

Intergenerational Continuity in Maltreatment

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Abstract Identification of the causes of child maltreatment perpetration is prerequisite for developing efficacious prevention initiatives to reduce its occurrence. Earlier maltreatment victimization is often suggested as an important cause of subsequent maltreatment perpetration. This study investigates a) whether maltreatment victimization causes subsequent perpetration and b) whether the timing of maltreatment victimization—childhood versus adolescence—alters this relationship. We use data from the Rochester Youth Development Study, a longitudinal study begun in Rochester, New York in 1988, based on a stratified random sample of 1000 seventh and eighth graders. At the most recent followup, 80 % were reinterviewed. Child Protective Services data were collected on substantiated incidents of maltreatment victimization from birth to age 17 and on maltreatment perpetration through average age 33, $n=816$. Using propensity score models to control selection effects, we find that a history of maltreatment victimization significantly increases the odds of becoming a perpetrator of maltreatment. Although childhood-limited maltreatment does not significantly increase the odds of maltreatment perpetration, maltreatment that occurs in adolescence or that begins in childhood and persists into adolescence does. Adolescent maltreatment was found to be more serious in terms of type, chronicity, and severity than childhood-limited maltreatment, offering a possible explanation for this finding. Therefore, maltreatment victimization,

especially during adolescence, is a likely cause of subsequent perpetration. Clinical services to interrupt the cycle of maltreatment are needed to protect subsequent generations from experiencing maltreatment and from experiencing the health-risking behaviors that often flow from maltreatment.

Keywords Child maltreatment · Intergenerational continuity · Cycle of maltreatment · Adolescent maltreatment

“... abused children become abusers and victims of violence become violent offenders” (Widom 1989b, p. 160).

Maltreatment, which includes physical abuse, sexual abuse, and neglect (Child Abuse Prevention and Treatment Act 1974) is a serious threat to child and adolescent health (Gilbert et al. 2009; Kempe et al. 1962). In addition to the immediate physical and psychological trauma that maltreatment causes to the victim, it has also been associated with a number of negative outcomes including substance use, violence, risky sex behaviors, depression, internalizing problems, and school disengagement (Gilbert et al. 2009). Maltreatment is, unfortunately, prevalent in American society. Recent estimates from national data based on Child Protective Services records indicate that in 2010 approximately 9.2 children per thousand were victimized by child maltreatment (U. S. Department of Health and Human Services 2011). Neglect is by far the predominant form of maltreatment, followed by physical abuse, and sexual abuse. Data based on reports from a national sample of community professionals offer a higher estimate: in 2005–2006 almost 40 children per thousand were maltreated (Sedlak et al. 2010). Maltreatment prevalence in community surveys is even higher, at 15 % or more (e.g., Straus and Gelles 1986; Thornberry et al. 2001). There are often multiple types of maltreatment occurring in the same families and even during the same incidents (Crittenden et al. 1994; McGee et al. 1997; Smith et al. 2004). Overall, maltreatment is a costly public

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health problem with estimates of its economic impact exceeding \$100 billion each year (Wang and Holton 2007).

Given the prevalence and burden of maltreatment, innumerable benefits would accrue if we could prevent the perpetration of maltreatment in the first place. Accordingly, the Centers for Disease Control and Prevention have called for “a better understanding of the developmental pathways and social circumstances that contribute to perpetration ... [in order to] enhance the development of effective primary prevention programs and guide refinement of existing prevention programs” (2002, p. 7). One commonly assumed pathway to perpetration—the premier developmental hypothesis in the field of abuse and neglect according to Garbarino and Gilliam (1980)—emanates from a prior history of having been abused as a child. Although often assumed, studies that have addressed this hypothesis suffer from such serious methodological limitations (see Ertem et al. 2000; Thornberry et al. 2012; and Widom 1989b, for reviews) that we do not yet have conclusive evidence about the strength of this relationship. The purpose of the present study is to assess the cycle of maltreatment hypothesis in a design that uses a community sample, prospective data about both maltreatment victimization and perpetration covering substantial portions of the life course, and propensity score matching to more closely assess causality (Rosenbaum and Rubin 1983). Doing so offers an assessment about whether maltreatment actually begets maltreatment, an issue that has important implications for the timing and focus of efforts to break the cycle of maltreatment.

The Cycle of Maltreatment

Several theoretical models predict that a history of maltreatment victimization is likely to exert a causal influence on the subsequent perpetration of maltreatment. Biological and genetic factors linked to maltreatment are transmitted across generations and may help account for why individuals who were maltreated by their parents would eventually maltreat their own children (Caspi et al. 2002; DiLalla and Gottesman 1991). Social learning theory posits that children’s behavior is largely shaped by their parents’ behaviors via imitation and schedules of reinforcement and punishment. Exposure to abusive and maltreating parents increases the risk that the victim will learn that such behaviors are acceptable and effective, incorporating them into their own parenting styles as adults (Dodge et al. 1990; Straus et al. 1981). Attachment theory (Morton and Browne 1998) posits that for infants the quality of the attachment relationship with their parent is based on the caregiver’s sensitivity and responsiveness to the infant. Maltreatment, an extreme form of insensitive parenting, leads the individual to form insecure and disorganized attachments (Main and Solomon 1990), which increases the likelihood that, as adults, they

will become abusive to their own children (Feldman and Downey 1994; Main and Goldwyn 1984). Finally, ecological or transactional theories (Belsky 1980; Cicchetti and Valentino 2006; Garbarino 1977) argue that maltreatment is determined through the interaction of multiple influences and systems. In this framework, mediating mechanisms associated with intergenerational transmission include the learning of antisocial behavior, philosophies of discipline, poor emotion regulation, hostile personalities, and dissociative symptomatology (Belsky 1993; Cicchetti and Valentino 2006). All of these can lead a parent with a history of maltreatment victimization to be more likely to perpetrate maltreatment.

