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Developmental Precursors of Externalizing Behavior: Ages 1 to 3

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Despite previous research indicating that early negative child behavior and the quality of the parent–child relationship are predictive of later externalizing problems, few investigators have attempted to trace these antecedents back to infancy. In a sample of 100 infants from low-income families, it was possible to identify developmental sequences leading from infant persistence and lack of maternal responsiveness to later child disruptive, aggressive child behavior at ages 2 and 3. Gender differences were found with respect to the range and type of variables that showed continuity in predicting disruptive behavior. For boys, salient predictors of age 2 and age 3 externalizing behavior were maternal unresponsiveness, infant attention-seeking, aggression, and noncompliance, whereas for girls, infant noncompliance was related to both age 3 externalizing and internalizing problems.

Antisocial behavior in childhood is important because of its direct cost to society in terms of damaged property and disruption of normal patterns of living, but it is also important because of the difficulty of treating delinquent youth and the possible emergence of later adult criminality (Loeber, 1982). Despite its costs and resistance to intervention, researchers have only recently begun to apply a developmental perspective to the study of externalizing behavior problems beginning early in childhood. Ultimately, this basic developmental information is necessary to the formation of risk groups, as well as for the determination of the optimal mode and timing of intervention.

Although there are many contributing factors to the development of externalizing problems, such as low income, parental conflict, and parental criminality, two reviews (Loeber & Dishion, 1983; Loeber & Stouthamer-Loeber, 1986) have come to the conclusion that harsh, inconsistent discipline, inadequate supervision, parental rejection, and lack of involvement with the child are important factors across a broad range of studies. Thus family factors involving discipline practices and the quality of the parent–child relationship are at the forefront of results from meta-analyses. In addition, from one of the same reviews, Loeber and Dishion found the second most predictive factor to be previous child behavior problems. As Olweus (1979) has demonstrated, from the early school years until adolescence, the stability of aggression for boys is comparable to that of intelligence. Thus, as a result of parenting practices and children's own contributions to the process, those children who are difficult to manage in the early school years have been found to show high rates of externalizing behavior problems.

Since the reviews by Loeber et al. (Loeber & Dishion, 1983; Loeber & Stouthamer-Loeber, 1986), results from a growing body of longitudinal studies indicate that, beginning as early as ages 2 or 3 years, the stability of aggression and externalizing behaviors is high, particularly among male subjects (Campbell, Ewing, Breaux, & Szumowski, 1986; Cummings, Iannotti, & Zahn-Waxler, 1989; Fagot, 1984; Rose, Rose, & Feldman, 1989; Zahn-Waxler, Iannotti, Cummings, & Denham, 1990). Thus, beginning as early as the toddler period, there is evidence to support the importance of the child's own contribution to the development of later externalizing behavior problems (Lytton, 1990).

However, if the development of disruptive behavior is to be studied during infancy, it is questionable whether using the term *aggressive* or limiting research to aggressivelike behavior would be most prudent. If aggression is defined as actions directed toward an individual that are intended to hurt or frighten, then infant behavior cannot be considered aggressive (Maccoby, 1980). However, during the second and third years, as children attain mobility, self-recognition, and object permanence and show directed, retaliatory aggression (24 to 36 months), it may be possible to measure aggressivelike behavior and extend the window through which the behavioral precursors of externalizing behavior can be seen. Thus, precursors of externalizing behaviors during the toddler period may include behaviors that are aversive as well as those that are experienced as such by caregivers. Infant noncompliance, fussiness, and attention-seeking may promote the development of coercive parent–child interaction sequences that have been associated with externalizing behavior problems at school age (Patterson, Reid, & Dishion, 1989).

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Investigators also have examined parenting factors during infancy that may be developmental precursors of school-age parenting correlates of externalizing problems. These factors can be subsumed under the broad category of parental unresponsiveness and lack of sensitivity to the child's needs (Shaw & Bell, 1993). Parental unresponsiveness has been conceptualized by attachment theorists as being most critical to the development of self-regulation skills. These theorists have hypothesized that differences in caregiver sensitivity, and the resultant bond between parent and infant, are important factors in later behavior patterns of the child (Bowlby, 1980; Sroufe, 1983). Theoretically, insecurely attached children have less to lose by disobeying parental requests (i.e., loss of love) and would have a less trusting view of adult's behavior, given the previous lack of contingent parental responsiveness. Such children would be less likely to function harmoniously in compliance situations and later in the preschool years, and they would be more prone to act in a disruptive or aggressive manner in order to engage an unresponsive caregiver (Greenberg & Speltz, 1988).

The proposed outcomes of attachment theory have been operationalized and studied with a sample from low-income families (Minnesota Mother–Child Project), by using assessments of attachment at 12 and 18 months to predict later externalizing behaviors (Erickson, Sroufe, & Egeland, 1985; Renken, Egeland, Marvinney, Mangelsdorf, & Sroufe, 1989). Results from the Minnesota study demonstrated an association between early insecure avoidant attachments and externalizing problem behaviors at ages 5 and 7–8 for boys only. Studies of attachment from middle-class families are less consistent, as are relations for girls versus boys (Bates, Maslin, & Frankel, 1985; Fagot & Kavanagh, 1990; Lewis, Feiring, McGuffog, & Jaskir, 1984). It is unfortunate that only one low-income longitudinal study exists for which infant attachment ratings and school-age externalizing behaviors were assessed, and whose sample size permits an examination of sex differences (Renken et al., 1989).

