Published in final edited form as:

Aggress Behav. 2011 ; 37(4): 349–361. doi:10.1002/ab.20397.

Developmental Associations Between Externalizing Behaviors, Peer Delinquency, Drug Use, Perceived Neighborhood Crime, and Violent Behavior in Urban Communities

David W. Brook, M.D., Judith S. Brook, Ed.D., Elizabeth Rubenstone, B.A., Chenshu Zhang, Ph.D., and Naomi S. Saar, L.C.S.W., Ph.D.
New York University School of Medicine

Abstract

This study examines the precursors of violent behavior among urban, racial/ethnic minority adults. Data are from an on-going study of male and female African Americans and Puerto Ricans, interviewed at four time waves, Time 1-Time 4 (T1-T4), from adolescence to adulthood. Structural Equation Modeling was used to analyze the developmental pathways, beginning in mid-adolescence (T1; $\bar{X}$ age=14.0 years), to violent behavior in adulthood (T4; $\bar{X}$ age=29.2 years). The variables assessed were: components of externalizing behaviors (i.e., rebelliousness, delinquency; T1, T3); illicit drug use (T2); peer delinquency (T2); perceived neighborhood crime (T4); and violent behavior (T3, T4). Results showed that the participants' externalizing behaviors (rebelliousness and delinquency) were relatively stable from mid-adolescence (T1; $\bar{X}$ age=14.0 years) to early adulthood (T3; $\bar{X}$ age=24.4 years). The participants' externalizing behaviors in mid-adolescence also had a direct pathway to peer delinquency in late adolescence (T2; $\bar{X}$ age=19.1 years). Peer delinquency, in turn, had a direct pathway to the participants' illicit drug use in late adolescence (T2), and to externalizing behaviors in early adulthood (T3). The participants' illicit drug use (T2; $\bar{X}$ age=19.1 years) had both direct and indirect paths to violent behavior in adulthood (T4). The participants' externalizing behaviors in early adulthood (T3) were linked with violent behavior at T3, and perceived neighborhood crime (T4), both of which had direct pathways to violent behavior in adulthood (T4). The findings suggest developmental periods during which externalizing behaviors, exposure to delinquent peers, illegal drug use, and neighborhood crime could be targeted by prevention and intervention programs in order to reduce violent behavior.

Keywords

violent behavior; externalizing behaviors; drug use; peer; neighborhood

INTRODUCTION

Violent behavior is defined by an extreme expression of hostility with the intent to threaten, attempt, or inflict harm on people (Panel on the Understanding and Control of Violent Behavior, 1993). Violence in the United States is a significant public health problem, which can result in physical injury, psychological scars, or death (Centers for Disease Control, 2007). In light of the devastating effects of violence, a better understanding of the pathways to violent behavior could inform prevention and intervention programs about the precursors

Address correspondence and reprint requests to Dr. Judith S. Brook, Department of Psychiatry, New York University School of Medicine, 215 Lexington Avenue, 15th Floor, New York, NY 10016 or judith.brook@nyumc.org..

The authors report no conflicts of interest.

of violent behavior. This study fills a significant gap in the literature by examining the developmental pathways from mid-adolescence ($\bar{X}$ age=14.0 years) to violent behavior in adulthood ($\bar{X}$ age=29.2 years) among an understudied population, i.e., urban African Americans and Puerto Ricans. Such information is necessary for developing successful strategies for prevention and intervention programs at each developmental stage.

The present study is guided by two developmental frameworks: Family Interactional Theory (FIT; J.S. Brook, Brook, Gordon, Whiteman, & Cohen, 1990), and Developmental and Life-Course Criminology (DLC; e.g., Farrington, 2003; Sampson & Laub, 2005; Thornberry, 1997). FIT (J.S. Brook et al., 1990) was originally conceptualized as a mediational model to explain the interrelationship of several domains, such as personality characteristics, the family, the peer group, and contextual factors, with respect to adolescent substance use. FIT proposed that the parent-child relationship is the cornerstone of adolescent behavior and that, for example, a weak parent-child mutual attachment, characterized by less affection and less identification with the parent by the child, is associated with the child's externalizing behaviors, e.g., drug use. FIT further posited that adolescents with greater externalizing behaviors were more likely to affiliate with deviance-prone, drug-using peers who, in turn, would model and reinforce drug use (J.S. Brook et al., 1990). Although FIT was originally conceptualized as a predictive model for adolescent drug use, its scope was broadened to include other psychological and behavioral outcomes, such as depression, academic achievement, and violent behavior, among both adolescents and young adults (e.g., J.S. Brook, Adams, Balka, & Johnson, 2002; J.S. Brook, Brook, & Whiteman, 2007; J.S. Brook, Whiteman, Finch, & Cohen, 1995). Here, we further extend FIT to examine the predictors of violent behavior during a later developmental period, i.e., adulthood. We also expand FIT by an examination of the broader ecological context during adulthood, i.e., perceived neighborhood crime, on violent behavior in the late twenties.

Our second conceptual framework, Developmental and Life-Course Criminology (DLC), posits that criminal and antisocial conduct, such as violent behavior, is not 'set in stone' at an early age, but rather, evolves from a continuous interaction between the individual and the environment (e.g., social and institutional bonds, key life events; Sampson & Laub, 2005). Thus, the individual may be affected by age-variant risk and protective factors at different developmental stages throughout the life course. According to several DLC theorists (e.g., Farrington, 2005; Sampson & Laub, 2005), some of the key concepts which may be linked to criminal behaviors, including the perpetration of violence, are poor child-rearing, attachment difficulty, antisocial role models, negative life events, peer substance use, and the absence of school or professional commitment, or of a marital partner. Furthermore, some DLC researchers emphasize the importance of the transition to adulthood, and specifically, social bonds established at this time, to the desistence from, or persistence of, violent and other antisocial behaviors (Farrington, 2003; Sampson & Laub, 1993; Stouthamer-Loeber, Wei, Loeber, & Mastenb, 2004). In the following section, we review literature that supports the components of FIT included in our analysis, and is consistent with aspects of DLC.

Components of Externalizing Behaviors

Externalizing behaviors are defined as rebelliousness and delinquency in the present study, and refer to aversive actions directed towards other individuals, and behaviors that run counter to social norms. It seems reasonable that some components of externalizing behavior, such as rebelliousness and delinquency, may be forerunners of violent behavior at a later developmental stage. As noted by Krueger and South (2009), both rebelliousness and delinquency underlie externalizing behaviors, the core feature of which is disinhibition. Rebelliousness and delinquency may be precursors of later violent behavior (e.g., Mason et al., 2004), and may represent a milder form of acting out or an inability to control one's

impulses (e.g., Monahan, Steinberg, Cauffman, & Mulvey, 2009a). Ellickson and McGuigan (2000), for instance, found that 7th graders who engaged in delinquent behavior, such as theft, were more likely to engage in violent behavior during late adolescence.

The findings of prior investigations suggest that externalizing behaviors are generally stable over time, although there is evidence of some discontinuity (Caspi & Moffitt, 1995; Sampson & Laub, 1993). For example, Shiner, Masten, and Roberts (2003) found that difficulty in inhibiting antisocial behavior is modestly stable between adolescence and adulthood. In a longitudinal study of psychopathology, Reef, Diamantopoulou, van Meurs, Verhulst, and van der Ende (2009) showed that childhood delinquent behavior was one of the most powerful predictors of both aggressive behavior and rule-breaking behavior in adulthood. In our developmental model, we emphasize the stability of components of externalizing behaviors and violent behavior.

