imply that there is a group difference in the etiology of the behavioral disorder (Rowe, Vazsonyi, & Flannery, 1994). To our knowledge, such statistical interactions between multiple risk factors and ethnic group membership and gender in the prediction of externalizing behavior problems have seldom been tested, most likely because it requires more statistical power than typically available (McClelland & Judd, 1993), although this approach has been used in the prediction of IQ scores (see Sameroff et al., 1993). However, knowing whether psychosocial risk factors predict externalizing behavior problems in the same way for boys and girls, and for ethnic minority and majority children, is of paramount importance to clinical research. Not knowing about potential group differences in these developmental processes impedes the implementation and evaluation of interventions (Last & Perrin, 1993). Because the sample sizes in the current study are adequate, gender and ethnic group differences in developmental process were tested using interaction terms.

Summary

The aim of this study was to answer five questions regarding the prediction of externalizing behaviors in middle childhood from multiple risk factors in early childhood:

1. What is the relation between each of the four general domains of risks (child, sociocultural, parenting/caregiving, and peer-related) and externalizing behavior problems?

2. Do the domains increment each other to support a multiple-risk model in the prediction of externalizing behavior problems?

3. Is there evidence for a cumulative stress model in the links between these risks and externalizing problems?

4. Are there ethnic and gender group differences in the prediction of externalizing problems from the cumulative stress models?

5. Is there evidence for equifinality—that is, do different patterns of risk factors predict similar outcomes?

We sought to answer these questions using data from an ongoing longitudinal study of risk factors in early childhood and externalizing behavior problems in middle childhood, including an ethnically diverse sample of boys and girls.

Method

Overview

After parents were recruited (described below), parents were interviewed in their homes during the summer preceding their children's entry into kindergarten. Two researchers visited the home, where one interviewed the mother and father (if he was available), and the other interviewed the child. Most of the interviewers were matched for ethnicity with families (for instance, when interviewing African American parents, typically one of the two interviewers was African American). The children were also assessed by their teachers and peers in kindergarten and grades one, two, three, and four.

Subjects

Subjects were recruited in two cohorts (1987 and 1988) from three sites: Nashville and Knoxville, Tennessee, and Bloomington, Indiana. The sample is described in more detail in Dodge, Pettit, and Bates (1994). Recruitment took place during preregistration for kindergarten (typically in April before beginning school), where research staff randomly approached parents and asked them if they would be interested in participating in a longitudinal study of child development. Just over two-thirds of the parents (70%) agreed. Because about 15% of the children locally did not preregister, this proportion of the sample was recruited in the first week of school through mail, telephone, or through the schools. The sample was diverse in terms of child sex (52% male, 48% female), ethnic group composition (82% European American, 16% African American, 2% other ethnic groups), and family composition (26% lived with single mothers at the time of recruitment). Using the Hollingshead Four-Factor Index of Social Status (Hollingshead, 1979), all five status categories were represented: 9% in the lowest, 16% in the next lowest, 26% in the middle, 32% in the next highest, and 17% in the highest ($M = 39.5$, $SD = 14.1$).

The sample included 585 families at the first assessment prior to kindergarten. Five annual assessments were conducted when the children were in kindergarten and grades one, two, three, and four. The percentages of subjects who had teacher ratings and/or peer nominations completed in each year were: kindergarten (99.5%), first grade (94.2%), second grade (92.6), third grade (87.7%), and fourth grade (82.0%). Sample attrition was unrelated to socioeconomic status or peer nominations of aggressiveness (see Dodge et al., 1994).

Only European American ($n = 466$: 222 girls and 244 boys) and African American children ($n = 100$: 51 girls and 49 boys) were selected from the total sample for this study, because there were not enough children to constitute additional ethnic groups of sufficient size for the analyses. The sample size for individual analyses varied somewhat due to randomly missing data; therefore, the sample sizes are reported for each analysis.

Measures

Externalizing behavior problems—Six months after the first in-home interview, and annually thereafter, teachers completed the 112-item Child Behavior Checklist-Teacher Report

Form (Achenbach, 1991). The highly reliable 55-item Externalizing Behavior Problems raw-score scale (1-week test–retest $r = .90$; teacher–aide agreement $r = .57$) was used for this study. Teachers responded to each item using a 3-point scale: 0 = *problem statement not true for child*; 1 = *somewhat or sometimes true*; 2 = *very or often true*. Raw item scores were summed to yield a raw scale score. A composite score was computed by averaging over the 5 years ($\alpha = .86$); all children with at least three assessments were included.

During the home visit in the 1st year (during the summer prior to the children's entry into Kindergarten), and annually thereafter through the mail, mothers completed the 110-item parent version of the Child Behavior Checklist (Achenbach, 1991); the Externalizing Behavior Problems raw-score scale was used for this study. This measure has also been shown to be valid and reliable with nationally normed data. Like the teacher ratings, these items were also scored on a 3-point scale, summed to yield a raw scale score, and averaged over all 5 years (again, only for those children with three or more valid assessments; $\alpha = .91$).

Peer reports of aggression were also measured. Peer sociometric ratings were completed in the winter of each school year, following a protocol similar to that by Coie, Dodge, and Coppotelli (1982). Each classmate whose parents consented for their child to participate was interviewed by a researcher. First, children were provided with a list of the children in their classroom and were asked to name up to three children who start fights with others (sociometric ratings of liking and disliking or social preference were also gathered and are described later in the section on peer risk factors). Frequencies of these nominations for each child were standardized within classrooms, to account for between-classroom variation in class size, and were then averaged over the 5 years for children with three or more valid assessments ($\alpha = .82$); this was used as a measure of peer-reported aggression.

Risk factors—Twenty risk variables from the four domains of risk (three child, seven sociocultural, eight parenting/caregiving, and two peer risks) were assessed during the 1st year. A 90-min interview was conducted with the mother by a trained researcher. Mothers were asked to reflect on various eras of the child's life—from birth to age 1 year, age 1 to age 4 years, and the most recent 12 months (age 4 to 5 years); risk factor scores were derived by averaging across these eras (when different scales were used in different eras, scores were standardized within each era prior to averaging).

The open ended format of the interview, and the training of the interviewers, was designed to promote cultural sensitivity in the interview process; training for reliability and sensitivity to parents' concerns was thorough, and is described in detail in Dodge et al. (1994). All interviewers attained interrater reliability of .80 or higher (compared to a criterion interviewer's responses) in practice interviews before conducting subject interviews. An additional reliability check was conducted by a second coder who accompanied the interviewer on 56 occasions (10% of the sample) and made independent ratings.

Parents also completed a 1-hr questionnaire battery, although only two risk factors (child temperament and attitudes toward aggression) were derived from these data. Because some fathers (about one-third) were not present or refused to participate, only those data from the mother interviews and questionnaires were used for this study.

Three child risks included (a) child gender (coded "0" for girls, and "1" for boys); (b) *resistant temperament*—mothers completed a three-item retrospective report (Bates & Bayles, 1984) of the child's resistance to control (e.g., won't stop when told to), rated on a 7-point (1 = *almost never*, 4 = *sometimes did and sometimes did not*, 7 = *almost always*) scale and summed ($\alpha = .83$, mother–father $r = .27$); (c) *medical complications*—mothers reported whether there were

medical complications during the pregnancy and birth (1 = *healthy*, 2 = *minor problems*, 3 = *major problems*).