Why would children, particularly boys, from low socioeconomic status (SES) backgrounds be more prone to show later externalizing problem behavior from unresponsive caregiving during infancy? The buffers of the middle-class child's ecosystem may prevent the behavior of the insecurely attached child from becoming dysfunctional. However, in low SES families characterized by greater economic challenges and poorer alternative child-care resources, the primary caregiver–child relationship may take on greater importance (Shaw & Bell, 1993). The child's sex may further increase the likelihood of externalizing versus internalizing types of behaviors. Boys have demonstrated higher rates and greater stability of aggression and other externalizing behaviors from the preschool period onward across SES and family structure (Emery, 1988; Hetherington, Cox, & Cox, 1982; Huesmann, Eron, Lefkowitz, & Walder, 1984; Hyde, 1984; Maccoby & Jacklin, 1980).

Given that early child aversive and disruptive behavior and early maternal unresponsiveness has each been shown to be predictive of later externalizing behavior problems, particularly among male adults and children from low SES backgrounds, it seems important that researchers conceptualize the interaction of child and parent behavior as reciprocal as well as transactional to formulate meaningful hypotheses. A transactional approach allows researchers to consider the development of externalizing behavior problems as an ongoing and constantly changing reciprocal process between children and their caretaking environment (Sameroff, 1990). Development should then be studied in short segments to avoid losing the traces of the rapidly evolving process of growth, especially during infancy and toddlerhood (Bell, 1992).

The transactional perspective provides us with a general orientation, but no specific hypotheses. To our knowledge, only one study has translated this approach into testable hypotheses in this area of inquiry. Martin (1981) applied a transactional perspective in a study tracing the origins of coercive cycles among a sample of well-educated, middle-class families. On the basis of Patterson's (1982) model of coercive family interactions in school-age children, Martin provided evidence for the development of coercive child behavior by using an intensity-matching model of mother and infant interaction. High values of intensity indicated a high level of maternal attention-giving and infant attention-seeking, respectively. Accordingly, mothers who are responsive to their infant's needs adjust their attention-giving on the basis of the infant's level of attention-seeking. The infant is assumed to lower attention-seeking whenever the mother responds in an appropriate manner. Later child noncompliant and coercive behavior is believed to be the result of the asynchronous interactions between unresponsive caregiving and demanding infant behavior.

Martin (1981) found that for boys only, the development of noncompliant child behavior at 22 months and coercive child behavior at 42 months was predicted by (a) a lack of contingent maternal attention-giving, (b) a high level of child attention-seeking, and (c) an interaction term involving the two variables, all measured at 10 months. Thus, by applying a transactional model to the study of early disruptive behavior, Martin traced a pathway leading to externalizing behaviors.

Beginning at 12 months, we applied Martin's (1981) transactional approach to the development of aggressive and disruptive behavior from 12 to 36 months among a sample of low-income children. In addition, by assessing different forms of early aversive child behavior (e.g., noncompliance and aggression) at two time points, we could examine changes in the rates of these behaviors across time and by gender. With respect to the first objective, we hypothesized that we would replicate the relations Martin found among early maternal unresponsiveness, aversive child behavior, and later externalizing problems. Statistically, maternal responsiveness, infant aversive behavior, and the interaction term of the two variables were expected to contribute independent variance to the prediction of aggressive behavior at age 2 and externalizing problems at age 3. On the basis of Martin's findings and research on infant attachment security and later externalizing behavior problems among low-income families (Erickson et al., 1985; Renken et al., 1989), results were expected to be stronger for boys than girls. Three different measures of infant aversive behavior were used: persistent seeking of maternal attention at 12 months, noncompliance at 18 and 24 months, and aggression at 18 and 24 months. Internalizing behaviors also were examined at age 3, given their strong relation to externalizing problems ($r = .71$ in the present sample) and the need to examine the specificity of the associations of infant

and parent behavior with externalizing behavior, as indicated by Renken et al. (1989).

Method

Subjects

Subjects originally included 100 mother–child dyads (59 male and 41 female infants) recruited from the Women, Infants, and Children (WIC) Nutritional Supplement Program of Allegheny County, Pennsylvania, as part of a larger longitudinal study of child development. The WIC program provides financial support to purchase nutritionally-sound food items for low-income families. At the time of the infant's birth, mothers ranged in age from 17 to 36 years, with a mean age of 25. Sampling of marital status was not restricted because of the considerable relationship instability within the sample. Forty-six percent of the mothers were either married or living together, whereas 54% were divorced (8%), separated (9%), or single (37%). The majority of families were White (61%) and the remainder were African American (39%). The mean family income in the sample was between $500 and $1,000 per month, with 72.5% of the families having yearly earnings equal to or less than $12,000. Mothers' average level of education was 12 years, with 73.5% having a high-school degree or less.