Peer Delinquency

During adolescence, there is a marked increase in the importance of the peer group to adolescent socialization, as adolescents shift their focus from the family to their peers (Oetting & Donnermeyer, 1998). Numerous studies have shown that adolescents who engage in externalizing behaviors are more likely to affiliate with delinquent peers (J.S. Brook et al., 1990; Burt, McGue, & Iacono, 2009). Conversely, association with delinquent peers has been shown to be a potent predictor of adolescent problem behaviors (e.g., J.S. Brook et al., 2007). Furthermore, youth are more likely to engage in deviant behaviors as a member of a delinquent peer group than they are individually (Lacourse, Nagin Tremblay, Vitaro, & Claes, 2003). The processes involved in deviant peer affiliation include selection (i.e., assortative friendships; Kandel, 1985), in which deviance-prone youth affiliate with delinquent peers, and socialization, wherein the peer group influences adolescent problem behavior (Erickson, Crosnoe, & Dornbusch, 2000), including illegal drug use (Henry, 2008), through role modeling and reinforcement (J.S. Brook et al., 2007; Ellickson & McGuigan, 2000). Patterson, Dishion & Yoerger (2000), for instance, found that early affiliation with a deviant peer group predicted the adolescent's engagement in new forms of deviance, a process which these investigators termed "deviancy training." Catalano and colleagues (1996) showed that pre-adolescent substance use was linked with antisocial behavior, as well as bonding with antisocial (drug-using) peers in mid-adolescence, which in turn, predicted substance use in late adolescence.

Illicit Drug Use

An important predictor of violent behavior during adulthood is drug use during adolescence (Sullivan & Piquero, 2010). White and Hansell (1998), for instance, reported that the use of illicit drugs during early adolescence, such as marijuana or cocaine, predicted aggressive behaviors in adulthood. Stouthamer-Loeber et al. (2004) also found that illegal drug use during late adolescence increased the likelihood of persistent serious delinquency (including violent behavior) during young adulthood. Adolescent drug use is influenced by both externalizing personality characteristics as well as interpersonal factors, e.g., association with deviant peers (Haller, Handley, Chassin, & Bountress, 2010).

Perceived Neighborhood Crime

There is a dearth of research on the effects of neighborhood crime on violent behavior among adults in their late twenties and early thirties. In contrast, a substantial literature on adolescents has shown that aspects of the neighborhood, including crime, drug activity, and gangs, are related to antisocial and violent behavior (D.W. Brook et al., 2003; J.S. Brook et al., 2007; Herrenkohl, et al., 2001). Herrenkohl et al. (2000), for instance, showed that youth exposed to neighborhood crime and drug activity in mid-adolescence were more likely to

perpetrate violence at age 18. Eamon and Mulder (2005) also reported that neighborhood quality predicted antisocial behaviors among Latino adolescents. Neighborhoods with elevated criminal activity may be linked with the individual's violent behavior through several mechanisms. Violence may appear to be a normative behavior that is modeled by neighborhood residents (Ng-Mak, Salzinger, & Feldman, 2002), or even an adaptive response to a threatening environment (Coie & Dodge, 1996). In addition, elevated rates of criminal activity may induce fear and distrust among neighborhood residents, which undermines the mutual cooperation prerequisite to setting and upholding pro-social standards of behavior (Sampson, Raudenbush, & Earls, 1997).

Gender

According to the literature, males are more likely than females to be both delinquent (Liu & Kaplan, 1999; Maldonado-Molina, Piquero, Jennings, Bird, & Canino, 2009; Mears, Ploeger, & Warr, 1998), and rebellious (A.A. Fagan, Van Horn, Hawkins, & Arthur, 2007; Rowe, Flannery, & Flannery, 1995), and to affiliate with delinquent peers (A.A. Fagan et al., 2007; Mears, et al., 1998). Similarly, adult males engage in violent behavior more frequently than adult females (Eitle & Turner, 2002).

Hypotheses for the Present Study

Based on the above theories and research, the developmental model for the present study focuses on the stability of components of externalizing behavior (i.e., rebelliousness and delinquency) from adolescence to young adulthood, as ultimately related to violent behavior in adulthood. The role of delinquent peers, as an important mediator of the continuity of externalizing behaviors, is also examined. Specifically, we hypothesized the following pathways to violent behavior at $\bar{X}$ age=29 years: 1) components of externalizing behaviors (rebelliousness and delinquency) are relatively stable from early adolescence to young adulthood ($\bar{X}$ age=14 to $\bar{X}$ age=24 years); 2) components of externalizing behaviors during earlier adolescence are associated with peer delinquency in later adolescence ($\bar{X}$ age=19 years), which in turn, is linked with a) the participants' illegal drug use in later adolescence, as well as b) components of externalizing behaviors (rebelliousness and delinquency) in young adulthood ($\bar{X}$ age=24 years); 3) illegal drug use in later adolescence has direct paths to violent behavior in young adulthood and in adulthood ($\bar{X}$ age=29 years); 4) components of externalizing behaviors in young adulthood are related to contemporaneous violent behavior, and to perceived neighborhood crime (e.g., drug and gang activity) in adulthood, both of which have direct pathways to violent behavior in adulthood. Finally, we postulate gender differences in the magnitude of the scores on some of the measures, but not in the pathways to violent behavior. That is, we expect females to report fewer externalizing behaviors, fewer delinquent peers, less drug use, and less violent behavior, but that the linkages between the domains, and overall model, will be the same for both genders.

METHODS

Sample and Procedure

Data for the present investigation are from a four-wave longitudinal study of African American and Puerto Rican participants. At Time 1 (T1, 1990), students in grades 7-10 ($N=1,332$; $\bar{X}$ age=14.0, $SD=1.3$) were recruited from eleven schools serving the East Harlem area of New York City. The schools were selected to be demographically representative of youth attending schools in the East Harlem, NY area. Analysis of variance showed that the school which the participant attended at T1 was not significantly related to the dependent variable of the present study, i.e., violent behavior at $\bar{X}$ age 29.2 years (F -statistic=1.00; $df1=10$, $df2=826$; $p=0.44$). Participating adolescents were given follow-up self-administered questionnaires at Time 2 (T2; $\bar{X}$ age=19.1 years, $SD=1.5$), Time 3 (T3; $\bar{X}$ age=24.4 years,

SD=1.3), and Time 4 (T4; $\bar{X}$ age=29.2 years, SD=1.7). Of the 838 participants assessed at T4, 79% provided data at all four time points, while 21% provided data at three of the four time points.

At T4, 59% (N=498) of the participants were female. There were 460 (55%) African American and 378 (45%) Puerto Rican participants. Forty-five percent of the participants' educational levels at T4 were below or at 12th grade. Twenty-two percent of the participants were married at T4. The median annual personal gross income range at T4 was \$15,001-\$22,500.

We conducted several chi-square and *t* tests to analyze the attrition from T1 to T4. We compared the 838 adults for whom we had data at T4 with those (N=494) who did not participate at T4. The attrition rate was significantly higher for males than for females (36.6% versus 23.9% for males and females, respectively; $\chi^2(1) = 22.9$, $p < 0.001$). The results showed no significant differences on the T1 psychological data (e.g., rebellion, $t = 0.68$; delinquency, $t = 0.09$).

The Institutional Review Board (IRB) of the Mount Sinai School of Medicine (our former affiliation) approved the study for the T1-T3 data collections, and the IRB of the New York University School of Medicine (our current affiliation) approved the study from T4 (2004) onward. A Certificate of Confidentiality was obtained for the study from the National Institute on Drug Abuse of the National Institutes of Health. Written informed assent from minors and consent from their parents were obtained from all participants after the procedures were fully explained. For participants $\geq$ age 18, written informed consent was obtained. Compensation was given to participants for their time and effort (portable tape recorders at T1, and, on average, \$25.00 at T2 and T3, and \$50.00 at T4). Additional information regarding the study methodology is available from previous reports (see J.S. Brook, Brook, & Zhang, 2008).

