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Abstract

Physical child abuse is a predictor of antisocial behavior in adolescence and adulthood. Few studies have investigated factors that moderate the risk of physical child abuse for later occurring outcomes, including antisocial behavior. This analysis uses data from the Lehigh Longitudinal Study to investigate the prediction of antisocial behavior from physical child abuse and the buffering role of 3 school-related factors (i.e., school commitment, school dropout, and IQ), which are hypothesized to change the course of antisocial behavior from childhood into the adult years. Results show an association between physical child abuse and early antisocial behavior. Early antisocial behavior predicts antisocial behavior in adolescence, and that, in turn, predicts antisocial behavior in adulthood. Child IQ moderated the relationship between child physical abuse and antisocial behavior in childhood. However, no other moderation effects were observed. Limitations and implications for future research and prevention are discussed.

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physical abuse, antisocial behavior, school commitment, dropout, IQ

Introduction

Patterns of continuity and discontinuity in antisocial behavior have been well documented in the research literature (Farrington, 1995; Hawkins & Herrenkohl, 2003; Loeber & Hay, 1997; Moffitt, 1993; Ou, Mersky, Reynolds, & Kohler, 2007; Sampson & Laub, 1997). According to Loeber's developmental pathways model, children with early-onset patterns of antisocial behavior engage in increasingly serious forms of antisocial behavior over time, starting with behavior such as aggression, lying, and stealing in childhood and then progressing to violent delinquency and adult crime, including physical assault, rape, and strong-arm methods (Loeber & Farrington, 2000). Although researchers have made significant progress toward understanding developmental patterns in antisocial behavior, it is important to investigate these patterns in the context of risk and protective factors measured at key developmental points.

Evidence shows that physical child abuse is a salient risk factor for early-onset and chronic antisocial behavior (R. C. Herrenkohl, Egolf, & E. C. Herrenkohl, 1997; T. I. Herrenkohl, Tajima, Whitney, & Huang, 2005; Mass, Herrenkohl, & Sousa, 2008; Maxfield & Widom, 1996; Ou et al., 2007; Reidy, 1977; Smith & Thornberry, 1995; Stouthamer-Loeber, Loeber, Homish, & Wei, 2001; Thornberry, Henry, Ireland, & Smith, 2010; Widom, 1989; Widom, Schuck, & White, 2006; Zingraff, Leiter, Myers, & Johnsen, 1993). Smith and Thornberry (1995) found that official reports of child maltreatment before age 12 (physical abuse and neglect) were significantly associated with official delinquency as well as violent and moderate youth self-reported delinquency. In another analysis of the same Rochester Youth Development Study dataset, Ireland, Smith, and Thornberry (2002) investigated the timing of child maltreatment (childhood only, adolescent only, and maltreatment occurring in both childhood and adolescence) and its relationship to antisocial behavior and other problem behaviors in adolescence. They found that childhood-only maltreatment was not predictive of adolescent antisocial behavior, whereas adolescent-only and childhood-adolescent maltreatment were both predictive of antisocial behavior during the adolescent years.

Widom and colleagues investigated developmental patterns of antisocial behavior in relation to child maltreatment (Widom, 1989, 1998; Widom et al., 2006). Their sample consists of children, now adults, with histories of officially recorded child maltreatment, matched to controls on age, race, gender, and

SES. Results show that maltreated children were at higher risk than controls for arrests and criminal behavior. Maltreated individuals also committed more crimes and registered more criminal recidivism than did controls (Widom, 1998). Widom, Schuck, and White (2006) found that early aggression, a proximal correlate of child maltreatment, was also a robust predictor of later violent behavior. Findings of a relation between maltreatment and various forms of antisocial behavior are also documented in several other prospective and cross-sectional studies (T. I. Herrenkohl, Sousa, Tajima, R. C. Herrenkohl, & Moylan, 2008).

Although evidence of the developmental continuity in antisocial behavior and its relation to child maltreatment (e.g., physical child abuse) is relatively consistent across studies, not all children who experience physical child abuse will engage in later antisocial behavior (DuMont, Widom, & Czaja, 2007; Grogan-Kaylor, Ruffolo, Ortega, & Clarke, 2008; T.I. Herrenkohl, 2011a, 2011b; Jaffee, Caspi, Moffitt, Polo-Tomas, & Taylor, 2007; McGloin & Widom, 2001). Unfortunately, there have been few studies that focus predominantly on factors that moderate the risk effects of child maltreatment.

