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Mechanisms in the Cycle of Violence

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Two questions concerning the effect of physical abuse in early childhood on the child's development of aggressive behavior are the focus of this article. The first is whether abuse per se has deleterious effects. In earlier studies, in which samples were nonrepresentative and family ecological factors (such as poverty, marital violence, and family instability) and child biological variables (such as early health problems and temperament) were ignored, findings have been ambiguous. Results from a prospective study of a representative sample of 309 children indicated that physical abuse is indeed a risk factor for later aggressive behavior even when the other ecological and biological factors are known. The second question concerns the processes by which antisocial development occurs in abused children. Abused children tended to acquire deviant patterns of processing social information, and these may mediate the development of aggressive behavior.

I N SPITE OF THE FACT THAT CHILD MALTREATMENT HAS occurred since the beginning of civilization (*1*), it was only several generations ago that modern society finally began to recognize the enormity of this problem (*2*). Testimony before the U.S. Congress indicates that in the United States alone, billions of dollars are spent every year in the medical, psychosocial, and social service treatment of physically abused children (*3*). Little is known

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empirically, however, of the long-term consequences of early abuse or of the mechanisms by which abuse might have an impact on behavioral development.

It is now becoming established that being the object of physical harm by an adult is a risk marker for the development of violent behavior toward others later in life (*4*). Early retrospective and clinical case studies are being supplanted by prospective, controlled studies to demonstrate this risk (*5, 6*). For example, Widom (*7*) reported that individuals who had been identified by juvenile courts as abused or neglected during childhood were 42% more likely than controls to perpetuate this cycle of violence by obtaining a criminal record of violence as adults. Methodological problems aside, this literature has yet to resolve two major questions regarding this cycle of violence. These questions are considered in this article, and empirical findings are reported that shed light on this topic.

What Is the Risk Factor in Child Abuse?

The first question concerns possible related factors that might account for the increased risk that is associated with early physical harm. Almost all prospective studies in this area have followed children who have been brought to the attention of juvenile courts or human service agencies (*5, 7*). These studies confound the experience of abuse with subsequent actions by these agencies, which usually involve separation of the child from her or his parents, foster home placement, labeling of the child and family, or other drastic measures that might account for the reported increased risk in this population. Also, by relying on agency reports, such studies include only a small, biased portion of all children who are physically harmed in early life. Interviews with national probability family samples reveal that a full 18% of children have been the object of a "severe violent act" (more serious than spanking or slapping) (*8*) by

parents at some time in their lives, with 11% experiencing an event in the past year (9). What is needed is a prospective study of children who have been severely physically harmed in early life but who have not necessarily been identified by public agencies. The study reported here has those characteristics.

It is also known that abuse is likely to occur in an ecological context of other risk variables (10). By this context, it is meant that abuse is more common among lower socioeconomic classes (11), among single-parent families (12), within stressful environments (13), and among families in which there is marital conflict or interspousal physical violence (14). To date, no study has assessed the impact of child abuse on later violence while taking into account these variables (15); thus, it is not clear that the experience of physical harm per se is responsible for later antisocial development. In fact, most studies have confounded the experience of physical abuse with child neglect, a more general problem of inadequate parental care. We focus on physical abuse and distinguish abuse from other risk variables.

Yet another possibility is that certain biologically based characteristics of the child lead adults to engage in physical harm toward that child, and it is those characteristics that are also responsible for the child's later violence. According to an extreme "child effects" (16) model, physical abuse is a marker of risk but does not contribute to the risk. There is clinical evidence that child temperament (fussiness, unadaptability, and resistance to control) is associated with physical abuse (17) and that children with health problems at birth (such as prematurity or low birth weight) are at risk for abuse (18). No study has controlled these factors while examining the possible aggression-inducing effects of abuse on children.

Through What Intrapersonal Mechanisms Does Abuse Have Its Effect?