Measures

Components of Externalizing Behaviors (T1 and T3)—The T1 externalizing behaviors domain consisted of two manifest variables: rebelliousness and delinquency. Rebelliousness consisted of 3 items, each scored on a 4-point scale: completely false (1)–completely true (4). Participants were asked how well each of the following items described themselves: (1) Sometimes you enjoy doing things you should not, just for the fun of it; (2) When rules get in the way, you ignore them; and (3) You enjoy seeing how much you can get away with (J.S. Brook, Balka, Fei, & Whiteman, 2006). The Cronbach's alpha for the rebelliousness scale at T1 was 0.62. The scale for delinquency comprised 5-items, scored on a 5-point scale, from never (1)–five or more times (5). The items for the delinquency scale were: (1) How often have you purposely damaged or destroyed property that did not belong to you? (2) How often have you broken into a house or building you were not supposed to be in? (3) How often have you faked an excuse for school (work) absence? (4) How often have you taken something worth more than \$5? and (5) How often have you gotten drunk? (Huizinga, Menard, & Elliott, 1989). The alpha for the T1 delinquency scale was 0.66. The T3 externalizing behaviors latent variable paralleled that at T1. The Cronbach's alphas at T3 were 0.70 for the rebelliousness scale, and 0.64 for delinquency.

Peer Delinquency (T2)—The T2 peer delinquency latent construct consisted of two manifest variables: peer delinquency and peer drug associations. Peer delinquency was a 3-item scale with a 4-point response range from none (1) to most (4). The alpha for peer delinquency was 0.79. Participants were asked: (1) How many of your friends have gotten into a serious fight at school or work? (2) How many of your friends have stolen something worth more than \$5? and (3) How many of your friends have gotten in trouble with the

police or the law for something they did? (Huizinga, et al., 1989). For peer drug associations (4-items, each of which were scored on a 4-point scale; $\alpha=0.67$), participants were asked to respond to the following questions: (1) How true is it that your close friends think you should use illegal drugs? [responses ranged from: not at all true (1)-very true (4)]; (2) How much have your close friends influenced you to use illegal drugs? [not at all (1)-a lot (4)]; (3) How often have your friends asked you to take any illegal drugs? [not at all (1)-very often (4)]; and (4) How much would your friends stop you from taking illegal drugs? [The responses to this item were reverse scored, and ranged from a lot (1) to not at all (4). (Oetting & Beauvais, 1987)].

Illegal Drug Use (T2)—The T2 illegal drug use measurement was a summative index of 15 items that assessed the frequencies of the participants' past year use of illicit drugs (e.g., marijuana, ecstasy, cocaine, heroin, etc.), and the non-medical use of controlled substances (e.g., tranquilizers). Answer options for the use of each drug included: Never (1), A few times a year or less (2), About once a month (3), Several times a month (4), and Once a week or more (5) (A.A. Fagan et al., 2007).

Perceived Neighborhood Crime (T4)—The T4 perceived neighborhood crime variable was a 5-item scale ($\alpha=0.89$) which asked about the participants' perception of their neighborhood [scored on a 4 point scale: not at all true (1)-very true (4)]. The items for this scale included: (1) How true is it that there is a lot of violence in your neighborhood? (2) How true is it that things in your neighborhood have gotten worse? (3) How true is it that there are people in your neighborhood who sell drugs? (4) How true is it that there are places in your neighborhood where you can buy or sell stolen property? and (5) How true is it that there are gangs in your neighborhood? (McCord, personal communication, 2002).

Violent Behavior (T3 and T4)—The T3 measure of violent behavior consisted of 4 items, scored on a 5-point scale: never (0)-5 or more times (4) ($\alpha=0.75$). Participants were asked to respond to the following items about their violent behavior toward others: (1) How often have you held a weapon to someone? (2) How often have you hit someone with a weapon or shot at someone? (3) How often have you cut someone with a knife? and (4) How often have you beaten up/thrown something at someone? (Chavez, Oetting, & Swaim, 1994). The T4 violent behavior measure and response range were parallel to those at T3, and the alpha was 0.73.

The scales used in the present study have been found in our own work, and that of other investigators, to have internal consistency, reliability, and predictive validity for drug use (Haller et al., 2010; Jolliffe et al., 2003; Oetting & Beauvais, 1987; White & Hansell, 1998), psychopathology, including externalizing behaviors (J. S. Brook, et al., 1990; Cohen & Cohen, 1991; Huizinga, et al., 1989; Jolliffe et al., 2003; Maldonado-Molina, et al., 2009), and violent behavior (J.S. Brook et al., 2007; Chavez & Oetting, 1994; Fergusson, Swain-Campbell, & Horwood, 2002; Kuhns, 2005; Williams, Van Dorn, Hawkins, Abbott, & Catalano, 2001). For each of the scales, a total score was obtained by summing the items in the scale.

Gender and Ethnicity—Gender was coded as 1=female or 2=male, such that positive gender coefficients indicated higher levels on the criterion for males and negative coefficients represented higher levels for females. Ethnicity was coded as 1=African American or 2=Puerto Rican, such that positive ethnicity coefficients indicated higher levels on the criterion for Puerto Rican participants and negative coefficients represented higher levels for African Americans.

Data Analysis

Maximum likelihood estimates of the model coefficients were obtained using Mplus Version 6 (Muthén & Muthén, 1998-2010). We used the Mplus default option, i.e., the full information maximum likelihood approach (FIML; Little & Rubin, 2002), to treat missing data. The advantage of FIML is that the results are less likely to be biased even if the data are not missing completely at random (Muthén, Kaplan, & Hollis, 1987). We chose two fit indices to assess the fit of the models: a) Bentler's comparative fit index (CFI), and b) the root mean square error of approximation (RMSEA). For the CFI, values between at least 0.9 and 1.0 indicate that the model provides a good fit for the data, while a good fit for the RMSEA is indicated by a value below 0.06 (Kelloway, 1998). In order to test the mediational effects, we calculated the standardized total effects and total indirect (i.e., mediated) effects by using the Mplus MODEL INDIRECT command. The standardized total effects equal the sum of the direct and the indirect effects of each earlier construct (estimated in the analysis) on the participants' violent behavior at T4. A total effects analysis was performed on each of the manifest and latent constructs that predicted adult violent behavior. The *t*-statistics of the standardized total effects and standardized total indirect effects were obtained.

We used the likelihood ratio tests (LRT) to investigate whether the pathways to violent behavior in adulthood (T3 and T4) were the same for males and females, as well as for African Americans and Puerto Ricans. We first tested whether the measurement coefficients were the same across the groups. We then tested whether the structural coefficients (i.e., the pathways) were the same. Throughout the tests, we used the original manifest variables without partialling out the effects of either gender or ethnicity.

Results

Table 1 presents the descriptive statistics of the manifest variables used in the current study. As shown in Table 1, there were statistically significant gender differences on the dependent and independent variables, with one exception, rebelliousness at T1. Specifically, as compared to females, males scored higher on the measures assessing components of externalizing behaviors (rebelliousness and delinquency), violent behavior, perceived neighborhood crime, and delinquent peer affiliations. (See Table 1.) There was only one significant difference between African Americans and Puerto Ricans (not shown in the table). As compared to Puerto Ricans, African Americans reported more peer delinquency (ethnic difference=0.69; $t=3.74$; $p<0.001$).

Latent variable structural equation models (SEM) were employed to examine the empirical validity of the proposed developmental model discussed above. In order to account for the influences of the youths' gender and ethnicity on the measurement and structural models, we statistically partialled out the effects of gender and ethnicity on each of the original manifest variables, as suggested by Newcomb and Bentler (1998). Table 2 presents the partial Pearson correlation matrix of the manifest variables. (See Table 2.)

The factor loading matrix for the measurement model appears in Table 3. As indicated in Table 3, all factor loadings were significant ($p<0.001$), showing that the indicator variables were satisfactory measures of the latent constructs.

The CFI of the obtained model was 0.97, the RMSEA was 0.033, and the degrees of freedom were 29. That is, the empirical model was satisfactory. The obtained model, shown in Figure 1, had the following significant standardized pathways ($p<0.05$): 1) externalizing behaviors (T1) had positive pathways to peer delinquency at T2 ($\beta = 0.47$, $t = 8.91$), and to externalizing behaviors at T3 ($\beta = 0.16$, $t = 2.11$); 2) peer delinquency (T2) had positive pathways to the participants' illegal drug use at T2 ($\beta = 0.67$, $t = 17.79$), and to externalizing

behaviors at T3 ($\beta = 0.51, t = 7.43$); 3) illegal drug use at T2 had a positive pathway to violent behavior at T3 ($\beta = 0.08, t = 2.02$), and to violent behavior at T4 ($\beta = 0.12, t = 3.67$); 4) externalizing behaviors (T3) had positive pathways to violent behavior at T3 ($\beta = 0.54, t = 11.69$), and to perceived neighborhood crime at T4 ($\beta = 0.20, t = 4.37$); 5) violent behavior at T3 had a positive pathway to T4 violent behavior ($\beta = 0.37, t = 10.39$); and 6) T4 perceived neighborhood crime had a positive pathway to T4 violent behavior ($\beta = 0.10, t = 3.10$) (see Figure 1).

