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Child Maltreatment and Adult Substance Abuse: The Role of Memory

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Abstract

Child maltreatment is a risk factor for substance abuse in adulthood. This study examines whether memory of maltreatment is a necessary link in the path leading from prospectively measured childhood maltreatment to adult substance use problems. Official Child Protective Services reports and adult retrospective recall of childhood maltreatment were used to predict illegal drug use and alcohol problems in adulthood controlling for covariates. Memory was a necessary link in the path between prospective reports of maltreatment and alcohol problems, and an important link in the path between prospective reports and illegal drug use. Implications for prevention and treatment are discussed.

Keywords

Child maltreatment; alcohol problems; illegal drug use; retrospective measurement; prospective measurement; memory

Maltreatment in childhood has long been associated with adult substance abuse. As many as two thirds of people receiving services for drug or alcohol abuse report histories of child maltreatment (Najavits, L. M., Weiss, R. D., & Shaw, S. R., 1997; Ouimette, P. C., Kimerling, R., Shaw, J., & Moos, R. H., 2000; Swan, 1998). However, many questions about the possible pathways between childhood maltreatment and subsequent substance abuse remain unanswered. One question is why some maltreated children grow up to abuse substances and others do not. Perhaps there are additional factors that tip the balance in one direction or the other. Another question is based on differences in the association between childhood maltreatment and adult substance abuse when retrospective measures of maltreatment are used compared to prospective measures of maltreatment. These differences suggest the possibility that adults who have problems with substance use are more likely to remember maltreatment in childhood than adults without substance use problems. Using an urban community sample that provides longitudinal data from early adolescence through the early 30s, this study presents findings about the role that memory of maltreatment plays in the relationship between prospectively measured maltreatment and adult substance use.

According to the 2010 National Survey on Drug Use and Health (SAMHSA, 2011) more than 22 million Americans annually abuse or are dependent on drugs or alcohol. The personal and societal cost of substance abuse is large. Economic costs to the U.S. were estimated at \$223.5 billion for excessive alcohol consumption in 2006 (Bouchery et al.,

2011) and \$193 billion for drug abuse in 2007 (NDIC, 2011). As reflected in the series of objectives in Healthy People 2020 (U.S. DHHS, 2010) reduction of substance abuse and related problems is a major public health target.

The literature on the etiology of alcohol and drug abuse, a review of which is beyond the scope of this study, provides evidence that many factors may contribute to the development of substance abuse. These factors include aspects of family environment such as parental substance use and abuse (Chassin, L., Curran, P. J., Hussong, A. M., & Colder, C. R., 1996; Stein, J. A., Leslie, M. B., & Nyamathi, A., 2002), parent monitoring and supervision, and parent-child attachment (Brook, J. S., Morojele, N. K., Pahl, K., & Brook, D. W., 2006; Fergusson, D. M., Boden, J. M., & Horwood, L. J., 2008). This study focuses on a particular aspect of family environment, child maltreatment, and its association with subsequent substance abuse.

Child maltreatment, a common and serious individual and public health problem in American society, generally encompasses physical, sexual, and emotional abuse, as well as several different dimensions of neglect. National estimates of the extent of maltreatment are based on data from the National Child Abuse and Neglect Data System (NCANDS) and the fourth National Incidence of Child Abuse and Neglect study (NIS-4). In 2009 NCANDS recorded about 3.3 million referrals of alleged maltreatment to state CPS agencies and identified 702,000 victims of 763,000 substantiated cases of maltreatment (U.S. DHHS ACF, 2011). In 2005–2006 NIS-4 which relied on reports from a sample of professionals in a position to recognize maltreatment estimated that approximately 1.25 million children experienced maltreatment using their harm standard, and slightly fewer than 3 million children – or about 1 in every 25 children – were maltreated using their endangerment standard (Sedlak et al., 2010).

As detailed below, many studies have found a positive association between maltreatment in childhood and later substance abuse. However, an indication that how maltreatment is remembered may be a factor in the development of substance abuse comes from differences in the association between maltreatment and substance abuse when maltreatment is measured prospectively rather than retrospectively. Prospective data on child maltreatment, measured approximate to the time the maltreatment occurs, is usually drawn from official records such as CPS (e.g., Smith et al., 2008) or family courts (e.g., Widom & Shepard, 1996). One advantage of prospective data is that because it measures maltreatment earlier in time it can more readily be used to establish causal versus correlational associations with subsequent outcomes (Briere, 1992). Another advantage is that CPS and court records of maltreatment usually involve substantiated findings by uninvolved parties (CPS workers, judges) of child abuse or neglect based on statutory criteria. Therefore the events involved are corroborated and meet reasonably clear and stringent standards of maltreatment. However, official prospective data also has disadvantages. The most notable of these is that official records capture only a portion of cases of child maltreatment (Hardt & Rutter, 2004; Sedlak & Broadhurst, 1996; Smith et al., 2008).