Although quite plausible, the cycle of maltreatment hypothesis still requires empirical verification before it can be used to guide the development of prevention programs. A number of studies have been conducted on this issue and several reviews summarize their findings and evaluate their methodological rigor. Ertem et al. (2000) developed eight methodological standards that studies should meet to validly assess intergenerational continuity in physical abuse. They then applied the eight criteria to ten relevant studies. Ertem et al. found only one study (Egeland et al. 1988) that met all eight methodological standards and only one other (Widom 1989a) that met as many as six of them; half met three or fewer of these basic standards. A more recent review (Thornberry et al. 2012) expanded the approach of Ertem et al. (2000) in two ways. First, it examined the broader category of child maltreatment, including studies of physical abuse, sexual abuse, and neglect and reviewed a total of 47 studies of intergenerational continuity in maltreatment. Second, it included additional methodological criteria, for example, the adequacy of the length of the follow-up period during which the perpetration of maltreatment was measured. The majority of studies in the review, 34 of the 47 (72 %), met fewer than 6 of these 11 methodological criteria. The review demonstrates that this body of research overwhelmingly relies on retrospective assessments of maltreatment; few studies are based on representative samples; half rely on a single reporter to assess both their own maltreatment and the maltreatment of the other generation; and most studies have relatively short follow-up periods.

Likely stemming from the methodological limitations of the literature on the cycle of maltreatment hypothesis, evidence to support it is mixed. For the eight studies in the Ertem et al. (2000) review for which an intergenerational effect could be calculated, four were statistically significant in the expected direction and four were not. For the two strongest studies, Egeland et al. (1988) found evidence of intergenerational continuity in maltreatment while Widom (1989a) did not. But even these two studies have serious limitations for testing this specific hypothesis. Egeland et al. (1988) only measured abuse during the first 48 months of

the child's life. Widom's (1989a) assessment of whether the parent is a perpetrator of maltreatment is based on whether or not they were arrested for maltreating a child; but, being arrested for maltreatment is quite rare, with a prevalence of only 1.1 % in her study. Thornberry et al. (2012), based on their methodological criteria, identified the nine most rigorous studies: four find support for the hypothesis (Dixon et al. 2005; Egeland et al. 1988; Pears and Capaldi 2001; Thompson 2006), three find limited support, for example, for one type of maltreatment but not for others (Berlin et al. 2011; Renner and Slack 2006; Sidebotham et al. 2001), and two find no support for the hypothesis (Altemeier et al. 1986; Widom 1989a).

In commenting on the general acceptance of the notion that maltreatment begets maltreatment, Belsky stated that "there are few in the scientific community who would embrace such remarks ... most scholars are all too aware of the inherent limitations of the available database" (1993, p. 415). Unfortunately, the database does not appear to have improved markedly during the ensuing time period. When more well-designed studies are conducted it is possible that there may be even stronger evidence in favor of the cycle of maltreatment hypothesis than is currently assumed. Of course, it is also possible that the relationship will be weaker. In other words, currently there is insufficient scientific evidence to draw a definitive conclusion about the cycle of maltreatment hypothesis.

Developmental Differences

Previous studies of the cycle of maltreatment hypothesis have typically relied on general measures of maltreatment victimization and have not examined developmentally-specific indicators that reflect when in the person's life course—e.g., childhood versus adolescence—the victimization occurred. Only 2 of the 47 studies reviewed by Thornberry et al. (2012) focus specifically on adolescent victimization; the rest either studied childhood maltreatment or an unspecified age range. Failure to take developmental issues into account may cloud our estimates of the level of intergenerational continuity and may offer one explanation for why support for the cycle of maltreatment hypothesis is inconsistent and weak.

For example, the developmental psychopathology perspective (Cicchetti 2006; Masten 2006) suggests that maltreatment that occurs early in the life course may be particularly damaging to the normal course of development and, therefore, may have the most lasting effects. Childhood is a time of rapid change across a number of domains including brain, social and emotional, and cognitive development. Trauma such as maltreatment is likely to disrupt the normal course of development and initiate a cascade of subsequent problems in multiple contexts. These effects

spread to other domains of function at varying times and inhibit the development of age-appropriate behavior and expectations that can persist across time. Dodge et al. (1990) found that child maltreatment altered the manner in which the victims processed social information and social cues which, in turn, is related to later maladaptive behaviors including, to some extent, maltreatment perpetration (Berlin et al. 2011). Thus, through a variety of cascading pathways early maltreatment may have serious long-term consequences including an increased likelihood of maltreatment perpetration when the individual becomes a parent or guardian.

There are also several reasons why maltreatment that occurs during adolescence may be more damaging in the long run. One concerns the unique developmental aspects of adolescence. During adolescence, brain development is characterized by growth in the systems that govern pleasure seeking and emotional reactivity that outpaces those that are related to regulation and self-control (Casey et al. 2010; Crockett and Pope 1993). Adolescence is also associated with increased autonomy and independence from parents, the formation of identity, higher-level cognitive processes, the establishment of broader reference groups, and greater susceptibility to peer influences (Casey et al. 2008; Collins and Steinberg 2006; Somerville and Casey 2010; Steinberg 2004). All of these influences may help adolescents to interpret and understand that maltreating behavior is wrong and inappropriate and to react more strongly to those experiences during a developmental stage at which they are quite vulnerable to trauma. Consistent with this perspective, several recent studies of the consequences of maltreatment have shown that adolescent maltreatment has a stronger and more pervasive impact on a variety of outcomes—for example, antisocial behavior, drug use, internalizing problems, and health-risking sex behaviors—as compared to childhood-limited maltreatment (Eckenrode et al. 2001; Ireland et al. 2002; Jonson-Reid and Barth 2000; Stewart et al. 2008; Thornberry et al. 2010).

An alternate explanation for these findings concerns changes in the nature of maltreatment itself. Maltreatment during one developmental period may be more severe than another in terms of type, severity, or chronicity, helping account for why we observe differential long term consequences. National data on substantiated cases indicate that both physical abuse and sexual abuse are more frequent during adolescence than childhood while neglect is more frequent during childhood than adolescence (U. S. Department of Health and Human Services, 2011), a pattern found in several other studies (Creighton 1985; Garbarino and Gilliam 1980; Raiha and Soma 1997; Sobsey et al. 1997). The relationship between age and the severity of physical abuse has also been investigated, with most studies finding that severity is higher at younger ages (Daley and Piliavin 1982; Egley 1991; Garbarino and Gilliam 1980;

Rosenthal 1988; Seaberg 1977), although Knutson and Schartz (1997) question this relationship based on the National Incidence Survey data. There is also evidence that fatalities that result from physical abuse are more apt to occur among younger children, perhaps because of their fragility (Hegar et al. 1994). Overall, while there are relatively few studies that directly compare adolescent and childhood maltreatment victims, adolescents are more apt to be victimized by physical and sexual abuse but the severity of physical abuse is somewhat greater for younger victims. We investigate this issue below using data from the current study.