Table 4 contains the standardized total direct effects and total indirect effects for each of the latent and manifest constructs on the participants' violent behavior at T4. The results indicate that each of the constructs had significant total effects. Violent behavior at T3 had the greatest standardized total effect on T4 violent behavior. Externalizing behaviors at T3, and peer delinquency (T2), had the next greatest standardized total effects. The results also indicated that all constructs had significant total indirect effects (if applicable).

Table 5 presents the total explained variance in violent behavior at T4, and each of the intervening latent or manifest variables for structural equations.

There were no statistically significant differences in the measurement coefficients between males and females at the 0.01 level (LRT $\chi^2(3) = 10.68, p=0.014$). We then tested whether the structural coefficients (i.e., the pathways) were the same. We found two significantly different pathways. As compared to females, males had stronger pathways from T3 externalizing behaviors (rebelliousness and delinquency) to T3 violent behavior (LRT $\chi^2(1) = 28.98, p<0.001$), and from violent behavior at T3 to violent behavior at T4 (LRT $\chi^2(1) = 8.6, p=0.003$). Nevertheless, both pathways (for males and females) were statistically significant. The other seven pathways were not statistically different (LRT $\chi^2(7) = 10, p=0.189$) between males and females. Based on these findings, we concluded that the male and female models do not appear to be structurally different.

Using the same strategy, we tested whether the pathways to adult violent behavior were the same for African Americans and Puerto Ricans. There were no statistically significant differences in the measurement coefficients between African Americans and Puerto Ricans at the 0.01 level (LRT $\chi^2(3) = 10.6, p=0.014$). We then tested whether the structural coefficients (i.e., the pathways) were the same for both racial/ethnic groups. We found two significantly different pathways. As compared to Puerto Ricans, African Americans had stronger pathways from externalizing behaviors at T3 to violent behavior at T3 (LRT $\chi^2(1) = 6.52, p=0.011$). Puerto Ricans showed stronger pathways from T3 violent behavior to T4 violent behavior (LRT $\chi^2(1) = 6.11, p=0.013$). Nevertheless, both pathways (for African Americans and Puerto Ricans) were statistically significant. The other seven pathways were not statistically different (LRT $\chi^2(7) = 6.97, p=0.432$) between African Americans and Puerto Ricans. Based on these findings, we concluded that the African American and Puerto Rican models also do not appear to be structurally different.

Supplemental Analysis—We also compared the means of the violent behavior scale (at both T3 and T4) with the means of a similar measure for age-matched participants in the Childhood Determinants of Adolescent/Adult Drug Use Study; a longitudinal, predominantly White sample that was representative of the Northeast United States at the study's inception (1975). The results showed that there were no statistically significant differences between the means of the two samples in self-reported violent behavior at $\bar{X}$ age=24 years ($t=0.40; ns$) or $\bar{X}$ age=29 years ($t=0.12; ns$). Thus, the violent behavior of the participants in the present study during young adulthood and adulthood did not appear to differ from that of the age-matched comparison sample.

DISCUSSION

Consistent with both the Family Interactional Theory (FIT; J.S. Brook et al., 1990), and Developmental and Life-Course Criminology approaches (DLC; Farrington, 2003; Thornberry, 1997), our results support the hypothesis that the predictors of violent behavior are multi-factorial, and occur across several developmental stages. Externalizing behaviors, peer delinquency, illegal drug use, and neighborhood crime are all factors that predicted violence perpetration in adulthood. The present study extends the literature by examining the long-term effects of these domains, beginning in adolescence, on violent behavior among adults. The arrangement of these domains within a developmental model, as discussed below, highlights their significance as precursors of adult violent behavior. This is also the first longitudinal prospective study to examine the pathways to violent behavior, from adolescence to adulthood, among male and female African American and Puerto Rican adults living in an urban community. Our inclusion of both males and females enables us to examine the generality or specificity of our findings. To our knowledge, this is also the first investigation to assess the relationship of neighborhood factors in adulthood and adult violent behavior, within a longitudinal developmental model.

Although the study was not designed to test life-course developmental criminology conceptualizations, as noted above, our results are in line with that approach, and with an expansion of Family Interactional Theory (FIT; J.S. Brook et al., 1990). According to FIT, adolescents who exhibit externalizing behaviors are more likely to associate with delinquent peer groups. Delinquent peers, in turn, serve as models for, and reinforce, deviant behaviors, which are related to the adolescent's illegal use of drugs. Drug use during adolescence then predicts later violent behavior (J.S. Brook, et al., 2007). We have also expanded FIT to include the influence of adverse neighborhood characteristics in adulthood on violent behavior.

Commensurate with both the FIT and DLC paradigms, our findings suggest that patterns of personal (e.g., drug use), interpersonal (delinquent peers), and contextual (neighborhood crime) risk factors, at different stages of development, are associated with the continuity of antisocial behaviors from adolescence to adulthood, i.e., in our model, components of externalizing behaviors were fairly stable from $\bar{X}$ age 14 to $\bar{X}$ age 24, and predicted the stability of violent behavior ($\bar{X}$ age 24 to $\bar{X}$ age 29 years). Our model also highlights the importance of drug use as both a direct effect, and an intervening variable, on the pathways to violent behavior. Peer delinquency was linked with contemporaneous illegal drug use in late adolescence ($\bar{X}$ age 19 years), which, in turn, predicted the continuity of violence perpetration.

Components of Externalizing Behaviors (T1 and T3)

As noted above, longitudinal studies of externalizing behaviors suggest that there is both considerable continuity, and some change, in the pattern of these behaviors over time (Loeber & LeBlanc, 1990; Robins & Ratcliff, 1979). Sampson and Laub (1993), for instance, reported that delinquent adolescents were five and seven times more likely to have arrest records at ages 17-25 and 25-32, respectively, as compared with their non-deviant peers. Roberts, Caspi, & Moffitt (2001) demonstrated continuity in antisocial behaviors from ages 18-26, as well as some evidence of change. In support of this premise, our results suggest modest, but statistically significant, continuity of components of externalizing behaviors from mid-adolescence (T1) to early adulthood (T3). As noted by Roberts and colleagues (2001), "Additional research needs to identify the particular life events and circumstances that are associated with both continuity and change and to determine whether and how specific life experiences shape" antisocial behavior (p. 681).

Peer Delinquency (T2)

Our results suggest that delinquent peers are an important factor in the continuity of both externalizing and violent behaviors. Affiliation with delinquent peers, who advocated drug use (T2), predicted the participants' externalizing behaviors at T3, and had a large total effect on the participants' violent behavior at T4. Although an extensive literature supports the role of delinquent peers in adolescent problem behaviors (e.g., Dodge et al., 2009; Thornberry, Lizotte, Krohn, Farnworth, & Sung, 1994; Wallace & Fisher, 2007), our results suggest that the effects of peer influences during adolescence may extend into later developmental periods. In this vein, Fergusson et al. (2002) demonstrated that affiliation with deviant peers in adolescence and in young adulthood predicted both the perpetration of violent crime and substance use. Haller et al. (2010) showed that substance-use promoting peers were linked with the youth's substance use during mid-adolescence, which, in turn, predicted substance use in young adulthood. Of note is that peer group delinquency (T2) mediated the pathway between components of externalizing behaviors at T1 and the participants' drug use at T2, and partially mediated the pathway from mid-adolescent (T1) to young adult (T3) externalizing behaviors. These findings suggest bidirectional effects involving both peer selection and peer socialization during adolescence. That is, participants with greater externalizing behaviors in mid-adolescence (T1) were more likely to affiliate with delinquent peers in late adolescence (T2), who, in turn, influenced the participants' illegal drug use (T2), as well as their externalizing behaviors in young adulthood (T3). In a related context, Monahan and colleagues (2009b) found that both peer selection and peer socialization processes occurred in mid-adolescence, but that peer socialization effects were predominant during late adolescence.