If it is established that physical harm does lead to later aggression, a separate goal must be to understand how this effect occurs. Widom has argued that "the goal should be further knowledge of the processes involved. . . . Research should be directed at understanding how these early experiences relate to later violent behavior" (7, p. 165). Theory and empirical findings point toward social-information-processing factors as mechanisms of child aggressive behavior. According to several models (19, 20), individuals ordinarily respond to environmental stimuli by first encoding relevant cues, interpreting those cues, accessing possible behavioral responses from long-term memory stores, evaluating the consequences of possible behaviors, and finally selecting and enacting a behavior. Aggressive children, relative to average children, have been found to display chronic biases and deficits in the processing of provocation stimuli. These children display deficits in attending to and encoding relevant social cues (19, 21) and biases and errors in over-attributing hostile intent to others (22). They access many aggressive responses and few competent responses from repertoires stored in memory (23, 24), and they tend to evaluate the outcomes of aggression as interpersonally and instrumentally positive (25). These processing patterns build on each other such that a comprehensive assessment of all these patterns yields a stronger prediction about the likelihood of aggressive behavior (19, 24).

It is hypothesized that abusive socializing experiences will lead to chronic aggressive behavior by having an impact on the development of social-information-processing patterns. The two major intrapersonal theories of the effects of child abuse, attachment theory (26, 27) and social learning theory (28), both posit that physical abuse could have such effects. According to attachment

theory, insecure attachments associated with abuse may lead a child to develop internal working models of the world as a threatening place. In social-information-processing terms, these children may fail to develop appropriate attention to interpersonal interactions (that is, they fail to encode relevant social cues) (29) and may become hypervigilant toward hostile cues. Crittendon and Ainsworth noted that "such vigilance resulting from internal models of conflict and dominance could easily lead the abused child to misinterpret the behavior of others and to respond with aggression himself" (27). Social learning theory posits that the experience of physical abuse will lead to later aggression to the extent that it makes aggressive responses salient in one's response repertoire and leads one to evaluate aggressive responses as efficacious in leading to positive outcomes (30).

These theories suggest a model of the development of violence in which the experience of severe physical harm is associated with later chronic aggressive behavior, but the mechanism through which this association operates is the acquisition of a set of biased and deficient patterns of processing social provocation information. Four hypotheses are posited in this model: (i) The experience of severe physical harm will increase a child's risk of later chronic aggressive behavior, above and beyond the risk that accrues from related environmental and temperamental characteristics. (ii) The experience of severe physical harm in early life will predict the later development of biased and deficient patterns in the processing of social information. (iii) Biased and deficient processing patterns will predict the occurrence of chronic aggressive behavior toward others. (iv) Social-information-processing patterns will mediate the relation between early physical harm and later aggression; that is, this relation will become nonsignificant once patterns of social information processing are taken into account.

The Multi-Site Child Development Project

To test these hypotheses, a descriptive longitudinal study was conducted in which a representative sample of 309 four-year-old children was identified at the time of kindergarten pre-registration and then followed over time. Three kinds of information were collected on each subject: child physical harm and related family experiences (in early life); child social-information-processing patterns (at age five); and child aggressive behavior (in school 6 months after collection of processing pattern data).

Children were selected for participation from three geographical regions: Nashville, Tennessee (n = 103; midsize urban community, with one-fourth of the selected sample living in federally subsidized housing); Knoxville, Tennessee (n = 100; Appalachian rural and small urban, mixed socioeconomic status); and Bloomington, Indiana (n = 106; small city and semi-rural, with much of the sample from working class backgrounds). At the time of kindergarten pre-registration in April 1987, parents of matriculating children were solicited (in person at the child's school or by mail) at random to become involved in a longitudinal study of child development. About 70% agreed. Interested parents were then visited at home by research staff, who explained the project in detail and obtained written permission for all phases of data collection. Families were paid $20 each for participation.

The sample was demographically diverse and representative of the geographic regions (53% male, 47% female; 83% white, 16% African-American, 1% other). The parents of 18% of the sample were not married at the time of the child's birth, and 29% of the children lived in single-parent households at age four (three children lived in foster care). The mother's mean age at the time of the child's birth was 27 years (SD = 5.0; range, 17 to 39), and the father's

mean age was 29 years (SD = 5.6; range, 18 to 50). The mother's median education level was 12 years (SD = 2.4; range, 5 to 20), and the father's was 13 years (SD = 2.9; range, 6 to 20). The Hollingshead four-factor index of social status (based on job status and education) ranged from 14 to 66 (possible range is 8 to 66), with a median of 38.5 (SD = 14.1). Eight percent of subjects came from the lowest socio-economic class, with 16%, 28%, 30%, and 18% from the other classes, in ascending order.