Hypotheses

In this study we rely on data from the Rochester Youth Development Study to test the cycle of maltreatment hypothesis anew. In doing so we contribute to the assessment of this hypothesis in several ways:

1. The Rochester study meets the design criteria identified in the previous reviews (Ertem et al. 2000; Thornberry et al. 2012).
2. It has long-term data on maltreatment victimization (from birth through age 17) and on the perpetration of maltreatment (from age 18 to 38) based on a representative community sample.
3. We use both a global indicator of maltreatment as well as developmentally-specific measures.
4. We use propensity score matching to control selection effects and to more adequately address causality.

Based on this design, we test two hypotheses. First, we hypothesize that a history of maltreatment victimization will be significantly related to the later perpetration of maltreatment, even after selection effects are taken into account. Second, based on previous findings we hypothesize that the effect of maltreatment victimization experienced in adolescence will be significantly related to maltreatment perpetration while childhood-limited victimization will not be.

Gaining firm empirical knowledge about these hypotheses is an important issue for several reasons. If there is a significant level of intergenerational continuity, then maltreatment will continue to cascade from generation to generation until the cycle of maltreatment is broken. Children in these families will, unfortunately, continue to be placed at increased risk of maltreatment and its negative consequences. Thus, successfully interrupting this intergenerational cycle will have truly long-term effects, potentially benefiting multiple generations, not just the one receiving services. Also, if the level of intergenerational continuity is, in fact, developmentally specific, it is important to understand this so that prevention services can be more efficiently targeted.

In addition, focusing prevention services on maltreatment victims has a number of appealing features. First, many victims are already known to youth serving agencies, and are therefore an identifiable population to receive services. Second, several types of intervention, for example, classes to improve parenting skills (Centers for Disease Control and Prevention 2009) or nurse visitation programs (Olds et al. 1997), are available to reduce the transfer of risk. Third, focusing on maltreatment victims to reduce the subsequent perpetration of maltreatment focuses our efforts on *early* prevention, even before the next generation children are born (Thornberry 2009). These and other benefits will only accrue, however, if maltreatment victimization is causally related to the subsequent perpetration of maltreatment. We turn now to an assessment of this issue.

Methods

Sample

The Rochester Youth Development Study (RYDS) is a multi-wave panel study of the development of antisocial behavior that, starting in 1988, interviewed a sample of 1,000 adolescents 14 times from age 14 to age 31. It also interviewed one of their parents until the participants were age 23 and collected official data from the police, schools, and social services, in some cases to as late as age 38.

RYDS oversampled youth at high risk for serious delinquency and drug use because the base rates for these behaviors are relatively low (Elliott et al. 1989; Wolfgang et al. 1987). To accomplish this while still being able to generalize the findings to a population of urban adolescents, the following strategy was used. The target population was limited to seventh and eighth grade students in the public schools of Rochester, New York, a city that has a diverse population and a high crime rate. The sample was then stratified on two dimensions. First, males were oversampled, 75 % versus 25 %, because they are more likely than females to be chronic offenders and to engage in serious delinquency (Blumstein et al. 1986). Second, adolescents from areas of the city where high proportions of adult offenders lived were oversampled on the premise that youth residing in these areas are at greater risk for offending. Each census tract in Rochester was assigned a resident arrest rate reflecting the proportion of the total population living in the tract that was arrested by the Rochester police in 1986. Subjects were sampled proportionate to the rate of offenders living in a tract.

Attrition has been acceptable for a longitudinal study of this duration. At age 18, 88 % of the adolescents and 79 % of their parents were retained. At age 23, 85 % of the adolescents and 83 % of their parents were retained. Finally, at age 30,

80 % of the initial adolescents were retained. Comparing the characteristics of respondents who are retained to those who left the study demonstrates that attrition did not bias the sample (Krohn and Thornberry 1999). All aspects of the study were reviewed and approved by the Institutional Review Board at the University at Albany. At numerous points throughout this long-term study, study procedures, including the collection of archival data such as CPS records, were described to the participants. Initially parents provided informed consent for themselves and their child; the child provided assent. As the children reached the age of majority they provided their own informed consent.

Table 1, used for developing the propensity score model, also contains descriptive information about the sample, especially the material presented in the columns labeled “before matching” (one for each group based on maltreatment status). The participants are predominately African American with about equal proportions of Hispanics and whites. Study participants come from relatively disadvantaged family backgrounds. For example, over half of their parents received public assistance, the parents completed on average 11 years of education, over half of the mothers had their first child as teenagers, only about one quarter of the youth lived with both biological parents during adolescence, and a substantial number lived in impoverished neighborhoods. Although the sample contains many at risk families, the full range of the Rochester city socioeconomic spectrum is represented (Farnworth et al. 1994).

Measurement

Maltreatment Victimization Our measure of maltreatment victimization is based on data from the Child Protective Services records of the Monroe County Department of Social Services, the county of residence for all participants at the start of the study. We only had access to, and therefore only recorded, substantiated incidents, that is, incidents for which an intake officer found that there was sufficient evidence to consider the case valid (U. S. Department of Health and Human Services 2001). We collected all incidents from birth through age 17 in which our study participant was the victim of maltreatment that includes neglect (the failure of caregivers to provide needed and age-appropriate care), physical abuse (acts that actually caused or could cause physical injury to a child), emotional abuse (behavior, typically verbal behavior, that causes or could cause conduct, cognitive, or affective disorders), and sexual abuse (involvement of the child in sexual activities including, but not limited to, direct contact for sexual purposes, molestation, or rape). Most maltreatment incidents, 62 % of the total, involved a combination of these types.

We use three measures of the prevalence of maltreatment victimization in the following analysis. To test our first

hypothesis we focus on *any maltreatment*, a measure indicating whether or not the participant had one or more substantiated cases of maltreatment at any point from birth through age 17. In order to test our second hypothesis about developmentally-specific effects two additional measures were created—childhood-limited maltreatment and adolescent maltreatment. *Childhood-limited maltreatment* denotes participants who experienced at least one substantiated incident of maltreatment from birth through age 11, but no substantiated cases of maltreatment at or after age 12. *Adolescent maltreatment* denotes participants who had a substantiated case of maltreatment from age 12 to 17. Most of these participants (61 %) only had a substantiated record during adolescence, but 39 % also had a substantiated case during childhood. We combined these two groups into the category of “adolescent maltreatment” for two reasons. First, there are too few participants in the group who were victimized in both childhood and adolescence to support a separate propensity score analysis, $n=28$. Second, previous investigations using the Rochester sample showed that the adolescence-limited group and the childhood-plus-adolescence group are quite similar to each other, and quite different from the childhood-limited group, with respect to subsequent outcomes (see, for example, Ireland et al. 2002; Thornberry et al. 2001).

