

# Does Age of Onset of Risk Behaviors Mediate the Relationship Between Child Abuse and Neglect and Outcomes in Middle Adulthood?

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**Abstract** Child maltreatment has been linked with a number of risk behaviors that are associated with long-lasting maladaptive outcomes across multiple domains of functioning. This study examines whether the ages of onset of four risk behaviors—sexual intercourse, alcohol use, drug use, and criminal behavior—mediate the relationship between child maltreatment and outcomes in middle adulthood among a sample of court-documented victims of child abuse/neglect and matched controls ( $N = 1,196$ ; 51.7 % female; 66.2 % White, 32.6 % Black). Adult outcomes included employment status, welfare receipt, internalizing symptoms of anxiety and depressive symptoms, substance use problems, and criminal arrests. The results indicated gender differences in these relationships. For females, age of onset of sexual intercourse mediated the relationship between child abuse/neglect and both internalizing symptoms and substance use problems in middle adulthood. For males, age at first criminal arrest mediated the relationship between child abuse/neglect and extensive involvement in the justice system in middle adulthood. Age of onset of alcohol use and drug use did not mediate the relationship between child abuse/neglect and middle adult outcomes. This study expands current knowledge by identifying associations between early initiation of risk behavior in one domain and later, continuing problems in different domains. Thus, early initiation of specific risk behaviors may have more wide-ranging negative consequences than are typically considered during intervention or treatment and strategies may need to target multiple domains of functioning.

**Keywords** Child abuse and neglect · Early onset · Risk behaviors · Age of onset

## Introduction

In discussing early substance use, Robins and Przybeck (1985) suggested that “predictors of age of initiation may be what forecasts outcome rather than early use itself” (pp. 178). More recently, in discussing early offending, Piquero et al. (2007) noted that “only a few studies have examined how age of onset relates to offending frequency among active offenders with age, and no research has linked these two criminal career dimensions (onset age and individual offense frequency) together in adulthood. Thus, it is not clear what an early age of onset predicts” (pp. 61). Child abuse and neglect have been linked to both of these social problems, in addition to other wide-ranging negative outcomes across the lifespan (Gilbert et al. 2009). However, it is not known whether the age of onset of these risk behaviors acts as a pathway for subsequent negative consequences for victims of childhood abuse and neglect. Previous research has consistently found associations between early-onset risk behaviors and later manifestation of these same risk behaviors [e.g., early-onset alcohol use is associated with substance use disorders in adulthood (Substance Abuse and Mental Health Services Administration 2009)], but few studies have examined whether these early-onset risk behaviors predict risk behaviors in other domains of functioning. Because there is frequent co-occurrence of problem behaviors across different domains, such as substance abuse and internalizing problems (O’Neil et al. 2011) or juvenile arrest and low educational attainment (Kirk and Sampson 2013), it is likely that early-onset risk behavior in one domain impacts functioning in other domains. While

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extensive research has documented consequences of child abuse and neglect, to our knowledge, research has not examined the role of early onset risk behaviors in relation to consequences of child abuse and neglect, although understanding the mechanisms by which children exposed to these adverse experiences subsequently engage in problematic behaviors is clearly important. Thus, the purpose of the present study is to examine whether the age of onset of four risk behaviors that have received considerable attention in the literature and whose relationships with child abuse and neglect have been documented in prospective longitudinal studies—sexual intercourse, alcohol use, drug use, and criminal behavior—mediates the relationship between childhood maltreatment and outcomes in middle adulthood.

### Impact of Child Abuse and Neglect

Child maltreatment has been associated with outcomes across many domains of functioning (Gilbert et al. 2009), including depression and anxiety (Johnson et al. 2000), posttraumatic stress disorder (Widom 1999), risky sexual behavior (e.g., prostitution; Widom and Kuhns 1996), criminal behavior (Maxfield and Widom 1996; Smith and Thornberry 1995), substance abuse and dependence (Widom et al. 2006), low intelligence (Perez and Widom 1994), and poor academic achievement (Eckenrode et al. 1993). In addition, previous research has identified associations between child maltreatment and earlier onset of risk behaviors. For example, maltreatment of all types has been linked to early-onset problem behaviors (e.g., cigarette use, sexual intercourse, illicit drug use, arrest, alcohol use; Eckenrode et al. 2001). Exposure to physical abuse, specifically, has been linked to early-onset externalizing problems in elementary school (Egeland et al. 2002) and youth homelessness (Gaets 2004), as well as early onset of substance use among females (Lansford et al. 2010) and early onset of sexual activity among females (Small and Luster 1994). Exposure to sexual abuse, specifically, has been linked to earlier use of alcohol and illicit drugs (Hawke et al. 2000) and earlier sexual activity (Brown et al. 2004).

### Early Engagement in Risk Behaviors

Previous research has also documented associations between early engagement in risk behaviors and subsequent maladaptive outcomes across multiple domains of functioning. Although much of the research examining early-onset risk behaviors has focused on associations with later problems within that same domain (e.g., early-onset conduct problems leads to life-course-persistent antisocial behavior; Moffitt 1993), some research has identified cross-domain outcomes associated with early-onset sexual intercourse, alcohol and drug use, and criminal behavior.

### *Early Engagement in Sexual Intercourse*

Although sexual intercourse is a normative behavior and often considered an appropriate developmental milestone, early initiation can be problematic for a number of reasons. Those who become sexually active by early adolescence are less likely to use effective contraception, engage in sexual behavior more often, and have more sexual partners (French and Dishion 2003), all of which increase the risk of pregnancy and transmission of sexually transmitted disease. Early initiation of sexual intercourse has also been associated with outcomes associated with delinquency and substance use, such as weapon-carrying (French and Dishion 2003), cigarette use (Coker et al. 1994), and getting into physical fights (Robinson et al. 1999).