Retrospective report of adults recalling events of maltreatment that occurred in their childhood or adolescence is a more common measure of maltreatment and has been used in many outcome studies. Retrospective reports have been shown to capture events that were not documented prospectively in childhood, i.e. maltreatment that never came to the attention of authorities (Della Femina et al., 1990; Hardt & Rutter, 2004; Kendall-Tackett & Becker-Blease, 2004; Smith et al., 2008). However, retrospective reports are measuring the recall or memory of childhood maltreatment rather than the maltreatment itself. As these memories are generally measured at the same time as adult outcomes they bear a correlational rather than potentially causal relationship to outcomes such as substance abuse

(Briere, 1992). In addition, because they involve memory over long periods of time, they are subject to forgetting and other functions of memory and related cognitive processes. Hardt and Rutter (2004), in a review examining the validity of retrospective self-reports of childhood adversity note that on average across studies about one third of adults do not report maltreatment that was documented in their childhood or adolescence. Thus, while prospective official measurement understates the prevalence of maltreatment, retrospective self-report measures also understate the prevalence of maltreatment although for different reasons. This raises the issue of the role of memory about the maltreatment experience.

Retrospective studies examining the relationship between child maltreatment and substance abuse generally involve clinical samples of adults or adolescents in treatment for substance abuse, trauma or other problems, as well as a range of community samples. Studies compare both whether persons with substance abuse disorders report a higher prevalence of child maltreatment than a comparison population without substance abuse disorders, as well as whether persons reporting maltreatment display a higher prevalence of substance use problems than comparison groups with no maltreatment. A wide range of studies have found associations between adult substance use problems and retrospectively reported histories of maltreatment (Afifi et al., 2006; Bartholow et al., 1994; Bensley et al., 1999; Burnam et al., 1988; Duncan et al., 1996; Fergusson et al., 1996; Fergusson & Lynskey, 1997; Kunitz et al., 1998; Langeland & Hartgers, 1998; Malinosky-Rummell & Hansen, 1993; Moncrieff & Farmer, 1998; Polusny & Follette, 1995; Saunders et al., 1999; Scott, 1992; Simpson & Miller, 2002; Spak et al., 1998; Wilsnack et al., 1997). There have been fewer reports of null findings (Dinwiddie et al., 2000; Langeland & Hartgers, 1998; Simpson & Miller, 2002).

There are many fewer prospective studies that examine whether maltreated children grow up to have higher rates of substance abuse than non-maltreated children, and results are more equivocal. While some studies have found a positive association between childhood maltreatment and adult substance abuse (Jasinski et al., 2000; Schuck & Widom, 2001), other studies have found no association between prospective measures of maltreatment and adult substance use problems (McCord, 1983) or have found an association for women but not for men (Ireland & Widom, 1994; Widom et al., 1995; Widom & White, 1997). Perhaps of most interest, albeit rare, are studies comparing prospective and retrospective measures using the same sample. Tajima et al. (2004) found that while the retrospective self-reports of physical abuse by emerging adults strongly predicted alcohol and marijuana abuse, prospective reports by their mothers more weakly predicted marijuana abuse and did not predict alcohol abuse. Widom et al. (1999) found that while official prospective measures of maltreatment were not associated with adult drug use problems, retrospective self-reports of childhood maltreatment in the same sample robustly predicted increased risk for drug use problems in adults of both genders.

These findings suggest a weaker association between prospective measures of maltreatment and adult substance use problems compared to retrospective measures of maltreatment and adult substance use problems. This raises the question of whether retrospectively reported memory of maltreatment mediates the relationship between childhood maltreatment and adult substance use problems. In other words, is a reported memory of maltreatment an important or even essential link in the chain leading from an experience of maltreatment in childhood to problem substance use as an adult? As noted above a substantial number (on average a third) of people with prospectively measured official records of maltreatment do not report a memory of maltreatment in adulthood. In order to help us understand why this might be so, we look briefly at evidence about autobiographical memory.

Much of what humans experience is either not remembered, forgotten rapidly, or forgotten more slowly over time (Neisser, 1986; Thompson et al., 1996), and memory for the “gist” or

central meaning of a remembered event is the most enduring (Barclay, 1986; Neisser, 1986). In addition, what humans remember are not reproductions or literal copies of past events but reconstructions (Barclay, 1986; Conway, 1996; Neisser, 1986; Singer & Salovey, 1993; Thompson et al., 1996). Thus, autobiographical memory is not an objective recounting of events but is subject to processes that include reconstruction and selection relevant to the self.

A salient feature of autobiographical memory is its strong and essential relationship to the self; in fact, some theorists believe autobiographical memory to be an intrinsic part of the self (Conway & Pleydell-Pearce, 2000; Howe & Courage, 1997; Singer & Salovey, 1993). Barclay (1986) describes identity formation as “the development of a sense of sameness or consistency about one’s self” (p. 86). This generalized schematic concept of the self is built from experience and social interaction in the world and in turn organizes current experience and is the basis of future expectations. Markus (1977) showed that self-schemata selectively influences how new experience is processed and that this selection supports existing theories of self. Subsequent research has supported and extended these findings; for example, by mapping the development of self-identity from early childhood through emerging adulthood (Bakermans-Kranenburg & van IJzendoorn, 1993; Barclay, 1986; Habermas & Bluck, 2000; McAdams, 2001; Mikulincer, 1998). This evidence supports the idea that events of maltreatment in childhood may be incorporated into autobiographical memory and self-identity differently by different people. Thus it may explain, at least in part, why maltreatment that was officially documented in childhood is not always reported in adulthood.