Mothers of infants 6–11 months of age were recruited in two WIC waiting rooms by D.S.S. Mothers were informed that the study was a project examining child development and mother–child interaction patterns and that they will be paid $15 for each lab visit, plus an additional $10 for transportation costs. If they agreed to participate, informed consent was sought and the first lab visit was scheduled within 2 weeks of the infant's first birthday. Mothers were contacted 2 weeks before the assessment by mail and 1 week before by phone to confirm the appointment. Of the 144 women who were asked to take part in the study, 129 (89.6%) agreed to participate, but only 100 (69.4%) completed the 12-month assessment. Of those 100 subjects seen when infants were 12 months old, 89 participated in the 18- and 24-month laboratory assessments; however, as a result of errors in the videotaping of assessments, sample sizes for specific videotape measures were slightly less than the total sample size at different assessment points, particularly at the 12-month assessments when there were problems with equipment and its operation. When the children were 3 years old, 82 mothers returned completed questionnaire reports on their child's behavior problems. No significant or appreciable differences were found when demographic characteristics of families who completed all assessments (82 of the 100) and those who did not (18 of the 100) were compared. A similar comparison was made between families who completed two of the three laboratory assessments (e.g., 12- and 18-month but not 24-month assessments) versus those who completed all three, with no appreciable differences found between groups on demographic variables.

Procedure

Three videotaped laboratory assessments were conducted when the child was 12, 18, and 24 months, and mothers were sent the Achenbach Child Behavior Checklist (CBCL) when the child was 36 months. Different laboratories were used at adjacent assessments (i.e., at 12 and 18 months and at 18 and 24 months), both of which were equipped with a one-way mirror through which the assessment was videotaped. On entering the laboratory, the mother was requested to set her infant down in front of a standard set of toys arranged on the floor and to sit at a table with the examiner to complete questionnaires. Unless otherwise specified, mothers were instructed to attend to their infants as they normally would.

Each laboratory assessment lasted approximately 2 hr and was purposefully varied in stress level so that parent and infant behavior could be observed across a broad spectrum of contexts (i.e., free play vs. the Strange Situation test). At each age, all laboratory procedures were conducted in the same order; however, across ages, there was some variation among procedures. At all ages (12, 18, and 24 months), assessments began with a 15-min free-play situation. At 12 months, free play was followed by the high-chair task (described later), and at 18 and 24 months, free play was followed by a cleanup task. These tasks were then followed by a situation with no toys in the room (Martin, 1981) and three mother–child problem-solving tasks (based on the work of Matas, Arend, & Sroufe, 1978). After a 10-min break, lab visits continued with an assessment of mother–infant attachment and another 5-min free-play situation for the infant, during which time the examiner continued to administer questionnaires to the mother.

Measures

High-chair task. Mother and infant were observed in a high-chair task at 12 months to evaluate maternal responsiveness and infant persistence (Martin, 1981). In this situation, the infant is placed in a high chair facing away from the mother with nothing to do for 3 min while the mother completes a questionnaire. The mother is instructed to complete the questionnaire but also to attend to her infant in whatever way she deems appropriate. The one restriction is that the infant cannot be removed from the high chair. This procedure was adapted from Martin (1981) because it had previously been demonstrated to (a) operationalize the measurement of the process of interaction as an interdependent flow of behavior involving both self and partner influences, (b) record quantitative shifts of all of the partner-directed behavior of each person, and (c) show longitudinal relations in the prediction of early externalizing problem behavior (Martin, 1981). In using this method, we assumed that the mother is affected both by her own prior behavior and the behavior of the other person (her child), taking into account bidirectional components of measurement.

First, behavioral frequencies were coded in 1-s intervals and scores were derived for the following variables: (a) mother behaviors—look at infant, smile, vocalize, and touch or hold infant; and (b) infant behaviors—look at mother, smile, vocalize, touch mother, and fuss/cry. Behavioral frequencies were coded from videotapes by a team of undergraduate research assistants who were unaware of the study's hypotheses. The coders used a computer program that allowed mother and infant behaviors to be coded on separate viewings. After 9 months of training, during which two teams of coders were trained, reliability was computed to assess whether a behavior was coded during 5-s intervals. Based on 14 randomly selected tapes, kappas ranged from .84 (infant smile) to .96 (infant look), with a mean of .91.