Assessment of physical harm and related variables. Mothers were interviewed privately in their homes in a 90-minute session (*31*). Following a "comfort-inducing" preliminary period, mothers were asked to recall the era between the child's birth and 12 months ago (*32*). They were asked questions about child misbehavior and discipline practices and then were asked whether the child had ever been physically harmed by an adult. Immediately following a detailed discussion, the interviewer rated the probability that the child had been physically abused, using a criterion of visible bruises or medical attention. Next, the mother was asked to consider the past 12 months and was asked the same questions. The interviewer then completed a rating for this era (*33*). Children were categorized as physically harmed if the interviewer had rated the likelihood of physical harm as probable or higher in at least one era. Forty-six children (15%) were so classified (*34–35*).

During the same standardized interview, additional questions were asked to assess factors that have been hypothesized to co-occur with abuse, including early family ecological and child biological variables. To assess the former, each mother was asked to describe her relationships with spouses and boyfriends during the child's life, particularly any physical conflicts to which the child might have been exposed. The interviewer then rated on five-point scales the degree to which the child had been exposed to adult physical conflict in each of the two life eras, and these ratings were averaged (*36*). Assessments of family marital status and socioeconomic status at the time of the child's birth and later were also made from standardized questions. To assess biological variables, the mother was asked to recall her pregnancy, particularly any health problems experienced by the child and herself during birth and delivery. Mothers reported that 6% of children had major health difficulties at birth, with an additional 21% having minor health difficulties at that time. Mothers experienced major health problems during delivery in 7% of cases, with an additional 20% experiencing minor health problems during delivery. Responses were scored on two three-point scales (0 if no problems, 1 if minor problems, and 2 if major problems). Each

Table 1. Family demographic variable mean scores of physically harmed and not harmed children.

| Variable | Subject group | | F(1,300) | P |
	Harmed (n = 46)	Not harmed (n = 258)		
Hollingshead socioeconomic status score (range, 14–66)	33.9 (2.2)*	41.4 (0.9)	10.36	0.001
Family status at child's birth (% with mother living alone)	30	16	4.84	0.028
Family status since birth (% ever divorced)	47	26	7.72	0.006
Marital violence rating (range = 1–5)	2.54 (0.21)	2.05 (0.05)	15.02	0.001

*Numbers in parentheses represent standard errors.

mother also completed a retrospective version of the Infant Characteristics Questionnaire (*37*), rating child temperament in infancy. Three reliable scale scores were derived from this instrument: fussiness, unadaptability, and resistance to control.

Assessment of child social information processing. Using videorecorded and cartoon stimuli, a trained adult (blind to the child's status as abused and to all knowledge of the child's behavior) assessed the child's characteristic patterns of processing social information during a home visit. Each of 24 vignettes was presented on a portable television monitor to each child, who then answered questions about each story. The child was asked to imagine being the protagonist in each vignette, which depicted a negative event for the child (either a direct provocation such as having one's building blocks knocked over by a peer or rebuff from an attempt to initiate play with one or more peers). The intention of the peer provocateur in each vignette systematically varied as hostile, benign, or ambiguous.

To assess the child's ability to attend to appropriate and relevant social cues, the child was asked to recall what had happened in the story. Responses were scored as 0 (not at all relevant), 1 (partially relevant), or 2 (fully relevant), and were averaged across the 24 vignettes.

As an assessment of the child's tendencies to attribute hostile intent to others, each of eight hypothetical ambiguous provocation stimuli were presented in cartoon-format. The child was asked how and why the peer might have acted the way that he or she did. Responses were scored as 0 (benign intent) or 1 (hostile intent), and were averaged across the eight stories.

To assess the child's response accessing tendencies, after each of the 24 video vignettes was presented, the child was asked how he or she would respond if the provocation had actually occurred. Responses were scored as aggressive, withdrawn or inept, or assertive and competent, and the proportions of each type across the 24 vignettes were computed. Because the score for withdrawal responses was redundant with the other two, it was dropped from analysis. To assess the child's ability to generate numerous behavioral responses to social problems, each of eight hypothetical social problems was also presented. The child was asked to generate as many behavioral solutions as possible (up to 10). The mean number generated per problem was computed.