### *Early Alcohol and Drug Use*

Early initiation of substance use has been associated with use of other, more dangerous drugs (Grant and Dawson 1998), risky sexual behavior (e.g., having sex with more than six partners), and poor academic achievement (Hyman et al. 2006), as well as increased risk of exposure to traumatic events (Kingston and Raghavan 2009). Alcohol use before age 15 is associated with a fourfold increase in the likelihood of meeting criteria for alcohol dependence (Substance Abuse and Mental Health Services Administration 2009). Marijuana, in particular, is considered to be a “gateway drug”—one that leads to the use of more dangerous drugs (e.g., cocaine), indicating that early use places youth at particular risk.

### *Early Engagement in Criminal Behavior*

Research on the long-term effects of early antisocial behavior, delinquency, and arrest consistently indicates that individuals who begin offending at a younger age are more likely to persist in their criminal activity and more likely to commit more serious offenses and antisocial behaviors than those who begin offending at an older age (Sampson and Laub 2005). In studies that examined cross-domain relationships, early antisocial behavior has been associated with increased risk for being a high school dropout (Sweeten 2006), having lower occupational success (low earnings and unemployment; Allgood et al. 1999), divorce or separation (Farrington 1989), substance abuse (Fergusson et al. 2005), and early mortality (Pajer 1998).

### Gender Differences

There are also differences between men and women in prevalence rates and age of onset of these risk behaviors. Compared to females, males typically engage in sexual

activity at a younger age (Upchurch et al. 1998), drink more heavily in adolescence (Cardenal and Adell 2000) and adulthood (Pitkänen et al. 2005), are more likely to suffer from substance use disorders (Brady and Randall 1999), and engage in offending behavior earlier and more frequently (Mazerolle et al. 2000). Gender differences have also been noted in the relationship between child abuse and neglect and a number of behavioral, emotional, and socioeconomic outcomes, including adult illicit drug use (Widom et al. 2006), coping and posttraumatic stress responses to maltreatment (Ullman and Filipas 2005), delinquency (Herrera and McCloskey 2001), and education, employment, earnings, and assets (Currie and Widom 2010). Given these findings from previous research, a secondary goal of the present study is to examine gender differences when considering ages of onset of risk behaviors as mediators in the relationship between child maltreatment and functioning in middle adulthood.

### The Present Study

To our knowledge, previous research has not examined the extent to which the age of onset of risk behaviors may serve as a pathway or mechanism linking child maltreatment to long-term outcomes, despite repeated calls for this type of research (Piquero et al. 2007; Robins and Przybeck 1985). Therefore, the primary goal of the present study is to examine whether child maltreatment leads to earlier initiation of specific risk behaviors (i.e., sexual intercourse, alcohol and drug use, criminal behavior), and whether these behaviors, in turn, predict maladaptive functioning in middle adulthood across a number of major domains of functioning, including socioeconomic, mental health, and behavioral problems. We hypothesized that the age of onset of each risk factor would mediate the relationship between child abuse and neglect and each of the outcomes in middle adulthood. Specifically, we hypothesize that individuals with histories of childhood abuse and/or neglect will engage in each risk behavior at an earlier age and, in turn, experience fewer employment opportunities, more reliance on public financial assistance, more internalizing and substance use problems, and more engagement in criminal behavior in middle adulthood, compared to individuals without such histories of childhood maltreatment (see Fig. 1). Secondly, given the gender differences in prevalence rates and ages of initiation of these risk behaviors and gender differences in consequences of childhood maltreatment that have been previously reported, we hypothesize that females will engage in these behaviors at a later age than males and, therefore, the mediation effect may not be as strong for females, given that some of these risk factors are considered to be developmentally normative when initiated in adulthood (i.e., sexual intercourse, alcohol use).

## Method

### Design

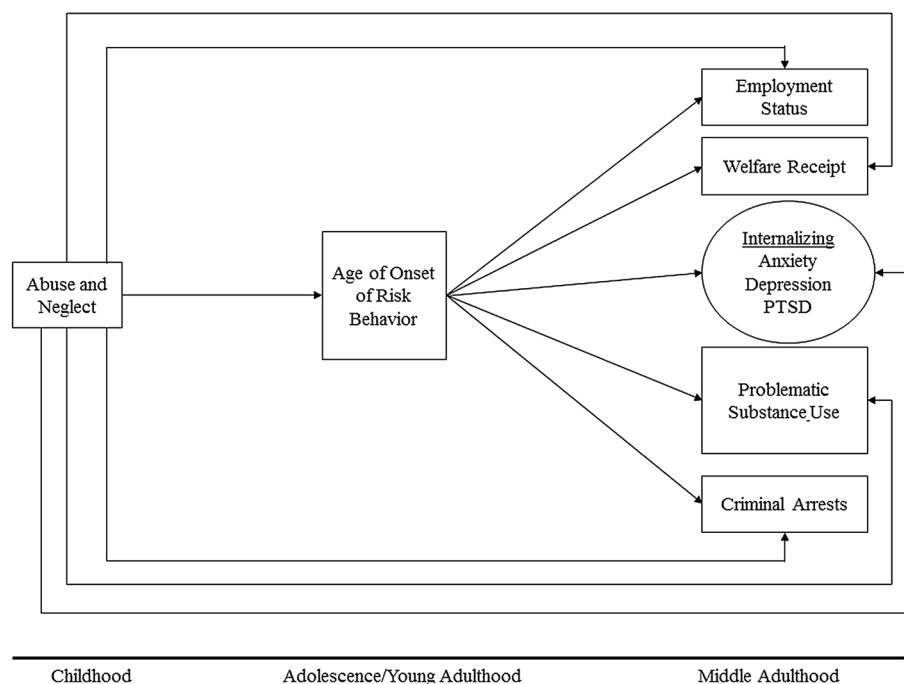
This research is based on a cohort design study (Leventhal 1982; Schulsinger et al. 1981) in which abused and neglected children were matched with non-abused and non-neglected children and followed prospectively into adulthood. Notable features of the design include: (1) an unambiguous operationalization of child abuse and/or neglect; (2) a prospective design; (3) separate abused and neglected groups; (4) a large sample; (5) a comparison group matched as closely as possible on age, sex, race and approximate social class background; and (6) assessment of the long-term consequences of abuse and/or neglect beyond adolescence and into adulthood.

