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Trajectories of Violent Behavior Among Females and Males

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Abstract

Both the psychological and criminological fields have long hypothesized the mechanisms that influence desistance from violent offending, but few studies have focused on violent females. This study identifies patterns of violent behavior across seven years among 172 females and 172 matched males ages 15 to 24, testing if heterogeneity in violent offending is linked to (a) developmental change in impulse control and (b) attainment of adult milestones. Fewer females persist in violence (25%) than males (46%); 19% of males increase in violent behavior. Females who develop impulse control and are employed are more likely to desist from violence. Violent offending is unrelated to other adult milestones. Developmental increases in impulse control may trigger desistance, while employment may maintain desistance from violence.

It is well documented that involvement in criminal behavior peaks during the adolescent years and declines as youth transition into adulthood (Farrington, 1986; Piquero, 2007). In particular, violent forms of offending, such as assault, rape, and murder, follow the same developmental trend, with most individuals ceasing to engage in violent forms of crime as they age (Elliott, 2006). Although most adolescents do not specialize in a specific type of offending (Piquero, Paternoster, Mazerolle, Brame, & Dean, 1999), understanding the underpinnings of this developmental trend has led to several debates in the field. For example, in the criminological literature, the developmental decline in general offending is attributed to the attainment of social roles that are incompatible with crime (Sampson & Laub, 1993), such as employment, marriage, and parenthood. In the psychological tradition, this developmental trend has been attributed to changes in psychosocial abilities that make engagement in crime less likely. Specifically, developmental changes in an adolescent's ability to control his or her impulses make a youth less likely to engage in crime (Monahan, Steinberg, Cauffman, & Mulvey, 2009, Monahan, Steinberg, Cauffman, & Mulvey, 2013). Although research has investigated both potential theoretical perspectives on desistance from criminal behavior, very few studies have specifically examined these perspectives for violent forms of offending. Moreover, the majority of this research has focused on violent offending (and criminal offending more generally) among males; considerably less work has focused on female offending. As such, the goal of this paper is twofold. First, we aim to understand how developmental trajectories of violent behavior unfold in a sample of known female offenders. We do so by comparing these females to male offenders who are similar in socio-

demographics and criminal histories. Second, we test if (a) developmental declines in violent offending over time are due to increases in impulse control across the same period, and (b) if attainment of adult milestones varies by desistance from or persistence in violent behavior.

When examining trajectories of general female offending, research suggests that, like males, females engage in heterogeneous patterns of offending across the lifespan (Fontaine, Carboneau, Vitaro, Barker, & Tremblay, 2009; Silverthorn & Frick, 1999). Although overall patterns of criminal behavior may be similar between males and females, it is notable that there are unique predictors of desistance or persistence among females (Gunnison & McCartan, 2010; Jennings, Maldonado-Molina, Piquero, Odgers, Bird, & Canino, 2010; Uggen & Kruttschnitt, 1998; Cauffman, Monahan, & Thomas, in press). Furthermore, females who persist in offending behavior tend to experience poorer outcomes in adulthood compared to males who persist in offending (Odgers et al., 2008). To date, however, we know very little about the trajectories of violent female offending. Existing research reveals that violence peaks at an earlier age and desistance occurs more rapidly among female offenders than male offenders (Elliott, 2006). While many of the predictors of violent offending are similar across the sexes, research suggests that violent females are more likely to have a history of abuse or exposure to violence (Bartlett, 2009; Nofzinger & Kurtz, 2005), engage in self harm (Stephenson, Woodhams, & Cooke, 2014; Gamelgard, Weizmann-Henelius, Koivisto, Eronen, & Kaltiala-Heino, 2012), and experience mental health problems (Sullivan, Veysey, & Dorangrichia, 2003) than non-violent females. It is less clear whether the same developmental and criminological perspectives that describe desistance from offending more broadly similarly apply to violent offending, and more specifically, to female violent offending.

Most females desist from violent offending as they transition into adulthood, and in one theoretical model, developmental increases in impulse control have been hypothesized to be the mechanism for this criminal desistance. Steinberg and Cauffman (1996; 2000) have argued that part of the reason why individuals engage in criminal behavior is because of psychosocial immaturity, a broad construct that includes impulse control. In brief, adolescent's developmental immaturity in the ability to control impulses contributes to their engagement in criminal behavior; as youth age, the ability to control impulses improves, and this underlies the diminished antisocial behavior observed as youth transition into adulthood. Evidence from the Pathways to Desistance study has supported this developmental hypothesis in males (Monahan, Steinberg, Cauffman, & Mulvey, 2013), but the model has not been investigated among female offenders. Moreover, the investigations of psychosocial maturity as a contributor to desistance from crime have focused on broad indices of antisocial behavior, which include violent, personal, property, and drug offending. It is unknown whether this developmental pattern will hold for violent offending specifically.

