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The Causal Impact of Childhood-Limited Maltreatment and Adolescent Maltreatment on Early Adult Adjustment

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Abstract

Purpose—We use full-matching propensity score models to test whether developmentally specific measures of maltreatment, in particular childhood-limited maltreatment versus adolescent maltreatment, are causally related to involvement in crime, substance use, health-risking sex behaviors, and internalizing problems during early adulthood.

Methods—Our design includes 907 participants (72% male) in the Rochester Youth Development Study, a community sample followed from age 14 to age 31 with 14 assessments, including complete maltreatment histories from Child Protective Services records.

Results—After balancing the data sets, childhood-limited maltreatment is significantly related to drug use, problem drug use, depressive symptoms, and suicidal thoughts. Maltreatment during adolescence has a significant effect on a broader range of outcomes: official arrest/incarceration, self-reported criminal offending, violent crime, alcohol use, problem alcohol use, drug use, problem drug use, risky sex behaviors, self-reported STD diagnosis, and suicidal thoughts.

Conclusion—The causal impact of childhood-limited maltreatment is focused on internalizing problems while adolescent maltreatment has a stronger and more pervasive impact on later adjustment. Increased vigilance by mandated reporters, especially for adolescent victims of maltreatment, along with provision of appropriate services may prevent a wide range of subsequent adjustment problems.

Keywords

Child maltreatment; Adolescent maltreatment; Crime; Substance use; Health-risking sex behaviors; Suicidal thoughts

Introduction

Since Kempe et al.'s paper identified the “battered child syndrome” as a unique threat to child well-being [1], maltreatment has been viewed as a significant health problem in American

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society. Attention has focused on the potential negative consequences of exposure to maltreatment, with maltreatment shown to be a risk factor for several health-compromising outcomes [2-6]. Nevertheless, the extent to which maltreatment actually *causes* such outcomes remains largely unknown. This is unfortunate since a risk factor is simply an antecedent characteristic associated with an increase in the likelihood of an outcome, while a cause, when altered, *changes* the likelihood of the outcome occurring. Thus, if maltreatment actually causes health-related problems, then preventing it, or changing the mechanisms through which it operates, will to some extent reduce those outcomes.

The strongest design for assessing causality, a true experiment, is obviously unethical and illegal for this topic. The best approach currently available to assess causality in non-experimental designs is propensity score matching [7]. All sample members have some underlying propensity to be exposed to the "treatment," which in this case is to be maltreated. But, for youth with similar propensities, only some actually experience maltreatment. By comparing them to non-maltreated subjects with similar propensities, selection effects are greatly reduced and the rigor of experimental design more closely approximated. Causal inferences can be made with greater confidence because propensity score matching ensures that there is balance on all observed covariates prior to estimation of treatment effects, thereby more thoroughly and appropriately controlling for pretreatment selection bias. Our first purpose in this paper is to use propensity score matching to examine whether maltreatment causes subsequent problems in four domains of adjustment during the early adult years: involvement in crime and violence, substance use, health-risking sex behaviors, and internalizing problems.

We also examine the developmental specificity of the maltreatment effect. Ontogenetic developmental models [8] hypothesize that maltreatment occurring in childhood "…should have stronger and more enduring negative effects on future adaptation than later exposure" because it disrupts the early course of human development [4, p.285], see also [2,9]. In contrast, sociogenetic developmental models [8] hypothesize that maltreatment that occurs in adolescence is likely to be more damaging because of the person's increased autonomy, cognitive ability, and heightened reaction to stress [10,11], as well as the proximity of the maltreatment to the outcomes. Our second purpose, therefore, is to consider whether the causal impact of childhood-limited maltreatment differs from that of maltreatment that occurs during adolescence.

Prior Studies

Longitudinal studies have shown that experiencing maltreatment at some point between birth and age 18 is a significant risk factor for crime and violence [5,12], alcohol and drug use [3, 13], risky sex behaviors and early pregnancy [6,14], and depression and suicidality [4,15]. Few studies, however, have investigated differences by the developmental stage at which the maltreatment occurred and most of those only examine antisocial behavior. Three studies only measured maltreatment occurring prior to age 12. They found that maltreatment at younger ages is related to externalizing problems [16]; that maltreatment at older ages has a stronger impact on externalizing problems while maltreatment at younger ages is related to depression and anxiety [9]; and that there are no age differences [17]. These studies did not extend the measurement of maltreatment into adolescence, however, and could not examine broader developmental differences. When this is done, we generally see that youth with no substantiated maltreatment and those with childhood-limited maltreatment are not statistically different with respect to externalizing problems, delinquency, and violence [18-21]. In contrast, youth maltreated in adolescence have significantly higher rates of those behaviors than those never maltreated. Maltreatment in adolescence is also more consistently and strongly related to early

pregnancy, internalizing problems, drug use [19], and smoking [22] than is childhood-limited maltreatment.