To assess the child's response evaluation tendencies, after each video vignette was presented, each of three possible behavioral responses (aggressive, nonaggressive-inept, and competent) was also presented, in random order. The child was asked to evaluate the probable outcomes of each response on a four-point scale (1, very bad; 2, bad; 3, good; 4, very good). Relative endorsement scores for aggressive and competent responses were computed as the score for each type of response divided by the total score (*38*).

Assessment of child aggressive behavior. Six months (±2 months) following the maternal and child interview, the child's aggressive behavior in the school peer environment was assessed by teacher ratings, peer nominations, and direct observation. The teacher completed the widely used teacher's report form of the Child Behavior Checklist (CBCL) (*39*). The aggression scale score was computed. Peer nominations were also collected because of their utility in predicting current and later violent behavior (*40*). In individual interviews, every peer in the child's classroom for whom parental permission was obtained (*41*) was asked to nominate up to three children as fitting each of three behavioral descriptions of highly aggressive behavior (starting fights, getting angry, and being mean toward others). Scores were tallied for all children in the classroom as the standardized (by z-score) number of nominations received for each item, and then averaged across items, yielding one peer-rated aggression score for each child (*42*).

Direct observations of aggression were conducted by trained observers using a focal-child, event-based system on the playground and in the classroom. Each child was observed for 12 5-min periods, broken down into 10-s intervals, in which the observer noted each occurrence of aggression by the child. Scores were computed as the rate of aggressive acts per hour (*43*). The three aggression scores were positively correlated ($r = 0.61$, 0.19, and 0.20; each $P < 0.001$).

Findings

Effects of abuse on aggressive behavior. The first hypothesis was tested by multivariate analysis of variance, in which early physical harm and sex were factors and the three aggression scores were dependent variables (*44*). A statistically significant main effect of abuse [$F(3, 298) = 4.01$, $P < 0.008$] indicated that children who had been physically harmed in early life became more aggressive toward peers than did those who had not been harmed. Univariate analyses revealed statistically significant effects of harm for the teacher rating [$F(1,300) = 11.90$, $P < 0.001$] and for the peer rating [$F(1,300) = 4.77$, $P < 0.03$]. As shown in Fig. 1, the teacher-rated aggression scores of harmed children were, on average, 93% higher than those of non-harmed children. The peer-rated scores averaged one-fourth of a standard deviation higher (meaning that about twice as many peers nominated harmed children as aggressive as they did non-harmed children), and the observed aggression rates averaged 30% higher. These findings were similar for girls and boys.

To test the hypothesis that these differences would hold even when family ecological variables and child biological variables are taken into account, multivariate analysis of covariance was conducted, with physical harm and child's sex as factors and nine variables as covariates. Four of these were family ecological variables: the Hollingshead socioeconomic status score, family status at the child's birth (parents married or living together = 1, and mother alone = 2), family status since birth (parents married = 1, and parents ever divorced = 2), and marital (or mother-boyfriend) physical conflict and violence (interviewer rating noted above). Five covariates were child biologically related variables: mother's health problems in pregnancy or at birth (scale noted above), child's health problems at birth (scale noted above), and the three scales of maternal recollections of child temperament in first year of life (fussiness, unadaptability, and resistance to control). These variables did correlate overall with the occurrence of physical harm to the child [$F(9,292) = 2.94$, $P < 0.002$], with all four family ecological variables predicting harm to the child (Table 1). None of the five child biologically related variables predicted harm to the child.

Even when all nine of these variables plus child's sex were controlled statistically, the multivariate main effect of physical harm on the child's aggressive behavior was still statistically significant [$F(3,289) = 3.18$, $P < 0.024$], indicating that physical harm is predictive of later child aggressive behavior, above and beyond any correlated contribution that family ecology and child biologically related characteristics might make.