We excluded some participants without an official maltreatment record from serving as controls for the propensity score analysis. In particular, participants without a maltreatment record who had five or fewer years of residence in New York State during the childhood developmental period (i.e., birth through age 11), $n=62$, or three or fewer years of residence in New York State during the adolescent developmental period (i.e., age 12 to age 18), $n=9$, were eliminated. Because these individuals spent a shorter period of time in New York State, we were not confident about their status as never maltreated and it was more conservative to exclude them from serving as controls. To ensure that removal of these potential cases did not bias the estimates, all analyses presented in this manuscript were also run excluding maltreated cases who met these same criteria, $n=8$, that is, they lived in New York for fewer than the above specified years. The results are similar to those presented here and all substantive conclusions are the same.

To maintain the representativeness of the sample we included all participants with valid data and did not select only those who were parents. Over the course of the study most of the participants (> 90 %) lived in households with children at one point or another, for example, as a live-in boyfriend, and had opportunity to maltreat. Previous analyses limited only to those who are parents or lived with children produce results substantively the same as those reported below (e.g., Thornberry 2008).

Details on each maltreatment incident were coded according to the classification system developed by Cicchetti and

Table 1 Covariate and Propensity Score Balance Before and After Matching

	Before matching			After matching		
	Maltreated	Not maltreated	Standardized bias	Maltreated	Not maltreated	Standardized bias
Any maltreatment						
Propensity score (logit)	-0.96	-1.87	1.13	-0.99	-1.01	0.02
Covariates						
G2 male	0.60	0.73	-0.26	0.61	0.61	0.00
G2 African American	0.74	0.68	0.14	0.75	0.75	0.00
G2 Hispanic	0.08	0.17	-0.32	0.08	0.08	0.00
G2 age on January 1, 1988	13.58	13.50	0.10	13.58	13.61	-0.05
G1 was maltreated	0.09	0.04	0.17	0.08	0.08	0.00
G1 maltreatment unknown	0.11	0.12	-0.01	0.11	0.11	0.00
G1 early first birth	0.62	0.51	0.24	0.62	0.60	0.06
G1 early first birth unknown	0.12	0.09	0.09	0.11	0.09	0.05
G1 years of education	11.11	11.50	-0.21	11.13	11.05	0.04
G2 lived with both biological parents	0.08	0.28	-0.76	0.08	0.07	0.02
G1 public assistance	0.83	0.53	0.79	0.83	0.83	0.00
Neighborhood arrest rate	4.49	4.12	0.18	4.50	4.46	0.02
Neighborhood poverty rate	0.34	0.33	0.09	0.34	0.34	-0.02
<i>n</i>	151	597		149	195	
Childhood-limited maltreatment						
Propensity score (logit)	-1.36	-2.56	1.29	-1.40	-1.42	0.02
Covariates						
G2 male	0.73	0.73	0.00	0.74	0.74	0.00
G2 African American	0.72	0.68	0.08	0.73	0.73	0.00
G2 Hispanic	0.07	0.17	-0.39	0.07	0.07	0.00
G2 age on January 1, 1988	13.60	13.50	0.13	13.60	13.69	-0.13
G1 was maltreated	0.11	0.04	0.20	0.10	0.10	0.00
G1 maltreatment unknown	0.10	0.12	-0.05	0.10	0.10	0.00
G1 early first birth	0.62	0.51	0.25	0.62	0.64	-0.03
G1 early first birth unknown	0.13	0.09	0.13	0.13	0.11	0.05
G1 years of education	11.21	11.50	-0.15	11.23	11.11	0.06
G2 lived with both biological parents	0.07	0.28	-0.86	0.07	0.06	0.05
G1 public assistance	0.85	0.53	0.91	0.85	0.85	0.00
Neighborhood arrest rate	4.36	4.12	0.13	4.35	4.19	0.08
Neighborhood poverty rate	0.33	0.33	0.04	0.33	0.33	-0.02
<i>n</i>	89	597		88	134	
Adolescent maltreatment						
Propensity score (logit)	-1.79	-2.81	1.22	-1.81	-1.81	0.00
Covariates						
G2 male	0.42	0.73	-0.63	0.43	0.43	0.00
G2 African American	0.77	0.68	0.22	0.79	0.79	0.00
G2 Hispanic	0.10	0.17	-0.23	0.10	0.10	0.00
G2 age on January 1, 1988	13.54	13.50	0.05	13.54	13.54	0.00
G1 was maltreated	0.07	0.04	0.11	0.06	0.06	0.00
G1 maltreatment unknown	0.13	0.12	0.03	0.13	0.13	0.00
G1 early first birth	0.61	0.51	0.23	0.62	0.63	-0.03
G1 early first birth unknown	0.10	0.09	0.02	0.08	0.06	0.08
G1 years of education	10.95	11.50	-0.28	11.00	11.07	-0.04
G2 lived with both biological parents	0.10	0.28	-0.63	0.10	0.09	0.03
G1 public assistance	0.79	0.53	0.64	0.79	0.79	0.00
Neighborhood arrest rate	4.69	4.12	0.25	4.73	4.80	-0.03
Neighborhood poverty rate	0.35	0.33	0.17	0.35	0.34	0.05
<i>n</i>	62	597		61	99	

G1 refers to the first generation—the parents of the original adolescent participants. G2 refers to the second generation—the original adolescent participants.

colleagues for which there is ample evidence of reliability and validity (Barnett et al. 1993; Cicchetti and Barnett 1991). For each incident we recorded the *types* of maltreatment—neglect, physical abuse, emotional abuse, and sexual abuse—identified by the CPS records. We also measured the *severity* of each of these types of maltreatment on a five-point scale from the narrative descriptions provided in the record.¹ Barnett et al. (1993) defined each level of severity for each type and then created exemplars illustrating each severity level. Physical abuse, for example, can vary from overly severe spankings leaving minor marks on or below the shoulders (coded as 1) to life threatening assaults that require hospitalization or result in permanent injuries or death (coded as 5). RYDS coders used the exemplars to score each incident of maltreatment in the Rochester data set. Interrater reliability was assessed throughout the coding process and coders agreed on 88 % of the assessments. Disagreements were resolved by consensus scoring and by discussion with a trained social worker with extensive clinical experience (Smith and Thornberry 1995). Finally, *chronicity* was measured by summing the total number of substantiated incidents of maltreatment experienced by each participant.