Risk factor studies typically control for several confounding variables to ward off spurious conclusions, but such designs fall far short of meeting the criteria for establishing causality. Three recent studies, however, suggest that maltreatment may be a cause of subsequent problems. Using a genetically-informed design, one study [23] found that childhood maltreatment increases antisocial behavior even after genetic influences are controlled, but this study did not rule out a spurious relationship due to prior environmental influences. Two additional studies used propensity score modeling and found a significant impact of maltreatment on criminal behavior [24] and on health-related quality of life [25]. These studies relied on long-term retrospective measures of maltreatment and did not examine the timing of maltreatment, however. The present study extends this research by using prospective data and developmentally-specific measures of maltreatment, and by examining multiple outcomes during the early adult years when temporal order is firmly established.

Methods

Sample

We use data from the Rochester Youth Development Study (RYDS) begun in 1988 with 1,000 seventh- and eighth-graders. Males and students from high arrest rate neighborhoods were oversampled because they are at greater risk for problem behaviors. Because gender and arrest rates were used to formulate the probability of selection, they are predictors in all models.

Since 1988, sample members and an adult caregiver have been interviewed (14 and 11 times respectively), and data from school, police, and Child Protective Services records have been collected. Here, we rely on data from the first 12 interviews. Interview Waves 1-9 were conducted at six-month intervals (ages 14-18); Waves 10-12 at annual intervals (ages 21-23). At Wave 1 the average age was 13.9 (SD = .78) and at Wave 14 it was 22.7 (SD = .81). The sample is 73% male and 27% female; 68% are African American, 17% are Hispanic, and 15% are white. At age 23, retention was 85% for the focal subjects and 83% for the caregivers, with no evidence of differential subject loss. Due to missing data on the covariates in the propensity score model, the final sample size is 907. All study procedures were approved by the Institutional Review Board at the University at Albany. The study was explained and written informed consent obtained from adult participants (for themselves and their minor children); assent was obtained from minor children.

Measurement

The maltreatment measure is based on all incidents of substantiated maltreatment (physical abuse, sex abuse, and neglect) from a county-wide search of Child Protective Services records through 1992 when participants were completing high school. Most incidents involve multiple types of abuse [19] with the most common being neglect, followed by physical abuse, and sex abuse. Based on developmental theory and prior research with this sample [19,26], we examine three groups. *Never maltreated* denotes subjects who never had a substantiated incident of maltreatment from birth through age 17 (n = 731, 80.6%). *Childhood-limited maltreatment* refers to participants who had at least one substantiated incident from birth through age 11, but none after age 11 (n = 104; 11.5%). The final category combines participants who had at least one substantiated incident between ages 12 and 17 with those who had an incident in both childhood and in adolescence (n = 72; 7.9%). Because all of these participants were maltreated in adolescence and the majority (61%) were maltreated only during adolescence, we refer to this group as *any adolescent maltreatment*. Sample size and the requirements of matching at different propensity score levels preclude analyzing these groups separately. Combining them

is based on previous analyses [19] that found that these groups had very similar relationships to outcomes and that neither group drove the observed relationships. Nevertheless, the reader should bear in mind that 39% of the any adolescent maltreatment group was maltreated in both childhood and in adolescence.

Outcome Variables

Antisocial Behavior: At the age 21 to 23 annual interviews we asked respondents to report their criminal offending during the previous year. Two self-report indices are used: *general offending* (26 offenses ranging in seriousness from minor offenses like petty theft to serious offenses like robbery) and *violent crime* (a 6-item sub-index of violent offenses). Cumulative frequency measures are employed. A dichotomous measure of *official arrest/incarceration* is based on a statewide search of New York State records covering the same ages.

Substance Use: *Alcohol use* is a 3-item index of the cumulative frequency of drinking beer, wine, and liquor during this three-year period. The *drug use* inventory covers ten illicit drugs from marijuana to heroin. Two measures, *problem alcohol use* and *problem drug use*, are 11-item inventories of the number of problems associated with the use of these substances modeled after the diagnostic content of the DSM-IV.

Health-Risking Sex Behaviors: *Risky sex* is a 14-item inventory asking about the respondent's risky sex behavior, for example, whether they ever had sex in exchange for money, been forced to have sex, had partners who were bisexual, or had HIV positive partners. The second measure, *STD diagnosis*, is a single item that asks if the respondent has ever been diagnosed with an STD.