Before computing the time-series analysis, we applied Martin's (1981) original weights for mother and infant behaviors to the raw data to create intensity scales for each partner. Martin's original weights were retained because he had previously cross-validated this scaling. Two scores were derived, one based on maternal behavior, the other on the infant's. First, a score for maternal responsiveness was computed, reflecting the extent mothers increase their attention-giving as a function of the level of infant attention-seeking. Second, a score for infant persistence was calculated, reflecting the extent to which the infant intensifies the level of attention-seeking following noncontingent maternal attention-giving. Data transformation initially involved converting the original behavioral frequencies to weighted scores, and these are presented in Table 1. In this system, an infant vocalization would receive a score of 25 and maternal touching would receive a score of 105. Weighted scores were then derived on the basis of the interaction of maternal and infant behavior. Thus, the maternal responsiveness score reflects how much the mother's score approaches the intensity of the infant, includ-

Table 1
Intensity Values for Mother and Infant Behaviors

Behavior	Infant intensity	Mother intensity
No behavior	5	0
Touch	100	105
Touch + vocalize	120	125
Touch + smile	105	105
Touch + look	110	110
Touch + fuss/cry	135	—
Touch + vocalize + smile	130	135
Touch + vocalize + look	120	130
Touch + smile + look	120	120
Touch + look + fuss/cry	140	—
Vocalize	25	25
Vocalize + smile	30	30
Vocalize + look	35	35
Vocalize + smile + look	40	40
Smile	10	10
Smile + look	20	20
Look	15	15
Look + fuss/cry	130	—
Look + vocalize + fuss/cry	130	—
Fuss/cry + smile	80	—
Fuss/cry	125	—

Note. From "A Longitudinal Study of the Consequence of Early Mother–Infant Interaction: A Microanalytic Approach" by J. Martin, 1981, *Monographs of the Society for Research in Child Development, 46*(3, Serial No. 190), p. 15. Adapted by permission. Dashes indicate that the behavior applies only to infants.

ing the same second when the infant's behavior occurs and up to 2 s following the initial infant behavior. Higher scores indicate that the mother's intensity of response is closer to matching the infant's intensity of attention-seeking behavior. The infant persistence score was derived by computing increases in the infant behavior when initial infant behavior is not responded to within the 2-s interval. Higher scores indicate greater intensity in the face of unresponsive maternal behavior.

We used a modification of Martin's (1981) method to estimate his original parameters of maternal and infant behavior given he had made no attempt to remove serial correlation from each mother–infant series and autoregressive effects could affect maternal responsiveness scores. The data were initially prewhitened to remove autoregressive effects, and then a second-order autoregression model was computed for each series. This had the effect of simplifying several of Martin's differential equations. A Durbin-Watson coefficient was then computed to ensure the adequacy of the prewhitening procedure, and the second-order autoregression model was found to be adequate. Because serial correlation can confound estimates of interpersonal influence, serial correlation must be either accounted for within the time-series regression or removed before the analysis of interpersonal influence. Martin used both approaches by differencing each time series and including a coefficient of serial correlation in all time-series regressions. Because differencing may introduce spurious effects (McCleary & Hay, 1980), we followed more recent practice and statistically removed serial correlation before conducting time-series regressions (Cohn & Tronick, 1988). This procedure simplified Martin's ordinal equations and produced estimates of parameters identified by Martin.

Aggression. Aggressive behavior was coded during selected intervals of the 18- and 24-month assessments based on three rationales: (a) the probability of the elicitation of aggression, which was thought to be more likely when the infant was experiencing stress; (b) ecological validity, that is, using situations that routinely occur in most infants' lives, such as having toys taken away from them and being left with other caretakers; and (c) creating a variety of situations to examine Loeber's (1982) hypothesis that pervasiveness of aggression (i.e., aggression manifested in a variety of situations) should correlate with stability.

Aggression was coded during the cleanup task, in the situation with no toys in the room, during specific segments of the Strange Situation test (when the stranger initially plays with the infant, the first separation, the second separation, and the reunion with the stranger), and during the free-play situation at the end of the assessment. The total coding time was 23 min. During the cleanup task, the mother was instructed to have the infant put all the toys in a basket. She was permitted to say anything she wished to her child but was not allowed to clean up the toys herself. After 5 min, the mother was signaled with a knock to clean up any remaining toys, place the basket outside the lab, and close the door. The no-toys situation began as soon as the basket was placed outside the door. In this task the infant had no toys to play with for 3 min while the mother was instructed to work on two questionnaires and to attend to her child as she normally would (see Smith & Pederson, 1988). The Strange Situation was administered in the standard format (see Ainsworth & Wittig, 1969), and the free-play situation consisted of unstructured infant play while the mother and examiner completed the remaining questionnaires.

We developed the behavioral codes for aggression based on previous investigations of disruptive behavior in the preschool period. The five measures of aggressive behavior were coded simultaneously during the four selected intervals of the 18- and 24-month assessments. The first four codes included (a) throwing toys at mother; (b) throwing toys at the examiner; (c) hitting, biting, or kicking mother; and (d) hitting or kicking the examiner. The fifth code assessed aggression directed at the toys or objects in the room (e.g., hammering the mirror, pounding or stepping on toys, or kicking the door). Undergraduate research assistants who were unaware of maternal responsiveness and noncompliance scores made up the aggression coding team. Team members were trained for 4 months, during which they attended weekly meetings and completed homework assignments of coding tapes. To establish adequate reliability, we reviewed each 5-s interval for the presence or absence of codes. Interrater reliabilities, using kappas, were at or above 85% for all five aggression codes based on 25 tapes. Counts of aggression were collapsed across situations and types to form one variable: summed aggression (see Keenan & Shaw, 1993, for analyses of aggressive behavior in different settings and against different targets).