An alternative, although not necessarily competing, framework for understanding desistance from criminal behavior comes from the criminology tradition. Within this framework, criminal desistance is generally believed to come about due to attainment of social roles that are incompatible with crime (Sampson & Laub, 1993). Social contexts such as education, employment, marriage, and parenthood are incompatible with a life of crime, both because they are likely to foster social values against antisocial acts but also because they take up

considerable time – leaving little time for antisocial behavior. Support has been found for this model – with education (Fella & Gallipoli, 2014), marriage (Gunnison, 2014), the birth of child (Zoutewelle-Terovan, van der Geest, Liefbroer, & Bijleveld, 2013), and attainment of quality employment (Wadsworth, 2006) being associated with less engagement in antisocial behavior. Indeed, evidence suggests that this pattern holds for violent offending as well (Elliott, Huizinga, & Morse, 1986). However, recent studies suggest these relationships may be less straightforward than originally thought. For example, Giordano, Cernkovich, and Rudolph's (2002) found that social control variables, such as marital attachment and job stability, were not associated with female or male desistance from crime; it was suggested that this may have been due in part to recent trends in postponement of marriage and reduced economic possibilities. Likewise, recent research indicates that the effect of parenthood on criminal engagement may be complicated by factors such as whether the pregnancy was wanted or not and the socioeconomic circumstances of that individual (Giordano, Seffrin, Manning, & Longmore, 2002). Furthermore, as in the broader literature on violent behavior and criminal behavior, evidence supporting this theory has come from studies of male offenders. Among female offenders, parenthood is likely at a younger age (Barrett, Katsiyannis, Zhang, & Kingree, 2011), and employment and education are less likely (Cauffman, 2008), making it questionable whether these same mechanisms will lead to female desistance from violent behavior. Giordano, Cerkovich, and Rudolph (2002) suggest that while tenets of social control theory may help to explain male desistance from crime, these same factors may not accurately describe the process of female desistance.

The present study investigates how the developmental and criminological perspectives may explain patterns of violent offending among females across adolescence and into adulthood. Moreover, we test the same hypotheses among a sample of males matched on a broad range of socio-demographic characteristics. To do so, we use a sample of known female and male adolescent offenders. The advantage of this approach is that we have rich longitudinal data on key variables of interest in a sample of youth who are most likely to engage in serious violent acts (remember that violent acts, although more common in adolescence, are still relatively uncommon occurrences). The disadvantage of this sample is that we lack a true “non-violent” control group – rather, we can only speak to youth who are relatively less violent than their peers. Nevertheless, we believe that an analysis of this sample allows us to examine more extreme forms of violent behavior across a developmental period when we should observe development change. As such, the present paper is poised to contribute to our theoretical understanding of violent behavior across adolescence and early adulthood.

Specifically, in the present study we identify patterns of violent behavior from ages 15 to 24 among females and (similar) males. We then test how demographic characteristics are related to different developmental patterns of violent behavior across the transition to adulthood. Next, we test if these developmental patterns of violent behavior are related to the development of impulse control. Finally, we test if youth who desist from or persist in violent behavior differentially attain key milestones of young adulthood: parenthood, education, and employment.

Method

Participants

The present study includes youth from the Pathways to Desistance study, which enrolled participants between 2000 and 2003 and followed participants for 7 years (see Mulvey et al., 2004). Pathways consists of serious juvenile offenders who were between 14 and 17 years of age at the time of their adjudication. Youth were recruited from Phoenix, AZ and Philadelphia, PA (see Schubert et al., 2004 for complete details of study methodology). Adolescents were eligible to participate in the study if their crimes included felony offenses (against persons and property), certain misdemeanor weapons offenses, or sexual assault. Of eligible youth identified, 67% of those located and invited to participate agreed to enroll in the study. Enrolled participants had more prior arrests leading to formal charges (2.1 vs. 1.5 for nonparticipants), were slightly younger at first arrest (13.9 years vs. 14.2 years for nonparticipants), were somewhat younger at adjudication (15.9 years vs. 16.1 years for nonparticipants), and were more likely to be non-Hispanic Caucasian (25% vs. 20% for nonparticipants) compared with youth who declined to participate in the study. Although these differences are statistically significant, the magnitude of differences is modest. The entire Pathways sample consists of 184 females and 1,170 males. At the time of the baseline interview, participants were predominantly of lower socioeconomic status (e.g., less than 4.5% of the youths' parents held a 4-year college degree, and 40% of the youths' parents had less than a high-school education) and were ethnically diverse with 41% African American, 35% Hispanic American, 20% non-Hispanic Caucasian, and 4% other.

The present study focuses on a matched sample of females and males from the Pathways study. Males and females were matched based on race, age, and committing offense using nearest-neighbor matching without replacement. The final matched sample included 172 males who were matched with 172 females (12 females did not have a match). One male was found to have lied about his age and was thus excluded from the analyses, leaving a total sample of 171 males. No significant differences were observed between the matched and unmatched females in age ($t(182) = 1.60, p = 0.12$), number of arrests ($t(182) = -0.65, p = 0.52$), or study site ($\chi^2(1) = 0.23; p = 0.63$). Females who were not matched were more likely to be "other" race or ethnicity ($\chi^2(3) = 8.63; p = 0.04$) compared to females who were matched – this is unsurprising given that there are few individuals in the overall sample who identified as "other," and thus a relatively small pool of males from which to draw for matches. Comparing matched and unmatched males, there were no differences in age ($t(1168) = 1.16, p = 0.25$), number of arrests ($t(1166) = -1.24, p = 0.22$), or study site ($\chi^2(1) = 0.32; p = 0.57$). Unmatched males were more likely to be White and less likely to be Black ($\chi^2(3) = 7.80; p = 0.05$).

Analyses include all females who had valid data for at least 70% of the assessments ($N = 167$). This same strategy was used to identify a sample to study trajectories of offending among males in the Pathways sample (Monahan, Steinberg, Cauffman, & Mulvey, 2013; Mulvey et al., 2010; Monahan, Steinberg, Cauffman, & Mulvey, 2009). The 167 females who had valid data for 70% of assessments are no different in age ($t(170) = -0.36, p = 0.722$), number of prior petitions ($t(170) = -0.62, p = 0.54$), study site location ($t(170) =$

-1.31; $p = 0.19$), or race or ethnicity ($\chi^2(3) = 2.97$; $p = 0.396$) than the 5 females who provided less data and were excluded from analyses. Analyses also include all males who had valid data for at least 70% of the assessments ($N = 161$). The 161 males who had valid data for 70% of assessments are no different in age ($t(169) = 1.12$, $p = 0.265$), number of prior petitions ($t(169) = .580$, $p = 0.56$), study site (Fisher's Exact χ^2 Test; $\chi^2(1) = 0.32$; $p = .057$), or race or ethnicity ($\chi^2(3) = 1.49$; $p = 0.686$) than the 10 males who provided less data and were excluded from analyses.