Internalizing Problems: *Depressive symptoms* is a 14-item scale derived from the CES-D [27] assessing the frequency of symptoms such as feeling nervous, stressed, or lonely. Categories for depressive symptoms and suicidal thoughts range from 1 (Never) to 4 (Often). *Suicidal thoughts* is a single item asking how often during the past year the respondent "thought seriously about suicide."

The propensity score model uses 19 variables that reflect risk factors for child maltreatment [28]. These include child's age at baseline, gender, race/ethnicity, mother's age at first birth, neighborhood arrest rate, neighborhood proportion of families living in poverty, family structure, and family socio-economic status; parent measures, including their education, alcohol use, drug use, depressive symptoms, level of stress, incidence of stressful life events, social support, and harsh parenting; as well as family history of maltreatment, of substance use, and/or of mental health problems.

Analysis

Two separate propensity score models were estimated by regressing each of the developmentally specific maltreatment indicators on the covariates just described. These models estimate the log odds that an individual would be maltreated and the resultant score is the propensity score. The sample of non-maltreated individuals was restricted to those in the region of common support of the maltreated individuals (i.e., non-maltreated youth with a propensity score more than .25 of a standard deviation outside the range of maltreated youth were excluded), a technique recommended when the average causal effect among the treated, which estimates the predicted difference between the observed outcomes for maltreated youth (i.e., the observed young adult outcomes for each maltreated youth) and the outcomes that would have been observed if each maltreated youth was not maltreated (i.e., if the maltreatment had been prevented), is desired [29]. Restriction of the data to the range of common support reduced the sample size for the child match from 835 to 749 (with 645 control cases and 104

maltreated cases) and for the adolescent match from 803 to 674 (with 602 control cases and 72 maltreated cases). Next, a full matching approach [30] to casual inference, which makes use of all available data by matching treated individuals with as many similar controls as possible, weighting each individual by the number of individuals in the set, was used [29].

To assess the balancing of covariates across groups, we first used t-tests and chi-square tests; no significant differences exist on any of the covariates between the groups in the matched datasets (p-values ranged from .22 to 1.00 for the childhood match and from .48 to 1.00 for the adolescent match). The standardized bias [30] should be less than .25 [29]; across all matches, the largest was .17 for the childhood match and .09 for the adolescent match and most (84% childhood; 72% adolescent) were .05 or less. The standardized bias for the propensity score was drastically reduced in both models to -.01 for childhood-limited maltreatment and to .01 for adolescent maltreatment. For the childhood match, the full matching procedure created 99 subclasses, ranging in size from 2 (1 maltreated and 1 non-maltreated youth) to 61 (1 maltreated and 60 non-maltreated youth). For the adolescent match, it created 71 subclasses, ranging from 2 (1 maltreated and 1 non-maltreated youth) to 88 (1 maltreated and 87 non-maltreated youth). After matched datasets were obtained, we employed either negative binomial (for count outcomes with over dispersion), logistic, or ordinary least squares regression models, depending on the measurement of the outcome variable. All regressions were weighted to account for the full matching subclasses. In addition to the maltreatment predictor, age at baseline, gender, race/ethnicity, family structure, neighborhood arrest rate, neighborhood poverty, and family socio-economic status were included in the regression models to adjust for any residual bias and to increase precision [31]. To account for missing data in the outcome variables, we created 10 multiply imputed datasets using a multiple imputation program that allows for categorical and count variables [32]. Missing data across the outcomes ranged from 3.6% to 10.5% for the childhood analyses and from 3.9% to 10.5% for the adolescent analyses. Analyses were run on each of the 10 imputed datasets and the estimates were combined using the procedures outlined by Rubin [33].

Results

The average causal effect of childhood-limited maltreatment is rather modest (Table 1, panel A). There are no significant effects for any of the criminal behaviors or the health-risking sex behaviors. There is, however, evidence of a causal impact of childhood-limited maltreatment on the frequency of drug use and on problem drug use. Childhood-limited maltreatment victims are also significantly more likely to report suicidal thoughts and more depressive symptoms.

In contrast, there is a more consistent impact of adolescent maltreatment on these outcomes (Table 1, panel B). Indeed, the only outcome without a significant effect is depressive symptoms. Study participants who were maltreated during adolescence have significantly higher levels of general offending and greater involvement in violent crime and official arrests/incarcerations. They exhibit significantly higher levels of alcohol use, drug use, problem alcohol use, and problem drug use. They engage in more risky sex behaviors and are more likely to report a diagnosis of an STD. Finally, they are significantly more likely to report suicidal thoughts than those who were never maltreated.