Social developmental theories of youth problem behaviors emphasize the importance of schools and schooling as sources of resilience and protection for vulnerable children (Catalano, Haggerty, Oesterle, Fleming, & Hawkins, 2004; Hawkins & Herrenkohl, 2003; Monahan, Oesterle, & Hawkins, 2010). Interestingly, most studies that have examined school factors in relation to child maltreatment have done so primarily from a deficits model in which there has been little attention given to the role of protective influences. For example, Eckenrode, Laird, and Doris (1993) found that maltreated children had lower test scores in math and reading, lower grades, increased levels of grade repetition, and more disciplinary referrals than their nonmaltreated counterparts. Zolotor and colleagues (1999) found that substantiation of child maltreatment was significantly predictive of poor school performance within their high-risk sample. However, Leiter and Johnsen (1994) found that maltreated children fared significantly worse than comparison children on a range of school-related outcomes, including standardized test scores, GPA, and grade retention. Maltreated children also had more absences and experienced a higher risk of school dropout.

One prior review of the literature on school-related protective factors found that youth who achieve highly and are committed to school are at lower risk for antisocial behavior than are other youth (Monahan et al., 2010). In a study by Loukas, Roalson, and Herrera (2010), school connectedness decreased rates of conduct problems and served as a protective factor for children who experienced family adversity. In an earlier analysis of data from Lehigh

Longitudinal Study, Herrenkohl et al. (2003) found that school commitment was negatively related to youths' involvement with antisocial peers and that lower peer involvement predicted less violent behavior during adolescence.

Although there is reason to be optimistic about the protective influence of school-related factors, more research is needed to show whether or not these factors actually change the risk for antisocial behavior after child maltreatment. Analyses are also needed to examine the possible exacerbating influence of school variables in relation to youth antisocial behavior. For example, dropping out of school may further increase the risk of antisocial behavior experienced by children who have been abused, although, to this point, we know only that maltreated children are more likely than others to drop out of school—not whether dropout necessarily leads to an escalation in behavior problems. This study uses data from the Lehigh Longitudinal Study to investigate the relation between physical child abuse and antisocial behavior, modeled developmentally from childhood through adolescence into adulthood. The study also investigates the role of three school-related factors as potential moderators of the relation between child abuse and antisocial behaviors. Variables of interest in the study are school commitment, school dropout (as a possible exacerbating risk factor), and child IQ. IQ is investigated as an early indicator of learning potential, a possible protective factor associated with school performance, and a known predictor of school success (Connor, 2002; Farrington, 1995; Maguin & Loeber, 1996). In analyses of school dropout, the goal is to determine whether the continuity in antisocial behavior from adolescence into adulthood is stronger for those who dropped out of high school compared to those who remained in school until completion. Primary research hypotheses are that: (H1) child maltreatment will increase the risk of antisocial behavior in childhood and possibly later in adolescence and adulthood; (H2) higher scores of school commitment and child IQ will moderate the effect of child maltreatment on antisocial behavior in childhood and adolescence, such that higher scores of each variable will be associated with a lower risk of antisocial behavior; (H3) school dropout will moderate the effect of antisocial behavior in adolescence on antisocial behavior in adulthood, such that dropping out of school will increase the risk of antisocial behavior continued into the adult years.

Method

Data and Sample

Data for this analyses are from the Lehigh Longitudinal Study, a prospective longitudinal study examining the long-term impacts of child abuse and

neglect on a broad range of behavioral outcomes spanning multiple developmental periods (see T. I. Herrenkohl et al., 2005 for a detailed sample description). Children and families were originally recruited from multiple settings, including child welfare caseloads for child abuse ($n = 144$) and neglect ($n = 105$), Head Start programs ($n = 70$), daycare programs ($n = 64$), and from middle-income nursery programs ($n = 74$). The preschool assessment occurred in 1976 when children were between the ages of 18 months and 6 years. The sample was reassessed between 1980 and 1982 when children were in elementary school (8-11 years of age), and again between 1990 and 1991 when the children were adolescents (average age = 18 years). A fourth assessment of the sample was conducted between 2008 and 2010 when participants were, on average, 36 years of age.