Illegal Drug Use (T2)

The pathway from the participants' illegal drug use in late adolescence (T2) to violent behavior in adulthood (T3 and T4) is consistent with previous psychosocial and epidemiological findings (e.g., Schroeder, Giordano, & Cernkovich, 2007). For example, Sullivan and Piquero (2010) found a positive relationship between substance use in late adolescence and the perpetration of both violent and non-violent crimes in adulthood among a sample of offenders. There are several mechanisms which could link drug use and violence. The nature of illegal drug use typically entails exposure to individuals involved in criminal activity, who may serve as role models and present violence as a normative behavior (Sommers & Baskin, 1997). Conversely, and as posited by both FIT and DLC, drug use may weaken ties to conventional individuals and institutions (e.g., school, employment), which are protective against antisocial behaviors and their persistence (J.S. Brook et al., 1990; Sampson & Laub, 1993). Furthermore, illegal drug users may engage in violent behavior in order to procure drugs (for example, they may commit assault to appropriate drugs or to steal money to buy them; Goldstein, 1985), or drug use may have long-term pharmacological affects that undermine impulse control or judgment (Goldstein, 1985). Illegal drug users also may be more likely to become involved in drug trafficking and sales, with violent behavior as a concomitant (Steinman, 2005), especially among individuals who have limited opportunity for conventional success (Kingston, Huizinga, & Elliot, 2009).

Neighborhood Crime (T4)

Our findings showed that residence in a neighborhood where crime is prevalent mediated between the participants' externalizing behaviors in young adulthood (T3), and their violent behavior as adults (T4). It is possible that adults who exhibited earlier externalizing behaviors (i.e., rebelliousness and delinquency), engaged in drug use, and affiliated with deviant peers, are at-risk for academic and professional failure (e.g., Caspi & Moffitt, 1995; J. Fagan & Pabon, 1990; Haller et al., 2010; Sampson & Laub, 1993; ; Stouthamer-Loeber et

al., 2004), which relegates them to residence in high-crime areas. The association of neighborhood crime and violent behavior at $\bar{X}$ age 29 is consistent with a Developmental and Life-Course Criminology perspective. According to some DLC theorists (e.g., Laub & Sampson, 1993; LeBlanc, 1997), conventional social bonds during adulthood may play an important role in the desistance from criminal activity, including violent behavior, by the exertion of informal social controls. High-crime neighborhoods, however, are more likely to lack the “collective efficacy” necessary for residents to monitor and uphold standards of behavior (Sampson, et al., 1997). Indeed, such environments may present models of and rewards for antisocial conduct, which further erode the individual's ties to prosocial institutions and behaviors (Farrington, 2003). In addition, as suggested by the findings of research on adolescents (e.g., Kingston et al., 2009), living in a neighborhood with high rates of illegal activity, such as drug-selling or property theft, puts individuals at-risk for witnessing or being the victims of violence, both of which are major risk factors for the perpetration of violence (Feigelman, Howard, Li, & Cross, 2000; Maldonado-Molina et al., 2009; Eitle & Turner, 2002). Frequent exposure to violence also may affect social information processing, wherein hostile attributions of others' behavior trigger a violent or aggressive response (Dodge & Frame, 1982; Halligan, Cooper, Healy, & Murray, 2007).

Violent Behavior (T3 and T4)

Our findings regarding the continuity of violent behavior (T3-T4) are comparable to other longitudinal studies, which have been conducted among predominantly White male samples. Simonoff and colleagues (2004), for instance, showed that the commission of a violent crime between the ages of 22 and 30 years was a potent predictor of violent crime at > age 31. In a longitudinal prospective study in Sweden, Samuelson, Hodgins, Larsson, Larm, and Tengström (2010) found that antisocial behavior prior to age 15 was related to criminal convictions for both violent and non-violent crimes in young adulthood (ages 21-25) and in adulthood (26-30 years), as well as during each stage of adulthood assessed ($\leq$ age 50).

Participants' Gender

Although there were similar pathways for males and females and for African Americans and Puerto Ricans, there were gender differences with regard to specific psychosocial predictors of violent behavior. Consistent with the literature, our findings indicate that women reported fewer externalizing behaviors, and less violent behavior, than men (Eitle & Turner, 2002; Liu & Kaplan, 1999; Mears, et al., 1998; Rowe, et al., 1995).

Limitations—There are several limitations to our findings. Because the study was conducted with an African American and Puerto Rican cohort, the results need to be replicated with diverse populations (e.g., Whites, Native Americans, other Latinos, Asians) in order to establish the generalizability of the causal model. In addition, while we can time order our data, given its correlational nature, we are limited in our ability to make inferences of a causal nature. Thirdly, the study is based on self-reports. Although there is debate in the literature regarding the validity of self-reports versus official records in the assessment of antisocial behaviors, it is possible that there was under- or over-reporting on measures (e.g., peer delinquency, violent behavior) by some participants in our study. Therefore, the addition of objective measurements, such as criminal records and neighborhood Census data, might allow for more precise and reliable assessments. Fourth, our constructs were based on scales comprising relatively few items. Given the number of constructs assessed, we decided to adapt the measures used in the present study, and selected those items with the highest loading on each construct. In addition, the adapted scales have been found to have internal consistency, reliability over time, and predictive validity. Despite these limitations, the results of this investigation provide important new evidence regarding

pathways to violent behavior, extending from adolescence to the late twenties, among a sample of urban African Americans and Puerto Ricans in the U.S.

Clinical Implications—This research has several clinical implications, at various stages of development, for the prevention of violent behavior in adulthood among urban African Americans and Puerto Ricans. First, adolescent externalizing behaviors may be early precursors of later violence perpetration, through greater exposure to delinquent and drug-involved peers. Affiliation with a delinquent peer group may both reinforce the adolescent's deviance-prone tendencies, and motivate the individual to engage in further criminal activities, such as illegal drug use. The continuity of externalizing and violent behavior is particularly likely if the effects of engaging in these behaviors are reinforcing. In addition, if the adolescent has been subjected to labeling effects, such as being perceived as delinquent (at school) or as an offender (in the criminal justice system), it may make it harder to achieve pro-social goals, thus thrusting him/her further into antisocial conduct (Farrington, 2003). Neighborhoods with high rates of criminal and gang activity, including drug sales, also may limit pro-social opportunities, as well as present models for and reinforcement of deviant behaviors, including violence (Markowitz, 2003).

Our findings have implications for risk-focused prevention. One should identify key risk factors (e.g., illegal drug use), at different developmental stages, for the onset and continuity of violent behavior, and counteractive prevention methods should be designed and implemented. For adolescents with a propensity to engage in externalizing behaviors, it is especially important to limit contact with delinquent peers. However, one should focus not only on the early prevention of externalizing behaviors, but also on the creation of interventions for later developmental periods in order to reduce violent behavior in early and later adulthood. Programs could be also implemented to help individuals develop skills (e.g., coping, job training) to offset neighborhood effects, and community resources (e.g., sports facilities) could be enhanced. As Krueger and South (2009) commented, primary prevention should assist the adolescent with changing “disinhibitory tendencies” into adaptive coping with environmental challenges in order to engage in less problematic choices (p. 2067). From an interventional perspective, further information is required about developmental sequences related to violent behavior in adulthood. As Farrington and Loeber (2000) suggested, it would be desirable to develop instruments that assess risk factors in childhood which can identify those individuals who are likely to become chronic and violent offenders.

Despite the challenges of conducting long-term investigations of violent behavior covering almost two decades, we believe that studies of this nature extending over multiple developmental stages and encompassing several psychosocial domains represent a significant step toward greater understanding of this important public health issue.