To indicate the size of these effects, Tables 2 and 3 present the average predicted score for the maltreated individuals under the observed condition as well as the unobserved counterfactual condition. These results were obtained by using the regression equation for each outcome and estimating the predicted score for each maltreated youth under their observed status and their counterfactual status. Only contrasts for statistically significant relationships are presented.

The impact of childhood-limited maltreatment (Table 2) on drug use and on problem drug use is pronounced. For example, the frequency of drug use in the observed condition is 173 as compared to 84 in the counterfactual condition. The predicted probability of having suicidal thoughts is .24 under the observed status and .15 under the counterfactual status. Likewise, depressions scores are, on average, higher under the observed condition.

Experiencing maltreatment either during adolescence or in both childhood and adolescence has a sizeable impact across these outcomes (Table 3). The average frequency of general offending under the observed, maltreated condition is 226 as compared to 110 under the counterfactual condition. The effects for drug use are particularly large – maltreated adolescents report rates of drug use and drug problems that are about four times higher than non-maltreated youth. Almost half of the adolescent maltreatment victims report engaging in risky sex behavior as opposed to a third under the counterfactual condition and the prevalence of STD diagnosis and of suicidal thoughts is twice as high.

Discussion

Based on these results it appears, first, that maltreatment is not merely a risk factor for later outcomes, but also a causal agent, and, second, that its impact is conditioned by the developmental stage at which the maltreatment occurs. Childhood-limited maltreatment significantly affects drug use, problem drug use, suicidal thoughts, and depressive symptoms – reactions to stress that are more inwardly directed. In contrast, maltreatment that occurs in adolescence has a more pervasive impact on early adult development, affecting 10 of the 11 outcomes including involvement in criminal behavior, substance use, health-risking sex behaviors, and suicidal thoughts. The consistent impact of any adolescent maltreatment suggests that there may be important recency effects (the adolescence-limited subgroup) and dose-response effects (the persistent maltreatment group) that future research needs to address.

These results also highlight the importance of using developmentally specific measures of maltreatment in assessing its subsequent impact. When a global measure of any maltreatment was used (analysis not shown), only 3 of the 11 relationships were statistically significant; this would mistakenly imply that, in general, maltreatment is not causally related to early adult outcomes. When developmentally specific measures are used, however, we see the strong, pervasive impact of adolescent maltreatment on these outcomes.

Implications

With respect to childhood-limited maltreatment, prior studies report that childhood maltreatment has negative consequences on child development in the short term [2,17] and the present findings extend that to a causal impact on selected consequences during the early adult years. It is possible that there are fewer negative effects for the childhood-limited group because they received services. Although our data cannot rule out this possibility, the treatment literature provides very little evidence that typical services are effective in reducing underlying maltreatment risk or in preventing recurrence of maltreatment among those with substantiated maltreatment. These results highlight the importance of developing *effective* services, both to prevent childhood-limited maltreatment and to reduce its negative impact on the outcomes to which it is causally related. Based on our results, services for childhood victims of maltreatment should pay particular attention to more inwardly directed reactions. At the same time, the null findings with respect to criminal behavior and health-risking sex behaviors remind us that childhood maltreatment does not necessarily cause any or all subsequent negative outcomes.

Results for adolescent maltreatment, which includes both adolescence-limited maltreatment and maltreatment that begins in childhood and extends into adolescence, greatly extend those of earlier risk factor studies. Given the breadth of its impact on early adult functioning, it is

imperative both to identify the mechanisms by which adolescent maltreatment generates those consequences and to understand why adolescent maltreatment differs so substantially from childhood-limited maltreatment in this regard. Adolescents face more adjustment demands from the intense emotional experiences of puberty and complex peer and romantic interactions [34] and they have greater cognitive sophistication that leads to new appraisals of maltreatment that are likely to increase negative emotions such as shame and anger [35]. All of this may heighten oppositional behavior and promote further victimization at home and on the streets [36] leading to long-term adjustment problems.

It is also essential to develop effective *and* developmentally appropriate programs for adolescent victims [37]. But as scholars have noted [10,21], there are fewer treatment programs for adolescent victims than child victims, and many adolescent interventions are either downward extensions of adult programs or upward extensions of child programs [38]. Also, there are numerous barriers to enrolling adolescent victims and their families in any program, partly because maltreated adolescents are more apt to leave home and act out and, as a result, are less likely to be offered or to accept preventive and supportive services [37], and partly because of unintentional biases of mandated reporters who assume that maltreatment at younger ages has more severe consequences and therefore requires more extensive intervention resources. Obviously, childhood victims require and deserve excellent services. Nevertheless, given the substantial causal impact that adolescent maltreatment has on later negative outcomes, re-doubling our efforts in this area is warranted.