Maltreatment Perpetration The outcome for this analysis is the perpetration of child maltreatment during the adult years based on the CPS records at the New York State Office of Children and Family Services (OCFS), the statewide repository for such records. For the 816 participants for whom records were searched, we recorded all incidents in which they were named as the perpetrator of any type of child maltreatment. Again, we only had access to substantiated incidents. We also collected characteristics of each incident, including the type or types of maltreatment that were involved—e.g., neglect, physical abuse, emotional abuse, and sexual abuse. Unfortunately, given the sample size and the overall prevalence of maltreatment, we cannot conduct analyses by type of maltreatment, in part because over half of the incidents (52 %) involved multiple types of maltreatment. As Belsky notes, however, the etiology of different types shows far more similarities than differences (1993).

In 2010, 82 % of the RYDS participants resided in New York State, so coverage from the statewide OCFS records is rather complete. Nevertheless, there is some right censoring in these data; that is, there is some censoring along the older or right-hand side of the distribution since we do not have data on all participants until the end of the follow-up period, age 38. We know either the age at which each participant experienced their first substantiated case of perpetration or, if none, their age at the last available year of observation (i.e., the age

at right censoring). For 59 % of the sample this is their age in 2010 when records were collected, but for some it represents their age at the last year we have consent to collect data or when they moved out of New York State. The average age of coverage is through age 33.2; 85 % were at least 30 and the oldest participants were 38. We therefore have data for a considerable portion of the early adult lifecourse, from age 18 to average age 33, or 15 years of exposure. Because of this right censoring we employ discrete time survival analysis (DTSA) as our primary analytic strategy. DTSA models the timing or onset of an event that is measured in discrete time periods and properly accounts for right censoring (Singer and Willett 2003). Merging the cases with complete data on victimization and perpetration leaves a total of 749 participants. One additional case was excluded from the analysis due to missing data on several of the propensity score covariates, resulting in a total sample size of 748.

As noted, we measure both victimization and perpetration with official, substantiated CPS records. We recognize that official maltreatment records have limitations; for example, not all instances of maltreatment are reported and not all reported cases are substantiated (Eckenrode et al. 1988; Straus and Smith 1995; Widom 1988). Also, investigation bias may lead to the overestimation or underestimation of involvement in maltreatment by certain groups within the overall population. Despite these limitations, Widom et al. (2004) provide evidence that prospective data from substantiated records have strong psychometric properties and, importantly, the pattern of results based on official maltreatment data, in our study and other studies that use them, argues strongly for their construct validity (Gilbert et al. 2009).

Pretreatment Selection Variables We employ propensity score analysis in order to match maltreated individuals to non-maltreated individuals with similar background characteristics (i.e., pretreatment selection variables). In forming the propensity score model for this analysis, we include 10 pretreatment selection variables. They are hypothesized to be causally prior to the maltreatment victimization, to predict the likelihood of maltreatment victimization, and to be correlated with the perpetration of maltreatment. These variables include the participant's gender, race/ethnicity (dummy coded to compare African American and Hispanic participants respectively to white, non-Hispanic participants), and age. We also include a set of variables that describe the participant's family environment at the start of the study (all reported by the primary caregiver): low socioeconomic status (comparing families on public assistance to all others), family structure (lived with both biological parents vs. all other family constellations), early first birth of participant's mother (comparing at or before age 18 to older than 18), primary caregiver's years of education, and a retrospective account of the maltreatment victimization of the primary caregiver during his/her

¹ These descriptions are unfortunately not available in the statewide records used to measure perpetration.

childhood or adolescence. Finally, we include two measures of the participant's neighborhood at the start of the study: neighborhood arrest rate and neighborhood poverty rate. The former is based on Rochester Police Department data and reflects the proportion of each census tract's total population that was arrested in 1986. The latter is based on 1980 census data and reflects the percentage of each tract's population living below the poverty level.

Results

To begin the analysis, we present descriptive statistics for the onset of perpetration. We model the onset of perpetration (i.e., the age of the participant when he/she first received a perpetration record) using a discrete time survival analysis (DTSA). In all DTSA models, we use a polynomial specification of time because there are many time periods and few incidents in some time periods (Singer and Willett 2003). To determine the best specification of the polynomial function, we tested 4 nested models: 1) intercept only, 2) linear growth, 3) quadratic growth, and 4) cubic growth. We compared the deviance statistics between each subsequent model, which is distributed as χ^2 with 1 degree of freedom for each model considered here. Model fit improved significantly for the linear compared to the intercept only model, $\chi^2(1)=22.49, p<.01$, and the quadratic compared to the linear model, $\chi^2(1)=6.28, p<.05$, but not the cubic model compared to the quadratic model. Therefore, we adopted a quadratic function for time in this and all subsequent models.

We then assessed the extent to which the survival function differed by maltreatment victimization status. We calculated these survival probabilities based on a conditional DTSA that added two dummy coded variables to compare childhood-limited maltreatment and adolescent maltreatment, respectively, to no maltreatment. Model fit was not significantly improved when interactions between the maltreatment status indicators and time were added to the model, $\chi^2(4)=2.43, ns$, indicating that the effect of maltreatment status on the odds of initiation of perpetration is similar across time. The resulting survival probabilities are presented in Fig. 1.² The predicted survival probability (i.e., the probability of having not yet perpetrated) by the last observed age (age 38) is 0.87 for participants who were not maltreated and 0.80 for participants who were maltreated in childhood only, but drops to 0.59 for participants who were maltreated in adolescence.

Next we assessed the potential causal effect of maltreatment victimization on maltreatment perpetration through the use of propensity score models. The analysis was conducted

in two phases. First we developed a propensity score model to predict the log odds of each maltreatment indicator (i.e., any maltreatment, childhood-limited maltreatment, and adolescent maltreatment). This was accomplished by regressing the maltreatment indicators on the pretreatment selection variables (Table 1) in a logistic regression model. In addition to these main effects, we also included gender by race/ethnicity interactions in order to account for potential differential effects of gender on maltreatment as a function of race/ethnicity. Next, the Matchit procedure in R (Ho et al. 2011) was used to conduct a nearest neighbor match (on the logit propensity score) with exact matching on gender, race/ethnicity, family history of maltreatment, and receipt of public assistance. Specifically, for each maltreated participant, two control cases with the exact same value for these 4 variables, and the nearest logit propensity score, were selected. This was done with replacement, so a non-maltreated case could serve as a control for more than one maltreated case. Weights were applied to adjust for some control cases being used more than once. In the second phase, onset of perpetration, specified as a DTSA, was regressed on maltreatment status, time, and two control variables (the stratifying variables of gender and neighborhood arrest rate) in the matched datasets.