Procedures

In order to participate in the study, the juvenile court in each site provided the names of eligible adolescents based on age and offenses. Only after proper consent was obtained were youth interviewed in either a facility (if the participant was confined), home, or in an agreed-upon location in the community. The baseline interview was conducted an average of 36.9 days ($SD = 20.6$) after the youths' adjudication. The baseline interview was administered over 2 days in two, 2-hour sessions out of earshot of other individuals whenever possible. Participants and interviewers sat side-by-side facing a computer, and questions were read aloud to avoid reading or comprehension difficulties. Participants were informed that there was a certificate from the federal government to maintain confidentiality and which prohibited research staff disclosing any individual information to those outside the study team. Youths were informed that there were four exceptions to this confidentiality agreement: (a) if child abuse was suspected or if the participant (b) expressed plans to hurt themselves or someone else, (c) had a specific plan to commit a crime in the future, or (d) disclosed that someone was in jail for a crime that the participant had committed. Adolescents were paid \$50 for their participation in the baseline interview (when allowed by facility rules) and all procedures were approved by the institutional review boards of the participating universities.

Participants were re-interviewed in one 2-hour session every 6 months for the 3 years following the baseline interview; after 36 months, participants were interviewed annually for the remaining 4 years of the study. In order to minimize attrition, compensation for the follow-up interviews increased gradually over time to a maximum of \$150. From the baseline interview to the 84-month follow up the retention of the sample was excellent. Specifically, of the 172 females: 122 females (70.9%) completed all 11 interviews; 33 females (19.2%) completed 10 interviews; 5 individuals (2.9%) completed 9 interviews; 5 individuals (2.9%) completed 8 interviews, and 2 individuals (1.1%) completed 7 interviews. Retention of the 171 matched male sample was also excellent: 114 males (66.7%) completed all 11 interviews; 26 males (21.1%) completed 10 interviews; 12 individuals (13.4%) completed 9 interviews; 6 individuals (3.5%) completed 8 interviews, and 3 individuals (1.8%) completed 7 interviews.

Measures

Violent behavior.—Involvement in violent behavior was assessed with a revised version of the Self-Report of Offending (Huizinga, Esbensen, & Weiher, 1991). Participants reported if they had been involved in any of 9 different violent acts (e.g., "Taken something from another person by force, using a weapon," "Beaten up or physically attacked someone so

badly that they probably needed a doctor”). At the baseline and 48- through 84-month annual interviews, these questions were asked with the qualifying phrase, “in the past 12 months have you...” At the 6- through 36- month bi-annual interviews, these questions were asked with the qualifying phrase, “In the past 6 months, have you...”

Variety scores, a count of the number of different types of violent acts that an individual endorsed, were calculated for each annual interval. Variety scores are widely used in criminological research because they are highly correlated with measures of seriousness of antisocial behavior, yet are less prone to recall errors than self-reported frequency scores, especially when the antisocial act is committed frequently (Osgood, McMorris, & Potenza, 2002). Some have argued that variety scores and frequency scores represent the same propensity to engage in antisocial behavior, and given the problems associated with frequency scores, variety scores represent a preferred method of measuring antisocial behavior, particularly in a sample with high rates of antisocial behavior (Hindelang, Hirschi & Weis, 1981; Thornberry & Krohn, 2000). In the computation of variety scores, each specific offense was counted only once in any yearlong recall period, even if an individual endorsed the item in both 6-month intervals. Thus, we created a count of the total number of different violent acts that an individual endorsed across a yearlong interval.

Across time, the standard deviation (and variance) was always larger than the mean, indicating overdispersion. As such, violent behavior was not normally distributed and was therefore modeled as a zero-inflated Poisson distribution in all analyses (see subsequent Plan of Analysis section). In general, violent behavior in the sample declined over time, but the standard deviations suggest that some individuals engaged in higher levels of violence well into their 20s.

Impulse control.—The Weinberger Adjustment Inventory (Weinberger & Schwartz, 1990) Impulse Control subscale was used to assess participants’ ability to control their impulses. This measure asks participants to assess how accurately a series of statements (e.g., “I say the first thing that comes into my mind without thinking enough about it”) matched their own behavior in the previous months (on a 5-point scale, from False to True). The scale was found to have adequate reliability (as indexed by Cronbach’s alpha - 8 items; alpha = .76) and good fit to the baseline data (as indicated by confirmatory factor analysis - normed fit index [NFI] = .95, comparative fit index [CFI] = .95, root-mean-square error of approximation [RMSEA] = .07).

Adult outcomes.—Participants were asked at each follow-up to self-report on a variety of life outcomes. Although each outcome was assessed at each time point, we were primarily interested in whether any of these occurred during the adult years (i.e., after age 18). Specifically, participants reported (yes or no) on whether or not they had a child or had gotten married since the prior interview. Participants were also asked at each assessment whether they had been legally employed, and, if so, the number of hours they were employed for each week of the assessment period. The number of hours employed was dichotomized into whether or not the participant had achieved full-time employment during adulthood (i.e., average of at least 40 hours per week during an assessment period). To assess academic attainment, participants reported on whether they had completed high

school and, if so, applied to college. Each of these adult outcomes was coded into a dichotomous yes or no variable.