Seven sociocultural risks included: (a) *socioeconomic status* (SES), measured as the five-level ordinal variable from the Hollingshead Four Factor Index of Social Status (Hollingshead, 1979); (b) *maternal marital status* (coded as "0" if married, living with partner, or living with another adult, and "1" if a single mother); (c) the *ratio of children to adults* in the home; (d) *teenage pregnancy* (coded as "0" if < or = 18 years old at first pregnancy, or "1" if > 18 years old); (e) mother's report of the *planfulness of the pregnancy* with the target child, using a 4-point scale (1 = *planned* to 4 = *unprepared*); (f) number of *stressful life events*; mothers reported whether or not the family had experienced each of 12 stressful life events in the second and third eras (Changes and Adjustments Scale; Dodge et al., 1994), including: moving or major remodeling of home, child-medical problems, close family medical problems, death of important person, divorce of child's parents, parent–child separation, financial instability, legal problems, stress/conflicts in the extended family, sibling additions/deletions, job-related stress, or loss of a job (0 = *had not occurred*, 1 = *had occurred*); these were then summed across both eras; (g) maternal *social isolation* and lack of social support: coded by the interviewer (1 = *very isolated* to 5 = *very well supported*), based on responses to several questions about whether the mother was able to get out of the house, the degree of emotional and instrumental support offered to and from her partner, and the availability of friends or relatives (coder agreement was $r = .47$ for Era 2 and $r = .44$ for Era 3); an average score was computed across the second and third eras.

Eight *parenting/caregiving* risks included (a) extensiveness of *nonmaternal childcare*—for the first era (birth–1 year old), hours in childcare were coded on a 7-point ordinal scale (ranging from 0 = *none* to 6 = *>30 hr for >7 months*), and for the second and third eras, mothers reported the amount of time the child spent in care outside the home (coded from 0 = *not in this type of care* to 4 = *major care, >20 hr per week*), for various settings including care by a relative, a small group sitter, group daycare, structured preschool, care by a neighbor, or other settings; a total score was computed by summing across the scores for each setting. The childcare score for each era was then standardized, and an average score was computed over all three eras. For information on coding reliability, see Bates et al., 1994; (b) biological *father involvement*— each mother reported the amount of involvement and instrumental support the child's biological father had provided to her, separately for the second and third eras. This was rated by the interviewer on a 5-point scale (0 = *no help* to 4 = *good help*), and averaged across the second and third eras; (c) *parental conflict*— the interviewer asked questions about the child's exposure to violence inside the home: "What kinds of conflicts, arguments, or violence was the child exposed to and aware of during this time (such as shouting, physical fights, pushing, etc.)? How about between the child's mother and father?" The interviewer then completed a 5-point rating of conflict and violence between the child's parents (1 = *rarely even shout* to 5 = *physical more than once*); coder agreement, as assessed by correlations in ratings, was .70 for Era 2, and .70 for Era 3. The final score was averaged over reports for the second and third eras. For the single-mother families where parental conflict was not coded (because there was no contact with the child's father), a score of 1 was given; (d) *exposure to violence* was also coded using a 5-point scale (1 = *none* to 5 = *physical, more than once*), and averaged across the second and third eras. Exposure to violence outside of the home was differentiated from exposure to violence inside the home only for the second cohort. Coder agreement was $r = .49$ for Era 2, and $r = .69$ for Era 3; (e) *harsh discipline*—during the interview, the mother answered several questions regarding the discipline of the child: "Who usually disciplined the child? How was the child disciplined? Was the child ever punished physically? If physical punishment was used, how did adults usually spank the child (e.g., with the hand or with objects)? Do you remember any times when the child was disciplined severely enough to be hurt or to require medical attention?" After answering these questions, the interviewer coded

responses to two questions rated on 5-point scales. The first rating was for the degree of restrictive or punitive discipline received by the child, with scores ranging from 1 = *nonrestrictive* to 5 = *severe, strict, often physical discipline*. Independent coder agreement was $r = .80$ for Era 2 and $r = .73$ for Era 3; an average score over both eras was computed; (f) *physical harm*—the interviewer also completed a rating of the likelihood that the child had been physically abused in either era, with scores ranging from 1 = *definitely not* to 5 = *authorities involved*. For both the harsh discipline and physical abuse ratings, reliability was high (proportion of agreement across independent raters = .97; correlation between scores derived from mother and father interviews = .74; correlations with parents' written discipline ratings = .4 to .6); (g) lack of *positive parenting*—each mother completed an interview about discipline strategies, based on the presentation of vignettes of child misbehavior (Concerns and Constraints Questionnaire). Five scenarios were presented: the child loses a race and calls the winner a bad name; the child is getting in line at school and is bumped, so he or she pushes the other child; the child asks to join a ballgame in the park, but when the others do not hear him or her, the child grabs the ball and threatens to throw it down the sewer; the child refuses to invite his or her cousin to a birthday party; the child teases a peer about being dumb. Mothers answered several questions about what they might do, including what types of discipline they would use. As a measure of positive parenting, mothers were asked what they would do to prevent their own child from behaving this way in the future. Mothers responded, and the interviewer rated this response, using a 5-point scale (1 = *do nothing, is unpreventable* to 5 = *preventable, anticipatory, situation specific*). An average score (across the five scenarios) was computed; internal consistency of scores across the five scenarios was $\alpha = .63$; (h) *attitudes toward aggression*—mothers rated their attitudes about aggression (Culture Questionnaire; Dodge et al., 1994) on 15 items coded on a 7-point scale (1 = *definitely disagree* to 7 = *definitely agree*). Example items were "It is important to keep a gun at home to protect the family" and "I wouldn't mind if my child got a reputation as the toughest kid in school." Five items were reverse scaled, to reduce response biases. An average score over these 15 items was computed. Internal consistency was low but acceptable for the present purpose ($\alpha = .55$).

Two peer experience risks included: (a) *peer rejection*—coded from peer sociometric nominations in the kindergarten year only, as already described. Frequencies of liked-most and liked-least nominations for each child were standardized within classrooms. The number of disliking nominations was subtracted from the number of liking nominations, resulting in a restandardized social preference score. Peer social status was computed using the formula in Coie and Dodge (1983). Those children who were rejected by their peers (coded as 1) were identified as having standardized social preference scores below −1, disliking scores greater than 0, and liking scores less than 0. All other children were coded as not-rejected (0) for this study; (b) *stability of peer group*—mothers described the history of their children's preschool peer groups, for the second and third eras. The interviewer then rated the degree of stability of peer contact, using a 5-point scale (1 = *high turnover* to 5 = *stable familiar group*). Independent rater agreement on this score was $r = .55$ for Era 2, and $r = .66$ for Era 3. An average score was computed across both eras.

Cumulative-risk status

Next, we computed four cumulative risk scores (one for each of the four domains of risks). Each risk variable was dichotomously coded (0 = *absence of risk factor*, 1 = *presence of risk factor*), so that a multiple-risk factor variable could be computed. Thresholds for determining risk were based on the scaling properties of the particular instruments used (with the exception of history of childcare and stressful life events, where arbitrary splits were used).

Child cumulative-risk was indicated by being male; presence of minor or major medical complications at birth and during pregnancy; resistant temperament, based on a mean score of 5 or more. These were summed to yield a score with a possible range of 0 to 3.

Sociocultural cumulative-risk was based on low-SES (category 1 or 2 on the Hollingshead Index −<29 on the continuous scale); living with a single mother; having more than two children to every adult in the household; teenage pregnancy (<18 years of age at first reported pregnancy); unplanned pregnancy, based on a score of four ("unplanned"); >11 stressful life events; high maternal social isolation, based on a score of 2 or less ("somewhat" to "very isolated"). These were summed to result in a score with a possible range of 0 to 7.

Parenting/caregiving cumulative-risk status was indicated by >1 standard deviation above the mean for amount of childcare; absence of father involvement and instrumental support (never helpful); high parental conflict, defined as a score of 3 (major verbal) or more; high exposure to violence, based on a score of 3 (major verbal) or more; harsh physical discipline, defined as a score of 3 (generally moderate, sometimes physical) or more; physical abuse likely, defined as a score of 3 (suspected, possible) or more; lacks positive parenting, based on a score of 2 (nonpreventative, power assertion, punish) or less; values aggression, defined as a mean score of 4 ("neutral") or more ("agree" to "strongly agree"). These were summed to yield a score of 0 to 8.