The prospective nature of the study disentangles the effects of childhood victimization from other potential confounding effects. Because of the matching procedure, subjects are assumed to differ only in the risk factor: that is, having experienced childhood neglect or sexual or physical abuse. Since it is obviously not possible to randomly assign subjects to groups, the assumption of group equivalency is an approximation. The comparison group may also differ from the abused and neglected individuals on other variables nested with abuse or neglect.

### Participants

The rationale for identifying the abused and neglected group was that their cases were serious enough to come to the attention of the authorities. Only court substantiated cases of child abuse and/or neglect were included. Cases were drawn from the records of county juvenile and adult criminal courts in a metropolitan area in the Midwest during the years 1967 through 1971 ( $N = 908$ ). To avoid potential problems with ambiguity in the direction of causality and to ensure that the temporal sequence was clear (that is, child abuse and/or neglect → subsequent outcomes), abuse and/or neglect cases were restricted to those in which children were less than 12 years of age at the time of the abuse or neglect incident. Physical abuse cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures, and other evidence of physical injury. Sexual abuse charges ranged from felony sexual assault to fondling or touching in an obscene manner, rape, sodomy, and incest. Neglect cases reflected a judgment that the parents' deficiencies in child care were beyond those found acceptable by community and professional standards at the time. These cases represented extreme failure to provide adequate food, clothing, shelter, and medical attention to children.

**Fig. 1** Theoretical model depicting age of onset of risk behaviors mediating the relationship between child abuse/neglect and outcomes in middle adulthood



A critical element of this design was the establishment of a comparison or control group, matched as closely as possible on the basis of sex, age, race, and approximate family socio-economic status during the time period under study (1967 through 1971). To accomplish this matching, the sample of abused and neglected cases was first divided into two groups on the basis of their age at the time of the abuse or neglect incident. Children who were under school age at the time of the abuse or neglect were matched with children of the same sex, race, date of birth ( $\pm 1$  week), and hospital of birth through the use of county birth record information. For children of school age, records of more than 100 elementary schools for the same time period were used to find matches with children of the same sex, race, date of birth ( $\pm 6$  months), same class in same elementary school during the years 1967 through 1971, and home address, within a five block radius of the abused or neglected children, if possible. Overall, there were 667 matches (73.7 %) for the abused and neglected children.

Matching for social class is important because it is theoretically plausible that any relationship between child abuse or neglect and later outcomes is confounded or explained by social class differences. It is difficult to match exactly for social class because higher income families could live in lower social class neighborhoods and vice versa. The matching procedure used here is based on a broad definition of social class that includes neighborhoods in which children were reared and schools they attended. Similar procedures, with neighborhood school matches, have been used in studies of individuals with schizophrenia

(Watt 1972) to match approximately for social class. A more recent textbook (Shadish et al. 2002) also recommended using neighborhood and hospital controls to match on variables that are related to outcomes, when random sampling is not possible. Busing was not operational at the time, and students in elementary schools in this county were from small, socio-economically homogeneous neighborhoods.

If the control group included subjects who had been officially reported as abused or neglected, at some earlier or later time period, this would jeopardize the design of the study. Therefore, where possible, two matches were found to allow for loss of comparison group members. Official records were checked, and any proposed comparison group child who had an official record of abuse or neglect in their childhood was eliminated. In these cases ( $n = 11$ ), a second matched child was selected for the control group to replace the individual excluded. No members of the control group were reported to the courts for abuse or neglect; however, it is possible that some may have experienced unreported abuse or neglect.

The first phase of the study began as an archival records check to identify a group of abused and neglected children and matched controls to assess the extent of delinquency, crime, and violence (Widom 1989). Subsequent phases of this research involved locating and interviewing the abused and/or neglected individuals (22–30 years after the initial court cases for the abuse and/or neglect) and the matched comparison group. The present study used data from official criminal arrest records (collected 1987–1988 and

1994) and the first two follow-up in-person interviews at age 29.2 (1989–1995,  $N = 1,196$ ) and 39.5 (2000–2002,  $N = 896$ ). Interviews were approximately 2–3 hours long and consisted of a series of structured and semi-structured questions and rating scales. Throughout all waves of the study, the interviewers were blind to the purpose of the study, to the inclusion of an abused and/or neglected group, and to the participants' group membership. Similarly, the participants were blind to the purpose of the study. Participants were told that they had been selected to participate as part of a large group of individuals who grew up in the late 1960s and early 1970s. Institutional Review Board approval was obtained for the procedures involved in this study and subjects who participated signed a consent form acknowledging that they understood the conditions of their participation and that they were participating voluntarily.

Initially, the sample was about half male (49.3 %) and half female (51.7 %) and about two-thirds White (66.2 %) and one-third Black (32.6 %). At the first interview (1989–1995), we asked participants to identify their race and ethnicity, and these self-definitions are used here. At interview 2 (2000–2002), the current sample was 47.2 % male, 59.3 % White, non-Hispanic, and mean age 39.50. There has been attrition associated with death, refusals, and our inability to locate individuals over the various waves of the study. However, the composition of the sample across time has remained about the same. The abuse and/or neglect group represented 56–59 % at each time period; White, non-Hispanics were 59–66 %; and males were 47–51 % of the samples. There were no significant differences across the samples on these variables or in mean age across these phases thus far.

At the time of the first interview, the average highest grade of school completed for the sample was 11.47 ( $SD = 2.19$ ). Occupational status of the sample at the time of the first interview was coded according to the Hollingshead Occupational Coding Index (Hollingshead 1975). Occupational levels of the subjects ranged from 1 (laborer) to 9 (professional). Median occupational level of the sample was semi-skilled workers, and less than 7 % of the overall sample was in levels 7–9 (managers through professionals). Thus, the sample overall is skewed and the majority of the sample falls at the lower end of the socioeconomic spectrum.