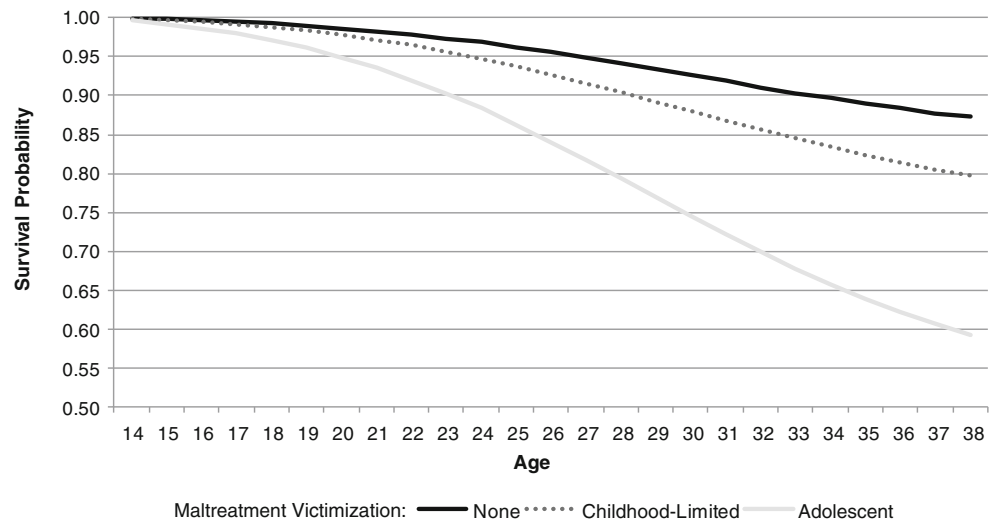
The results of the matching procedure for each type of maltreatment are presented in Table 1. For any maltreatment and adolescent maltreatment, the initial propensity score model produced well matched samples of maltreated cases and control (not maltreated) cases. For childhood-limited maltreatment, the inclusion of two additional interactions—mother's early age at first birth by age of the child and neighborhood arrest rate by age of the child—was necessary in order to produce well matched samples. One childhood-limited maltreatment case and one adolescent maltreatment case could not be matched to any controls and were therefore discarded.

In well matched samples, the standardized bias for the logit propensity score and for each of the covariates should be $|0.25|$ or less. The propensity score and many of the covariates exceeded $|0.25|$ before matching (Table 1) but after matching all values are far less than $|0.25|$, indicating that all three models produced matched samples of maltreated and control cases that are well balanced on the propensity score and all covariates.

Last, we estimated the effect of maltreatment on perpetration in each of the matched datasets. Proportionality was assessed for maltreatment status and both covariates (gender and neighborhood arrest rate). Only one violation was found. Model fit was improved by including an interaction between gender and both linear and quadratic time in the model for any maltreatment; the final model for any maltreatment, therefore, included these interactions.

² The small number of maltreatment perpetration incidents that occur before age 18 (< 2 %) involve teen parents.

Fig. 1 Survival probabilities for the perpetration of maltreatment as a function of maltreatment victimization status (unmatched data)



First consider the results for any maltreatment. Any maltreatment significantly increases the odds of becoming a perpetrator of maltreatment, $OR=2.38$, 95 % $CI=1.38, 4.08$. Next consider the effect of the developmentally-specific indicators of maltreatment. Childhood-limited maltreatment does not significantly increase the odds of becoming a perpetrator of maltreatment, $OR=1.83$, 95 % $CI=.84, 3.97$. Compared to those who were never maltreated, childhood-limited victims are not significantly more likely to maltreat a child. Adolescent maltreatment, however, has a significant and substantial impact on increasing the odds of becoming a perpetrator of maltreatment. The odds ratio is 5.49, 95 % $CI=2.35, 12.80$, indicating that victims of adolescent maltreatment are considerably more likely than those who were never maltreated to engage in maltreating behaviors.

Finally, for each measure of maltreatment, we also tested the maltreatment status by gender interaction. The interaction term was non-significant in each model, indicating that the effect of maltreatment on perpetration was not significantly different for male and female participants.

To depict these effects, Figs. 2, 3 and 4 present the survival probabilities calculated from each of the three models, holding constant gender and neighborhood arrest rate at the mean in each respective matched sample. These graphs offer compelling evidence of the impact of maltreatment victimization, especially victimization that occurs during adolescence, on the later perpetration of maltreatment. For any maltreatment there is a noticeable disparity in the survival functions for the two groups. In the childhood-limited case the survival curves, as expected, deviate only slightly. Finally, for those participants who were maltreated during adolescence, their survival curve is quite different from those who were never maltreated. By age 38, the predicted probability of not maltreating is about 0.90 (ranging

between 0.89 and 0.92 across propensity score models) for those who were not maltreated, about 0.82 for those who were maltreated during childhood only, and about 0.63 for those who experienced maltreatment during adolescence.

Differences in Childhood and Adolescent Maltreatment

One potential explanation for the greater impact of adolescent maltreatment on subsequent perpetration is the nature of the maltreatment victimization itself. Table 2 presents data comparing childhood-limited to adolescent maltreatment on three dimensions of maltreatment: type, chronicity, and severity. Recall that almost two thirds of the incidents involved multiple types, but there is no significant difference between childhood-limited (1.53) and adolescent maltreatment (1.55) in terms of the average number of types per incident. Consistent with previous studies we find that the type of maltreatment experienced differs by developmental stage. Maltreatment is significantly more likely to involve physical and sexual abuse for the adolescent group while the proportion of neglect cases declines, albeit not significantly. In terms of chronicity, the average number of maltreatment incidents for the childhood-limited group is 1.33 while it is 2.16 for the adolescent group, a difference that is statistically significant. Finally, it appears that the maltreatment experienced by the adolescent group is also significantly more severe. Across all incidents the average severity score is 3.91 for the childhood-limited group and 4.71 for the adolescent group, a difference that is marginally significant, $p<.10$. Within types, neglect is significantly more severe and physical abuse is marginally more severe for adolescent victims, although there are no differences for emotional abuse and sexual abuse. Overall, it appears that the maltreatment experienced by the adolescent group is more serious in terms of type, chronicity, and severity than that experienced by the childhood-limited group.