Demographic factors and individual characteristics.—Age was based on self-reported birth date as reported at the baseline interview. Race was also based on youth self-report and organized into four categories: White, Black, Latino, or Other Race.

Two measures of cognitive functioning were used in the present analyses as individual risk factors for violent behavior: IQ score on the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) and performance on the Trail-Making Test (Reitan, 1979). The WASI produces an estimate of general intellectual ability based on two subtests, Vocabulary (42 total items that require the subject to orally define 4 images and 37 words presented both orally and visually) and Matrix Reasoning (35 incomplete grid patterns that require the participant to select the correct response from five possible choices). Administered in approximately 15 minutes, the WASI is a quick estimate of an individual's level of intellectual functioning, with higher scores indicating greater intellectual ability. The WASI is highly correlated with both the Wechsler Intelligence Scale for Children (WISC-III) and the Wechsler Adult Intelligence Scale (WAIS-III), and has been normed for individuals' ages 6 to 89 years (Wechsler, 1999).

The Trail-Making Test is a measure of general brain function (see Reitan, 1979). The skills required in completing the Trail-Making Test (Reitan, 1979) are indicative of the presence of brain damage. We use Part B as a measure of three types of cognitive functioning: ability to sequence, ability to shift cognitive set, and processing speed. Longer completion times (Child: Part A, greater than 18 seconds - Part B, greater than 37 seconds; Adult: Part A, greater than 39 seconds - Part B, greater than 85 seconds) are indicative of neurological deficit.

Covariates.—Because incarceration can limit opportunity to engage in antisocial acts, failure to account for the time spent in the community, as opposed to in a secure setting, can affect the identification of trajectories of antisocial behavior (Piquero et al., 2001). Youths reported on a calendar the number of days during the recall period that they had been in a detox or drug-treatment program, psychiatric hospital, residential treatment program, or secure institution. The proportion of time that an individual spent in an institutional setting during the year was calculated and used as a covariate in models. Because this information was not available at the baseline interview, all baseline values for this variable were set to 1, a method consistent with other work on antisocial behavior that utilizes exposure time as a covariate (e.g., Monahan et al., 2009; Mulvey et al., 2010).

Plan of Analyses

Analyses were conducted in four steps, and each step was conducted separately for females and the matched sample of males. First, semi-parametric group-based modeling was used to identify trajectories of violent behavior by age. Group-based modeling is a data-driven analytic technique that organizes individuals together based on similar patterns of development on a variable over time. The entire pattern of development – from adolescence to early adulthood – is used to derive the trajectories of violent behavior. Second, we

examined how covariates were related to membership in the violent trajectory groups. Third, we used dual-trajectory modeling to identify the relation between the development of impulse control and the violence trajectory groups. Finally, we compared the violent trajectory groups on adult outcomes.

To identify patterns of violence over time, we used group-based trajectory modeling (Nagin, 2005; Nagin & Odgers, 2010) to identify separate trajectories of violent behavior in the male and female samples. Because analyses were based on count data (the number of different violent acts endorsed), we used zero-inflated Poisson modeling to account for the clustering at zero (Lambert, 1992). We simultaneously derived the probability that each individual belonged to a given group based on his or her (i.e., posterior probabilities of group membership) and the maximum-likelihood parameters estimates associated with membership in each of the defined trajectories (i.e., average level and rate of change for a given group). On the basis of posterior probabilities, individuals were assigned membership in their most likely group trajectory. Violent behavior was assessed at baseline and seven annual follow-up interviews. Analyses were limited to ages 15 to 24 years due to small participant counts at ages 14, 25, and 26.

Different group solutions were tested and the fit of different models was compared using the Bayesian information criterion (BIC; Jones, Nagin, & Roeder, 2001). Solutions with up to seven different groups were considered. The best trajectory solution was determined by three criteria: the lowest BIC value across models, a conceptually clear model, and a model in which each group included at least 5% of the sample. After the number of latent classes was decided, the form of the polynomial (e.g., linear, quadratic) was determined for each latent class. The highest significant polynomial trend was included in analyses. Posterior probabilities were estimated for the likelihood of being in each trajectory group. Ideally, each individual should have a very high probability of belonging to one group, and very low probabilities of membership in all other groups. In general, posterior probabilities above .70 indicate that individuals are well matched to groups and that an adequate group solution has been achieved (Nagin, 2005). For ease of interpretability, we assigned names to each violence trajectory group based on theoretical nomenclature (persisters and desisters). Full Information Maximum Likelihood was used to account for missing data (e.g., if an individual is missing data at a given time point). The advantage of FIML is that it uses all data, regardless of missing data pattern.

To test how trajectory group membership was related to demographic and individual characteristics, we used binary and multinomial logistic regression, with the lowest violent offenders as a reference groups. We tested how ethnicity, parent education, or cognitive functioning (as measured by IQ and the Trails B) were related to membership in the different trajectories. Because of limited sample size, we analyzed this data with each covariate in a separate model.

Patterns of change in the development of impulse control were then compared among individuals who followed different trajectories of violent behavior identified in the group-based trajectory models. This enabled us to explore how violence group membership varied as a function of impulse control development. The joint trajectory model was designed to

analyze the developmental course of two distinct but related outcomes (Nagin & Tremblay, 2001). The model was used to analyze connections between the developmental trajectories of two outcomes that evolved contemporaneously. Because we are interested in developmental changes in impulse control that co-vary with violent behavior, we conducted group-based trajectory analyses by age. Impulse control was modeled by age and used the censored normal distribution, which is designed for the analysis of repeatedly measured, continuous scales that are censored by a scale minimum and a scale maximum. We then obtained joint-trajectory probabilities between the previously identified trajectories of violent offending and trajectories of impulse control over time, separately for males and females.