## Variables and Measures

### *Child Abuse and Neglect*

Official reports of child abuse and/or neglect, based on records of county juvenile (family) and adult criminal courts from 1967 to 1971, were used to operationalize maltreatment. Only court-substantiated cases involving

children under the age of 12 at the time of abuse and/or neglect were included. Within the present sample of 896, 77 participants (8.6 %) had documented histories of physical abuse, 67 (7.5 %) had histories of sexual abuse, and 404 (45.1 %) had histories of neglect. A small proportion of participants ( $n = 52$ , 5.8 %) had documented histories of more than one type of maltreatment.

### *Potential Mediators: Age of Onset of Risk Behaviors*

In the first interview, participants reported on their first experiences with alcohol, drugs, and sexual intercourse, specifically, whether or not they had ever engaged in the behavior and if so, the age at which they first engaged in this behavior. Official arrest records were collected from local, state, and federal law enforcement agencies and these records were used to determine age of first arrest. While many studies examining age of onset of risk behaviors divide participants into “early” and “late” onset groups, in the present study we elected to include age of onset as a continuous variable. This decision was made to enable us to capture more accurately the full range of ages (up to age 29) at which these behaviors were initiated, without prescribing labels about what age would be considered normative and what age would be considered “early”. In addition, utilizing the original, continuous variables avoids issues such as lost variance and reduced power (MacCallum et al. 2002). For participants who had never engaged in a specific risk behavior, the age-of-onset variable was coded as missing.

### *Outcomes in Middle Adulthood*

Participants reported on their employment status, welfare receipt, internalizing symptoms, and problematic substance use during the second interview (2000–2002).

**Employment Status** Participants provided information regarding the type of work that they normally do (regardless of whether or not they were employed at the time of the interview), which was then recoded to a 5-item ordinal scale based on the Hollingshead occupational scale (Hollingshead 1975): (1) laborer/semi-skilled (20.5 %), (2) skilled (19.0 %), (3) service (20.5 %), (4) clerical/sales/business owner (18.3 %), and (5) managerial/professional (21.8 %).

**Welfare Receipt** As part of an assessment of economic status, participants were asked to indicate whether or not they were currently participating in a number of federal or state assistance programs (e.g., food stamps, Temporary Assistance for Needy Families [TANF], Social Security Disability Income [SSDI]). Out of 13 possible programs,



participants were enrolled in a range of 0–6 programs ( $M = 0.54$ ,  $SD = 1.06$ ).

**Internalizing Symptoms** Three self-report measures were used to assess symptoms of anxiety, depression, and post-traumatic stress disorder (PTSD). The Beck Anxiety Inventory (BAI; Beck 1987) is a 21-item self-report scale that asks respondents about anxiety symptoms over the past week, with responses ranging from 0 (not at all) to 3 (severely—I could barely stand it). Anxiety symptom scores ranged from 0 to 58 ( $M = 9.24$ ,  $SD = 10.28$ ) and the measure demonstrated good reliability (Cronbach's  $\alpha = .90$ ). The Center for Epidemiological Studies—Depression Scale (CES-D; Radloff 1977) is a 20-item self-report scale that asks about depressive symptoms over the past week, with responses ranging from 0 (none of the time) to 3 (most or all of the time). Depressive symptom scores ranged from 0 to 57 ( $M = 12.83$ ,  $SD = 11.13$ ) this measure also demonstrated good reliability (Cronbach's  $\alpha = .91$ ). Participants reported PTSD symptoms associated with events in either childhood or adulthood using the Composite International Diagnostic Interview (CIDI; Kessler et al. 2001). PTSD symptoms ranged from 0 to 17 ( $M = 7.19$ ,  $SD = 4.99$ ). These three constructs were combined into a latent variable for the main study analyses.

**Problematic Substance Use** Substance use problems were assessed on the basis of participants' responses to questions on the 23-item Rutgers Alcohol Problem Inventory (White and Labouvie 1989), adapted to cover drug use problems as well as those associated with alcohol. Respondents answered yes or no to each item (e.g., “Kept using drugs or alcohol when you promised yourself not to”). Symptoms ranged from 0 to 18 ( $M = 2.06$ ,  $SD = 3.77$ ) and Cronbach's alpha for the sample is .92.

**Criminal Behavior** Official arrest records were collected from searches through three levels of law enforcement—local, state, and federal—at two time points. The first searches were conducted between 1987–1988 (mean age = 26) and then again in June 1994 (mean age = 32). Participants with a criminal record had an average of 2.14 adult criminal arrests ( $SD = 4.78$ , range = 1–45).

### Statistical Analyses

Preliminary descriptive analyses examined gender and race/ethnic differences in the outcome variables and the prevalence and age of onset of sexual intercourse, alcohol use, illicit drug use, and criminal behavior. Then, as is standard with mediation analyses (Kenny et al. 1998), bivariate associations between each of the study variables were examined to assess for mediation: (a) relationships

between child abuse and neglect and age of onset of each of the risk behaviors, (b) relationships between child abuse and neglect and each of the outcomes in middle adulthood, and (c) relationships between age of onset of each of the risk behaviors and outcomes in middle adulthood.

Next, using MPlus 7.0 (Muthén and Muthén 1998–2012), structural equation modeling (SEM) was utilized to test full models with the mediating variables that were supported by simple regression analyses. A measurement model tested the individual factor loadings and fit of one latent outcome variable (internalizing problems in middle adulthood) and structural models tested the fit of the overall mediation effects. Multiple fit indices, as well as individual path coefficients, were used to evaluate the overall pattern of fit of the models, including the critical ratio ( $\chi^2/df$ ), root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI; Hu and Bentler 1998). An adequate fit is indicated by a critical ratio below 3, RMSEA of .10 or lower, and CFI and TLI values of .90 or greater (Schermelleh-Engel et al. 2003). Indirect effects were assessed via the multivariate delta method (Bishop et al. 1975), as is standard in MPlus. Each model was examined first with the total sample and then separately by gender. Gender differences were further examined through statistical tests of equality of regression coefficients (Paternoster et al. 1998). To deal with attrition across the multiple time points of the present study, full information maximum likelihood estimation was utilized to avoid biases and loss of power (Enders and Bandalos 2001).