Other factors have been shown to be associated with child maltreatment and/or substance abuse and may exert a spurious effect on these relationships. Parental substance use has been linked both to childhood maltreatment (Famularo et al., 1992; Kirisci et al., 2001; Zielinski & Bradshaw, 2006) and to substance use problems in offspring (Chassin et al., 1996; Stein et al., 2002). The relationship between child and parent has also been shown to moderate the association between maltreatment and subsequent substance use problems (Bolen & Lamb, 2002; Chandy et al., 1997; Leifer et al., 2001). Thus these variables need to be accounted for in examining the relationships in our hypothesized model described below.

Conceptual Framework

As discussed in the literature review there is a body of evidence that links maltreatment in childhood or adolescence to an increased risk for substance abuse problems in adulthood; however, this link appears to be stronger for retrospective self-report as compared with prospective official report suggesting that processes of memory play a role in the pathways between maltreatment and adult substance use problems. Consistent with theories of the development of autobiographical memory, we propose that the internal schema of the self, other people, and the world in general developed throughout childhood and adolescence is the lens through which events of maltreatment are interpreted, incorporated – or not—as part of a self-identity, and remembered. These theories postulate that from early childhood each person develops a set of internal constructs of the self, others and the world that provide the basis for cognitive processes involved in interpersonal relationships, emotional well-being and a variety of behaviors including substance use. This internal map will be influenced by sexual abuse, physical abuse or neglect by caregivers. However, these internal constructs in turn will influence how events such as maltreatment are interpreted and remembered. Our theorized model results in three specific hypotheses. Hypothesis 1: Prospectively measured maltreatment in childhood or adolescence will have a positive association with substance use problems in adulthood. Hypothesis 2: Retrospectively reported memory of maltreatment in early adulthood will mediate the association between prospectively measured child or

adolescent maltreatment and adult substance use problems. Hypothesis 3: Prospectively measured maltreatment will have no direct association with adult substance use problems when retrospectively reported memory of maltreatment is included in the model (i.e. memory of maltreatment will fully mediate the association between prospectively measured maltreatment and adult substance use problems).

Methods

Sample

Data for this research comes from the Rochester Youth Development Study (RYDS), a longitudinal study designed to increase understanding of the development of antisocial behavior and drug and alcohol use in an urban community sample. During the 1987–1988 academic school year, 1,000 7th and 8th grade students were randomly drawn from the Rochester, New York, public school district. In order to over-represent youth at high risk for antisocial behavior, boys and students from census tracts with high crime rates were over-sampled. Table 1 presents characteristics of the RYDS participants. Due to the over-sampling 73% of participants were male. Participants were drawn from an urban, high-minority school district; 68% of participants were African-American, 17% were Hispanic, and 15% were white.

There are three phases of the RYDS. During Phase 1, separate interviews with each student and their primary caregiver were held every 6 months over the course of 4 ½ years (mean age 13 to 18). After a gap of two years Phase 2 involved annual interviews held for three years with each participant, now in their early 20s. Following a longer gap, Phase 3 involved two interviews a few years apart held with participants now in their late 20s to early 30s. Data from all three phases are used in this study. In addition to interviews, data were collected from official sources including the Department of Social Services of the local county, which provided substantiated reports of maltreatment on RYDS participants from birth through age 17. All human subject research protections have been observed throughout the RYDS, which is monitored by the Institutional Review Board of the University at Albany.

Retention of RYDS participants has been good: at the end of Phase 2, 85% of participants and 83% of primary caregivers participated, and at the end of Phase 3, 76% of participants were retained. Earlier analyses found no evidence of differential attrition for delinquency measures including drug use and only minor differences have been found on demographic measures between participants remaining and participants lost to the study (Krohn & Thornberry, 1999; Thornberry et al., 2003). Analyses for this study found no substantive differential attrition related to substance use problems, maltreatment, or covariates (detail available from author).

Measures

The two outcomes measures used in this study are any illegal drug use and any alcohol-related problems from both of the adult (Phase 3) interviews. For the measure of *Illegal Drug Use* all respondents were asked whether they had used an index of illegal drugs during the past year including marijuana, crack cocaine, cocaine other than crack, heroin, PCP, barbiturates, amphetamines, inhalants, hallucinogens, and other non-prescription drugs such as ecstasy or steroids. The measure used in this study is any use of illegal drugs at either of the adult interviews, where no use is coded as zero and any use is coded as one. As shown in Table 1, 34% of RYDS participants reported illegal drug use in adulthood.

Respondents who reported at least monthly use of any alcoholic beverage were asked a series of 11 questions about *Problem Alcohol Use*, for example, whether participants had “Tried to cut down on drinking and found that you could not?” Questions included problems with personal relationships, functioning at work or school, legal problems, health problems, and increased tolerance or an inability to stop or reduce alcohol use. These problem use indicators are based on common alcohol and drug screening instruments. The measure used in this study is an endorsement of one or more problems experienced in the past year at either adult interview, with no reported alcohol use related problems coded as zero and one or more alcohol use related problems coded as one. As shown in Table 1, 13% of the RYDS participants reported one or more alcohol related problem in adulthood.