Fig. 2 Survival probabilities for the perpetration of maltreatment for any maltreatment victimization vs. no maltreatment (matched samples)



Discussion

This article tested the cycle of maltreatment hypothesis using prospective data on both maltreatment victimization and perpetration that covered substantial portions of the person's life course. Two general conclusions are warranted. First, using a propensity score model to provide clearer evidence about causality, we found a moderate general relationship between maltreatment victimization and the subsequent perpetration of maltreatment. Supporting the cycle of maltreatment hypothesis, participants who were maltreated at some point in their childhood or adolescence are significantly more likely to eventually maltreat their children than those who were never maltreated.

Second, this relationship is overwhelmingly driven by maltreatment that occurs in adolescence or that starts in childhood and persists into adolescence. The effect of

childhood-limited maltreatment is not statistically significant; in contrast, the effect of adolescent maltreatment is statistically significant and very substantial. Previous studies (Eckenrode et al. 2001; Ireland et al. 2002; Jonson-Reid and Barth 2000; Stewart et al. 2008) have also found a more pronounced effect of adolescent maltreatment, relative to childhood-limited maltreatment, on negative outcomes such as delinquency, violence, and substance use. It appears that the perpetration of maltreatment can be added to the list of negative sequelae of adolescent maltreatment.

Our findings also suggest that one possible explanation for why there is a greater impact for the adolescent maltreatment group is the severity of the maltreatment. They experience a significantly greater average number of substantiated incidents of maltreatment, they are more likely to be victims of physical and sexual abuse, and the overall average severity score per incident is larger, although only the difference for the

Fig. 3 Survival probabilities for the perpetration of maltreatment for childhood-limited maltreatment victimization vs. no maltreatment (matched samples)

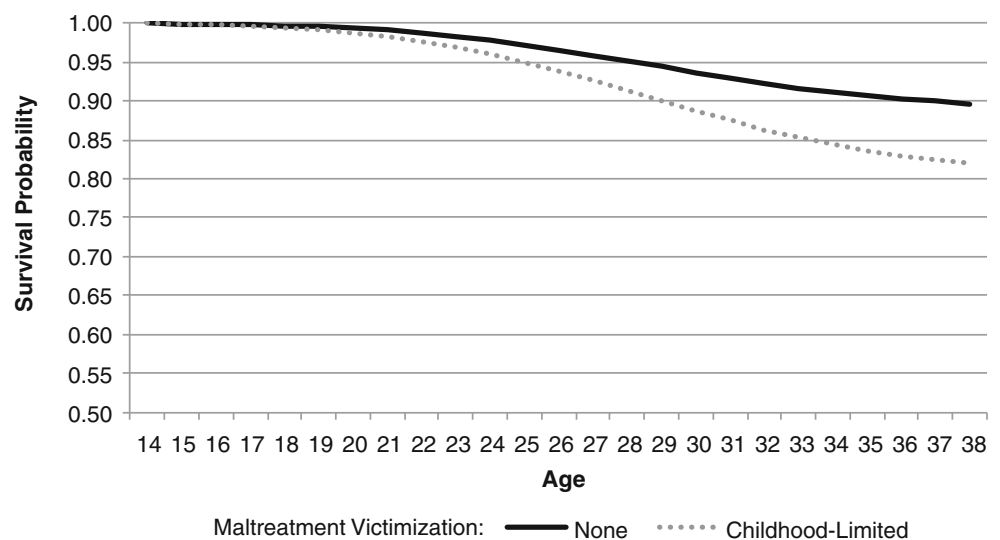
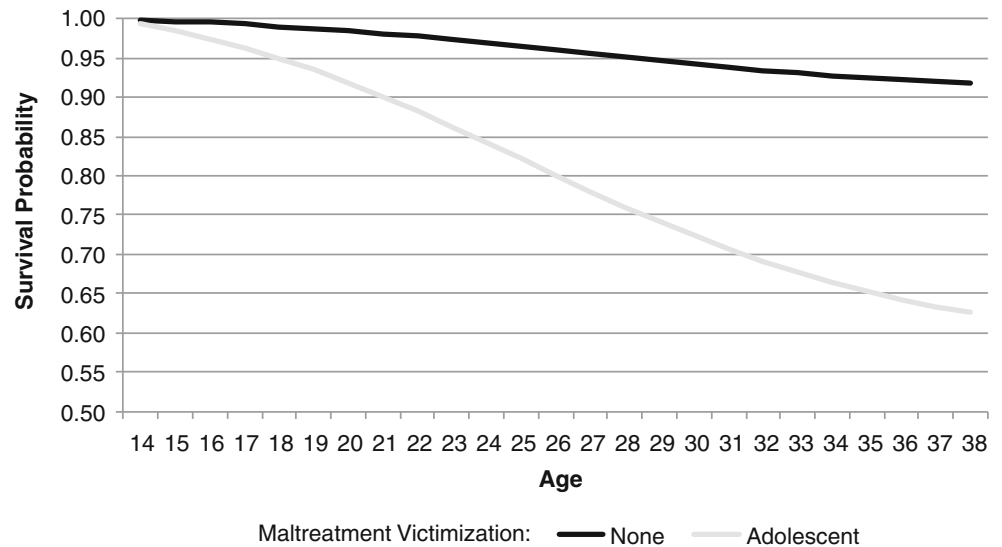


Fig. 4 Survival probabilities for the perpetration of maltreatment for adolescent maltreatment victimization vs. no maltreatment (matched samples)



severity of neglect cases reaches statistical significance. This pattern is quite consistent with a dose-response model. Youth in the adolescent group experience a more severe pattern of maltreatment and it is possible that this increases the burden of their victimization, placing them at greater risk for subsequent negative outcomes such as the eventual perpetration of maltreatment against the next generation.