In addition to coding specific aggressive behaviors, the coders provided a global rating to characterize the behavior of the child throughout the coded segments of the assessment. The global rating took into consideration all of the aforementioned codes, but also instances of socially appropriate aggression, that is, aggressivelike behavior that was considered to be on-task and not codable according to the molecular scoring criteria (e.g., throwing a toy in the basket during the cleanup task or playing a game with a toy roughly). The 4-point global scale (1 = *unaggressive,* 2 = *mildly aggressive,* 3 = *moderately aggressive,* and 4 = *severely aggressive*) was adapted from Cummings et al. (1989). The kappa reliability for the global scale was .90. In the present analysis, only the global aggression scores were used given their high intercorrelation with the summed scores ($r = .73$, $p < .001$ at 18 months, and $r = .65$, $p < .001$ at 24 months).

Noncompliance. Following a system devised by Martin (1981), we coded the following behaviors as noncompliant at both 18- and 24-month assessments: walking away, changing the task, and struggling or resisting. Noncompliance was coded during three intervals: a 5-min cleanup task and two 3-min problem-solving tasks. During the problem-solving tasks the mother was instructed to spend 3 min working with her child on each of two toys. At 18 months, the tasks were putting

a puzzle together and fitting colored blocks and animal shapes in a gazebo toy. At 24 months, the same puzzle task was used along with a toy mailbox task, in which plastic letters were placed in the mailbox and retrieved. The total coding time for noncompliant behavior at both 18 and 24 months was 11 min.

Similar means for establishing reliability for the coding of aggression were used in the coding of noncompliance. A separate group of undergraduate research assistants who were unaware of the aggression and maternal responsiveness scores made up the noncompliance coding team. Because a composite measure of noncompliant behavior representing all types of noncompliance was used in the present analyses, kappas also were based on agreements across the three types of noncompliant behavior: walking away, changing the task, and struggling/resisting. After 6 months of training, with supervision comparable with that received by the aggression team, the kappa for noncompliance was .71 using 5-s intervals based on 15 tapes. Because agreement for specific codes was relatively low (i.e., walking away or changing the task), coders were instructed to question behaviors that were unclear and to jointly discuss and code them at weekly meetings (see Crockenberg & Litman, 1990).

CBCL for ages 2–3. The CBCL (Achenbach, Edelbrock, & Howell, 1987) is a 100-item questionnaire designed to assess behavioral and emotional problems in children ages 2–3 years. The questionnaire generates two broadband factors, Externalizing and Internalizing problems, which were used for analyses in this study. Unlike the CBCL for older children, there are no sex-specific scales on the 2–3-year-old version, so that the Externalizing and Internalizing factors consist of the same items for boys and girls. The mean test–retest reliability is .87. Discriminative validity between nonreferred children and children referred to mental health services is strong, and divergent validity has been demonstrated by a lack of significant correlations between the CBCL and standard cognitive measures.

Results

Results are presented in three stages: (a) descriptive statistics for all independent and dependent variables, (b) correlations among and between independent and dependent variables, and (c) regression analyses to predict age 2 and age 3 problem behavior. For the second and third set of analyses, results were computed separately by gender on the basis of previous research demonstrating different predictors of later problem behavior (Martin, 1981; Renken et al., 1989).

Preliminary Analyses

First, means and standard deviations are presented in Table 2 separately by gender for all independent and dependent variables. The number of cases for each variable differed as a result of attrition at the 18- and 24-month assessments and errors in videotaping at the 12-month assessment. For two variables, namely 12-month maternal responsiveness and 24-month noncompliance, mean scores relative to standard deviations were markedly wide. The variability in maternal responsiveness scores reflects the diversity of maternal behavior during the high-chair task (i.e., some mothers did not look at or speak to their crying infants for 2–3 min of the procedure, whereas others responded to infant attention-seeking by smiling, looking at, talking to, or touching contingently). The variation in the distribution of infant noncompliant behavior reflects the range at the 18–24-month period. The relative decrease in noncompliance from 18- to 24-months is also notable and was significant, $t(58) = 6.27$, $p < .001$. Aggression and noncompliance scores were then examined by gender over time. For aggression and noncompliance, multivariate analyses of variance indicated no significant gender effects.

Correlational Analyses

Pearson product-moment correlations among predictor and dependent variables are presented separately by gender in Table 3. Relations among family income, maternal age and education, and dependent variables also were examined but are not shown because only 1 of 24 correlations attained statistical significance. Maternal education was negatively related to girls' noncompliance at 24 months ($r = -.35$, $p < .05$). This finding should be interpreted with caution given that 1.2 tests would be expected to be significant by chance using a 5% significance level. Some correlations are omitted in Table 3 because of the interdependence of measurement (e.g., noncompliance and aggression scores were measured during the same lab components). Variation in sample size is due to differential loss of cases at separate assessment periods.