Peer cumulative-risk was based on being rejected by kindergarten peer group; unstable peer group, based on a score of 3 ("some variability") or less ("high turnover"). These were summed, resulting in a score of 0 to 2.

A total cumulative-risk score was also computed, by summing across all 20 binary risk factors (possible range of 0 to 20).

Results

Description of externalizing problems

We first computed descriptive statistics for children's externalizing and aggression scores at each assessment. There was little age-related change in the sample means on these measures (TRF means, child age 5 = 5.75, age 6 = 6.61, age 7 = 7.02, age 8 = 6.63, age 9 = 6.59; CBCL means for child age 5 = 11.51, age 6 = 10.34, age 7 = 9.60, age 8 = 9.33, age 9 = 9.27). Variability was similarly stable, for both TRF scores (standard deviations from 8.67 to 10.42) and CBCL scores (standard deviations from 6.80 to 7.47). Age-related changes in peer reports of aggression were not explored, as these scores were standardized within each annual assessment. Stability of individual rank within the sample was estimated using correlations between each assessment. For all three outcome measures, individual differences were stable ($p < .001$): teacher ratings $r = .51$ to .63 ($n = 444$ to 532), mother ratings $r = .55$ to .74 ($n = 385$ to 484), peer reports $r = .40$ to .60 ($n = 466$[1]). For subsequent analyses, we computed average externalizing and aggression scores across all 5 years, teacher ratings average score (TRF), ($M = 6.49$, $SD = 7.89$); mother ratings average score (CBCL; $M = 10.13$, $SD = 6.12$); peer reports of aggression average score (PEER; $M = −0.09$, $SD = 0.72$).

We used analysis of variance (ANOVA) to test gender and ethnic group mean differences in these averaged externalizing and aggression scores.[2] Teacher-rated externalizing raw scores were higher for boys ($M = 8.12$, $SD = 8.55$) than girls ($M = 4.72$, $SD = 6.58$), $F(1, 516) = 15.96$,

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[1]The sample size was small ($n = 162$) for 5th year peer reports, because only data for the first cohort were available.
[2]We also compared gender and ethnic group means at each assessment; the results were very similar to the results reported for the averaged externalizing and aggression scores.

$p < .001$, as were peer reports of aggression; boys $M = 0.24$, $SD = .79$; girls $M = -0.45$, $SD = .37$), $F(1, 465) = 86.62$, $p < .001$. In contrast, there were no gender differences in mother-rated externalizing raw scores (boys $M = 10.62$, $SD = 6.03$; girls $M = 9.62$, $SD = 6.18$). Teacher-rated externalizing raw scores were higher for African American children ($M = 9.04$, $SD = 9.25$) compared to European American children ($M = 5.94$, $SD = 7.41$), $F(1, 516) = 13.72$, $p < .001$, as were peer reports of aggression (African American $M = .08$, $SD = .72$; European American $M = -0.13$, $SD = .70$), $F(1, 465) = 10.32$, $p < .001$. The two ethnic groups were not significantly different in mother-rated externalizing raw scores (African American $M = 10.70$, $SD = 6.56$; European American $M = 10.04$, $SD = 6.08$). It is noteworthy that the ethnic group differences in teachers' and peers' ratings were no longer significant ($p > .50$) when socioeconomic status (SES) was included as a covariate in the analyses. For all three outcome measures, the interaction between gender and ethnic group was not significant.

Individual risk variables and externalizing behavior problems

The first question we asked was whether these 20 selected risk variables from four domains of risk were associated with externalizing behavior problems. We computed bivariate Pearson correlations between the 20 risk variables, and between these risk variables and the averaged externalizing raw scores and aggression scores (see Table 1). First, risk variable intercorrelations were explored within each of the four risk domains using pairwise deletion of missing data ($n = 566$ to 427). The three child risk variables were uncorrelated (gender, temperament, and medical problems at birth; rs from .04 to .08, *ns*). The correlations between the seven sociocultural risk variables were modest to moderate (SES, marital status, child:adult ratio, teenage pregnancy, unplanned pregnancy, stressful life events, and social isolation; rs from ± .01, *ns*, to .35, $p < .001$). There was also covariation between the eight parenting/ caregiving risk variables (extensiveness of daycare, father's involvement, parent conflict, exposure to violence outside of home, harsh discipline, likelihood of physical harm, no positive parenting, and attitudes about aggression; rs from ± .00, *ns*, to .55, $p < .001$). The two peer experience risk variables were uncorrelated (peer rejection in kindergarten, and unstable peer group; $r = -.05$, *ns*).

Next, the risk variables were correlated with externalizing outcomes using pairwise deletion of missing data ($n = 520$ to 375). Eighteen of the 20 risk variables were significantly correlated with at least one of the three externalizing problems measures. In general, higher externalizing and aggression scores were associated with variables from all four sets of risk variables: child risk variables (being a boy, more adverse temperament, more medical problems at birth), sociocultural risk variables (lower SES, living with a single mother, higher child-to-adult ratio, teenage pregnancy, unplanned pregnancy, more stressful life events), parenting/caregiving risk variables (more extensive nonmaternal child care, lower father involvement, higher parental conflict, more exposure to violence, harsher discipline, a greater likelihood of physical abuse, and maternal positive attitudes toward aggression), and peer experience risk variables (peer rejection in kindergarten). Two risk variables—maternal isolation and the stability of the peer group—were not correlated with any of the outcome measures.

Multiple risk factors and externalizing behavior problems

The second question was whether there was evidence for multiple risk factors for externalizing behavior problems. To test the statistical prediction of externalizing problems and aggression from each of the four sets of risk variables (child, sociocultural, parenting/caregiving, and peer experience), we used two regression models. In the first model, we estimated the maximized or initial statistical prediction of each set of risk factors and interactions with ethnicity and gender, using the following hierarchical regression: ethnic group, the set of risk factors of interest. This model provided an estimate of the variance accounted for by each set of risk factors without regard to covariation with the other three sets of risk variables.

In the second model, we estimated the unique contribution of each of the four sets of risk variables using the following hierarchical regression: ethnicity; the three other cumulative-risk variables; the cumulative-risk variable of interest.

Separate models were tested for TRF scores, CBCL scores, and peer-reported aggression scores. In every model, ethnic group status was entered first into the model. The results are shown in Table 2. Overall, the 20 risk variables accounted for 36% of the variance in TRF externalizing raw scores, 37% of the variance in CBCL externalizing raw scores, and 45% of the variance in peer-reported aggression scores, each $p < .001$.

All four sets of risk variables (child, sociocultural, parenting/caregiving, and peer experiences) accounted for variance in externalizing and aggressive behaviors. Child risk variables explained 7–24% of the variance in externalizing outcomes ("initial" regression model). Half or more of this variance was unique to these child risk variables—this set of factors accounted for 4% to 19% of the unique variance in these outcomes when all other risks had been statistically controlled ("unique" regression model). Sociocultural risks accounted for 4% to 11% ($p < .05$ to $p < .001$) of the variance in externalizing problems (initial regression model). Up to slightly more than half of this was variance unique to the sociocultural risk variables, 1% (*ns*) to 4% ($p < .05$) of the variance in the unique regression model. Parenting and caregiving risk variables accounted for 10% to 20%, all $p < .001$, of the variance in externalizing outcomes (initial regression model)—up to slightly more than one-quarter of this variance was unique variance, 2% (*ns*) to 6% ($p < .001$) in the unique regression model. Peer experience risks accounted for 6% to 16%, all $p < .001$, of the variance in externalizing outcomes in the initial regression model. Half to nearly all of this variance was unique to these peer risks, 5% to 13% of the variance, all $p < .001$, in the unique regression model.

Cumulative-risk status: Individual and group differences

The third question was whether there was evidence for cumulative-risk in the prediction of externalizing problems, and the fourth related question was whether this cumulative-risk effect varied across gender and ethnic groups. First, we estimated the prevalence of each dichotomous risk variable (see Method, where we have described how these were derived) for the entire sample as well as within ethnic and gender groups. These prevalence rates are shown in Table 3.