Acknowledgments

This study was supported by grants from the National Institute on Drug Abuse #DA005702, the National Cancer Institute #CA084063-08, and by Research Scientist Award #DA00244 to Judith S. Brook from the National Institute on Drug Abuse.

References

- Brook DW, Brook JS, Rosen Z, De La Rosa M, Montoya ID, Whiteman M. Early risk factors for violence in Colombian adolescents. *American Journal of Psychiatry*. 2003; 160:1470–1478. [PubMed: 12900310]
- Brook JS, Adams RE, Balka EB, Johnson E. Early adolescent marijuana use: risks for the transition to young adulthood. *Psychological Medicine*. 2002; 32:79–91. [PubMed: 11883732]

- Brook JS, Balka EB, Fei K, Whiteman M. The effects of early parental tobacco use and personality attributes on child rearing in African American and Puerto Rican young adults. *Journal of Child and Family Studies*. 2006; 15:157–168.
- Brook JS, Brook DW, Gordon AS, Whiteman M, Cohen P. The psychological etiology of adolescent drug use: A Family Interactional approach. *Genetic, Social, and General Psychology Monographs*. 1990; 116:111–267.
- Brook JS, Brook DW, Whiteman M. Growing up in a violent society: Longitudinal predictors of violence in Colombian adolescents. *American Journal of Community Psychology*. 2007; 40:82–95. [PubMed: 17562159]
- Brook JS, Brook DW, Zhang C. Psychosocial predictors of nicotine dependence in Black and Puerto Rican young adults. *Nicotine & Tobacco Research*. 2008; 10:959–967. [PubMed: 18584459]
- Brook JS, Whiteman M, Finch S, Cohen P. Aggression, intrapsychic distress, and drug use: antecedent and intervening processes. *Journal of the American Academy of Child & Adolescent Psychiatry*. 1995; 34:1076–1084. [PubMed: 7665446]
- Burt SA, McGue M, Iacono WG. Nonshared environmental mediation of the association between deviant peer affiliation and adolescent externalizing behaviors over time: Results from a cross-lagged monozygotic twin differences design. *Developmental Psychology*. 2009; 45:1752–1760. [PubMed: 19899929]
- Caspi, A.; Moffitt, T. The continuity of maladaptive behavior: From description to understanding in the study of antisocial behavior. In: Cicchetti, D.; Cohen, D., editors. *Manual of Developmental Psychopathology*. Vol. 2. John Wiley & Sons; New York: 1995. p. 472–511.
- Catalano RF, Kosterman R, Hawkins JD, Newcomb MD, Abbott RD. Modeling the etiology of adolescent substance use: A test of the Social Development Model. *Journal of Drug Issues*. 1996; 26:429–455. [PubMed: 17848978]
- Centers for Disease Control. Violence Prevention. The Social-Ecological Model: A Framework for Prevention. 2007. Retrieved from http://www.cdc.gov/ncipc/dvp/social-ecological-model_dvp.htm
- Chavez EL, Oetting ER. Dropout and delinquency: Mexican-American and Caucasian non-Hispanic youth. *Journal of Clinical Child & Adolescent Psychology*. 1994; 23:47–55.
- Cohen, P.; Cohen, J. *Life Values and Adolescent Mental Health*. Lawrence Erlbaum Associates; Mahwah, NJ: 1991.
- Coie, JD.; Dodge, KA. Aggression and antisocial behavior. In: Eisenberg, N., editor. *Handbook of child psychology: Vol. 3. Social, emotional, and personality development*. 5th ed.. John Wiley & Sons; New York: 1996. p. 779–862.
- Dodge KA, Frame CL. Social cognitive biases and deficits in aggressive boys. *Child Development*. 1982; 53:620–635. [PubMed: 7094675]
- Dodge KA, Malone PS, Lansford JE, Miller S, Pettit GS, Bates JE. A dynamic cascade model of the development of substance-use onset. *Monographs for the Society of Research in Child Development*. 2009; 74:vii–119.
- Eamon MK, Mulder C. Predicting antisocial behavior among Latino young adolescents: an ecological systems analysis. *American Journal of Orthopsychiatry*. 2005; 75:117–127. [PubMed: 15709855]
- Eitle D, Turner RJ. Exposure to community violence and young adult crime: the effects of witnessing violence, traumatic victimization, and other stressful life events. *Journal of Research in Crime and Delinquency*. 2002; 39:214–237.
- Ellickson PL, McGuigan KA. Early predictors of adolescent violence. *American Journal of Public Health*. 2000; 90:566–572. [PubMed: 10754971]
- Erickson KG, Crosnoe R, Dornbusch SM. A social process model of adolescent deviance: Combining social control and differential association perspectives. *Journal of Youth and Adolescence*. 2000; 29:395–425.
- Fagan AA, Van Horn ML, Hawkins D, Arthur MW. Gender similarities and differences in the association between risk and protective factors and self-reported serious delinquency. *Prevention Science*. 2007; 8:115–124. [PubMed: 17226092]
- Fagan J, Pabon E. Contributions of delinquency and substance use to school dropout among inner-city youths. *Youth & Society*. 1990; 21:306–354.

- Farrington DP. Developmental and life-course criminology: Key theoretical and empirical issues - the 2002 Sutherland award address. *Criminology*. 2003; 4:221–256.
- Farrington DP, Loeber R. Epidemiology of juvenile violence. *Child and Adolescent Psychiatric Clinics of North America*. 2000; 9:733–748. [PubMed: 11005003]
- Feigelman S, Howard DE, Li X, Cross SI. Psychosocial and environmental correlates of violence perpetration among African-American urban youth. *Journal of Adolescent Health*. 2000; 27:202–209. [PubMed: 10960219]
- Fergusson DM, Swain-Campbell NR, Horwood LJ. Deviant peer affiliations, crime and substance use: A fixed effects regression analysis. *Journal of Abnormal Child Psychology*. 2002; 30:419–430. [PubMed: 12108769]
- Goldstein PJ. The drugs/violence nexus: A tripartite conceptual framework. *Journal of Drug Issues*. 1985; 15:493–506.
- Haller M, Handley E, Chassin L, Bountress K. Developmental cascades: Linking adolescent substance use, affiliation with substance use promoting peers, and academic achievement to adult substance use disorders. *Development and Psychopathology*. 2010; 22:899–916. [PubMed: 20883589]
- Halligan SL, Cooper PJ, Healy SJ, Murray L. The attribution of hostile intent in mothers, fathers and their children. *Journal of Abnormal Child Psychology*. 2007; 35:594–604. [PubMed: 17351751]
- Henry KL. Low prosocial attachment, involvement with drug-using peers, and adolescent drug use: A longitudinal examination of mediational mechanisms. *Psychology of Addictive Behaviors*. 2008; 22:302–308. [PubMed: 18540728]
- Herrenkohl TI, Guo J, Kosterman R, Hawkins JD, Catalano RF, Smith BH. Early adolescent predictors of youth violence as mediators of childhood risks. *The Journal of Early Adolescence*. 2001; 21:447–469.
- Herrenkohl TI, Maguin E, Hill KG, Hawkins JD, Abbott RD, Catalano RF. Developmental risk factors for youth violence. *Journal of Adolescent Health*. 2000; 26:176–186. [PubMed: 10706165]
- Huizinga DH, Menard S, Elliott DS. Delinquency and drug use: Temporal and developmental patterns. *Justice Quarterly*. 1989; 6:419–455.
- Jolliffe D, Farrington DP, Hawkins JD, Catalano RF, Hill KG, Kosterman R. Predictive, concurrent, prospective and retrospective validity of self-reported delinquency. *Criminal Behaviour and Mental Health*. 2003; 13:179–197. [PubMed: 14654870]
- Kandel DB. On processes of peer influences in adolescent drug use: a developmental perspective. *Advances in Alcohol and Substance Abuse*. 1985; 4:139–163. [PubMed: 3874527]
- Kelloway, KE. Using LISREL for Structural Equation Modeling: A Researcher's Guide. Sage Publications; Thousand Oaks, CA: 1998.
- Kingston B, Huizinga D, Elliott DS. A test of social disorganization theory in high-risk urban neighborhoods. *Youth & Society*. 2009; 41:53–79.
- Krueger RF, South SC. Externalizing disorders: Cluster 5 of the proposed meta-structure for DSM-V and ICD-11. Paper 6 of 7 of the thematic section: 'A proposal for a meta-structure for DSM-V and ICD-11'. *Psychological Medicine*. 2009; 39:2061–2070. [PubMed: 19796431]
- Lacourse E, Nagin D, Tremblay RE, Vitaro F, Claes M. Developmental trajectories of boys' delinquent group membership and facilitation of violent behaviors during adolescence. *Development & Psychopathology*. 2003; 15:183–197. [PubMed: 12848441]
- Laub JH, Sampson RJ. Turning points in the life course: Why change matters to the study of crime. *Criminology*. 1993; 31:301–325.
- Le Blanc M. A generic control theory of the criminal phenomenon, the structural and the dynamical statements of an integrative multilayered control theory. *Advances in Criminological Theory*. 1997; 8:215–285.
- Little, RJ.; Rubin, DB. Statistical Analysis with Missing Data. 2nd edition. John Wiley & Sons; New York: 2002.
- Liu X, Kaplan HB. Explaining the gender difference in adolescent delinquent behavior: A longitudinal test of mediating mechanisms. *Criminology*. 1999; 37:195–216.
- Loeber, R.; LeBlanc, M. Toward a developmental criminology. In: Tonry, M.; Norris, N., editors. *Crime and Justice: A Review of Research*. Vol. 12. University of Chicago Press; Chicago: 1990. p. 375–473.