For boys, maternal responsiveness was negatively related to 24-month aggression and 36-month externalizing problems. The 12-month infant persistence measure also was significantly associated with 24-month aggression, and the correlations with 18-month aggression and noncompliance were in the expected direction that approached but did not reach standard levels of significance ($p < .10$). Eighteen-month noncompliance was positively related to 24-month aggression, which in turn was related to 36-month CBCL Externalizing problems ($p < .01$).

In contrast, for girls, the only predictor of 24-month noncompliance and 36-month CBCL scores was noncompliance. Eighteen-month noncompliance was significantly predictive of 24-month noncompliance, which in turn was associated with 36-month CBCL Externalizing and Internalizing problems. Both 12-month infant persistence and maternal responsiveness measures were poor indicators of later disruptive behavior for girls; in fact, there was a trend for 12-month infant persistence to be negatively related to 24-month noncompliance.

Hierarchical Regression Analyses

Finally, based on Martin's (1981) findings, we hypothesized that maternal and infant behavior and interaction terms that were based on both would best predict early disruptive behavior at 24 and 36 months, particularly for boys. Hierarchical multiple regression procedures were computed to construct models of boys' and girls' early aggression and externalizing behavior based on the hypothesized relations among maternal responsiveness, child aversive behavior, the first two variables' interaction term, and later externalizing behaviors. The most recent child behavior terms were entered first in the regressions to account for autoregressive effects.

Developmental Models for Boys

For boys, based on the work of Martin (1981), we hypothesized that both maternal and child components and their in-

Table 2
Descriptive Statistics for Study Variables

Variable	*N*		*M*		*SD*		Range	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Maternal responsiveness, 12 months	53	36	0.03	0.02	0.04	0.02	−0.04–0.21	−0.02–0.10
Infant persistence, 12 months	53	36	0.37	0.32	0.26	0.23	−0.04–1.64	−0.49–0.74
Noncompliance								
18 months	54	35	108.20	96.66	70.09	54.20	0–316	17–228
24 months	51	37	59.18	43.49	58.84	34.67	0–278	0–151
Global aggression								
18 months	55	38	2.25	1.87	0.84	0.66	1–4	1–3
24 months	54	40	2.30	1.98	0.80	0.83	1–4	1–3
CBCL Internalizing, 36 months	51	30	51.27	49.70	9.17	9.55	30–68	30–68
CBCL Externalizing, 36 months	51	30	48.90	49.63	7.71	9.46	36–63	29–76

Note. CBCL = Child Behavior Checklist.

teraction terms would add unique variance to the prediction of age 2 and age 3 disruptive behavior. Aggression was selected as the disruptive behavior of choice at age 2 based on previous research documenting strong stability between age 2 and age 5 for boys (Cummings et al., 1989). Twelve-month infant persistence and 18-month noncompliance were placed in the regression equation first (child terms entered in chronological order), followed by 12-month maternal responsiveness. Interaction terms based on infant persistence and maternal responsiveness, and noncompliance and maternal responsiveness, respectively, were entered, but they added insignificant variance to the equation. With infant persistence, noncompliance, and maternal responsiveness entered, the equation accounted for 23% of the variance in age 2 aggression, $F(3, 41) = 4.09$, $p < .02$. Results are presented in Table 4.

To examine predictors of boys' 36-month CBCL Externalizing scores, we selected 24-month global aggression and 12-month maternal responsiveness on the basis of the aforementioned stability of aggression in boys and findings from Martin (1981), Erickson et al. (1985), and Renken et al. (1989) demon-

Table 3
Correlates of Early Disruptive Child Behavior for Boys and Girls

Variable	18-month		24-month		36-month CBCL	
	Aggression	Noncompliance	Aggression	Noncompliance	Externalizing	Internalizing
			Boys			
Sample size range	45–46	45–46	45–54	45–51	43–47	
Maternal responsiveness, 12 months	−.01	.04	−.32*	−.02	−.29*	−.17
Infant persistence, 12 months	.21†	.21†	.25*	.00	−.11	−.07
Noncompliance						
18 months	—	—	.35**	.01	.19	.01
24 months	—	—	—	—	.20†	−.01
Global aggression						
18 months	—	—	.22†	−.03	−.06	−.01
24 months	—	—	—	—	.34**	.22†
			Girls			
Sample size range	30–32	30–32	32–40	33–36	27–30	
Maternal responsiveness, 12 months	−.14	.01	.04	−.05	−.05	.00
Infant persistence, 12 months	−.18	.01	.14	−.28†	.24	.23
Noncompliance						
18 months	—	—	.09	.41**	.15	.29†
24 months	—	—	—	—	.37*	.32*
Global aggression						
18 months	—	—	.35*	.18	−.25†	−.22
24 months	—	—	—	—	−.01	−.08

Note. CBCL = Child Behavior Checklist. Dashes indicate no data.
* $p < .05$. ** $p < .01$. † $p < .10$.