## Results

### Gender and Race/Ethnicity Differences

Differences by gender and race/ethnicity were noted in many of the outcomes. Regarding gender differences, men reported holding jobs at the lower end of the socioeconomic scale ( $t = 7.60$ ,  $p < .001$ ), but women reported receiving significantly more forms of public assistance than men ( $t = 4.65$ ,  $p < .001$ ). Women also reported significantly more symptoms of depression ( $t = 2.73$ ,  $p < .01$ ), anxiety ( $t = 3.89$ ,  $p < .001$ ), and PTSD ( $t = 6.30$ ,  $p < .001$ ) than men. Men experienced significantly more substance-related problems ( $t = 4.20$ ,  $p < .001$ ) and had significantly more extensive arrest records than women ( $t = 9.14$ ,  $p < .001$ ). Regarding race/ethnic differences, Black participants reported receiving significantly more forms of public assistance ( $t = 2.38$ ,  $p < .05$ ) and had more extensive arrest records than White participants ( $t = 4.03$ ,  $p < .001$ ). Therefore, gender and race/ethnicity were included as covariates in all regression analyses and

**Table 1** Prevalence and age of onset of risk behaviors (N = 1,196)

Behavior	Item	Year collected	Prevalence (n)	Age of onset (in years)			
				Mean (SD)	Median	Mode	Range
Sexual intercourse	How old were you when you had sexual intercourse for the first time?	1989–1995	1,069	14.70 (4.09)	15.00	16.00	5–30
Alcohol use	How old were you when you first had any wine, beer, or other alcohol at least once a month (for 6 months or more)?	1989–1995	943	17.07 (3.64)	17.00	18.00	5–34
Drug use	Have you ever taken any other drugs on your own either to get high or for other mental effects [excluded alcohol, tobacco, caffeine, and prescribed substances]?	1989–1995	830	15.80 (3.43)	16.00	16.00	5–34
Criminal arrest	Search of official records	1987–1988, 1994	603	18.59 (5.42)	17.00	15.00	5–37

structural models with the exception of models examined separately by gender, in which only race/ethnicity was controlled. In addition, respondents' age at the first interview was included as a covariate, to control for the longer period of time available for older participants to have experienced the outcomes.

#### Extent of Engagement in Risk Behaviors

At the time of the first interview, the majority of participants reported engaging in sexual intercourse (97.2 %), alcohol use (78.8 %), and drug use (69.4 %), and more than half the sample (50.4 %) had a criminal arrest. Participants reported initiation of these behaviors primarily during their adolescent years, although ages of initiation ranged from childhood through the mid-30s (see Table 1). Initiation of these behaviors by some participants at very young ages prompted further examination, which revealed a relatively normal distribution of ages of onset for each risk behavior; therefore the low minimum age was not simply the result of one or two outliers. It is plausible that sexual intercourse at a very young age may be indicative of childhood sexual abuse. However, this very early age of onset of sexual intercourse was not exclusively reported by participants with known histories of abuse. Arrests at these very young ages most often involved charges of truancy, incorrigibility, or running away.

Compared to the controls, victims of child abuse and neglect were more likely to have ever used illicit drugs (71.4 vs. 66.7 %;  $\chi^2 = 3.08$ ,  $p < .10$ ) and been arrested (56.5 vs. 42.5 %;  $\chi^2 = 23.08$ ,  $p < .001$ ), but were not more likely to have ever engaged in sexual intercourse (97.2 vs. 97.5 %, *ns*) or ever used alcohol (80.3 vs. 78.1 %, *ns*) than controls. In terms of age of onset, individuals with documented cases of child abuse and neglect engaged in sexual intercourse at an earlier age ( $\beta = -.14$ ,  $p < .001$ ) and were first arrested at a younger age ( $\beta = -.12$ ,  $p < .01$ ) than controls (see Table 2). There were no differences

between the two groups in terms of age of onset of alcohol or drug use. Child abuse and neglect significantly predicted all of the outcomes in middle adulthood (see Table 2). Table 3 shows the results of bivariate analyses of the relationships between the age of onset mediators and outcomes in middle adulthood. Results indicated that the age of onset mediators were all significantly, yet differentially related to a number of the outcomes in middle adulthood.

#### Mediation Models

Structural equation modeling (SEM) was then used to examine whether age of onset of sexual intercourse and age of first arrest mediated the relationship between child abuse and neglect and outcomes in middle adulthood. Given that the bivariate regression analyses did not show significant associations between child abuse and neglect and age of initiation of alcohol use or illicit drug use, these factors were not examined as mediators. Before running the full models, confirmatory factor analysis (CFA) was used to assess the fit of symptoms of depression, anxiety, and PTSD onto one latent variable measuring internalizing symptoms. The structure coefficients ( $\beta$ 's = .51–.87,  $p$ 's < .001) supported this latent factor, which was significantly correlated with the other outcome variables in this study (see Table 3).

Next, the full structural models were examined, first for the total sample and then separately by gender. Separate sets of models were run for each mediator. Each model included paths directly from child abuse and neglect to the outcomes as well as the mediation paths (see earlier Fig. 1). Path coefficients are presented in Table 4.

#### Model 1: Sexual Intercourse as a Mediator

The model examining age of onset of sexual intercourse as a mediator with the full sample yielded fit indices within the acceptable range [ $\chi^2(18) = 82.60$ ; CFI = .96;

**Table 2** Risk behaviors (potential mediators) and outcomes for abused/neglected children and matched controls followed up into middle adulthood participants (N = 896)