The prevalences of the child and peer-related risk variables were similar for African American and European American children. However, African American children had higher, $p < .05$ or less, prevalences for six of the seven sociocultural risk variables (low-SES, single-mother, high child:adult ratio, teenage pregnancy, unplanned pregnancy, and maternal social isolation) and five of the eight parenting/caregiving risk variables (father not helpful, exposure to violence, harsh discipline, physical harm, and positive attitudes about aggression).

By comparison, there were few gender differences in the prevalences of these risk variables. There were no statistically significant, $p < .05$, gender differences in the prevalences of child or sociocultural risk variables. However, there were a few gender differences in the prevalences for the parenting/caregiving and peer experiences risk variables. Boys were more likely to have received harsh discipline (55 vs. 45% of girls), to have mothers who valued aggression (8 vs. 4% of girls), and to have been rejected by their peers in kindergarten (14 vs. 8% of girls). More girls had fathers who were uninvolved in childcare (13 vs. 5% of boys).

Next, we computed bivariate Pearson correlations between the cumulative-risk variables, and between these and the outcomes. These, along with the descriptive statistics for the cumulative-risk variables, are shown in Table 4. Children had just less than four risk factors ($M = 3.81$, $SD = 2.5$), on average. These included 1.45 parenting/caregiving risks, 1.25 sociocultural risks,

0.83 child risks, and 0.27 peer experience risks. African American children had significantly (*t* test, *p* < .001) more risk factors, on average (*M* = 5.67), compared to European American children (*M* = 3.44), including over twice as many sociocultural risks (*p* < .001), and nearly twice as many parenting/caregiving risks (*p* < .001). In contrast, boys and girls had nearly identical numbers of risk factors; the only difference, as shown in Table 4, is an artifact of the inclusion of child gender in the child cumulative-risk variable (so that boys have, on average, one more risk factor than girls, given that being male was included as one of the child risk variables).

The number of child risks was independent of the number of sociocultural, parenting/caregiving, and peer experience risks. In contrast, sociocultural risk was moderately correlated with the number of parenting/caregiving risk variables, *r* = .42, *p* < .001, and both of these were correlated with the number of peer-related risk variables, *r* = .19 for sociocultural, and .17 for parenting/caregiving, *p* < .001. All four cumulative-risk variables, as well as the total cumulative-risk variable, were correlated with externalizing and aggression scores, *r*s ranged from .15 to .40, *p* < .001, so that externalizing and aggression scores were higher for children with more risk factors.

To test the statistical prediction of externalizing problems and aggression from each of the four cumulative-risk variables (child, sociocultural, parenting/caregiving, and peer experience), we used two regression models (see Table 5). In the first model, we estimated the maximized or initial statistical prediction ($I\Delta R^2$ in Table 5) of each cumulative-risk factor and its interactions with ethnicity and gender, using the following hierarchical regression: ethnic group and gender; the cumulative-risk variable of interest; two-way interactions between the cumulative-risk variable with ethnicity, and with gender; and the three-way interaction between the cumulative-risk variable, ethnicity, and gender. This model provided an estimate of the main effect of each cumulative-risk variable without regard to overlapping covariation with the other three cumulative-risk variables.

In the second model, we estimated the *unique* contribution of each of the four cumulative-risk variables ($U\Delta R^2$ in Table 5), using the following hierarchical regression: ethnicity and gender; the three other cumulative-risk variables; the cumulative-risk variable of interest; the two-way interactions between the cumulative-risk variable of interest, with ethnicity, and with gender; and the three-way interaction between the cumulative-risk factor of interest, ethnicity, and gender. We have also reported the total explained variance for each of these two regression models (Final R^2) once all of the variables and interaction terms had been entered into the equation. Note that the variance estimates for each of the four cumulative-risk variables from either the maximized variance model or from the unique variance model do not necessarily sum to equal the Final R^2, because these models do not account for prediction from overlapping or shared variance among these four cumulative-risk variables, and the contribution of interaction terms to the final explained variance in a model also varied depending on the cumulative-risk variable being tested. Overall, the total number of risk factors accounted for about 20% of the variance in TRF externalizing raw scores, about 20% of the variance in CBCL externalizing raw scores, and about 30% of the variance in peer-reported aggression scores. This Final R^2 varied slightly, depending on the contribution of interaction terms to explained variance in the final equation.

The number of child risk variables accounted for 2% of the variance (1% of the unique variance) in TRF scores, and 8% of the variance (7% of the unique variance) in CBCL scores. This cumulative-risk variable also accounted for just less than 1% of the variance in peer-reported aggression (although this effect was not significant for the unique variance model). The interaction terms were not significant.

Sociocultural risk explained 6% of the variance (2% unique) in TRF scores, 6% of the variance (1% unique) in CBCL scores, and 3% of the variance (1% unique) in peer-reported aggression scores. Both two-way interactions, as well as the three-way interaction, were significant in the prediction of peer-reported aggression. Having more sociocultural risks was related to higher aggression scores among European American children and especially boys, $r = .33$, $n = 202$, $p < .001$; European American girls, $r = .20$, $n = 176$, $p < .001$, but not among African American children, boys $r = .01$, $n = 45$, $ns;$ girls $r = −.08$, $n = 46$, ns.

Parenting/caregiving risk accounted for 5% of the variance (1% unique) in TRF scores, 8% of the variance (4% unique) in CBCL scores, and 1% of the variance (none unique) in peer-reported aggression scores. There was a marginally significant interaction between parenting/caregiving risk and ethnicity in the prediction of TRF scores, whereby higher risk was associated with higher externalizing scores, but only for European American children, $r = .30$, $n = 426$, $p < .001$ versus African American children, $r = .04$, $n = 94$, ns. The same interaction term was significant for peer-reported aggression, so that higher risk was related to higher aggression scores, but again only for European American children, $r = .21$, $n = 378$, $p < .001$ versus African American children, $r = −.09$, $n = 91$, ns.

Peer experience risk accounted for 5% of the variance (3% unique) in TRF scores, 4% of the variance (1% unique) in CBCL scores, and 3% of the variance (2% unique) in peer-reported aggression scores. The interaction with ethnicity was significant in the prediction of CBCL scores, so that higher risk was associated with higher externalizing scores, but only for European American children, $r = .26$, $n = 402$, $p < .001$ versus African American children, $r = −.09$, $n = 85$, ns.

We also analyzed the total number of risk variables (summing the number of child, sociocultural, parenting/caregiving, and peer experience risks) as a predictor. This total cumulative-risk variable accounted for 10% of the variance in TRF scores, 16% of the variance in CBCL scores, and 4% of the variance in peer-reported aggression scores. The interaction with ethnic group status was significant for TRF and peer-reported aggression scores, and was marginally significant for CBCL scores. Higher risk was more strongly related to higher externalizing for European American children, TRF: $r = .44$, $n = 426$, $p < .001$ versus African American children, $r = .15$, $n = 94$, $ns;$ CBCL: $r = .44$, $n = 402$, $p < .001$ versus African American children, $r = .25$, $n = 85$, $p < .05$; peer-reported aggression: $r = .41$, $n = 378$, $p < .001$ versus African American children, $r = −.02$, $n = 91$, ns.

The statistical prediction of these outcome measures from the total cumulative-risk variable was very similar at each assessment. The results of the hierarchical regression analyses (described in the previous paragraph) for the total multiple-risk variable, predicting TRF, CBCL, and peer-reported aggression at each assessment (child age 5, 6, 7, 8, and 9 years), are shown in Table 6. Having more risk factors was consistently associated with higher externalizing raw scores and peer-reported aggression scores, regardless of child age. There was also consistency in the contribution of the risk-status by ethnic group status interaction term.