Limitations

Given the uneven gender distribution in the Rochester study (73% male; 27% female), it was impossible to conduct gender-specific analyses. We recognize that there are gender differences across these areas of functioning, and we controlled for gender both in the propensity score and regression analyses, but unfortunately cannot address this issue further with these data. It would be helpful to examine these relationships when maltreatment is disaggregated by type and by finer developmental distinctions. We relied entirely on official Child Protective Services records to measure maltreatment. These records have well-known biases [39], but also have substantial validity [40] and enable the construction of developmentally specific measures. Finally, while propensity score models more closely approximate the features of randomized experiments, the lack of random assignment to treatment conditions limits our ability to definitively test a causal hypothesis.

Conclusion

Despite limitations, this study presents compelling evidence about the causal status of developmentally specific measures of maltreatment. Childhood-limited maltreatment impacts a somewhat narrower range of early adult outcomes, primarily affecting internalizing problems. Adolescent maltreatment has a much more pervasive influence affecting all four areas of adjustment that we investigated: criminal behavior, substance use, health-risking sex behaviors, and suicidal thoughts. These results underscore the importance of having all mandated reporters, including health care providers, show the same level of vigilance for cases of adolescent maltreatment that have historically been shown for childhood maltreatment. Preventing maltreatment and providing services to reduce its negative sequelae are likely to have major benefits for society given the extensive damage to later functioning that maltreatment appears to cause.

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Table 1

Effect of maltreatment on early adult outcomes (matched samples)

	A. Childhood-Limited Maltreatment				B. Any Adolescent Maltreatment			
	Est	**SE**	**exp(Est)**	**Est/SE**	**Est**	**SE**	**exp(Est)**	**Est/SE**
Crime								
General offending[a]	0.04	0.25	1.04	0.14	0.72	0.30	2.06	2.41*
Violent crime[a]	-0.19	0.25	0.83	-0.77	0.60	0.26	1.83	2.28*
Official arrest/incarceration[b]	0.44	0.23	1.55	1.88	0.74	0.28	2.10	2.63**
Substance use								
Alcohol use[a]	0.31	0.17	1.37	1.84	0.40	0.18	1.49	2.18*
Problem alcohol use[a]	0.30	0.21	1.35	1.41	0.85	0.27	2.33	3.10**
Drug use[a]	0.72	0.31	2.05	2.32*	1.36	0.35	3.89	3.94**
Problem drug use[a]	0.73	0.28	2.08	2.60**	1.32	0.33	3.73	4.00**
Health-risking sex behaviors								
Risky sex[b]	0.07	0.28	1.07	0.26	0.58	0.27	1.78	2.10*
STD diagnosis[b]	0.06	0.39	1.06	0.15	0.85	0.31	2.34	2.76**
Internalizing problems								
Suicidal thoughts[b]	0.67	0.28	1.95	2.34*	0.90	0.32	2.46	2.80**
Depressive symptoms[c]	0.12	0.06		2.14*	0.08	0.05		1.47

*$p < .05$ (2-tailed test).

**$p < .01$ (2-tailed test).

Notes: Est = regression coefficient; SE = standard error; exp(Est) = exponentiated regression coefficient.

[a]Negative binomial regression coefficient.

[b]Logistic regression coefficient.

[c]Linear regression coefficient.

Table 2

Predicted mean scores for young adult outcomes by childhood-limited maltreatment status

	Observed Status (Maltreated)	Counterfactual Status (Not Maltreated)
Substance use		
Drug use	173.02	84.22
Problem drug use	0.60	0.29
Internalizing problems		
Suicidal thoughts[a]	0.24	0.15
Depressive symptoms	2.02	1.90

[a]Estimate is a predicted probability.

Table 3

Predicted mean scores for young adult outcomes by any adolescent maltreatment status

	Observed Status (Maltreated)	Counterfactual Status (Not Maltreated)
Crime		
General offending	225.57	109.67
Violent crime	2.10	1.15
Official arrest/incarceration[a]	0.54	0.39
Substance use		
Alcohol use	208.59	139.54
Problem alcohol use	1.58	0.68
Drug use	355.00	91.28
Problem drug use	0.90	0.24
Health-risking sex behaviors		
Risky sex[a]	0.47	0.33
STD diagnosis[a]	0.28	0.15
Internalizing problems		
Suicidal thoughts[a]	0.24	0.12

[a]Estimate is a predicted probability.