The original sample ($n = 457$) is gender balanced; 248 (54%) males and 209 females. The racial and ethnic composition of the sample is relatively homogeneous but consistent overall with the makeup of the two-county area from which participants were selected: 1.3% ($n = 6$) American Indian/Alaska Native, 0.2% ($n = 1$) Native Hawaiian or Other Pacific Islander, 5.3% ($n = 24$) Black or African American, 80.7% ($n = 369$) White, 11.2% ($n = 51$) more than one race, and 1.3% ($n = 6$) unknown. Just over 7% ($n = 33$) self-identify as Hispanic or Latino and 91.5% ($n = 418$) self-identify as not Hispanic or Latino. For a small percentage, 1.3% ($n = 6$), the ethnicity of the child was unknown (T. I. Herrenkohl, Klika, & Brown, 2012). Study protocols and procedures for the childhood and adolescent waves of the study were approved by the human subjects review committee of Lehigh University. For the adult assessment, study procedures were reviewed and approved by the human subjects committees at the University of Washington and at Lehigh University.

Measures

Physical child abuse is a severity weighted index of abusive physical disciplining practices reported by parents in the preschool and school-age waves of the larger study. A total of eight items were used in the construction of this measure. Examples include biting a child, slapping or spanking a child to bruise the child, and hitting a child with a strap, rope, or belt. Each practice was rated for severity by a group of 24 child welfare workers and child development specialists and then assigned a severity weight (R. C. Herrenkohl & Herrenkohl, 1991). In the preschool wave of the study, parents were asked about the frequency with which they disciplined their children “prior to the last three months” and “during last three months” on each of the disciplining items. In the school-age wave of the study, parents reported on these same

practices for the prior 12 months. Parent responses from preschool and school age were standardized and combined to form the physical child abuse composite. Composite scores for the analysis sample range from -4.10 to 7.26 (mean = -0.01 , $SD = 2.22$).

Childhood antisocial behavior was measured using data from a modified version of the Child Behavior Checklist (Achenbach, 1991) administered during the school-age wave of the study (T. I. Herrenkohl et al., 2005). The measure is based on parents' reports of child aggression (18 items: e.g., teases, cruel, or mean to others, destroys things) and delinquency (10 items: e.g., vandalizes, steals, runs away) in the past year. The items from the two subscales (Cronbach's $\alpha = .84$ and $.71$, respectively) were standardized and combined to create an overall composite of childhood antisocial behavior.

Adolescent antisocial behavior is based on youth reports of 39 lifetime antisocial behaviors including acts such as stealing, breaking, and entering, and property damage. Responses to these 39 items were scored "0" for "no" responses and "1" for "yes" responses. Positively endorsed items were summed to create a composite measure of adolescent antisocial behavior. As noted elsewhere (Moylan et al., 2010), this scale was originally developed for the National Youth Survey (see Elliott, 1987).

Adult antisocial behavior was scaled similarly to the adolescent measure. Adult participants were asked about the same 39 antisocial behaviors assessed in adolescence and reported on their past-year involvement in various activities including stealing, breaking and entering, and damaging property (yes/no). Again, positively endorsed items were summed to create an overall adulthood antisocial behavior index. For the present analysis, this variable was transformed using the natural logarithm to address its skewness and kurtosis.

Moderator variables consist of school commitment, school dropout, and child IQ. *School commitment*, measured in adolescence, consists of 11 items referring to a youth's commitment to and perceived importance of their education (e.g., I am satisfied with and value my education, I spend time studying; T. I. Herrenkohl et al., 2005). Indicator scores were summed and standardized before being combined to create the school commitment variable. The α coefficient for the school commitment variable is $.84$. Three separate tests of moderation were completed with this variable (i.e., run as an interaction as continuous variable, median split, and top 25% versus bottom 75% of sample). Results that are reported are those for tests with the school commitment variable split at the median value.

IQ was measured during the school-age wave of the study using scores from the Wechsler Intelligence Scale for Children-Revised (WISC-R;

Wechsler, 1974). Those scoring 100 or above (i.e., above-average IQ) on the WISC-R were coded “1,” and otherwise “0” ($n = 197$).

School dropout was coded as “1” for adolescents who dropped out of high school prior to the 12th grade and “0” for those who did not drop out prior to the 12th grade.

To account for the potential influence of known predictors and correlates of antisocial behavior and physical abuse, we included two covariates in our models: gender and child socioeconomic status (SES). *Gender* is a dichotomous variable (male/female). *SES* consists of mother’s occupational status and educational level, family income from the preschool wave, and the total number of rooms in the family’s house. Indicators were standardized and summed to create an overall composite measure, which has a mean of 0 and a standard deviation of 3.29.