One general issue regarding the interaction between ethnic group status and cumulative-risk status is whether this effect is in fact due to social-class differences. Although we statistically controlled SES in these analyses, we estimated the correlations between total cumulative-risk and TRF and peer-reported aggression scores (the two significant interaction effects in the total cumulative-risk model just described) separately for low-SES and middle/high SES European American and African American children. For European American children, the correlations were similar for low-SES, TRF: $n = 65$, $r = .32$, $p < .001$; peer-reported aggression: $n = 62$, $r = .32$, $p < .001$ and middle-SES children, TRF: $n = 361$, $r = .39$, $p < .001$; peer-reported

aggression: $n = 316$, $r = .37$, $p < .001$. Among African American children, the correlations were similar for low-SES, TRF: $n = 51$, $r = .08$, *ns;* peer-reported aggression: $n = 50$, $r = .03$, *ns* and middle-SES children, TRF: $n = 43$, $r = .10$, *ns;* peer-reported aggression: $n = 41$, $r = .06$, *ns*. The observed ethnic group difference in the covariation of cumulative-risk status and externalizing outcomes was not due to any SES differences between European American and African American children.

Another related issue was whether risk status was related to children's subsequent aggression and externalizing behavior problems, once earlier measures of aggression and externalizing had been taken into account. In other words, given the high stability of these behaviors over middle childhood, does risk status at age 5 years statistically predict later aggression and externalizing problems, once individual differences in our initial measures of these behaviors (also assessed when the children were 5 years old) had been statistically controlled? In order to answer this question, we estimated the first-order partial correlations between total cumulative-risk status and children's subsequent teacher, mother, and peer reports of externalizing and aggression scores, controlling for our initial measure (age 5 years) of teacher, mother, or peer reports of externalizing and aggression. Even after controlling for initial levels of aggression or externalizing behaviors, having more risk factors was correlated with higher subsequent (5th year) aggression or externalizing scores, TRF: $n = 460$, $r = .34$, $p < .001$; CBCL: $n = 410$, $r = .23$, $p < .001$; peer-reported aggression (4th year due to incomplete peer report data in 5th year; see Footnote 1): $n = 430$, $r = .16$, $p < .01$.

Lastly, we tested whether each of the four domains of individual risk variables accounted for any variance above and beyond the effect of the total cumulative-risk variable. That is, we wanted to estimate the degree to which the variance attributable to each domain of individual risk factors was due to the number of risk factors present. We used hierarchical regression analysis with the following steps: ethnicity; total number of risks; set of risk variables of interest (child, sociocultural, parenting/caregiving, or peer experiences). Four separate models were estimated, one for each set of risk variables. For all four domains, individual risk factors accounted for variance beyond that due to the total number of risk factors present: (a) child risks: TRF $R^2 = .03$ ($p < .01$), CBCL $R^2 = .09$ ($p < .001$), peer-reported $R^2 = .17$ ($p < .001$); (b) sociocultural risks: TRF $R^2 = .02$ (*ns*), CBCL $R^2 = .04$ ($p < .01$), peer-reported $R^2 = .01$ (*ns*); (c) parenting/caregiving risks: TRF $R^2 = .05$ ($p < .01$), CBCL $R^2 = .04$ ($p < .01$), peer-reported $R^2 = .07$ ($p < .001$); (d) peer risks: TRF $R^2 = .10$ ($p < .001$), CBCL $R^2 = .02$ ($p < .01$), peer-reported $R^2 = .13$ ($p < .001$). Thus, the prediction of externalizing outcomes from these risk factors was not only a function of cumulative risk; individual risk variables accounted for variance in externalizing behavior problems, even after the total number of risk factors had been statistically controlled.

Patterns of cumulative risk: Equifinality

The fifth and final question we asked was whether there was evidence for equifinality in the prediction of externalizing behavior problems from these multiple risk factors. Hierarchical cluster analysis (between-group linkage method) of the four multiple-risk variables (child, sociocultural, parenting/caregiving, and peer) was used to identify groups with different sets of multiple-risk factors, and to test whether these different groups had similar or different outcomes (based on an approach used by Sameroff et al., 1993). We selected those children who had 4 or more of the 20 risks (above the sample mean of 3.88 risks). This resulted in a subsample of 272 children (60% male, 27% African American).

Five clusters with samples large enough for statistical analyses were identified (see Table 7). The first group ($n = 100$) was undifferentiated, with risk factors present from all four domains (child, sociocultural, parenting/caregiving, and peer). The second group ($n = 41$) was high in child and sociocultural risks. The third group ($n = 32$) was high in child and parenting/

caregiving risks. The fourth group ($n = 51$) was high in sociocultural and parenting risks, with moderate levels of peer-related risks. The final group ($n = 32$) was similar to the fourth (high sociocultural and parenting risk), but had low levels of peer-related risks. Sixteen children did not cluster into these five groups and were excluded from analyses.

Group membership was related to gender ($\chi^2[4] = 41.47$, $p < .001$) and ethnic status ($\chi^2[4] = 22.36$, $p < .001$). Boys were overrepresented (compared to the selected subsample proportion of 60%) in the second and third groups. However, this gender difference is an artifact, because these two groups were high in child risks, and child gender was included as a child risk in this multiple-risk variable. African American children were overrepresented (compared to the selected subsample proportion of 27%) in the second, fourth, and fifth groups. Interestingly, all three of these groups were similarly high in sociocultural risks.

There was a significant association between group membership and total number of risks, Tukey honestly significant difference, $F(4, 251) = 91.78$, $p < .001$, as is evident from the means shown in Table 7. The fourth group (high sociocultural, parenting, moderate peer risks) was particularly high in total number of risks compared to the other groups, whereas the first three groups had similar total risk means.

We tested whether group membership was related to mean differences in externalizing and aggression (analysis of covariance—ANCOVA), once the effect of total number of risks had been statistically controlled. Group differences would indicate that particular patterns of risk factors were more or less important in the prediction of externalizing problems. Group similarity would indicate that the different patterns of risks led to similar outcomes. The adjusted means (adjusted for total number of risks present) and observed standard deviations for TRF, CBCL, and peer-reported aggression are also shown in Table 7. All five groups of children had similar levels on the outcomes; the group membership factor in the ANCOVA models was not significant, TRF: $F(4, 225) = 0.42$, $p > .7$; CBCL: $F(4, 209) = 0.93$, $p > .4$; peer-reported aggression: $F(4, 205) = 1.55$, $p > .18$. Once overall level of risk had been statistically controlled, the particular pattern of risks was unrelated to externalizing and aggression.

Discussion

Externalizing behavior problems in middle childhood have been shown to be predicted from various child, sociocultural, parenting, and peer-related risk factors. The aim of this study was to explore the patterns of risk and externalizing outcomes in a large and diverse community sample of school-age children and their parents. We addressed four specific questions about the nature of these risk factors, and the ways in which they operated in different identifiable groups of children.

What is the relation between each of the four general domains of risks and externalizing problems?

Consistent with the literature on psychosocial risk factors for externalizing problems (Campbell, 1995; Hinshaw, 1994; Kazdin, 1995), most (18 of 20) of the risk factors were significantly correlated with externalizing behavior problem scores, and all effects were in the expected direction. A contribution of this study is in demonstrating these relations in a diverse community sample using a prospective design across 5 years. Furthermore, all four general domains of risk (child, sociocultural, parenting/caregiving, and peer related) were related to externalizing problems.

Statistical prediction was very good; together, along with gender and ethnicity, risk factors accounted for about one-third (36–45%) of the variance in externalizing and aggressive

behavior in middle childhood. Higher externalizing problems were associated with all three child risk variables (being a boy, more resistant temperament, medical problems), six of the seven sociocultural risks (lower SES, living with a single mother, higher child to adult ratio, teenage pregnancy, unplanned pregnancy, more stressful life events), all eight parenting/ caregiving risks (more extensive nonmaternal child care, lower father involvement, higher parental conflict, more exposure to violence, harsher discipline, a greater likelihood of physical abuse, lack of positive parenting, and maternal positive attitudes toward aggression), and one of the two peer experience risks (peer rejection in kindergarten).