- Maldonado-Molina MM, Piquero AR, Jennings WG, Bird H, Canino G. Trajectories of delinquency among Puerto Rican children and adolescents at two sites. *Journal of Research in Crime and Delinquency*. 2009; 46:144–181.
- Markowitz FE. Socioeconomic disadvantage and violence. Recent research on culture and neighborhood control as explanatory mechanisms. *Aggression and Violent Behavior*. 2003; 8:145–154.
- Mason WA, Kosterman R, Hawkins JD, Herrenkohl TI, Lengua LJ, Mccauley E. Predicting depression, social phobia, and violence in early adulthood from childhood behavior problems. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2004; 43:307–315. [PubMed: 15076264]
- Mears DP, Ploeger M, Warr M. Explaining the gender gap in delinquency: Peer influence and moral evaluations of behavior. *Journal of Research in Crime and Delinquency*. 1998; 32:251–266.
- Monahan KC, Steinberg L, Cauffman E, Mulvey EP. Trajectories of antisocial behavior and psychosocial maturity from adolescence to young adulthood. *Developmental Psychology*. 2009a; 90:566–572.
- Monahan KC, Steinberg L, Cauffman E. Affiliation with antisocial peers, susceptibility to peer influence, and antisocial behavior during the transition to adulthood. *Developmental Psychology*. 2009b; 45:1520–1530. [PubMed: 19899911]
- Muthén B, Kaplan D, Hollis M. On structural equation modeling with data that are not missing completely at random. *Psychometrika*. 1987; 52:431–462.
- Muthén, LK.; Muthén, BO. *Mplus User's Guide*. Sixth Edition. Muthén & Muthén; Los Angeles, CA: 1998-2010. Retrieved from: <http://www.statmodel.com/download/usersguide/Mplus%20Users%20Guide%20v6.pdf>
- Newcomb MD, Bentler PM. Impact of adolescent drug use and social support on problems of young adults: A longitudinal study. *Journal of Abnormal Child Psychology*. 1998; 97:64–75.
- Ng-Mak DS, Salzinger S, Feldman R. Normalization of violence among inner-city youth: a formulation for research. *American Journal of Orthopsychiatry*. 2002; 72:92–101. [PubMed: 14964598]
- Oetting ER, Beauvais F. Peer cluster theory, socialization characteristics, and adolescent drug use: A path analysis. *Journal of Counseling Psychology*. 1987; 34:205–213.
- Oetting ER, Donnermeyer JF. Primary socialization theory: The etiology of drug use and deviance: I. Substance Use & Misuse. 1998; 33:995–1026. [PubMed: 9548633]
- Panel on the Understanding and Control of Violent Behavior. *Understanding and Preventing Violence*. Reiss, AJ., Jr.; Roth, JA., editors. Vol. 1. National Academy Press; Washington, D.C: 1993.
- Patterson GR, Dishion TJ, Yoerger K. Adolescent growth in new forms of problem behavior: Macro- and micro-peer dynamics. *Prevention Science*. 2000; 1:3–13. [PubMed: 11507792]
- Reef J, Diamantopoulou S, van Meurs I, Verhulst F, van der Ende J. Child to adult continuities of psychopathology: a 24-year follow-up. *Acta Psychiatrica Scandinavica*. 2009; 120:230–238.
- Roberts BW, Caspi A, Moffitt TE. The kids are alright: Growth and stability in personality development from adolescence to adulthood. *Journal of Personality and Social Psychology*. 2001; 81:670–683. [PubMed: 11642353]
- Robins LN, Ratcliff KS. Risk factors in the continuation of childhood antisocial behavior into adulthood. *International Journal of Mental Health*. 1979; 7:96–116.
- Rowe DC, Flannery AT, Flannery DJ. Sex difference in crime: Do means and within-sex variation have similar causes? *Journal of Research in Crime and Delinquency*. 1995; 32:84–100.
- Sampson RJ, Laub JH. A life-course view of the development of crime. *Annals of the American Academy of Political and Social Science*. 2005; 602:12–45.
- Sampson, RJ.; Laub, JH. *Crime in the making: Pathways and turning points through life*. Harvard University Press; Cambridge, MA: 1993.
- Sampson RJ, Raudenbush SW, Earls F. Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*. 1997; 277:918–924. [PubMed: 9252316]
- Samuelson YM, Hodgins S, Larsson A, Larm P, Tengström A. Adolescent antisocial behavior as predictor of adverse outcomes to age 50. A follow-up study of 1,947 individuals. *Criminal Justice and Behavior*. 2010; 37:158–174.

- Schroeder RD, Giordano PC, Cernkovich SA. Drug use and desistance processes. *Criminology*. 2007; 45:191–222.
- Shiner RL, Masten AS, Roberts JM. Childhood personality foreshadows adult personality and life outcomes two decades later. *Journal of Personality*. 2003; 71:1145–1170. [PubMed: 14633061]
- Sommers I, Baskin DR. Situational or generalized violence in drug dealing networks. *Journal of Drug Issues*. 1997; 27:833–849.
- Steinman KJ. Drug selling among high school students: Related risk behaviors and psychosocial characteristic. *Journal of Adolescent Health*. 2005; 36:71.e1–71.e8. [PubMed: 15661603]
- Stouthamer-Loeber M, Wei E, Loeber R, Mastenb AS. Desistance from persistent serious delinquency in the transition to adulthood. *Development and Psychopathology*. 2004; 16:897–918. [PubMed: 15704820]
- Sullivan CJ, Piquero AR. Investigating stability and change in substance use and criminal activity using a synthesized longitudinal modeling approach. *Journal of Drug Issues*. 2010; 40:63–92.
- Thornberry, TP. Introduction: Some advantages of developmental and life-course perspectives for the study of crime and delinquency. In: Thornberry, TP., editor. *Developmental Theories of Crime and Delinquency*. *Advances in Criminological Theory*. Vol. 7. Transaction Publishers; New Brunswick, NJ: 1997. p. 1-10.
- Thornberry TP, Lizotte AJ, Krohn MD, Farnworth M, Sung JJ. Delinquent peers, beliefs, and delinquent behavior: a longitudinal test of interactional theory. *Criminology*. 1994; 32:47-55–87.
- Wallace SA, Fisher CB. Substance use attitudes among urban black adolescents: The role of parent, peer, and cultural factors. *Journal of Youth and Adolescence*. 2007; 36:441–451.
- White HR, Hansell S. Acute and long-term effects of drug use on aggression from adolescence into adulthood. *Journal of Drug Issues*. 1998; 28:837–858.
- Williams JH, Van Dorn RA, Hawkins JD, Abbott R, Catalano RF. Correlates contributing to involvement in violent behaviors among young adults. *Violence and Victims*. 2001; 16:371–388. [PubMed: 11506447]

Figure 1.
Standardized Coefficients of Pathways to Adult Violent Behavior (N=838).
Notes:

1. CFI=0.97; RMSEA=0.033; $df=29$;
2. * $p<0.05$; ** $p<0.01$; *** $p<0.001$;
3. Ethnicity and gender were statistically controlled; and
4. T1 = Time 1, $\bar{X}$ age = 14.0; T2 = Time 2, $\bar{X}$ age = 19.1; T3 = Time 3, $\bar{X}$ age = 24.4; T4 = Time 4, $\bar{X}$ age = 29.2.