Analysis

Variable scaling and descriptive statistics were run in SPSS 15.0. Path models were conducted in Mplus 6.0 (Muthen & Muthen, 2000). Missing data were handled using multiple imputation (Rubin, 1987) available in Mplus. Researchers have noted that multiple imputation procedures result in less biased estimates compared to procedures such as listwise deletion or mean substitution for dealing with missing data (Schafer, 1997). The results reported in this manuscript are the averaged results from 50 imputed datasets to achieve a sample size of 457.

In the analysis, physical child abuse was modeled as a predictor of childhood antisocial behavior. Childhood antisocial behavior was modeled as a predictor of adolescent antisocial behavior (H1), itself a predictor of antisocial behavior in adulthood (see Figure 1). Analyses also investigated the extent to which physical child abuse predicted adolescent and/or adult antisocial behavior (H1). However, these paths were non-significant and, thus, not estimated in the final analysis shown in Figure 1. Tests of moderation using interaction terms for school commitment and child IQ (H2) and school dropout (H3) were then conducted. All the analyses were adjusted for gender and SES.

Results

Bivariate correlations are provided in Table 1. As shown, physical child abuse is significantly correlated with childhood antisocial behavior ($r = .40$, $p < .01$) and adolescent antisocial behavior ($r = .20$, $p < .01$), yet is only marginally correlated with adulthood antisocial behavior ($r = .11$, $p < .10$). It

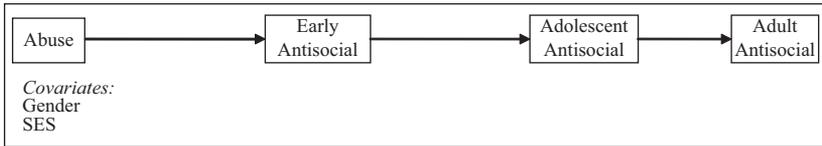


Figure 1. Final estimated model.

is marginally correlated with adulthood antisocial behavior ($r = .11, p < .10$). Childhood antisocial behavior is significantly correlated with antisocial behavior in adolescence ($r = .34, p < .01$) and adulthood ($r = .14, p < .05$). Adolescent antisocial behavior is significantly correlated with adult antisocial behavior ($r = .29, p < .01$).

Figure 2 shows the final estimated model with standardized path coefficients. Prior to the imputation of our data, the model fit the data without error: $\chi^2(6) = 5.093, p = .5319, RMSEA = .00, CFI = 1.0, \text{ and } TLI = 1.0$. As shown in the figure, parent reported physical child abuse predicted childhood antisocial behavior ($\beta = .35, p < .01$). Childhood antisocial behavior predicted adolescent antisocial behavior ($\beta = .22, p < .01$) and adolescent antisocial behavior predicted adult antisocial behavior ($\beta = .29, p < .01$). In line with our first hypothesis, these findings demonstrate a pattern of continuity in antisocial behavior, set in motion by early experiences of child abuse.

Next, we tested the hypotheses that school-related factors would change the continuity in antisocial behavior from childhood into adulthood. Although school commitment and school dropout did not show signs of moderation, we did detect a statistically significant interaction of child physical abuse with IQ, when predicting early antisocial behavior ($\beta = -.12, p < .05$). These findings suggests that above-average IQ in childhood (i.e., above 100) appears to lessen the risk of childhood antisocial behavior associated with having been physically abused.

Discussion

Consistent with other studies focused on the risk of child maltreatment and later antisocial behavior (R. C. Herrenkohl et al., 1997; Ireland et al., 2002; Smith & Thornberry, 1995; Widom, 1989, 1998; Widom et al., 2006), results of this prospective investigation indicate that physical child abuse is a predictor of early antisocial behavior and that there is continuity in antisocial behavior measured over time.

Table 1. Descriptive Statistics and Bivariate Correlations Among the Analysis Variables

	Mean (%)	SD	1	2	3	4	5	6	7	8
1. SES	0.00	3.28	—							
2. Gender (female)	46.00%	—	-0.03	—						
3. Physical abuse	-0.01	2.22	-0.16***	-0.12*	—					
4. Early antisocial	-0.02	0.95	-0.29***	-0.35***	0.40***	—				
5. Adolescent antisocial	10.79	7.69	-0.19***	-0.45***	0.20***	0.34***	—			
6. Adult antisocial	0.42	0.55	-0.06	-0.17**	0.11*	0.14**	0.29***	—		
7. School commitment (high)	49.00%	—	0.47***	0.21***	-0.14**	-0.29***	-0.42***	-0.07	—	
8. School dropout	34.00%	—	-0.60***	0.02	0.19***	0.32***	0.41***	0.17***	-0.65***	—
9. IQ	41.00%	—	0.61***	-0.09	-0.18***	-0.27***	-0.03	-0.03	.37***	-0.45***

* $p < .10$, ** $p < .05$, *** $p < .01$.