These results are not too surprising, given that the selection of these risk factors was based on previous findings. Other studies have identified sociocultural (McLoyd, 1990) and parenting risks (Patterson et al., 1992), peer rejection (Parker & Asher, 1987), child gender (Zahn– Waxler, 1993), and adverse temperament (Caspi, Henry, McGee, Moffitt, et al., 1995; Rothbart & Bates, 1997; Rubin et al., 1995) as being particularly salient risk factors. However, the important contribution of this study is that almost all of these risk factors were related to individual differences in externalizing behavior problems in this large, diverse community sample of children.

Do the domains increment each other to support a multiple-risk model in the prediction of externalizing behavior problems?

The findings clearly establish that risk factors in each of the four domains studies provide significant unique contributions to the prediction of later externalizing behavior problems. Child factors uniquely explained up to 19% of the variance in externalizing problems, with peer-related factors (up to 13%), parenting factors (up to 6%), and sociocultural factors (up to 4%) also providing unique contributions. These findings strongly suggest that the development of externalizing behavior problems is not dictated merely by child or sociocultural factors present at birth; rather, experiences with parents and peers in early life play important roles in altering the trajectories of conduct problems. A full model of the development of conduct problems should include at least these four domains.

Is there evidence to support a cumulative-risk model in the prediction of externalizing behavior problems in middle childhood?

The cumulative-risk model (Yoshikawa, 1994; Biederman et al., 1995) was also supported. The number of risk factors present, regardless of which ones they were, predicted individual differences in externalizing behavior problems in middle childhood, as well as at each of the five annual assessments. The total number of risk factors present (ranging from none to 12 in this sample) accounted for 10–16% of the variance in externalizing and aggressive behaviors. Furthermore, total cumulative-risk status was correlated with subsequent aggression or externalizing problems, even after the initial measures of aggression or externalizing problems had been statistically controlled. Perhaps most importantly, cumulative-risk status in all four domains of risk provided unique statistical prediction of externalizing behavior problems.

It is noteworthy that the statistical prediction of externalizing problems was lower in the cumulative-risk models, compared to the prediction from the variation in the individual risk factors. In addition, the individual risk factors still accounted for variance in externalizing outcomes, after total cumulative risk had been statistically controlled. It is clear from this comparison of prediction from individual risks, and prediction from cumulative-risk variables, that although the number of risks may be a more parsimonious model (Sameroff et al., 1993), individual differences in the presence or absence of particular risk factors remained vital to predicting externalizing behavior problems.

Are there ethnic and gender group differences in the prediction of externalizing problems from the cumulative risk model?

Although boys were reported by their teachers and peers as being more aggressive and higher in externalizing behavior problems than girls (group means were at least 0.5 standard deviation apart), higher risk similarly predicted higher problem scores for both genders. There was little evidence that child gender operated as a moderator of the links between each child's multiple risk status (measured as the number of risk factors present) and his or her externalizing and aggressive behaviors. This is an important finding, because it means that although girls are less likely to be highly aggressive or oppositional, their risk factors do not differ from those of boys (but see Blanz et al., 1991, and Shaw et al., 1994, for evidence of gender differences in risk for psychopathology). This may also be an indication that the etiology of externalizing behavior problems is similar for girls and boys, in spite of the mean difference in outcome found in most studies (Zahn–Waxler, 1993; Zoccolillo, 1993).

On average, more psychosocial risk factors were present for African American children compared to their European American peers. This is not surprising, given the disparity in environmental risk between ethnic majority and minority children found in the United States (McLoyd, 1990). By contrast, although there were no ethnic group mean differences in aggression and externalizing scores (after SES was statistically controlled), a significant two-way interaction between cumulative risk and ethnic status indicated that the multiple-risk model was operating differently for African American and European American children. Unlike the moderate positive association found among European American children between the number of risk factors and externalizing and aggression outcomes, more modest (nonsignificant) positive and negative (non-significant) correlations were found among African American children between the number of risks (largely in the parenting/caregiving domain) and teacher ratings and peer reports of outcome. Although the African American sample was smaller than the European American sample, there were still enough children within this ethnic group to detect correlations of .3 at 80% power ($n > 88$ required). The lower positive or negative correlations found between risk status and externalizing outcomes for African American children are probably not artifactual, as the distributions of these variables were similar for both ethnic groups (in spite of the mean differences in number of risks), and were not due to confounds with SES.

A group difference in the covariation of risk and outcome implies that the developmental processes involving psychosocial risk and externalizing problems may differ for the groups (see Rowe et al., 1994); in this case, having more parenting/caregiving risk factors was not related to behavior problems for African American children. This lack of an association between negative aspects of parenting and African American children's is consistent with several other studies of social–emotional development and school achievement (Basic Behavioral Science Task Force Report, 1996; Deater–Deckard & Dodge, 1997; McLeod et al., 1994). One explanation is that the meaning of these risk factors varies across cultural groups. For example, there may be cultural variations in the ways adults and children view parental discipline (Deater–Deckard, Dodge, Bates, & Pettit, 1996), family structure and values (Ogbu, 1981), and maternal employment (Anderson, 1990). In measurement terms, there may be group differences in the validity of these measures, thus making group moderating effects suspect. It is also important to emphasize that ethnicity is only one aspect of cultural variation; without more information about each individual's own cultural identity (including, among other things, education and occupation, religion, and social attitudes), it is difficult to make conclusive statements about culture based only on ethnic status. Further research, testing for replication in other samples using more rigorous measurement of cultural variation, is required, before anything conclusive can be said about the moderating effects of ethnicity.

Is there evidence for equifinality in the links between these risks and externalizing problems?

The principle of equifinality is that there are multiple pathways leading to similar outcomes; the evidence from this study supports this idea. The individual risk factors were not colinear with each other in predicting externalizing outcomes. Nearly all of the twenty individual risk factors were correlated with externalizing problems and aggression, and they were not simply redundant with one another in their covariation with these outcomes. Each of the four sets of risk factors (child, sociocultural, parenting/caregiving, and peer-related) made unique contributions to the statistical prediction of externalizing problems. The prediction from the cumulative-risk factors is also informative in this regard. Having more risks, regardless of what they were, was related to problems in middle childhood. Identified groups of children with different patterns of risk factors (derived from cluster analysis) had similarly elevated externalizing and aggression scores, once overall level of risk had been statistically controlled.

The findings in support of equifinality suggest that conduct problems have diverse developmental pathways, a finding that is consistent with other recent investigations of the multiple pathways to disruptive behaviors in young children (Shaw, Owens, Vondra, Keenan, & Winslow, 1996; see also Harter & Whitesell, 1996, for an example of multiple pathways to depression among adolescents). Some children show higher levels of externalizing problems due to poor quality parenting, whereas others develop these problems through negative peer experiences. Such diverse pathways may ultimately prove to be linked by a common core etiology. Alternately, these diverse pathways might suggest distinct subtypes of conduct problems that merit further inquiry. For example, it is possible that the quality, life course, and treatment of conduct problems that are predicted from child risk factors differ appreciably from conduct problems that are predicted from poor-quality parenting. This idea is not new—others have suggested single predominant pathways (for example, Patterson, DeBaryshe, & Ramsey, 1989) or multiple categories of pathways (for example, Moffitt, 1993) to antisocial behaviors in adolescence and adulthood. The current study provides additional evidence that there are probably multiple pathways to conduct problems based on risk factors in early childhood.