	Child abuse and neglect <i>M (SD)</i>	Control <i>M (SD)</i>	$R^2$	$\beta$
<i>Potential mediators</i>				
<i>Age of onset of risk behaviors</i>				
Sexual intercourse	14.11 (4.38)	15.25 (3.80)	.03	-.14***
Alcohol use	17.07 (3.81)	17.07 (3.40)	.05	-.01
Drug use	15.84 (3.65)	15.75 (3.11)	.07	.07
Criminal arrest	18.12 (5.28)	19.41 (5.58)	.04	-.12**
<i>Outcomes in middle adulthood</i>				
Employment status	2.92 (1.38)	3.13 (1.49)	.08	-.09*
Welfare receipt	0.71 (1.20)	0.34 (0.82)	.06	.16***
<i>Internalizing symptoms</i>				
Anxiety symptoms	10.32 (11.27)	7.89 (8.70)	.03	.11**
Depressive symptoms	15.40 (11.65)	10.73 (10.08)	.04	.16***
PTSD symptoms	7.74 (5.10)	6.51 (4.77)	.06	.11**
Problematic substance use	2.32 (4.02)	1.73 (3.41)	.03	.08*
Criminal arrests	2.73 (5.68)	1.40 (3.17)	.13	.15***

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ . PTSD posttraumatic stress disorder. Italicized terms indicate latent constructs created out of the variables beneath

TLI = .86; RMSEA = .06 (95 % C.I. = .04–.07)]. The indirect effects were significant for child abuse and neglect through age of onset of sexual intercourse on internalizing symptoms ( $\beta = .02$ ,  $p < .01$ ), problematic substance use ( $\beta = .02$ ,  $p < .01$ ), and criminal arrests ( $\beta = .01$ ,  $p < .05$ ), and at the trend level, employment status ( $\beta = -.01$ ,  $p < .10$ ). When neglect cases were examined uniquely,<sup>1</sup> the results were very similar, with fit indices indicating acceptable fit [ $\chi^2(18) = 69.38$ ; CFI = .96; TLI = .87; RMSEA = .05 (95 % C.I. = .04–.07)] and significant indirect effects for neglect through age of onset of sexual intercourse on employment status ( $\beta = -.02$ ,  $p < .05$ ), internalizing symptoms ( $\beta = .02$ ,  $p < .01$ ), problematic substance use ( $\beta = .02$ ,  $p < .01$ ), and criminal arrests ( $\beta = .01$ ,  $p < .05$ ).

When examined separately by gender, the model continued to yield fit indices within the acceptable range for both males [ $\chi^2(16) = 50.98$ ; CFI = .94; TLI = .82; RMSEA = .06 (95 % C.I. = .04–.08)] and females [ $\chi^2(16) = 30.97$ ; CFI = .98; TLI = .93; RMSEA = .04

(95 % C.I. = .02–.06)]. However, the relationship between child abuse and neglect and age of onset of sexual intercourse remained statistically significant for females, but only significant at the trend level for males (see Table 4). A statistical test of the equality of these regression coefficients across gender supported this finding ( $z = 2.87$ ,  $p < .01$ ). For males, examination of the indirect effects indicated that there was no effect of child abuse and neglect on the outcomes through age of onset of sexual intercourse. However, for females, there was a significant indirect effect for child abuse and neglect through age of onset of sexual intercourse on internalizing symptoms ( $\beta = .04$ ,  $p < .01$ ) and problematic substance use ( $\beta = .03$ ,  $p < .05$ ). Again, this finding was supported by a statistical test of the equality of these regression coefficients ( $z = 2.89$ ,  $p < .01$ ).

#### Model 2: Age of First Arrest as a Mediator

The model examining age of first criminal arrest as a mediator with the full sample yielded fit indices within the acceptable range [ $\chi^2(18) = 85.88$ ; CFI = .95; TLI = .85; RMSEA = .06 (95 % C.I. = .05–.07)]. Examination of the indirect effects indicated that there was a significant indirect effect of child abuse and neglect through age of first criminal arrest to number of criminal arrests through middle adulthood ( $\beta = .02$ ,  $p < .05$ ), and a trend-level indirect effect for internalizing symptoms ( $\beta = .01$ ,  $p < .10$ ) and problematic substance use ( $\beta = .01$ ,  $p < .10$ ). When neglect cases were examined uniquely, the results were again similar, with fit indices indicating acceptable fit [ $\chi^2(18) = 75.01$ ; CFI = .96; TLI = .86; RMSEA = .06 (95 % C.I. = .05–.07)] and significant indirect effects for neglect through age of first arrest on total number of criminal arrests ( $\beta = .02$ ,  $p < .05$ ), and at the trend level, internalizing symptoms ( $\beta = .02$ ,  $p < .10$ ) and problematic substance use ( $\beta = .01$ ,  $p < .10$ ).

When examined separately by gender, this model continued to yield fit indices within the acceptable range for both males [ $\chi^2(16) = 53.06$ ; CFI = .94; TLI = .81; RMSEA = .07 (95 % C.I. = .05–.09)] and females [ $\chi^2(16) = 30.78$ ; CFI = .98; TLI = .93; RMSEA = .04 (95 % C.I. = .02–.07)], however, the mediation effect was seen only for males. For females, the path from child abuse and neglect to the mediator was not significant (see Table 4). A statistical test of the equality of regression coefficients indicated that this gender difference was only significant at the trend level ( $z = 1.60$ ,  $p < .10$ ). For males, the indirect effect of child abuse and neglect through age of first arrest was significant for criminal arrests ( $\beta = .04$ ,  $p < .01$ ), but only significant at the trend level for internalizing symptoms ( $\beta = .02$ ,  $p < .10$ ) and problematic substance use ( $\beta = .02$ ,  $p < .10$ ). This indirect path was

<sup>1</sup> Physical and sexual abuse could not be examined separately due to the relatively small sample sizes of these subgroups.



**Table 3** Bivariate relationships between age of onset of risk behaviors and outcomes in middle adulthood

	1	2	3	4	5	6	7	8
<i>Age of onset mediators</i>								
1. Sexual intercourse								
2. Alcohol use	.27***							
3. Drug use	.29***	.55***						
4. Arrest	.08	.13**	.07					
<i>Outcomes in middle adulthood</i>								
5. Employment status	.09*	.09*	.07	.07				
6. Welfare receipt	−.04	−.03	.02	−.04	−.15**			
7. Internalizing symptoms	−.15***	−.06	−.05	−.12*	−.19***	.26***		
8. Problematic substance use	−.11**	−.13***	−.12**	−.10*	−.18***	.15***	.38***	
9. Criminal behavior	−.10**	−.13***	−.06	−.19***	−.12**	.08*	.13***	.20***

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ . Analyses controlled for gender, race, and age

significantly different for males and females ( $z = 2.79$ ,  $p < .01$ ).