Effects of abuse on child social information processing. The second hypothesis was tested with harm and child's sex as factors and the seven processing variables as dependent variables. As hypothesized, physically harmed children developed different processing styles than non-harmed children [$F(7,294) = 2.10$, $P < 0.043$]. Harmed children (relative to non-harmed children) came to be significantly less attentive to relevant social cues, more biased toward attributing hostile intent, and less likely to generate competent solutions to interpersonal problems (Table 2). These findings were similar for girls and boys.
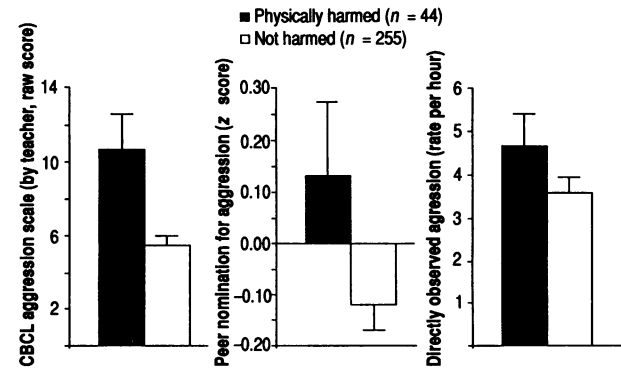

Fig. 1. Teacher-rated, peer-rated, and directly observed aggressive behavior in groups of physically harmed and not harmed children. Bar represents the group mean with the standard error.

Relation between early child social information processing and later aggression. Multiple regression analyses revealed that the seven processing variables significantly predicted later aggression (the third hypothesis), as assessed in all three ways: as rated by teachers [$R = 0.24$, $F(7,294) = 2.51$, $P < 0.017$], as rated by peers [$R = 0.25$, $F(7,294) = 2.70$, $P < 0.01$], and as directly observed [$R = 0.29$, $F(7,294) = 3.86$, $P < 0.001$] (*45*). Bivariate correlations indicated that teacher-rated aggression was predicted by poor encoding of cues ($r = 0.16$, $P < 0.006$), accessing of aggressive responses ($r = 0.16$, $P < 0.007$), and a failure to access competent responses ($r = -0.17$, $P < 0.003$). Peer-rated aggression was predicted by poor encoding of cues ($r = 0.13$, $P < 0.027$) and accessing of aggressive responses ($r = 0.19$, $P < 0.001$). Directly observed aggression was predicted by hostile attributional biases ($r = 0.14$, $P < 0.018$), generating few solutions to interpersonal problems ($r = -0.21$, $P < 0.001$), and evaluating aggression as leading to positive outcomes $r = 0.16$, $P < 0.005$). Thus, a child's patterns of processing social information at age five appear to predict that child's aggressive behavior patterns at a later date.

Table 2. Social information processing mean scores of physically harmed and not harmed children.

Variable	Subject group		$F(1,300)$	P
	Harmed ($n = 46$)	Not harmed ($n = 258$)		
Encoding of relevant cues (z-score)	0.19 (0.13)*	-0.04(0.04)	5.07	0.025
Hostile attributional bias (% hostile attributions)	0.47 (0.06)	0.25(0.04)	6.00	0.015
Number of responses generated to each social problem	4.16 (0.32)	4.48(0.14)	<1	NS†
Proportion of aggressive responses	0.49 (0.05)	0.40(0.02)	2.84	NS
Proportion of competent responses	0.10 (0.02)	0.16(0.01)	4.33	0.038
Positive evaluation of the outcomes of aggressing (z-score)	0.26 (0.15)	-0.06(0.07)	3.28	NS
Positive evaluation of the outcomes of acting competently (z-score)	-0.18 (0.19)	0.02(0.08)	1.03	NS

*Numbers in parentheses represent standard errors.   †Not significant (NS).

Social information processing as a mechanism in the effect of early harm on aggressive behavioral development. To test the fourth hypothesis, physical harm and child sex were factors, the three child aggression scores were dependent variables, and the seven child social-information-processing variables were covariates. As hypothesized, when child processing was covaried, early physical harm no longer had a statistically significant effect on later child aggression $[F(3,290) = 2.16]$. On the other hand, when stepwise regression analyses were conducted and physical harm was covaried (by first entry), the seven processing variables continued to predict later aggression: for teacher-rated aggression, $F(7,294) = 2.11$, $P < 0.043$; for peer-rated aggression, $F(7,294) = 2.20$, $P < 0.035$; and for directly observed aggression, $F(7,294) = 3.76$, $P < 0.001$. These findings are consistent with the hypothesis that early physical harm has its effect on a child's aggressive behavioral development largely by altering the child's patterns of processing social information.