Memory of Child Maltreatment

Retrospective self-reports on childhood maltreatment were collected in early adulthood (Phase 2) when participants had a mean age of 22.7 years. Participants were asked a series of questions about specific events of neglect, physical abuse, and sexual abuse that they experienced before the age of 12. These questions were adapted from the work of Widom (e.g., 1999) and others (Finkelhor, 1979). For neglect, respondents were asked 6 questions about specific types of neglect such as “Were there circumstances where your parents or caretaker left you home alone when you didn’t feel old enough to take care of yourself or keep yourself safe?” For physical abuse, participants were asked 8 questions such as “Did parents/caretaker hit you with something hard like a stick or baseball bat?” For sexual abuse, 11 questions were asked such as “Did another person touch your sex organs?” In each category, respondents were also asked whether they remembered any other maltreatment and asked to describe it. For this study, memory of maltreatment was coded as 1 if participants endorsed any memory of maltreatment and 0 otherwise. As presented in Table 1, 29% of RYDS participants had a memory of one or more events of maltreatment in childhood.

Official Prospective Childhood Maltreatment

Substantiated child maltreatment data were collected from the CPS of Monroe County, the county of residence for all RYDS participants. For each participant a search was conducted to find any substantiated reports of maltreatment between birth and 1992, when mean age of participants was 17. Details on every incident were coded according to the classification system developed by Cicchetti (Barnett et al., 1993; Smith & Thornberry, 1995) for which there is ample evidence of strong reliability and validity (Bolger et al., 1998; Cicchetti & Barnett, 1991). Inter-rater reliability among coders was 0.8. An extensive description of the subtypes and dimensions of official substantiated maltreatment (and the self-reported maltreatment described above) for the RYDS sample are detailed in a separate analysis (Elwyn, 2011). In part because the different subtypes are often co-occurring (41% of those maltreated had reports of multiple subtypes) in the following analyses one or more substantiated reports of maltreatment is coded as 1 and no maltreatment is coded as 0. As shown in Table 1, 20% of the RYDS sample had at least one substantiated report of maltreatment.

Covariates

In order to control for potentially confounding effects several other measures are included in the multivariate analyses including adolescent substance use problems, parental substance use, and adolescent relationship with parent. (In earlier models we also included a measure of family poverty but as this was not associated with any outcome or mediator and did not contribute to any model, for reasons of parsimony we exclude it from this final presentation.) Table 1 presents the prevalence or sample means of these covariates. *Late*

adolescent illegal drug use is the same measure as in adulthood for a year-long period when the average age of participants was 17.7. Similarly, *late adolescent alcohol problems* are a measure of one or more alcohol-related problem at age 17.7. As shown in Table 1, the prevalence of illegal drug use at this age was 27% and the prevalence of any alcohol-related problem was 10%.

Parental substance use is derived from the information collected from primary caregivers and is coded as 1 if the primary caregiver endorsed any one of the following over the course of Phase 1: often had 3 or more alcoholic drinks, used marijuana, or used other illegal drugs. It is coded as zero if the primary caregiver did not report substance use at any interview. It should be noted that because the majority of primary caregivers were women, either mothers or mother surrogates such as foster mothers or grandmothers, this is primarily a measure of maternal substance use rather than paternal substance use. As Table 1 presents, the prevalence of parental substance use was 30%. A measure of *Adolescent-Parent Relationship* is derived from an 11-item index adapted from Hudson's Index of Child's Attitude Toward Mother Scale. The scale measures agreement on a four-point response scale with items on the affective dimension of family life including parent-adolescent warmth, liking, lack of hostility, and sense of parental approval. The scale can range from 1 indicating little attachment with the primary caregiver to 4 indicating very strong attachment to the primary caregiver. The measure used in this study is from mid-adolescence when the mean age of participants was 14.5. The reliability for this measure is 0.87. As shown in Table 1, the mean score on adolescent-parent relationship was 3.4 (SD 0.44) with a range of 1.18 to 4.

In general, core RYDS measures including outcomes such as illegal drug use, predictors such as self-reported maltreatment and covariates such as adolescent-parent relationship, have been developed over the span of the project and their validity reported in many publications e.g., Krohn et al. (1992), Thornberry and Krohn (2000; 2003) and Thornberry et al. (2003).

Results

The major question in this study is whether memory of maltreatment is a mediator in the association between official maltreatment and substance use problems in adulthood. The concept of mediation is that the association of one variable with another variable is transmitted, either partly or completely, through a third variable; this is also referred to as an indirect effect. A useful method for assessing mediation is path analysis, which can assess the magnitude, direction, and statistical significance of path coefficients for direct, indirect, and total effects, with indirect effects tested by the joint significance of the involved paths (MacKinnon, 2008; MacKinnon et al., 2002). We therefore used path analysis for multivariate analyses.

Data Analyses

Bivariate analyses were conducted using SAS Version 9.2. Path analysis was conducted using Mplus Version 4.21. Due to the need to model categorical mediators in the path analyses, probit regression models were conducted using the weighted least squares mean and variance adjusted estimator (WLSMV) developed by Muthen (Kaplan 2009; Muthen & Muthen 1998–2007). Probit regression uses the cumulative distribution function of the standard normal distribution to link the probability of a categorical outcome to a linear combination of predictors. The sign and statistical significance of estimated probit coefficients are interpreted similarly to OLS regression. For example, a negative, statistically significant coefficient would indicate that an increase in the predictor would

result in a decrease in the probability of the outcome, controlling for other variables in the equation (Liao, 1994; Long, 1997).