Table 1
Descriptive Statistics and Gender Differences in the Independent and Dependent Variables.

Variables	Variable Range	Overall Mean (S.D.)	Male Mean (S.D.)	Female Mean (S.D.)	Gender Differences (<i>t</i> statistic)	Gender Differences (Cohen's <i>d</i> statistic)
Violent Behavior T4	0-16	1.29 (2.43)	1.89 (3.00)	0.88 (1.84)	1.01 (5.54) ***	0.43
Perceived Neighborhood Crime T4	4-16	9.86 (3.80)	10.21 (3.72)	9.61 (3.84)	0.60 (2.23) *	0.16
Violent Behavior T3	0-16	1.46 (2.67)	2.27 (3.28)	0.73 (1.65)	1.54 (7.11) ***	0.60
Rebelliousness T3	3-12	6.14 (2.18)	6.48 (2.25)	5.84 (2.08)	0.64 (3.60) ***	0.30
Delinquency T3	5-25	9.24 (3.66)	10.09 (4.18)	8.47 (2.93)	1.62 (5.43) ***	0.46
Illegal Drug Use T2	15-24	15.85 (1.46)	16.15 (1.69)	15.65 (1.24)	0.50 (4.69) ***	0.35
Peer Delinquency T2	3-12	6.16 (2.66)	7.11 (2.69)	5.51 (2.43)	1.60 (8.75) ***	0.63
Peer Drug Association T2	4-16	5.66 (2.19)	6.22 (2.40)	5.28 (1.94)	0.94 (6.06) ***	0.44
Rebelliousness T1	3-12	7.28 (2.28)	7.30 (2.21)	7.26 (2.32)	0.04 (0.25) <i>ns</i> .	0.02
Delinquency T1	5-25	7.67 (3.19)	8.21 (3.86)	7.30 (2.59)	0.91 (3.78) ***	0.29

Notes:

1. * $p < 0.05$; *** $p < 0.001$; *ns*=not significant.
2. A positive *t* value indicates a higher mean value for males versus females
3. T1 = Time 1, $\bar{X}$ age = 14.0; T2 = Time 2, $\bar{X}$ age = 19.1; T3 = Time 3, $\bar{X}$ age = 24.4; T4 = Time 4, $\bar{X}$ age = 29.2.

Table 2

Partial Pearson Correlation Coefficients of the Manifest Variables.

	A	B	C	D	E	F	G	H	I	J
Violent Behavior T4 (A)	1.00									
Perceived Neighborhood Crime T4 (B)	0.16	1.00								
Violent Behavior T3 (C)	0.42	0.13	1.00							
Rebelliousness T3 (D)	0.21	0.14	0.28	1.00						
Delinquency T3 (E)	0.28	0.11	0.45	0.45	1.00					
Illegal Drug Use T2 (F)	0.24	0.11	0.30	0.23	0.31	1.00				
Peer Delinquency T2 (G)	0.20	0.09	0.25	0.17	0.18	0.31	1.00			
Peer Drug Association T2 (H)	0.15	0.05	0.16	0.15	0.21	0.34	0.28	1.00		
Rebelliousness T1 (I)	0.11	0.13	0.14	0.20	0.18	0.19	0.13	0.07	1.00	
Delinquency T1 (J)	0.13	0.06	0.18	0.11	0.20	0.24	0.20	0.14	0.42	1.00

Notes:

1. Ethnicity and gender were statistically controlled.

2. $p < 0.05$ for correlations between 0.07 and 0.09; $p < 0.01$ for correlations of $r = 0.11$; and $p < 0.001$ for correlations ≥ 0.13 .

Table 3

Factor Loading for the Measurement Model.

	Violent Behavior (T4)	Perceived Neighborhood Crime (T4)	Violent Behavior (T3)	Components of Externalizing Behaviors (T3)	Illegal Drug Use (T2)	Peer Delinquency (T2)	Components of Externalizing Behaviors (T1)
Violent Behavior (T4)	1.00						
Perceived Neighborhood Crime (T4)		1.00					
Violent Behavior (T3)			1.00				
Rebelliousness (T3)				1.00			
Delinquency (T3)				2.26 (t=10.37)			
Illegal Drug Use (T2)					1.00		
Peer Delinquency (T2)						1.00	
Peer Drug Association (T2)						0.83 (t=8.80)	
Rebelliousness (T1)							1.00
Delinquency (T1)							1.70 (t=6.61)

Note: All *t* statistics were significant ($p < 0.001$).

Table 4

Standardized Total Effects (*t*-statistic) and Total Indirect Effects (*t*-statistic) of Components of Externalizing Behaviors, Illegal Drug Use, Peer Delinquency, Violent Behavior at T3, and Neighborhood Crime, on Violent Behavior at T4 (N=838).

Independent Constructs	Adult Violent Behavior (T4)	
	Standardized Total Effects (<i>t</i> -statistic)	Standardized Total Indirect Effects (<i>t</i> -statistic)
Perceived Neighborhood Crime (T4)	0.10 (3.10)**	Not Applicable
Violent Behavior (T3)	0.37 (10.39)***	Not Applicable
Components of Externalizing Behaviors (T3)	0.22 (8.24) ***	0.22 (8.24)***
Illegal Drug Use (T2)	0.15 (4.35) ***	0.03 (1.98)*
Peer Delinquency (T2)	0.21 (8.15) ***	0.21 (8.15) ***
Components of Externalizing Behaviors (T1)	0.13 (6.78) ***	0.13 (6.78) ***

Notes:

1. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$;
2. Ethnicity and gender were statistically controlled
3. T1 = Time 1, $\bar{X}$ age = 14.0; T2 = Time 2, $\bar{X}$ age = 19.1; T3 = Time 3, $\bar{X}$ age = 24.4; T4 = Time 4, $\bar{X}$ age = 29.2.

Table 5

Percent of Total Variance of Each Construct (“Dependent Constructs”) Explained by Other Constructs (“Independent Constructs”). (N=838).

Independent Constructs	Dependent Constructs	% of Total Explained Variance
Components of Externalizing Behaviors (T1) ^I	Peer Delinquency (T2)	22%
Peer Delinquency (T2)	Illegal Drug Use (T2)	46%
Components of Externalizing Behaviors (T1), and Peer Delinquency (T2)	Components of Externalizing Behaviors (T3)	36%
Illegal Drug Use (T2), and Externalizing Behaviors (T3)	Violent Behavior (T3)	33%
Components of Externalizing Behaviors (T3)	Perceived Neighborhood (T4)	4%
Illegal Drug Use (T2), Violent Behavior (T3), Components of Externalizing Behaviors (T3), and Perceived Neighborhood Crime (T4)	Violent Behavior (T4)	20%

^I - e.g., Components of Externalizing Behaviors explained 22% of the variance of peer delinquency.

Notes:

1. Independent constructs are those constructs with arrows pointed toward the dependent construct (see Figure 1)
2. Ethnicity and gender were statistically controlled
3. T1 = Time 1, $\bar{X}$ age = 14.0; T2 = Time 2, $\bar{X}$ age = 19.1; T3 = Time 3, $\bar{X}$ age = 24.4; T4 = Time 4, $\bar{X}$ age = 29.2.