Conclusions

Our findings offer evidence that the experience of physical abuse in early childhood is a risk marker for the development of chronic aggressive behavior patterns. A full 36% of the children defined as "harmed" received teacher-rated aggression scores in the deviant range (defined as >1 SD above the mean), in contrast with just 13% of other children. This almost threefold increase in risk held even when the nine demographic and child biological variables were first considered. Even though nonexperimental data such as these can never be used to prove a causal relation, the current evidence indicates that the risk is not due to co-occurring family ecological factors (low socioeconomic status, single parenthood, marital dissolution, and marital violence) or child health problems and temperament. Because the cases of harm had generally not involved interventions, the risk is not likely to be due to treatment by social service agencies. Thus, this prospective study provides stronger evidence than ever before to support the hypothesis that physical abuse leads to a cycle of violence.

Analyses indicate that child abuse is relatively likely to occur in a context of poverty, deprivation, and marital conflict, even though instances of abuse were reported in all family contexts. But it appears that the experience of physical abuse raises one's risk for developing chronic aggressive behavior problems beyond the risk afforded by these other factors (46). It is still possible, however, that the risk afforded by child abuse is due to some other co-occurring family or environmental factor that was not assessed.

In contrast, child health problems and perceived temperament were not correlated with physical abuse at all. The child's contribution to her or his own physical abuse is a matter of controversy (13, 47). Although child "difficultness" has been shown to have short-term effects on parental reactions (48) and has been speculated, on the basis of case studies, to raise the chances of abuse, the current findings indicate that child factors do not account for the occurrence of child abuse. There is no evidence in our data for blaming the victim of abuse.

Our findings also offer initial support for a theory of how physical harm has its effect on child development. We found that harmed children are likely to develop biased and deficient patterns of processing social information, including a failure to attend to relevant cues, a bias to attribute hostile intentions to others, and a lack of competent behavioral strategies to solve interpersonal problems. These patterns, in turn, were found to predict the development of aggressive behavior. Moreover, the path between early physical harm and later child aggression appeared to go through

these processing patterns. The findings are consistent with the hypothesis that the experience of physical harm leads a child to conceptualize the world in deviant ways that later perpetuate the cycle of violence.

Several caveats must be expressed about these findings. Our measure of abuse is maternal report, which is subject to inaccurate recall, lack of knowledge, and lying. Alternate measures, such as official records, are equally subject to inaccuracies and biases, however, and may also be associated with subsequent confounding variables such as stigma, intervention, and self-fulfilling prophecies (7). Our logic for relying on maternal report is that we doubt that mothers would over-report abuse (thus, our "abused" group is probably accurately labeled), and under-reporting of abuse (false negatives in our control group) would serve only to weaken any correlation that we could find between abuse and later outcomes. Also, any bias in reporting by mothers is probably equally represented in mothers' reports about marital violence and child temperament. Abuse was found to predict later child aggression even when these variables (and, therefore, maternal reporting bias) was controlled. Thus, to the extent that our measure of abuse is invalid, our estimates of the magnitude of the effects of abuse may actually be underestimates.

Another limitation is our use of child behavior in kindergarten as the outcome. Numerous studies have indicated remarkable stability of aggressive behavior across time, with estimates as high as the stability of the intelligence quotient (40, 49); however, we did not assess aggressive behavior in adolescence or adulthood. One cannot conclude from this study that physical abuse has effects on child behavior that persist over many years. This question awaits further longitudinal follow-ups.

A third limitation is that we do not mean to suggest that the mediating variables that we have studied are the only possible mechanisms in the abuse-aggression cycle. It is also possible, for example, that early physical abuse has an effect on the child's physiological reactivity (either by emotional trauma or by direct physical impact to the brain), and this acquired overreactivity mediates later aggressive tendencies. We are intrigued by such a theory, but it does not contradict the current perspective. In fact, physiological explanations require cognitive counterparts and vice-versa.