Chi square difference testing using the option developed in Mplus for mean and variance adjusted estimators (Asparouhov & Muthen, 2006) was used to examine the effect of constraining (i.e. removing) specific paths. Three global fit indices were used to assess overall fit of the model to the data. Good fit is indicated by a model chi square that is not statistically significant, a Root Mean Square Error of Approximation (RMSEA) that is less than 0.05 and a Comparative Fit Index (CFI) that is greater than 0.90 (Kaplan 2009). Modification indices were used to assess local fit of the model to the data. Although as described above we did not find evidence of differential attrition on the measures used in this study, some data was missing due to attrition or non-response on particular items. To address missing data we used a full information approach for weighted least squares estimation developed by Asparouhov and Muthen (2010) that maximizes available information and increases the efficiency of estimates.

Bivariate Associations

Table 2 presents the simple bivariate associations between the measures. For categorical measures, a chi square test was used to assess differences in prevalence of the outcome; for the one continuous measure (adolescent-parent relationship) a t-test was used to assess mean differences between groups defined by the other measures. As shown in the first two rows of Table 2, a memory of maltreatment in early adulthood increases the likelihood of both illegal drug use and alcohol problems in adulthood at a statistically significant level. As shown in the third and fourth row of Table 2, any substantiated CPS report in childhood or adolescence was weakly associated with illegal drug use in adulthood and not associated with any alcohol problem in adulthood. As would be expected official maltreatment was associated with a memory of maltreatment. Note, however, that less than half (44%) of those with an official substantiated finding of maltreatment reported a memory of maltreatment in early adulthood.

Memory of maltreatment as a proxy

In a set of analyses with details published separately (Elwyn, 2011), we also evaluated whether memory of maltreatment was simply a proxy for some dimension of official maltreatment, for example, the severity of abuse. The Cicchetti classification system codes for maltreatment subtype and severity and provides the basis for coding other dimensions such as duration and number of incidents of abuse. These analyses, which extensively describe these dimensions, showed no relationship between the number of subtypes, number of incidents, duration, or severity of official substantiated maltreatment with memory of maltreatment. For example, participants who reported a memory of maltreatment in early adulthood experienced on average the same level of official maltreatment severity as participants who did not report a memory of maltreatment in early adulthood. These analyses confirmed that reported memories of maltreatment are not simply markers for the subtypes, extent, or severity of substantiated maltreatment.

Table 2 presents the bivariate associations between the covariates and the adult outcomes as well as with memory of maltreatment. As would be expected, illegal drug use in late adolescence increased the likelihood of illegal drug use in adulthood at a statistically significant level. Any alcohol problem reported in late adolescence was a strong predictor of any alcohol problem reported in adulthood. Late adolescent drug use was also associated with memory of maltreatment but any late adolescent alcohol problem was not. *Parental substance use* was associated with an increased likelihood of illegal drug use and any alcohol problem in adulthood. The lower panel of Table 2 presents the results of t tests on

the *adolescent-parent relationship* scale for groups defined by adult substance use problems, and memory of maltreatment. The respondents who reported illegal drug use or any alcohol problem in adulthood had, on average, a more negative perception of their relationship with their parent in adolescence. Similarly, respondents who reported a memory of maltreatment in early adulthood had a more negative perception of their relationship with their parent as adolescents than those who did not report a memory of maltreatment. Perhaps surprisingly, there was no statistically significant difference in adolescent-parent relationship between the group with substantiated maltreatment reports compared to those without such reports, nor were there differences for the group whose primary caregiver reported substance use compared to those who did not (results not shown). Male *gender* was associated with an increased likelihood of illegal drug use and alcohol problems in adulthood, but not with memory of maltreatment. Finally, white participants were more likely to report an alcohol problem in adulthood.

Path Analyses

In order to look at these relationships in a multivariate context and to assess the mediated (indirect) effects we turn now to path analyses. Figure 1 presents the probit regression path model for the outcome of adult *illegal drug use*. The fit indices for this model were good: the model chi square statistic was not statistically significant ($p=0.9$), the CFI was 1.0 and the RMSEA was 0.0, all indicating a good global fit with the data. In addition, there were no modification indices above 3.84 indicating good local fit of the model with the data.

We first address Hypothesis 2 (H2) as to whether a memory of child maltreatment in early adulthood mediated the association between official substantiated maltreatment and adult drug use; we found that it did. Figure 1 shows the two portions of the path between official maltreatment and adult drug use via memory of maltreatment. Consistent with bivariate results, respondents with a history of substantiated maltreatment reports were more likely to have a memory of maltreatment in early adulthood (probit coefficient (pc)=0.48, $p < .001$), and respondents with a memory of maltreatment were more likely to report use of illegal drugs in adulthood (pc =0.26, $p < .001$). The product of these two paths, the indirect effect, is presented in Table 3 (pc =0.13, $p < .01$) and was also statistically significant.