Finally, to examine how risk factors for violent offending were related to trajectory group membership, we conducted binary logistic regressions for females, and multinomial logistic regressions for boys. Violent offending group was regressed on each risk factor. To examine whether violence trajectory groups differed on adult outcomes, we conducted chi-square analyses or regressed each adult outcome on violence group.

Results

Trajectories of Violent Offending

Females.—Based on the log-likelihood values, low BIC value, and criteria for model solution (see Plan of Analyses), a two group solution was found to provide the best fit to the data (Table 1). The three group solution did not provide a trajectory group that was unique in shape or function, thus we selected the two group solution as the most parsimonious. Figure 1a presents the two trajectories over time. The first group (74.4% of the sample) consisted of individuals who declined in violent offending after age 15, and then reported low levels of violent offending through age 24 (desisters). The second group (25.6%) engaged in high levels of violence through young adulthood (persisters). Posterior probabilities indicated that, on average, individuals were well matched to the groups to which they were assigned (average posterior probabilities were as follows: desisters = .94, persister = .89).

Males.—Based on the log-likelihood values, low BIC value, and criteria for model solution, a three group solution was found to provide the best fit to the data (Table 1). Figure 1b presents the three trajectories over time. The first group (34.5% of the sample) consisted of individuals who declined in violent offending after age 15 and reported the lowest levels of violent offending through age 24 (desisters). The second group (46.1%) engaged in moderate levels of violence through young adulthood (persisters). The third group (19.4%) engaged in moderate levels of violence at age 14 and increased through young adulthood (increasers). Posterior probabilities indicated that, on average, individuals were well matched to the groups to which they were assigned (average posterior probabilities were as follows: desisters = .78, persister = .78, increasers = .91).

What are the Socio-Demographic Risk Factors for Persistent Offending?

Females.—Table 2 presents the means and standard deviations of key variables for each of the violence offending trajectory groups. Using binary logistic regression, we tested how

demographic factors and cognitive functioning were related to membership in the persister female trajectory group compared to being in the desister group. Table 3 presents the results of these models. Because of limited sample size, each covariate was tested separately. Female persisters and desisters did not differ on ethnicity, parent education, or cognitive functioning.

Males.—Table 2 presents the means and standard deviations of key variables for each of the violence trajectory groups. Using multinomial logistic regression and the desisters as the reference group, we tested how demographic factors and cognitive functioning were related to boys' membership in violence trajectory groups (see Table 3). Because of limited sample size, each covariate was tested separately. Violence trajectory groups of boys did not differ on race or cognitive functioning (as measured by IQ and the Trails Part B). However, violence trajectories did differ by parent education. Specifically, boys in the increasing violence condition were more likely to have parents who did not graduate from high school ($p = .018$).

Development of Impulse-Control as a Function of Violence Trajectory Group Membership

Because we were interested in comparing patterns of developmental change in self-control across trajectory groups, we conducted joint trajectory modeling of impulse control and violence for each gender separately. The model is used to analyze connections between the developmental trajectories of two outcomes that evolve contemporaneously.

Females.—Based on the log-likelihood values, low BIC value, and criteria for model solution, a two group solution of the development of impulse control was found to provide the best fit to the data (Table 1). The three and four group solutions did not provide trajectory groups that were unique in shape or function, thus we selected the two group solution as the most parsimonious. Figure 2a presents the two trajectories over time. The first group (55.9% of the sample; posterior probability = 95.7%) consisted of individuals whose impulse control did not increase into young adulthood. The second group (44.1%; posterior probability = 95.3%) consisted of individuals who developed impulse control linearly through young adulthood.

Joint trajectory analyses were then conducted to compare the patterns of developmental change in impulse control with the concurrent developmental change in violent offending (see Table 4). Joint trajectory analyses estimates the probability of individuals who belong to the trajectory of one variable (in this case offending) of following each of the trajectories for the other construct (in this case, impulse control). In other words, given membership in the desister or persister trajectory, what is the probability a youth will follow the increasing or decreasing trajectory of impulse control? Results indicated that violence desisters were more likely to be in the group who developed impulse control than the group whose self-control did not change into young adulthood ($p < .001$). Female violence persisters, in contrast, were more likely to be in the group whose impulse control did not develop than to be in the group who developed impulse control into young adulthood ($p < .001$).

Males.—Examining trajectories of impulse control among males, based on the log-likelihood values, low BIC value, and criteria for model solution, a two group solution was found to provide the best fit to the data (Table 1). The three and four group solutions did not provide trajectory groups that were unique in shape or function, thus we selected the two group solution as the most parsimonious. Figure 2b presents the two trajectories. The first group (46.8% of the sample; posterior probability = 95.3%) consisted of individuals whose impulse control did not increase into young adulthood. The second group (53.1%; posterior probability = 94.3%) consisted of individuals who developed impulse control linearly through young adulthood.

Joint trajectory analyses were then conducted to compare the patterns of developmental change in impulse control across violence trajectory groups of males (see Table 4). Specifically, we estimated the posterior probabilities of belonging to the increasing or decreasing impulse control trajectory group given membership in the desisting and persisting trajectory group. Males who desisted from violent offending were more likely to be in the group who developed impulse control than to be in the group whose impulse control did not change ($p < .001$). Males who persisted in violent offending were more likely to be in the group that did not develop self-control than to be in the group that developed impulse control ($p < .001$). Finally, males who increase in violent offending were equally likely to be in either impulse control group ($p = .383$).