Caveats and conclusions

There are several caveats to consider. Risk status was measured at only one time point, and our attempts to represent the presence of risk factors over the course of the child's first 5 years (using retrospective reports for several eras between infancy and 5 years of age) resulted in low internal consistency for a few risk variables. In addition, the correlational nature of the data limits interpretation. Furthermore, although we were able to statistically predict individual differences for the total sample and within gender and ethnic groups from risk factors measured at the beginning of the study, it is possible that changes in risk over time reduced the predictive power of these models. We could not test whether it was concurrent risk status, or the chronicity of risk status, that was most important. Intraindividual variation in risk status, particularly if there were systematic differences for African American and European American children, could be affecting these results. Lastly, the generalizability of these findings should be considered in light of the multiple-cohort, multiple-site nature of the sample. There was not a cohort effect for cumulative-risk status, but there was a small site difference in the total number of risk factors present (Nashville, $M = 4.93$; Knoxville, $M = 3.09$; Bloomington, $M = 3.44$).

Nonetheless, the current study demonstrates that one-third to almost one-half of the variance in externalizing problems in middle childhood can be predicted from risk factors present at age 5 years. The fact that risk status was based solely on parent reports is both a strength and a weakness of the study—although we relied on parental report, we were able to obtain substantial prediction from these parental reports. Shared method variance was not an issue, given that the prediction from these multiple risk variables, almost all based on mothers' reports, predicted teacher-reported and mother-reported externalizing scores equally well (see

Table 4, for instance). Further research will undoubtedly refine this prediction through the identification of other risk variables and, more importantly, combinations of risk variables, suggesting that preventive interventions can appropriately target a high-risk group by the time of school entry.

Acknowledgments

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Table 1

Correlations: Between risk variables and with externalizing problems

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TRF	CBCL	Peer
Child:																							
1. Gender	—																				22	09	48
2. Temperament	08	—																			18	36	13
3. Medical problems	04	07	—																		06	15	06
Sociocultural																							
4. SES	05	-07	-02	—																	-32	-25	-19
5. Marital status	-08	-02	03	-35	—																20	14	17
6. Child : adult ratio	01	-02	05	-25	31	—															14	14	10
7. Teen pregnancy	-03	-07	-02	-27	20	19	—														10	07	09
8. Unplanned preg	-01	08	00	-26	21	14	01	—													17	15	10
9. Life events	00	06	03	-12	24	12	-02	08	—												09	23	10
10. Isolation	06	05	-06	27	-13	-12	-10	-10	-04	—											-08	-03	-06
Parenting/caregiving																							
11. Daycare	04	-01	-01	08	08	-03	-01	01	16	14	—										12	06	18
12. Dad helps	12	02	-04	32	-52	-33	-06	-17	-17	28	02	—									-20	-13	-10
13. Parent conflict	03	08	05	-30	25	19	18	07	33	-21	03	-27	—								18	26	13
14. Violence	-01	08	12	-30	26	12	16	23	16	-15	00	-25	26	—							08	18	04
15. Harsh discipline	10	21	09	-28	09	06	08	08	13	-16	-01	-21	30	22	—						23	31	19
16. Physical harm	04	16	04	-37	28	15	06	19	24	-16	02	-23	41	30	55	—					29	30	21
17. No + parenting	01	-03	00	19	-07	-05	-07	-08	05	14	06	18	-02	-04	-07	-06	—				-14	-12	-08
18. Values aggress	11	11	01	-33	12	14	10	07	07	-13	01	-11	24	13	19	21	-17	—			16	23	10
Peer experiences:																							
19. Peer rejection	10	12	05	-12	02	04	05	08	07	-08	07	-06	14	03	15	20	01	08	—		39	24	39
20. Stable peer grp	04	02	01	21	00	-06	-12	-04	-11	32	20	10	-15	-15	-14	-18	05	-12	-05	—	-04	-07	07

Between Risk Variables | With Outcome Measures

Note: Decimals not shown; correlations based on pairwise deletion of missing data (between risk variables, $n = 566$ to 427; with outcomes, $n = 520$ to 375). Statistical significance for this range of n's approximated to be: $p < .05$ for $rs > .08$, $p < .01$ for $rs > .11$, and $p < .001$ for $rs > .14$. Continuous variables used for estimation of correlations, except for the dichotomous variables marital status (0 = *two-parent*, 1 = *single mother*), peer rejection (0 = *not rejected*, 1 = *rejected*), and teen pregnancy (0 = *18 years or older*, 1 = *younger than 18 years*). Outcome measures include TRF (teacher report of externalizing), CBCL (mother report of externalizing), and Peer (peer report of aggression).

Table 2

Prediction of externalizing problems from ethnic group and individual risk variables: Initial and unique regression weights and explained variance

| | TRF: total $R^2 = .36$*** | | | | CBCL: Total $R^2 = .37$*** | | | | Peer: Total $R^2 = .45$*** | | | |
| | β | | ΔR² | | β | | ΔR² | | β | | ΔR² | |
	I	U	I	U	I	U	I	U	I	U	I	U
Ethnic group	.15***	—	.02***	—	.04	—	.00	.07***	.11*	—	.01*	.19***
Child			.07***	.04***			.15***	—			.24***	—
Gender	.19***	.16***	—	—	.04	.00	—	—	.47***	.43***	—	—
Temperament	.16***	.12***	—	—	.35***	.25***	—	—	.10*	.08†	—	—
Med prob	.03	.01	.07***	.04*	.13**	.13*	—	—	.02	.01	—	—
Sociocultural			.07***	.04*			.11***	.03†			.04*	.01
SES	−.20***	−.13*	—	—	−.23***	−.05	—	—	−.08	−.08	—	—
Marital	.06	−.06	—	—	−.01	−.04	—	—	.10†	.00	—	—
Child: adult ratio	.05	.16**	—	—	.05	.08	—	—	.03	.08	—	—
Teenage preg	.02	−.01	—	—	.05	.03	—	—	.05	.02	—	—
Unplanned preg	.07	.04	—	—	.05*	.06	—	—	.05	.00	—	—
Life events	.05	−.04	—	—	.20***	.14*	—	—	.06	.03	—	—
Isolation	.02	.04	—	—	.08†	.08	—	—	.00	−.01	—	—
Parenting			.11***	.02			.20***	.06***			.10***	.04*
Daycare	.12*	.10*	—	—	.04	.03	—	—	.18**	.14**	—	—
Dad no help	−.04	−.01	—	—	.02	.00	—	—	−.03	−.06	—	—
Parent conflict	.00	−.02	—	—	.10†	.06	—	—	−.03	−.07	—	—
Violence	−.05	−.06	—	—	.08	.03	—	—	−.06	−.07	—	—
Harsh discipline	.03	−.05	—	—	.17***	.11†	—	—	.09	.01	—	—
Physical harm	.25***	.12†	—	—	.14*	.03	—	—	.19**	.07	—	—
No pos parenting	−.09†	−.06	—	—	−.12*	−.12*	—	—	−.06	−.05	—	—
Values aggress	.04	−.03	—	—	.17	.16***	—	—	−.01	−.11*	—	—
Peer experiences			.16***	.13***			.06***	.05***			.17***	.10***
Peer rejection	.40***	.40***	—	—	.23***	.23***	—	—	.40***	.33***	—	—
Unstable peer grp	.00	−.02	—	—	−.05	−.05	—	—	.09*	.07	—	—

Note: Total explained variance for model with all predictors included. Standardized regression (β) weights and explained variance (ΔR²) for individual risk variables within each set when entered without other risk factors (Initial: *I*), and when entered after other risk factors (Unique: *U*) in last step of hierarchical multiple regression model. Outcome measures include TRF (teacher report of externalizing), CBCL (mother report of externalizing), and Peer (peer report of aggression).