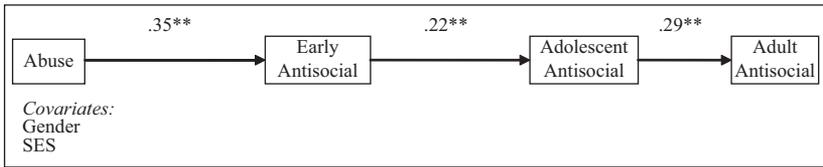


Figure 2. Standardized path coefficients from Mplus model testing the links between abuse and antisocial behavior in childhood, adolescence, and adulthood. * $p < .05$, ** $p < .01$.

This study found no evidence of moderation for two of the three hypothesized variables: school commitment and school dropout. However, analyses did show that the relationship between physical abuse and childhood antisocial behavior was moderated by IQ measured in childhood. This finding lends support to the notion that children with above average IQ may be at lower risk for antisocial behavior, but it is unclear from these analyses why. One possibility is that children with higher IQ scores are more able than those with lower IQ scores to process the experience of abuse in a manner that appropriately attributes responsibility for the abuse to the abuser, and viewing the experience as one over which he or she had little control. Another possibility is that those with higher IQ scores are able to channel strong emotional reactions to having been abused into actions that better one's life rather than those that ultimately result in further self-harm, as is in the case of perpetrating violence and other antisocial behaviors. Whether or not either explanation has value should be investigated in future longitudinal studies.

Why additional findings on the buffering role of school-related factors were not revealed may be a function of the variables used to test for moderation, as well as the method applied to study these effects. In addition, it may be that these school factors will, in the context of other protective factors such as social support, have more of a risk mitigating effect (Monahan et al., 2010). It is indeed possible that more evidence of protection would appear if potential moderating variables were organized not as stand-alone variables, but as cumulative protection scales. Such an approach is supported by findings elsewhere of significantly lower levels of antisocial behavior for youth exposed to multiple protective factors measured both concurrently and longitudinally (T.I. Herrenkohl, 2011a, 2011b; Pollard, Hawkins, & Arthur, 1999).

Nonsignificant moderation effects may also be attributable to low statistical power, as discussed by McClelland and Judd (1993). As noted by the

authors, the ability to detect moderating effects is dependent on a number of factors, including sample size and variable score distributions. Nonetheless, this study represents one of the few attempts to examine at least a few of the school-related variables hypothesized to change (lessen or increase) the risk for antisocial behavior among maltreated children.

Although interventions focused on violence have been more reactionary than proactive (Widom, 1998), the field of prevention science has helped to advance knowledge of a range of programs that can both lessen risk and enhance protection for children at risk for antisocial behavior, including those who have been physically abused or exposed to domestic violence (T.I. Herrenkohl, 2008, 2011a, 2011b). Other programs focus specifically on preventing child abuse and providing skills training to parents in an effort to promote positive development in children, particularly those raised in low-income and vulnerable families (see Bilukha et al., 2005; Guterman, 2001 for a review of early childhood home visitation). The Nurse-Family Partnership (NFP) of Olds and colleagues (Olds, 2002, 2006; Olds, Henderson, Chamberlin, & Tatelbaum, 1986) provides services from a public health nurse to first-time, unmarried, low-income mothers. In one evaluation of the NFP, there were 80% fewer verified cases of child maltreatment in the first 2 years of life among those who received nurse visitation compared to those who did not receive the service. By age 15, nurse-visited children had fewer arrests and convictions for crimes, in addition to less running away, fewer sexual partners, and fewer days of alcohol use in the past 6 months. Clearly, the NFP carries promise in the ultimate prevention of child maltreatment and later adverse consequences associated with experiencing child abuse and neglect.

In sum, analyses used data from a prospective longitudinal study to investigate the prediction of developmental pathways involving child abuse and antisocial behavior. Although analyses revealed little evidence of moderation involving school factors, they represent an important effort to apply advanced statistical methods to the study of child abuse and its effects on children. Future research should continue to examine issues raised in this study to promote understanding, particularly of protective factors and school-related buffers hypothesized to lessen the risk of antisocial behavior for children who experience physical child abuse and other forms of child maltreatment.

Declaration of Conflicting Interests

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