Finally, one must not conclude that the effects of abuse are limited to behavioral outcomes of aggression. Even though our study focused on aggression, our findings indicate that abused children, particularly girls, are also at risk for the development of internalizing problems, such as withdrawal and isolation, that have been hypothesized to be precursors of depression. Teacher-reported internalizing problems (measured by the CBCL internalizing scale score) were 19% higher in harmed boys (mean ± standard error, 4.85 ± 1.37) than non-harmed boys (4.05 ± 0.39) and 87% higher in harmed girls (6.46 ± 1.17) than non-harmed girls (3.46 ± 0.38), a statistically significant effect of harm $[F(1,294) = 6.67, P < 0.01]$. It is interesting that our hypothesized mediators of aggressive outcomes, namely processing patterns of hostile attributional biases and aggressive problem solving, did not mediate internalizing outcomes. The main effect of physical harm on the CBCL internalizing score remained statistically significant after controlling for the seven social-information-processing variables $[F(1,286) = 6.27, P < 0.013]$. We would not expect the mediators to be the same for both types of outcomes; in fact, we suspect that internalizing outcomes of early physical abuse may be mediated by the development of a different set of processing patterns (including attributions of self-blame and expectations that aggression would not succeed in eliminating negative outcomes). Why some children follow a path of hostile attributions and aggression and other children a path of self-blame and depression awaits further inquiry.

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31. Parents were informed of the range of questions to be asked and were told of the legal and ethical obligation by staff to report any suspicion of physical danger to the child. This statement was made in the context of wanting to help the family.
32. The child's life was originally segmented into the periods birth to age 1, age 1 to 12 months ago, and the past 12 months in order to help the mother recall specific events and because of staff fears that mothers would be less revealing about current physical harm than about past behavior. The first two eras were combined, yielding two eras. In this way, mothers could reveal past abuse without fear of being reported to authorities, as long as the danger was not current. (This is consistent with local reporting laws.) In spite of this procedure, three mothers reported current abuse (by the father or a boyfriend).
33. Ratings from the two periods were positively correlated ($r = 0.56$, $P < .001$), and the rating averaged across the two periods was reliable, with the coefficient $\alpha = 0.72$, $P < .001$.
34. This proportion is similar to that found in national probability samples by Straus and Gelles (8).
35. As a check on this classification, mothers also completed the conflict tactics scale, the most widely used written instrument to assess physical abuse (8). Parent-to-child aggression scale scores for each of the two age periods were significantly greater for mothers of physically harmed children than for those of non-harmed children (each $P < 0.001$). Interview ratings, rather than CTS scores, were used to classify children because the interviewer's probes offered an opportunity to clarify actual harm and severity, thus limiting the number of abuse cases.
36. The reliability of this score was computed as the coefficient α of the two constituent scores and was found to be high (0.85, $P < .001$). As a check on these ratings, mothers completed the conflict tactics scale for spousal relationships. Aggression scale scores for husband-to-wife and wife-to-husband aggression correlated significantly with interviewer ratings ($r = 0.47$ and 0.41, respectively, each $P < 0.001$).
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42. The reliability of this score was significant, 0.87 ($P < 0.001$) by coefficient α.
43. Interobserver agreement on this score was evaluated by having a second observer code the child's behavior at the same time, for 130 observation sessions. Agreement on occurrence [no. agreements/(no. agreements + no. disagreements)] was 96%, and the κ was 0.63 ($P < 0.001$).
44. For all analyses, the problem of missing data was resolved by substituting the population mean score. This is a common resolution that is conservative because between-group differences will be reduced. This strategy was taken because, even though missing data were rare (fewer than 3% of cases), casewise elimination of a subject with any missing data would have reduced the n significantly. Also, all analyses were replicated with a single child aggression score that was the mean of the three standardized aggression scores. All reported findings held up with this alternate score.
45. The incremental prediction from processing variables at time 1 (t_1) to aggression at time 2 can best be assessed by holding the child's level of aggression at t_1 constant. Because the child was not yet in school at t_1, our only measure of aggression at that time was the mother's report (assessed by the aggression scale of the CBC). When this score was covaried (by first entry in hierarchical regression analyses), the seven processing variables still tended to predict later aggression, as rated by teachers [$F(7,280) = 1.96$, $P < 0.06$], peers [$F(7,279) = 1.90$, $P < 0.07$], and directly observed [$F(7,275) = 3.50$, $P < 0.002$].
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