†$p < .10$.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 3

Prevalences of risk variables: Ethnic and gender group comparisons

Risk Variables	All	By Ethnicity		By Child Sex	
		Eu-Am	Af-Am	Girls	Boys
Child:					
1. Gender	52	52	49	—	—
2. Temperament	10	09	14	09	11
3. Medical problems	22	21	26	21	24
Sociocultural:					
4. SES	23	17	54 ***	24	22
5. Marital status	24	18	54 ***	27	21 †
6. Child: adult ratio	08	05	21 ***	08	08
7. Teenage pregnancy	07	04	25 ***	08	07
8. Unplanned pregnancy	13	10	24 ***	13	12
9. Life events	17	17	16 **	17	17
10. Isolation	34	31	46 **	37	30 †
Parenting/caregiving:					
11. Daycare	11	11	13	11	11
12. Dad no help	08	06	21 ***	13	05 **
13. Parent conflict	21	21	23 ***	20	22
14. Violence	17	13	35 ***	17	16
15. Harsh discipline	49	48	59 *	45	55 *
16. Physical harm	12	11	18 *	11	13
17. No pos parenting	22	20	28 †	22	21
18. Values aggress	06	05	13 **	04	08 *
Peer experiences:					
19. Peer rejection	11	12	10	08	14 *
20. Stable peer grp	16	15	18	16	16

Note: Percentage of sample or group. Significance based on χ^2 test between ethnic groups, and between gender groups.

†
$p < .10.$

*
$p < .05.$

**
$p < .01.$

***
$p < .001.$

Table 4

Cumulative-risk factors: Descriptive statistics and correlations with externalizing and aggression

| | M and SD, and Group Comparisons | | | | | Correlations for Entire Sample | | | | | | |
| | | By Ethnicity | | By Child Sex | | Between Factors | | | | With Outcomes | | |
	All	Eu-Am	Af-Am	Girls	Boys	1	2	3	4	TRF	CBCL	Peer
1. Child	0.83 (0.8)	0.83 (0.7)	0.89 (0.8)	0.30 (0.5)	1.34 (0.6)***	—				25***	25***	40***
2. Sociocultural	1.25 (1.4)	1.02 (1.1)	2.40 (1.7)***	1.34 (1.4)	1.17 (1.3)	01	—			28***	24***	18***
3. Parenting/caregiving	1.45 (1.3)	1.33 (1.2)	2.10 (1.4)***	1.42 (1.3)	1.50 (1.2)	07	42***	—		25***	30***	15***
4. Peer risks	0.27 (0.5)	0.27 (0.5)	0.28 (0.5)	0.23 (0.5)	0.30 (0.5)	07	19***	17***	—	24***	20***	18***
Total risks	3.81 (2.5)	3.44 (2.3)	5.67 (2.7)***	3.29 (2.6)	4.31 (2.4)***	35***	79***	78***	41***	39***	39***	32***

Note: Decimals for correlations not shown. *T* tests of ethnic and child gender group mean comparisons. Outcome measures include TRF (teacher report of externalizing), CBCL (mother report of externalizing), and Peer (peer report of aggression).

*** $p < .001$.

Table 5

Prediction of externalizing problems from cumulative-risk factors: Initial explained variance for ethnic and gender group, initial and unique explained variance for each cumulative-risk variable, and significance of interaction terms

	TRF			CBCL			Peer		
	$I\Delta R^2$	$U\Delta R^2$	Final R^2	$I\Delta R^2$	$U\Delta R^2$	Final R^2	$I\Delta R^2$	$U\Delta R^2$	Final R^2
Ethnicity	.02***	—	—	.017**	—	—	—	—	—
Gender	.05***	—	—	.23***	—	—	—	—	—
Child risk	.02***	.01**	.19***	.007*	.07***	.20***	.006†	.006†	.30***
× E	ns	ns	—	ns	ns	—	ns	ns	—
× S	ns	ns	—	ns	ns	—	ns	ns	—
× E × S	ns	ns	—	ns	ns	—	ns	ns	—
Socio risk	.06***	.02***	.19***	.03***	.01**	.20***	.01**	.01**	.32***
× E	ns	ns	—	ns	ns	—	ns	ns	—
× S	ns	ns	—	*	ns	—	*	ns	—
× E × S	ns	ns	—	*	ns	—	*	ns	—
Parent risk	.05***	.01**†	.20***	.01**	.04***	.20***	*	ns	.32***
× E	ns	ns	—	*	ns	—	ns	ns	—
× S	ns	ns	—	ns	ns	—	*	ns	—
× E × S	.05***	.03***	.19***	.04***	ns	.21***	.02***	.02***	.30***
Peer risk	.05***	.10***	.19***	.01**	.16***†	.17***	.04***	.04***	.32***
× E	ns	ns	—	ns	ns	—	ns	ns	—
× S	ns	ns	—	ns	ns	—	ns	ns	—
× E × S	ns	ns	—	ns	ns	—	ns	ns	—
Total risk	—	.10***	.19***	—	.16***	.17***	—	.04***	.32***
× E	—	ns	—	—	ns	—	—	ns	—
× S	—	ns	—	—	ns	—	—	ns	—
× E × S	—	ns	—	—	ns	—	—	ns	—

Note: Explained variance for ethnic and gender group when entered as first step in regression equation, and explained variance for cumulative-risk variable and significance of interaction terms when entered without other cumulative-risk variables ($I\Delta R^2$ = initial change in explained variance), when entered after other cumulative-risk variables ($U\Delta R^2$ = unique explained variance), and when all variables have been entered (Final R^2) using hierarchical multiple regression. E = cumulative-risk factor by ethnicity interaction; S = cumulative-risk factor-by-gender interaction; $E \times S$ = three-way interaction. Outcome measures include TRF (teacher report of externalizing), CBCL (mother report of externalizing), and Peer (peer report of aggression).

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 6

Prediction of externalizing problems from total cumulative-risk variable, at each assessment

	ΔR^2 for Each Assessment: Child Age				
	5	6	7	8	9
TRF					
Total risk	.06***	.04***	.07***	.06***	.13***
×E	.01*	.02**	.01†	ns	.02*
CBCL					
Total risk	.11***	.12***	.10***	.09***	.14***
×E	.005†	.005†	.008†	.01*	ns
Peer					
Total risk	.03***	.02***	.02***	.02***	.04***
×E	.01*	.01*	.01*	.01†	.01†
×S	ns	ns	.01*	ns	.04**

Note: Explained variance with total cumulative-risk factor entered in hierarchical multiple regression model from hierarchical multiple regression model, analyzing each assessment separately. Outcome measures include TRF (teacher report of externalizing), CBCL (mother report of externalizing), and Peer (peer report of aggression).

†
p < .10.

*
p < .05.

**
p < .01.

***
p < .001.

Table 7

Five clusters of cumulative-risk factors: M and SD, and mean comparisons, on total number of risk factors, and externalizing problems

Group	n	Total No. Risks	Externalizing/Aggression		
			TRF	**CBCL**	**Peer**
1. Undifferentiated	1004	4.77 (0.91)	9.30 (8.39)	13.47 (5.94)	0.10 (0.78)
2. Child, sociocultural	415	5.43 (1.53)	9.96 (10.33)	12.42 (6.91)	0.45 (0.87)
3. Child, parenting/caregiving	324	4.88 (1.04)	8.55 (7.49)	13.44 (4.51)	0.32 (0.76)
4. Sociocultural, parenting, peer	518	4.57 (1.15)[a]	7.40 (9.42)	10.11 (7.09)	0.01 (0.81)
5. Sociocultural, parenting	326	4.06 (1.68)[b]	10.01 (9.67)	12.66 (7.12)	0.03 (0.86)

Note: Means and standard deviations (in parentheses) in total number of risks present. Adjusted means (controlling for total number of risks present) and observed standard deviations (in parentheses) for outcome measures: TRF (teacher report of externalizing), CBCL (mother report of externalizing), and Peer (peer report of aggression), by cluster group. The five groups, derived from cluster analysis, are described by their most prevalent risks from the four domains measured (child, sociocultural, parenting/caregiving, peer-related).

[a] *p* < .05 Tukey h.s.d., from all four other groups.

[b] *p* < .05 Tukey h.s.d., from third group.