However, a history of illegal drug use in late adolescence also mediated the association between official substantiated maltreatment and adult drug use. Official maltreatment increased the likelihood that respondents engaged in illegal drug use in late adolescence (pc =0.25, $p < .05$), and illegal drug use in late adolescence increased the likelihood of illegal drug use in adulthood (pc =0.46, $p < .001$). The indirect effect of official maltreatment on adult drug use via late adolescent drug use was 0.11, ($p < .05$). Also presented in Table 3, is the total effect of substantiated maltreatment on adult drug use, which is the sum of the two indirect effects. This was also statistically significant (pc =0.24, $p < .001$). This finding addressed H1 and indicated an overall association between official substantiated maltreatment and adult drug use. Notably, however, we did not find a direct effect of official maltreatment on adult drug use (H3). In earlier models (not shown) we included a direct path from official maltreatment to adult drug use; the coefficient for this path was 0.002, $p=0.99$. We also conducted a formal test to determine whether constraining this path to zero had any impact on the model; the result of this chi square difference test was $X^2(1)=0.00$, $p=0.99$, confirming that there was no direct effect of official substantiated maltreatment on illegal drug use in adulthood.

These findings indicate that participants with a history of official substantiated CPS reports in childhood or adolescence have an increased likelihood of engaging in illegal drug use in adulthood. However, this is the case only because these participants have an increased likelihood of reporting a memory of maltreatment and/or an increased likelihood of

engaging in late adolescent drug use. It is worth noting here that less than half of those respondents with a substantiated CPS report of maltreatment reported a memory of maltreatment in early adulthood. Those respondents who had a substantiated CPS report but who did not report a memory of maltreatment or engage in late adolescent drug use had no more likelihood of engaging in adult illegal drug use than those respondents with no history of official maltreatment. The implications of this for intervention and treatment are discussed further in the last section.

We briefly turn our attention to the role of other factors in the path analysis model of illegal drug use. As shown in Figure 1, neither adolescent perception of relationship with parent nor parental substance use directly predicted illegal drug use in adulthood. Earlier models showed that the direct paths were not statistically significant and chi square difference tests for both showed that constraining these paths to zero was not detrimental to the model. Both predictors however did have a statistically significant association with adult drug use through indirect paths. Table 3 presents the probit coefficients and 95% confidence intervals for the indirect and total effects. *Parental substance use* increased the likelihood of late adolescent drug use ($\beta=0.35$, $p < .001$). The total effect on adult drug use via late adolescent drug use was also statistically significant ($\beta=0.16$, $p < .01$). A more negative *adolescent-parent relationship* increased the likelihood of both a memory of maltreatment ($\beta=-0.54$, $p < .001$) and of late adolescent drug use ($\beta=-0.49$, $p < .001$). Both indirect paths were statistically significant as was the total effect of parent-adolescent relationship on adult drug use ($\beta=-0.37$, $p < .001$). Consistent with bivariate results, adult males were more likely to use illegal drugs than adult females but this difference was not true in late adolescence when the likelihood of drug use for each gender was similar. In this path model we found no statistically significant differences in late adolescent or adult drug use for groups defined by race and ethnicity.

Adult alcohol problems

Figure 2 presents the fit indices for the model of adult alcohol problems: the model chi square statistic was not significant ($p=0.95$), the CFI was 1.0 and the RMSEA was 0.0, all indicating good global model fit. There were no modification indices greater than 3.84 suggesting good local fit of the model to the data. As shown in Figure 2, the probit coefficient for the path between official maltreatment and memory of maltreatment was 0.49, $p < .001$ and the probit coefficient for the path between memory of maltreatment and any alcohol problem in adulthood was 0.27, $p < .001$. As presented in the second column of Table 3, the probit coefficient for the indirect effect was 0.13, $p < .01$. These findings confirm H2 that memory of maltreatment mediated the association between official substantiated maltreatment and any alcohol problems in adulthood.

However, (unlike the model for illegal drug use) we did not find a path between official substantiated maltreatment and late adolescent alcohol problems. We included this path in earlier models and found a probit coefficient of 0.20 that was not statistically significant ($p=0.18$). A chi square difference test ($X^2(1)=1.82$, $p=0.18$) indicated that constraining this path to zero had no detrimental effect on the model. Thus the only mediator between official maltreatment and adult alcohol problems was memory of maltreatment.

We also evaluated the direct path between official maltreatment and adult alcohol problems in earlier models and found a probit coefficient of 0.06, $p=0.70$. A chi square difference test for constraining this path to zero indicated no effect on the model ($X^2(1)=0.15$, $p=0.69$). This result confirmed H3 that there was no direct path between official maltreatment and adult alcohol problems. Therefore the indirect effect via memory of maltreatment was also the total effect ($\beta=0.13$, $p < .01$). This finding confirmed H1 that there was a positive

association between official substantiated maltreatment and any alcohol problems in adulthood. However, this association was completely mediated by memory of maltreatment.

As in the model of illegal drug use, parental substance use increased the likelihood of adult alcohol problems through the path mediated by late adolescent alcohol problems. The probit coefficient for this mediated total effect was 0.25, $p < .001$. A more negative adolescent-parent relationship increased the likelihood of both memory of maltreatment and late adolescent alcohol problems, both of which in turn increased the likelihood of adult alcohol problems. The total effect of adolescent parent relationship on adult alcohol problems had a probit coefficient of -0.3 , $p < .001$. Consistent with bivariate results male gender increased the likelihood of adult alcohol problems both directly and indirectly through late adolescent alcohol problems. White participants were also more likely to report late adolescent alcohol problems resulting indirectly in an increased likelihood of adult alcohol problems.