## Discussion

Previous research has found that child abuse and neglect puts individuals at risk for a wide range of negative outcomes across the lifespan (Gilbert et al. 2009), including problem behaviors that, when initiated at a young age, are associated with long-lasting problems across multiple domains of functioning. Early engagement in sexual activity, substance use, and antisocial behavior has been associated with problems within these same domains; however, previous research has not yet examined whether early onset of risk behaviors mediates relationships between adverse experiences in childhood and maladaptive outcomes in adulthood. The present study attempted to fill this gap in knowledge using documented cases of child abuse and neglect that were followed prospectively and assessed in middle adulthood. Given that prior research has reported gender differences in a number of these risk behaviors and outcomes in middle adulthood, we examined whether different patterns emerged for males and females. We hypothesized that child abuse and neglect would be both directly related to these negative outcomes in middle adulthood and indirectly related to these outcomes through the age of onset of each risk behavior.

The results from this study indicate that abused and neglected children are more likely to engage in sexual intercourse and criminal behavior earlier than controls and that this earlier engagement in these risk behaviors mediated the relationship between child abuse and neglect and a number of outcomes in middle adulthood. However, there were noteworthy and significant gender differences. Specifically, sexual intercourse acted as a mediator only for

females, with victims of child abuse and/or neglect becoming sexually active at a younger age than controls and, in turn, this led to more internalizing symptoms and substance use problems in middle adulthood. Previous research has found that adolescents with a history of either physical or sexual abuse report being more sexually active (Small and Luster 1994) and a history of sexual abuse has been linked to earlier engagement in sexual activity (Butler and Burton 1990). Thus, the present finding is consistent with this prior literature, but extends knowledge of this relationship by our use of a prospective long-term follow-up of children with documented cases of child abuse and neglect and suggests the important role played by the early onset of sexual intercourse in influencing later outcomes for these individuals. We also found that childhood neglect was associated with early sexual activity and, in turn, that this early age of onset of sexual intercourse predicted employment status, internalizing symptoms, problematic substance use, and criminal behavior in middle adulthood. These new results are consistent with previous work reporting associations between low family attachment and parental supervision and early sexual behaviors (Smith 1997). Although our samples of physically and sexually abused children were too small to examine differences in patterns of these relationships by the types of abuse for males and females separately, our findings indicate that this may be an important avenue for future research.

These new findings also indicated that earlier age of first arrest (that is, early contact with the criminal justice system) was a significant mediating pathway for males, showing that abused and neglected males were arrested at a younger age than control males, and, in turn, this predicted more criminal arrests by middle adulthood. Earlier work has shown that early-onset behavior problems (e.g., delinquency, aggression, offending) are associated with chronic, severe antisocial behavior in adolescence and adulthood

**Table 4** Parameter estimates in the models examining age of onset of sexual intercourse and age of first criminal arrest as mediators in the relationship between child abuse/neglect and outcomes in middle adulthood

Path	Total sample		Females		Males	
	<i>B</i> ( <i>SE</i> )	$\beta$	<i>B</i> ( <i>SE</i> )	$\beta$	<i>B</i> ( <i>SE</i> )	$\beta$
<i>Model 1: Age of onset of sexual intercourse</i>						
Child abuse and neglect →						
Age of onset of sexual intercourse	−1.12 (0.22)	−.15***	−1.75 (0.32)	−.23***	−0.51 (0.29)	−.07 <sup>+</sup>
Employment	−0.26 (0.10)	−.09*	−0.32 (0.15)	−.12*	−0.22 (0.15)	−.08
Welfare receipt	0.34 (0.07)	.16***	0.42 (0.12)	.17***	0.23 (0.08)	.14**
Internalizing problems	2.54 (0.60)	.15***	2.75 (0.89)	.16**	2.08 (0.76)	.05
Problematic substance use	0.50 (0.26)	.07*	0.75 (0.32)	.11*	0.25 (0.40)	.03
Criminal arrests	1.35 (0.30)	.14***	0.64 (0.19)	.16**	2.19 (0.57)	.18***
Age of onset of sexual intercourse →						
Employment	0.03 (0.10)	.07*	0.02 (0.02)	.06	0.04 (0.02)	.10 <sup>+</sup>
Welfare receipt	−0.01 (0.01)	−.02	−0.03 (0.01)	−.08 <sup>+</sup>	−0.02 (0.01)	.07
Internalizing problems	−0.28 (0.08)	−.12***	−0.41 (0.11)	−.18***	−0.03 (0.11)	−.01
Problematic substance use	−0.10 (0.03)	−.10**	−0.10 (0.04)	−.11*	−0.12 (0.06)	−.10*
Criminal arrests	−0.11 (0.04)	−.08**	0.00 (0.02)	.01	−0.26 (0.08)	−.15**
<i>Model 2: Age of first criminal arrest</i>						
Child abuse and neglect →						
Age of First criminal arrest	−1.29 (0.45)	−.12**	0.25 (0.82)	−.02	−1.82 (0.53)	−.17**
Employment	−0.27 (0.11)	−.09*	−0.35 (0.14)	−.13*	−0.19 (0.15)	−.07
Welfare receipt	0.34 (0.07)	.16***	0.47 (0.11)	.19***	0.20 (0.08)	.12*
Internalizing problems	2.68 (0.60)	.16***	3.50 (0.88)	.20***	1.78 (0.76)	.12*
Problematic substance use	0.54 (0.26)	.07*	0.92 (0.32)	.14**	0.14 (0.41)	.02
Criminal arrests	1.31 (0.30)	.14***	0.63 (0.19)	.16**	1.86 (0.57)	.15**
Age of first criminal arrest →						
Employment	0.01 (0.01)	.05	0.00 (0.02)	.02	0.02 (0.02)	.09
Welfare receipt	−0.01 (0.01)	−.03	0.00 (0.01)	.00	−0.01 (0.01)	−.07
Internalizing problems	−0.16 (0.08)	−.11*	−0.11 (0.13)	−.07	−0.19 (0.08)	−.14*
Problematic substance use	−0.06 (0.03)	−.09*	−0.04 (0.04)	−.06	−0.09 (0.04)	−.12*
Criminal arrests	−0.15 (0.03)	−.17***	−0.01 (0.02)	−.04	−0.28 (0.06)	−.24***