Do the Violent Offending Groups Differ on Adult Outcomes?

Females.—Chi-square analyses were used to examine whether the violence trajectory groups differed on the achievement of key adult outcomes (Table 5). Notably, there were no differences in likelihood of having a child after age 18, getting married, high school completion or application to college if high school had been completed. Desisters, however, were more likely than persisters to be employed during adulthood ($p = .051$). Further, desisters were more likely than persisters to achieve full-time employment during adulthood ($p = .022$).

Males.—Chi-square analyses were used to examine whether the violence trajectory groups differed on the achievement of key adult outcomes (Table 5). There were no differences in likelihood of having a child after age 18, getting married, high school completion, or application to college if high school had been completed. Surprisingly, the persister group (96.1%) was more likely to be employed than either the desister (81.1%; $p = .014$) or the increaser group (78.6%; $p = .011$). However, the violence groups differed on likelihood of being employed *full-time* during adulthood ($p = .028$). Indeed, only 14.3% of the increasers were employed full-time, compared to 28.6% of the desisters and 38.9% of the persisters.

Discussion

Understanding the mechanisms that influence adolescent offending, particularly violent offending, have been a prominent focus of both the psychological and criminological literatures. In addition, understanding how these violent behaviors change over time among female offenders is virtually unknown. The results of the present study indicate that, while the majority of female offenders desist in their violent behaviors as they transition from

adolescence into adulthood, a small percentage of female offenders (25%) persist in their violent offending. Importantly, the mechanisms that influence females' desistance from violent offending are consistent with both psychological and criminological perspectives on desistance. Specifically, females who develop control over their impulses are more likely to desist in their violent offending compared to females who do not develop impulse control. In addition, females who desist from violent crime are more likely to be employed and to be employed full-time (40 hours per week). It is important to note, however, that other demographic and adult role outcomes (having a child, getting married, completing high school, etc.) do not relate to females' desistance from violent offending. One intriguing implication of this pattern of findings is that developmental changes (i.e., improvement in impulse control) may trigger the desistance process and the adult milestones typically identified in the criminological literature may maintain desistance. Alternatively, developmental changes in impulse control may underlie both desistance as well as attainment of adult roles that further maintain desistance.

Although understanding the trajectories of violent offending among females is critical, it is important to place these findings in context, particularly in comparison to similar types of male offenders. For instance, our findings indicate that even though a small group of female offenders persist in their violent offending, the base rate of violent offending among females is considerably lower than the base rate for males. In addition, the pathways of males' violent offending appear to be slightly different, with only 36% desisting from violent behavior (compared to 74.4% of violent females). In fact, 46% of males appear to persist in their violent offending, albeit at low levels. A paramount difference, however, is the small group of males (approximately 19%) who increase in their violent behavior as they make their transition from adolescence into adulthood, as this increasing group is not observed among females. These differences are notable as findings from prior research on male and female general offending (rather than violent offending specifically) show roughly similar trajectories between the sexes and very small percentages of persistence (Cauffman, Monahan, & Thomas, in press).

Although studies have documented sex differences in the correlates and predictors of offending, it is interesting that in a matched-sample of male and female offenders, one result was consistent across the sexes: developmental change in impulse control is linked to desistance. This is in line with prior research on general offending, which indicates that youth tend to desist from crime as they develop self-regulatory skills and improve in their ability to control their impulses (Monahan, Steinberg, Cauffman, & Mulvey, 2009; Monahan et al., 2013). It makes good sense that developing impulse control would distinguish between offending patterns, as developmental gains in self-regulation more broadly are the hallmark of psychosocial development during the teen years. The universality of this appears consistent with this finding that as youth become less impulsive, their involvement in violent (and likely impulsive) behaviors declines.

However, we find that the development of impulse control does not appear to explain the offending trajectory of males who increase in violent crimes. In fact, it appears that socio-demographic characteristics and adult milestones may account for more of this type of male behavior. Specifically, males who increase in their violent behavior from adolescence to

adulthood tend to come from lower socio-economic backgrounds (based on parent education level), and are less likely to be employed. As such, while the developmental changes associated with impulse control may also trigger desistance for males, it appears that other contextual factors may play a role as well. We are hesitant to make too much out of the group of increasing male violent offenders as other analyses with this data set using the full sample and a broader measure of criminal behavior have not found such a pattern (Monahan et al., 2013).

With respect to attainment of adult milestones, however, there are diverging results for males and females. First, attainment of full time employment is associated with differential patterns of offending over time, but appears to operate in opposite ways. Female employment was associated with desistance from violence, as was expected, whereas male employment was surprisingly associated with violence persistence. The finding that persisting males were more likely to be employed than desisters contradicts much of what has been shown in the general offending literature, which suggests employment may serve as a turning point that leads individuals away from a life of crime (Wadsworth, 2006; Savolainen, 2009). Considerable research has documented the role of employment in the trajectories of general offending and found that it is not simply the act of being employed that leads to desistance in offending, but rather it is the *quality* of the employment that matters (Van der Geest, Bijleveld, & Blokland, 2011). Furthermore, some literature indicates that the association between employment and desistance is not relevant to adolescents or young adults, but rather that work only serves as a deterrent from crime for adults (Monahan, Steinberg, & Cauffman, 2013; Uggen & Staff, 2001). New research suggests this may be due to the timing of employment occurring after the process of desistance; that is, the transition to gainful employment may come as a result, rather than a cause, of desistance (Skardhamar & Savolainen, 2014).