Table 2 Dimensions of Maltreatment for Childhood-Limited and Adolescent Victims

	Childhood-Limited Maltreatment Victimization	Adolescent Maltreatment Victimization
Type		
Proportion of incidents involving:		
Neglect	0.67	0.56
Emotional abuse	0.35	0.44
Physical abuse	0.33	0.51*
Sexual abuse	0.06	0.16*
Average number of types per incident	1.53	1.55
Chronicity		
Number of incidents	1.33	2.16*
Severity		
All incidents	3.91	4.71 ⁺
Neglect	2.56	3.13*
Emotional abuse	2.85	2.96
Physical abuse	2.09	2.47 ⁺
Sexual abuse	3.60	3.60

* $p < .05$

⁺ $p < .10$

These findings highlight the need for future research to determine why adolescent maltreatment and persistent maltreatment (starting in childhood and continuing into adolescence) increases the likelihood of deleterious outcomes, while childhood-limited maltreatment does not (or at least does so to a much lesser extent). One important avenue for future research is made obvious in Table 2. There are some key differences in type, chronicity, and severity of maltreatment. We need to determine if these dimensions can be used to explain why adolescent maltreatment appears to be more harmful than childhood-limited maltreatment. This type of inquiry may offer important implications for prevention. If, for example, the greater ill effects of adolescent maltreatment are primarily driven by the type of maltreatment experienced, as opposed to the sheer number of substantiated incidents, that will provide crucial information for the development of prevention and intervention services focused on the most harmful types of abuse. Alternatively, the fact that maltreatment is more serious on all three dimensions investigated suggests that it could be the overall severity that leads to subsequent negative outcomes. If this is the case, then this too will have implications for prevention and intervention, suggesting the value of systemic or holistic approaches. We noted earlier that adolescent maltreatment may be particularly harmful because it takes place during a critical period of time in a young person's life—one that is characterized by critical phases of brain development, establishment of one's personal identity and autonomy, and the development of social and romantic relationships. It is possible that the greater severity of adolescent maltreatment interacts with these developmental changes that adolescents undergo to generate a greater impact on subsequent behavior. Our findings also highlight the importance of identifying the mediating processes that link adolescent victimization to subsequent perpetration. That is, we need to determine the intermediate factors that link maltreatment to

subsequent negative outcomes, including subsequent perpetration of maltreatment. Improving knowledge of which intermediate variables provide the strongest links between maltreatment histories and later perpetration will enhance our ability to establish developmentally-appropriate treatment services, for example, programs that can help maltreated adolescents overcome the identified deficits that maltreatment victimization may have caused.

Although there is a significant level of intergenerational continuity in maltreatment, it should also be noted that there is a substantial degree of discontinuity as well. Approximately 77 % of the participants with a history of maltreatment do not go on to maltreat children, at least through their early to mid-30s. Understanding why maltreatment is not perpetuated, that is, why there is intergenerational resilience, is also an important topic for future research. Identifying the protective factors that reduce the risk created by a history of maltreatment will inform not only our theoretical understanding of this process but also greatly aid in the development of effective intervention programs.

These findings have several additional policy implications. First, we concur with Berlin et al. (2011) that a parent's history of maltreatment, especially adolescent maltreatment, should be considered an important risk factor for later maltreatment perpetration. Several maltreatment programs define risk somewhat indirectly, based on demographic and psychosocial characteristics (e.g., Healthy Families America 2012; Olds 2006), but our results, along with those of Berlin et al. (2011), suggest that a more direct approach may be beneficial given the strength of intergenerational continuity. Future research should develop effective assessment and screening tools to appropriately elicit this sensitive information.

Second, services to victims of maltreatment often focus on warding off more immediate sequelae such as school disengagement, delinquency, and depression. Those efforts obviously need to be continued and improved. At the same time, to break the cycle of maltreatment our results highlight the value of also taking a long-range approach. As Lundahl et al. (2006) note, preventing maltreatment in the first place is clearly preferable to ameliorating its negative consequences once it has occurred. For example, programs that provide services to adolescent maltreatment victims could emphasize such things as the advantages of delaying initial childbirth, developing knowledge about normal infant and child development, encouraging effective parenting behaviors including the accurate identification of maltreating behaviors and their negative consequences, and providing therapeutic services to adults who have suffered maltreatment.

As is true of all studies, the present one has its own methodological limitations. From a statistical perspective both maltreatment victimization and perpetration are relatively rare events and it is difficult to conduct refined subgroup analyses.

For example, we were not able to conduct propensity score analyses for separate types of maltreatment. In addition, we relied entirely on official measures of substantiated maltreatment, the only measures available for both victimization and perpetration in the Rochester study. Official data are likely to underestimate the level of maltreatment and they incorporate, to some unknown extent, biases that may exist in official reporting and recording procedures. These results are also specific to a particular cohort drawn from a single city and replicating these findings in other settings would certainly strengthen their generalizability. Given the total sample size we were not able to separately examine the persistent maltreatment group which may be the group at highest risk for intergenerational continuity.

Because of the initial purpose of the Rochester study, males were oversampled by a ratio of 3 to 1 which creates additional limitations. First, we were not able to conduct analyses by gender to examine the cycle of maltreatment separately for mothers and fathers. Although in some cases the cell sizes are quite small, we did conduct exploratory analysis by gender. The pattern of results is identical to those reported here for the full sample. Childhood-limited maltreatment is not significantly related to perpetration for either mothers or fathers but any maltreatment and adolescent maltreatment are significantly related to perpetration for both, with the impact of adolescent maltreatment being considerably stronger. This pattern is consistent with the non-significant interaction terms between the maltreatment indicators and gender reported earlier. Thus, it is likely that the effects observed here hold for both mothers and fathers. Second, there is an imbalance between the present study which is based primarily on males and the general literature on the intergenerational transmission of maltreatment which often focuses on maternal maltreatment experiences. It is impossible to determine if differences between the present findings and those in the literature are influenced by this difference but it should be carefully considered when interpreting these results.

Despite these limitations the present study does make important contributions to the investigation of the cycle of maltreatment hypothesis relative to the existing literature. It is based on a representative community sample, prospective data, developmentally-specific measures, and it traces the occurrence of perpetration until an average age of 33. Using a propensity score model to control selection effects we conclude that a history of maltreatment victimization, especially maltreatment that occurs during adolescence, has a significant causal impact on the perpetration of maltreatment. These findings offer strong support for the cycle of maltreatment hypothesis and highlight the necessity for future research to identify the mediating processes that link generations in this maladaptive way. They also highlight the importance of developing effective prevention programs to

break the cycle of maltreatment and to interrupt the cascading consequences of maltreatment that flow from one generation to the next.

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