In summary, our findings confirmed all three hypotheses for the outcome of any adult alcohol problem. Hypotheses 1 and 2 were confirmed for the outcome of illegal drug use; however, the association between prospective substantiated maltreatment and adult illegal drug use was mediated not only by memory of maltreatment but also by late adolescent drug use. Official substantiated maltreatment had an association with both adult substance use problem outcomes. However, for adult illegal drug use this association was fully mediated by illegal drug use in late adolescence and a memory of maltreatment in early adulthood. Those respondents who had an official maltreatment report but did not use illegal drugs in adolescence and did not report a memory of maltreatment in early adulthood were no more likely to use illegal drugs in adulthood than those respondents with no official maltreatment report. The association between official substantiated maltreatment and adult alcohol problems was fully mediated by memory of maltreatment alone. Respondents who had a substantiated finding of maltreatment by CPS as a child or adolescent only had an increased risk of alcohol use problems in adulthood if they also reported a memory of maltreatment in early adulthood.

Discussion

The idea that the subjective construction of maltreatment as part of a life story and self-identity is what links these experiences to substance use problems in adulthood is consistent with theory about autobiographical memory (Conway & Pleydell-Pearce, 2000), which proposes that experiences are interpreted and selectively incorporated into an internal self-schema that is influenced by relationships and experience, but also provides the framework for assigning meaning and selective importance to experience. For example, an individual whose internal self-schema was adapted to a harsh, punitive early environment may continue to conceptualize the self, others, and the world in negative ways that result in problems such as substance abuse.

The findings from this study are consistent with this conceptualization. Maltreatment in childhood or adolescence may be measured more or less objectively by substantiated CPS reports where the events of abuse or neglect must meet standard official criteria. However, the official criteria for abuse or neglect do not determine how these events were subjectively experienced and interpreted by the child or adolescent or whether and to what extent they were incorporated into the internal schema. This interpretation and incorporation of experience is also not based simply on the events of maltreatment themselves, but also on the child or adolescent's internal schema at the time. The conception of self and others that dictates how events are interpreted and incorporated has itself developed from a variety of prior experiences and relationships, particularly primary caregiver relationships. Thus events of maltreatment that are seen as the same when viewed through the lens of official criteria

may be interpreted and remembered as maltreatment by one child or adolescent but not by another. In adulthood, whether events are remembered and reported as maltreatment is thus based on how the experiences were initially interpreted and incorporated into the internal schema as well as any subsequent revision of this internal schema in relation to the experience of maltreatment. It is this subjective memory of maltreatment, rather than the objective events based on official criteria themselves, that increases the likelihood of substance use problems.

Existing recommendations for treatment of persons with substance use problems are consistent with this understanding. For example, SAMHSA's Treatment Improvement Protocol on Substance Abuse Treatment for Persons with Child Abuse and Neglect Issues (SAMHSA, 2008) states:

Clinicians must, therefore, understand how clients interpret their experiences. Not all abuse meets the legal or commonly held criteria for abuse; nor will all clients perceive as abusive those experiences which fit the legal definition. For example, a client might report being spanked every day as a small child and might feel that he deserved the spankings because he disobeyed his mother. He might also explain that his mother loved him and that the spankings occurred within a context of caring. Such a client would deny that he had been abused as a child and would not be well served by therapists who insisted otherwise. In contrast, another client may have accepted chronic belittling and criticism while growing up and may not understand its relationship to career failures and repeated relapses. (pages 13–14)

Thus the primary finding of this study that memory mediates the association between maltreatment and substance use problems does not engender new or revised treatment recommendations. Instead this finding provides additional empirical support for a clinical approach based on an individual's internal conceptualization of maltreatment and its impact.

The finding that a more positive early adolescent relationship with the primary caregiver decreases the likelihood of memories of maltreatment and associated substance use problems in adulthood, even controlling for a history of substantiated maltreatment has implications for prevention efforts, particularly with maltreated adolescents and their families. Interventions that are focused on strengthening family relationships between adolescents and primary caregivers may promote the development of positive self-identity during this important developmental phase, which in turn may decrease the likelihood of substance use problems later on. The results of this study thus support efforts to promote positive relationships between adolescents with a history of maltreatment and their family members.

Study Limitations

This study was affected by some limitations. In part because the study involved analysis of longitudinal secondary data initially collected over two decades ago, the choice of measures, including of substance use problem outcomes, was constrained. In addition, although we controlled for the effects of gender, race and ethnicity in this study, there was a lack of power to examine differences between these groups in the pathways or degree of association that we examined. The characteristics of the RYDS sample, which was over-selected for male participants and is from an inner-city, high minority school district, should be considered when applying these findings. Future research in this area would further illuminate the applicability of these relationships for other groups. This study also did not specifically examine differences in subtypes or other dimensions of maltreatment; further research that examined differences in the effects of maltreatment subtypes such as sexual abuse or neglect would also contribute to our understanding of the pathways between

maltreatment and adult substance use problems. Examination of the relationships of official maltreatment and memory of maltreatment on other adult outcomes such as depression would also increase our understanding. Finally, there may be other mediators in the pathways between childhood maltreatment and adult substance abuse -- depression, for example -- that will be important to identify. In general, the findings of this study should be replicated with different samples.

It should be noted, however, that the RYDS has a number of features that were invaluable in addressing the hypotheses of this study. These include the collection of data on both prospective substantiated CPS reports and retrospective self-reports on events of maltreatment for the full sample. The longitudinal nature of the RYDS was essential to the ability to relate constructs from early and late adolescence to constructs from early adulthood and adulthood. In addition, the long term span of the RYDS appears to have resulted in a high level of trust by participants in the study and thus their willingness to accurately report on sensitive topics such as maltreatment and substance use. These strengths suggest that the findings of this study can be looked on with some confidence.