<sup>+</sup>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ . *B* unstandardized estimate. *SE* standard error.  $\beta$  standardized estimate

(Moffitt 1993). However, the reasons for this are not clear and explanations have ranged from environmental (Ingoldsby and Shaw 2002) to familial (Dishion et al. 2008), genetic (D’Onofrio et al. 2007), or systemic biases (Piquero et al. 2005). In addition, earlier age of first arrest (and associated contact with the justice system) mediated the relationship between childhood maltreatment and problems with anxiety, depressive symptoms, and substance use in middle adulthood for males, indicating that early antisocial behavior affects other domains of functioning in later life.

Regardless of exposure to child abuse or neglect, the results of this study also demonstrate that early initiation of risk behaviors has a significant impact on outcomes in middle adulthood. Our findings suggest that those who are sexually active at a younger age are more likely to suffer from internalizing and substance use problems in middle

adulthood and are more likely to have more extensive arrest histories. Those who engage in alcohol and drug use at a younger age are likely to report more drug use and more problems associated with substance use and more extensive arrest histories in middle adulthood than those who begin using alcohol or drugs later on in life.

Our finding that childhood maltreatment did not impact the age of initiation of substance use is surprising, given that previous research has found that physical and sexual abuse are associated with earlier use of drugs and alcohol (e.g., Hawke et al. 2000). Interestingly, in our sample, controls reported using illicit drugs at a younger age than victims of childhood abuse and/or neglect, although this difference did not reach statistical significance. Furthermore, in earlier research (Widom et al. 1995), we did not find that abuse and neglect was associated with higher rates

of alcohol abuse and/or dependence diagnoses at the time of the first interview, a finding that might be explained by a saturation effect. Alternatively, it may be that factors that remain unaccounted for in the present study explain more of the variance in age of first substance use. Given that genetic and other environmental factors, such as parental and peer substance use or parental monitoring, have been associated with early substance use (e.g., Hopfer et al. 2003), future research that examines these as mediators or moderators in the relationship between child maltreatment and the age of onset of substance use may help to explain the findings in the present study.

Although this study has a number of strengths, there are several limitations that warrant attention. First, because these are court-documented cases of abuse and neglect, these findings may not be generalizable to cases that are not reported to authorities or cases of abuse and neglect in middle or upper class families. Second, for the participants who experienced sexual abuse in childhood, their first experiences of sexual intercourse may have involved abuse. While it was not possible for us to determine whether participants' reports of their age of initiation of sexual intercourse included incidences of sexual abuse, we repeated the mediation analyses without the victims of sexual abuse and the results did not differ. Third, it is possible that participants' self-reports of age of onset of each of the risk behaviors may suffer from retrospective bias (with the exception of first criminal arrest, which was collected via official records). Although retrospective bias was avoided regarding child abuse/neglect due to our reliance on official records, it is possible that participants in the control group were exposed to unreported abuse and/or neglect, thus potentially diluting the significance of our findings. In addition, it was not possible to determine whether participants lost to follow-up differed in any of the mediators or outcomes from those who participated in all waves of the study. Finally, this study did not consider other potential mediators or moderators that may account for significant variance in the relationships examined, such as other environmental, familial, genetic, or individual-level factors. Future research may build on this study by considering the influences of other potentially relevant factors, such as parental monitoring and supervision or child temperament, to ensure that the results found in the present study are not spurious.

This study has expanded current knowledge by identifying associations between early initiation of risk behavior in one domain and later, continuing problems in different domains. These findings suggest that early initiation of specific risk behaviors may have more wide-ranging negative consequences than are typically considered during intervention or treatment. Our finding that child abuse and neglect influences early initiation of sexual intercourse

among females and, in turn, predicts symptoms of depression and anxiety, problematic substance use, and to a lesser extent whether they receive financial assistance from federal or state programs in middle adulthood, suggests that interventions should be multifaceted. For girls with histories of maltreatment who engage in early initiation of sexual intercourse, preventive interventions might target effective coping mechanisms that are protective against anxiety, depressive symptoms, and substance abuse and provide guidance on employment opportunities. Based on our findings, males may also benefit from multifaceted interventions, such as those that not only attempt to reduce externalizing behaviors among boys with early problem behaviors, but also provide education on effective coping techniques to buffer against anxiety, depressive symptoms, and substance abuse.

## Conclusion

While significant prior research has documented the link between early engagement in risk behaviors and later domain-specific problems, sparse research has attempted to examine other factors that may play a role in this association. The results of this study highlight the important role that child abuse and neglect plays in relation to early-onset risk behaviors and later maladaptive functioning across multiple domains. Victims of childhood abuse and neglect are more likely to engage in early-onset sexual activity and to be arrested at an earlier age compared to non-maltreated youths. By middle adulthood, individuals with histories of childhood abuse and neglect experience more emotional, behavioral, and financial difficulties. We identified important gender differences in these relationships, which have direct relevance to the development of intervention and treatment efforts to buffer the maladaptive effects of both child maltreatment and early engagement in risk behavior. For females, child abuse and neglect leads to earlier-onset sexual behavior, which leads to financial, emotional, and substance use problems. For males, child abuse and neglect leads to earlier age of onset of first arrest (and contact with the justice system), which is linked to continued antisocial behavior, as well as emotional and substance use problems. The impact of early-onset risk behaviors across multiple domains indicates that intervention and treatment programs should be multifaceted to target all areas of maladaptive functioning. Although this study overcame a number of important limitations of previous research on early-onset risk behaviors, future research is needed to understand the potential impacts of genetic and environmental factors, other than child abuse and neglect that may help to explain maladaptive outcomes in adulthood that many abused and neglected children manifest.

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