While this is one of the first studies to review violent female offending from adolescence to adulthood, it is important to note the limitations of this research. Specifically, although trajectory analyses were possible, it is still a relatively small sample for analytical purposes. As such, we were unable to conduct other types of analyses on the predictors of trajectories. Nevertheless, our current analytic strategy still provided some important insights into psychological and criminological perspectives for both male and female violent offending. In addition, despite availability of official records of offending, the analyses focused solely on self-reported offending. Given the tendency of official records to under-represent the true extent of offending behavior (Farrington, Jolliffe, Hawkins, Catalano, Hill, & Kosterman, 2003) and the correlation between self-reported antisocial behavior and official arrest records (Brame, Fagan, Piquero, Schubert, & Steinberg, 2004), we chose to focus on these self-reported acts.

Overall, the findings from this study indicate that, while violent offending occurs more often among males than females, it is a low base rate phenomenon for all adolescents. It is not until young adulthood that we see an increase in violent offending and this increase is only observed among a small minority of males. More importantly, this study highlights the importance of both the developmental and criminological perspectives on violent offending among adolescents. Specifically, it appears that the development of impulse control, and not

the obtainment of adult milestones, triggers the desistance process during young adulthood. While employment does play an important role in the desistance process, other adult milestones that have been highlighted in previous research (childbearing, marriage, etc.) do not seem to play a role. This may be due to the fact that our sample is relatively early in their adult years (oldest age is 25). This is consistent with findings by Uggen (2000) that suggest that the effect of employment on offending is age-graded, such that having a job only serves as a “turning point” for offenders older than 26 years of age. As such, it could be that the development of impulse control triggers the desistance process (particularly around age 18 for females) but that adult milestones like marriage and child-rearing do not appear until later in the adult years. Thus, those adult milestones may serve as maintenance and keep young adults out of trouble, but they do not seem the impetus for the process. As such, both developmental and criminological perspectives should be joined together to better understand offending in general, and violence in particular.

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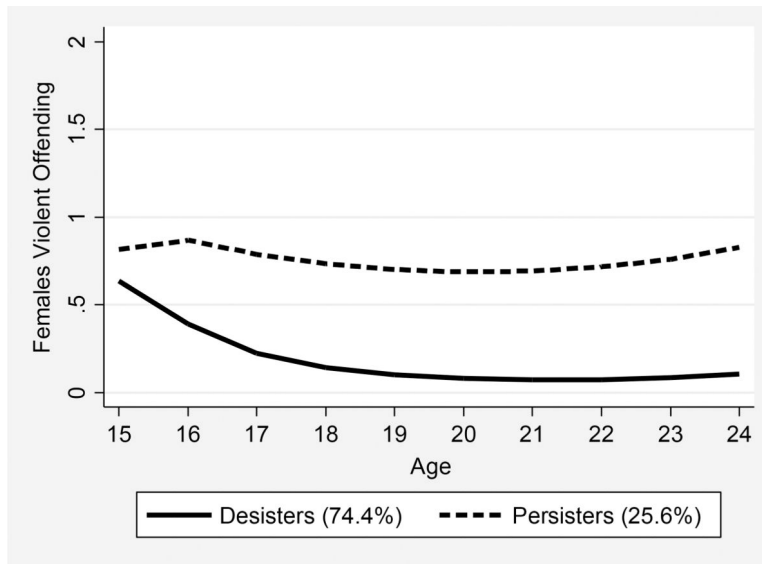


Figure 1a.
Trajectories of Violent Offending for Females

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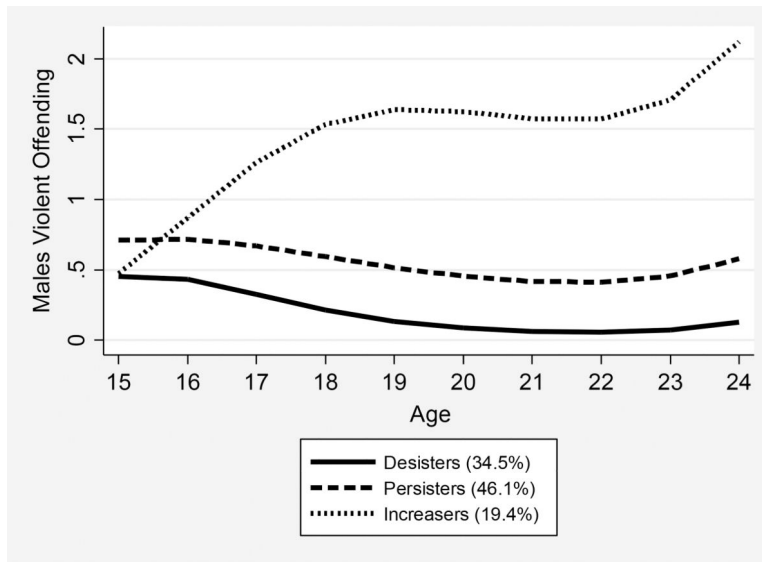


Figure 1b.
Trajectories of Violent Offending for Males

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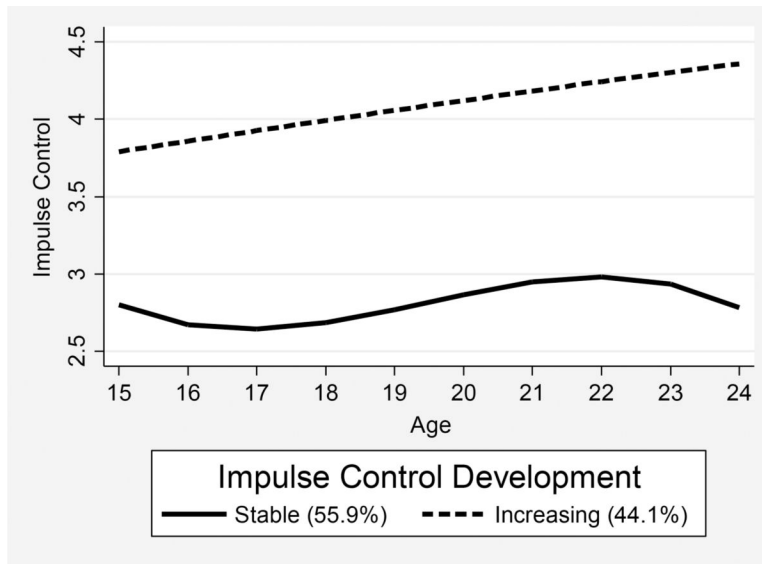