Table 4
Prediction of Age 2 Aggression: Hierarchical Multiple Regressions for Boys

	Dependent variable: Global aggression at 24 months					
Independent variable	Multiple R	R^2	R^2 change	F	df	Significance of F change
Infant persistence, 12 months	.26	.07	.07	3.10	1, 43	.08
Infant noncompliance, 18 months	.38	.14	.07	3.57	2, 42	.04
Maternal responsiveness, 12 months	.48	.23	.09	4.09	3, 41	.04

Note. Overall $F(3, 41) = 4.09, p < .02$.

strating a relation between early maternal unresponsiveness and later externalizing child behavior. Although the effects of 12-month maternal responsiveness on age 3 CBCL Externalizing scores were largely accounted for by 24-month global aggression, the addition of the responsiveness and 24-month aggression interaction term added marginally significant variance to the prediction of age 3 CBCL Externalizing scores. Results are presented in Table 5.

Developmental Models for Girls

Because maternal responsiveness was unrelated to girls' age 2 and age 3 disruptive behavior, and few indexes of 18- or 24-month disruptive behavior were related to age 2 and age 3 disruptive behavior (i.e., only 18- and 24-month noncompliance were related to age 2 and age 3 disruptive behavior, respectively), it was apparent that regression procedures using these variables would be insignificant. However, based on the results from the correlational analyses, a series of stepwise regressions were computed using maternal education and the noncompliance scores to predict 24-month noncompliance and age 3 CBCL Externalizing and Internalizing scores, respectively. However, in all cases, the resulting regression coefficients were not significant.

Discussion

The results from the present study provide preliminary evidence for the existence of precursors in infancy of later externalizing problems. As in previous studies examining the stability of disruptive behaviors and the relation between early maternal responsiveness and later behavior problems, gender differences were the rule rather than the exception. Despite few significant sex differences in the means of predictor and outcome variables, boys showed a greater number and range of correlates that displayed continuity in predicting age 2 and age 3 disruptive behavior. For boys, 12-month maternal unresponsiveness and two types of disruptive infant behavior, most notably 18-month noncompliance, were all predictive of 24-month aggression, which in turn was associated with 36-month externalizing problem behavior. In contrast, for girls, maternal education and 18-month child noncompliance were related to 24-month noncompliance, which in turn was associated with both 36-month externalizing and internalizing behavior problems.

Results regarding the prediction of aggression at age 2 and externalizing behavior at age 3 are consistent with the findings of Martin (1981) and attachment theorists that maternal responsiveness is salient in the formation of preschool and school-age behavior problems (Greenberg & Speltz, 1988; Renken et al., 1989; Shaw & Bell, 1993). In Martin's longitudinal study of 10- to 42-month well-educated, middle-class mother–infant dyads, noncompliance at 22 months was accounted for by the independent influences of 10-month indexes of maternal unresponsiveness, infant demandingness, and their interaction term. At 42 months, 10-month maternal and 22-month infant characteristics were still predictive of child coercive behavior. In two follow-ups of the Minnesota poverty sample, Erickson et al.

Table 5
Prediction of Age 3 CBCL Externalizing Behaviors: Hierarchical Multiple Regressions for Boys

	Dependent variable: CBCL externalizing problems at 36 months					
Independent variable	Multiple R	R^2	R^2 change	F	df	Significance of F change
Global aggression, 24 months	.44	.20	.20	8.88	1, 37	.005
Maternal responsiveness, 12 months	.48	.23	.03	5.26	2, 36	.23
Global Aggression × Maternal Responsiveness	.55	.30	.07	4.85	3, 35	.08

Note. Overall $F(3, 35) = 4.85, p < .007$. CBCL = Child Behavior Checklist.

(1985) and Renken et al. (1989) found that insecure–avoidant attachments at 18 months were associated with significantly higher rates of externalizing problems at ages 5 and 7–8. In both the Martin and Minnesota poverty sample studies, these associations were found only for boys. In the present study of low-income mother–infant dyads, a similar pattern of relations between lack of maternal responsiveness and externalizing behavior emerged at ages 2 and 3, but again only for boys. Twelve-month maternal responsiveness, 12-month infant persistence, and 18-month noncompliance all added unique variance to the prediction of 24-month aggression. Twenty-four-month aggression accounted for much of the variance in 36-month CBCL Externalizing scores; however, the interaction term involving 24-month aggression and 12-month responsiveness contributed near-significant additional variance after the individual variables were entered.

The study's findings also highlight the utility of studying the development of behavior problems beginning in infancy. Interestingly, if the present investigation had begun when children were age 2, it is questionable whether the effects of maternal unresponsiveness would have emerged, given that its individual effects were accounted for by age 2 global aggression scores. However, because maternal responsiveness was not assessed after 12 months, the answer to this question remains unclear. Similarly, it is possible that infant factors in the first 6 months of life may have been influential in affecting 12-month maternal responsiveness. For example, Bates et al. (1985) have shown that maternal perception of infant difficulty in the first year of life is predictive of age 3 behavior problems. It could be that maternal unresponsiveness at 12 months is the result of previously formed maternal perception of infant difficulty.