CONCLUSION

The primary finding of this study is that memory of maltreatment mediates the association between prospectively measured official maltreatment and adult substance use problems. This result supports the idea that how maltreatment is interpreted and incorporated into the subjective conception of self and others is an important consideration in understanding its effect on adult substance use problems. Hopefully, this contribution improves our understanding of the link between child maltreatment and adult substance use problems, and as a result can help to inform more effective interventions.

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Figure 1.
Path Model of Illegal Drug Use

Figure 2.
Path Model of Alcohol Problems

Table 1

Measures

Time Period	Categorical Measure	Percentage (n)	Total n
Adulthood	Illegal Drug Use	33.62% (270)	803
	Any Alcohol Problem	12.70% (102)	
Early Adulthood	Any Memory of Maltreatment	28.84% (244)	846
Birth through Late Adolescence	Any Substantiated Maltreatment	19.8% (198)	1,000
Late Adolescence	Illegal Drug Use	26.97% (240)	890
	Any Alcohol Problem	10.22% (91)	
Adolescence	Parental Substance Use	29.95% (233)	778
	Male	72.9% (729)	1,000
	African-American	68% (680)	
	Hispanic	17% (170)	
	White	15% (150)	
	Continuous Measure	Mean (SD) Range	
	Adolescent-Parent Relationship	3.4 (0.44) 1.18 – 4	947

Table 2

Bivariate Associations between Adult Substance Use Problems, Maltreatment, and Covariates

Categorical Measures (X ² Test)				
<i>Memory of Maltreatment</i>	% Adult Illegal Drug Use		% Adult Alcohol Problems	% Memory of Maltreatment
	Yes	No		
<i>Substantiated Maltreatment</i>	Yes	39.74+	15.23	43.98***
	No	32.21+	12.12	25.15***
<i>Late Adolescent Drug Use</i>	Yes	56.82***	-	35.81**
	No	24.83***	-	26.39**
<i>Late Adolescent Alcohol Problems</i>	Yes	-	40.48***	34.48
	No	-	9.50***	28.32
<i>Parental Substance Use</i>	Yes	41.23**	17.06*	31.19
	No	30.23**	10.56*	27.01
<i>Gender</i>	Male	38.81***	15.73***	28.26
	Female	20.78***	5.19***	30.29
<i>Race/Ethnicity</i>	Afr-Am	33.58	10.89*	29.17
	Hispanic	31.78	13.95*	24.29
	White	35.77	19.51*	32.31

Continuous Measures (T Test)				
<i>Adolescent-Parent Relationship: Mean (SD)</i>				
<i>Adult Drug Use</i>	<i>Adult Alcohol Problem</i>		<i>Memory of Maltreatment</i>	
	Yes	No	Yes	No
3.30*** (.48)	3.43*** (.42)	3.30* (.46)	3.40* (.44)	3.44*** (0.41)

+p < .1;

* p < .05;

100' > d

'10' < d
**

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Table 3

Direct, indirect and total effects on outcomes from probit regression path models

MEDIATORS	Effect Type	Probit Coefficients (95% Confidence Intervals)	
		Adult Illegal Drug Use	Adult Alcohol Problems
Memory of Maltreatment	Total/Direct	0.26*** (0.15 – 0.38)	0.27*** (0.13 – 0.41)
Late Adolescent Drug Use	Total/Direct	0.46*** (0.36 – 0.56)	-
Late Adolescent Alcohol Problems	Total/Direct	-	0.53*** (0.39 – 0.66)
EXOGENOUS			
Official Maltreatment	Indirect (via Memory of Maltreatment)	0.13** (0.05 – 0.21)	0.13** (0.04 – 0.22)
	Indirect (via Late Adolescent Drug Use or Alcohol Problems)	0.11* (0.01 – 0.21)	-
	Total	0.24*** (0.11 – 0.37)	0.13** (0.04 – 0.22)
Parental Substance Use	Total/Indirect (via Late Adolescent Drug Use or Alcohol Problems)	0.16** (0.06 – 0.26)	0.25*** (0.10 – 0.39)
Adolescent-Parent Relationship	Indirect (via Memory of Maltreatment)	-0.14*** (-0.22 – -0.06)	-0.14** (-0.23 – -0.05)
	Indirect (via Late Adolescent Drug Use or Alcohol Problems)	-0.22*** (-0.33 – -0.12)	-0.16* (-0.30 – -0.02)
	Total	-0.37*** (-0.49 – -0.24)	-0.30*** (-0.46 – -0.14)
Male	Direct	0.62*** (0.40 – 0.84)	0.46* (0.09 – 0.83)
	Indirect (via Late Adolescent Drug Use or Alcohol Problems)	-	0.23* (0.03 – 0.42)
	Total	0.62*** (0.40 – 0.84)	0.68*** (0.34 – 1.03)
Hispanic	Total/Indirect (via Late Adolescent Drug Use or Alcohol Problems)	0.01 (-0.11 – 0.13)	0.10 (-0.08 – 0.27)
White	Total	-0.04 (-0.16 – 0.09)	0.19* (0.02 – 0.35)