For girls, although early noncompliance was associated with later noncompliance and with externalizing and internalizing problem behaviors, the present findings raise more questions than they answer regarding the influence of early parenting practices on emerging problem behavior. Maternal responsiveness at 1 year, a robust predictor of boys' later disruptive behavior, was unrelated to behavior problems for girls despite the absence of sex differences in the mean rates of infant demandingness and externalizing-type behaviors from 12 to 36 months. However, maternal education was negatively related to noncompliance, suggesting that mothers with higher educational attainment were using different parenting strategies than their less educated peers. This finding is reinforced by correlations between maternal education and age, and 18-month aggression and noncompliance, all significant in the same direction. These showed that more educated and older mothers had daughters with lower rates of early aggressive and noncompliant behavior. If older and more educated mothers use different parenting practices to produce lower rates of aggressive and noncompliant behavior among their daughters, our present assessment strategies were not attuned to detect such differences.

The study also highlights the importance of taking a transformational perspective in constructing models of children's disruptive behavior. Shaw and Bell (1993) suggested that the most flexible theories of developmental psychopathology will be transformational or epigenetic, meaning that developmental changes arising from parent–child interaction as well as other sources (e.g., stability of individual differences in child characteristics) may take on forms not previously shown. In the present study, the best pathway of early disruptive behavior was found by tracking different forms of early aversive child behavior at different ages. For example, boys' 24-month aggression was better predicted by 18-month noncompliance rather than 18-month aggression, although 24-month aggression was significantly more related to age 3 externalizing problems than 24-month noncompliance. For girls, although 18-month noncompliance was strongly related to 24-month noncompliance and to age 3 externalizing behaviors, 24-month noncompliance also was related to age 3 internalizing problems. The transformational perspective appears particularly appropriate to the exploration of psychopathology during infancy and the preschool period when the rapidity of developmental change is high.

The transformational perspective also takes into account the relations between maternal unresponsiveness and boys' later aggression and externalizing behaviors. Although research on school-age children has identified consistency of discipline practices and parental involvement as important correlates of antisocial behavior (Loeber & Dishion, 1983), the present study suggests that, for boys, a precursor of such later parental involvement and consistent discipline practices may be parental responsiveness. A parent who is not responsive to an infant's request for attention may only provoke the infant into escalating the intensity of demands and into making appropriate parental responses more difficult. This would lead to higher rates of parent–child coercive interactions and less parental involvement because of the increasing aversive quality of the parent–child interactions.

The study is not without its limitations. First, although the sample is more than twice the size of Martin's (1981) original cohort, it is relatively small when gender differences are examined. In particular, results regarding the smaller subset of girls should be interpreted with caution. Second, it is important to discuss the generalizability of these findings to other populations. On the favorable side, mothers who continued in the study through the age 3 assessment showed no demographic differences with those who terminated. Even though it is a low-income sample, in which rates of psychopathology are generally elevated, we believe that our study participants do not represent a clinical sample. This view is reinforced by mean CBCL *t* scores (49 for Internalizing and 50 for Externalizing), which are extremely close to those obtained for community-based samples of middle-class children of the same age (Achenbach et al., 1987). It is further reinforced by our initial sample selection process. By recruiting families from WIC, the range of family dysfunction was most likely restricted, as all subject families were involved in a program designed to improve the quality of their children's nutritional needs. In sum, the mean CBCL scores, the involvement in WIC, and our own clinical impressions lead us to believe the generalizability of our results may be limited to relatively high functioning, low SES families.

Finally, from the perspective of a transactional model, parental variables should have been measured at later assessment points, and each assessment should have tapped some new features of parenting that had evolved out of reactions to changing child behavior. However, Martin (1981) found that assessment

of parental teaching strategies at 22 months added insignificant variance to the prediction of 22-month child compliance or 42-month coercive child behavior, in contrast with prediction that is based on the 10-month measure of maternal responsiveness. In planning the present study, we assumed that Martin's 10-month assessment had struck a "tap root" of parental behavior. Future longitudinal studies might improve on the present model by attempting to identify new facets of parent behavior that are developmentally appropriate to 24 and 36 months and that show prospective or concurrent prediction.

In summary, aside from the singular predictive power of the assessment of parent behavior near the end of the first year, the present results indicate that a transactional perspective provides a useful guide to the identification of event sequences over the first 3 years of life. Precursors to the development of externalizing behavior can be identified from infancy to the preschool period by using independent sources of reporting, and the longitudinal results are consistent with a transformational or epigenetic model. However, the gender differences suggest that different models are needed to capture developmental pathways leading to problem behavior for boys and girls. Other maternal child-rearing variables associated with maternal education and age, and not measured in the Martin (1981) procedure, need to be explored in studies of girls.

For boys, the finding on the predictive utility of early disruptive behavior and maternal unresponsiveness to later externalizing behavior problems at age 3 may eventually provide a foundation for the development of intervention efforts. The data on girls suggest that early disruptive behavior is salient but may later be manifested in the form of both externalizing and internalizing behavior. Both sets of findings are in need of replication, particularly with young children from other low SES populations who are at greater risk than children from middle-class samples for developing all types of child adjustment difficulties. Future research also should be aimed at refining the model presented here for the development of externalizing behavior in boys, and to understand the effects of gender differences and socialization practices on the changing manifestations of child behavior problems.

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