Figure 2a.
Trajectories of Impulse Control Development among Females

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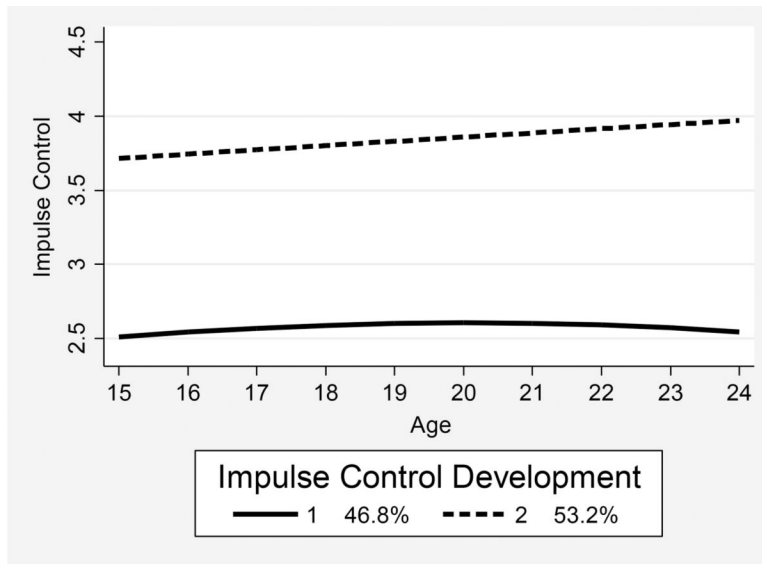


Figure 2b.
Trajectories of Impulse Control Development among Males

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Table 1.

Bayesian Information Criterion (BIC) of the Violence Group Based Trajectory Models and Impulse Control Group Based Trajectory Models Considered for Females and Males.

No. of Groups	Violence		Impulse Control	
	<u>Females</u>	<u>Males</u>	<u>Females</u>	<u>Males</u>
	BIC	BIC	BIC	BIC
1	-871.77	-1256.12	-1762.44	-1443.02
2	-819.28	-1167.14	-1535.06	-1382.48
3	-827.40	-1162.09	-1478.66	-1382.38
4	-837.25	-1170.26	-1465.71	-1383.40
5	-847.87	-1182.96	-1463.26	-1386.33
6	-857.72	-1193.02	-1463.16	-1387.90
7	-867.78	-1205.27	-1463.14	-1396.94

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Table 2.

Means of Baseline Covariates by Violent Trajectory Group among Females and Males

	Females			Males			χ^2	P
	Desister	Persister		Desister	Persister	Increaser		
	n = 127	n = 40		n = 56	n = 77	n = 28		
	M(SD)	M(SD)		M(SD)	M(SD)	M(SD)		
Demographic								
Ethnicity	White%	22.5%	0.69	19.6%	33.8%	21.4%	1.96	0.375
	Black%	40.0%		46.4%	28.6%	35.7%		
	Hispanic%	29.9%		28.6%	35.1%	32.1%		
	Other%	4.7%		5.4%	2.6%	10.7%		
Parental Education							7.54	0.274
	More than high school	27.2%	1.30	26.8%	29.3%	10.7%		
	High school	36.8%		35.7%	38.7%	32.1%		
	Some high school	32.8%		32.1%	28%	53.6%		
	Grade school or less	3.2%		5.4%	4%	3.6%		
Cognitive Functioning								
IQ		83.3(14.9)	0.71	85.9(12.1)	86.9(14.1)	85.4(12.2)	0.70	0.706
Trailis B		2.04(1.04)	2.33	2.17(.99)	2.08(.89)	2.21(1.07)	0.60	0.741

Table 3.

Comparisons of violent offending trajectory groups within each gender

Effect	Girls ^A		Boys ^B	
	LR χ^2	p	LR χ^2	p
Demographic				
Race	.690	.875	1.96	.390
Parental Education	1.30	.730	6.54	.038
Cognitive Functioning				
IQ	0.69	.406	0.34	.843
Trails B	2.60	.107	0.50	.771

Note: All models were conducted separately using binary logistic regressions and multinomial regressions for males and females, respectively. Bolded items indicate significant findings.

^AThe reference group is female desisters.

^BThe reference group is male desisters.

Table 4.

Joint Probability of Classification in Violence and Impulse Control Trajectories

Girls Joint Probability Trajectories		
Violence Trajectories	Impulse Control Trajectories	
	Stable (56%)	Increasing (44%)
Desisters (74%)	30.50%	43.70%
Persisters (26%)	25.70%	0
Boys Joint Probability Trajectories		
Violence Trajectories	Impulse Control Trajectories	
	Stable (47%)	Increasing (53%)
Desisters (35%)	0.0%	35.4%
Persisters (46%)	38.5%	6.8%
Increases (19%)	9.3%	9.9%

Table 5. Descriptives and Differences in Adult Outcomes by Gender and Violent Trajectory Group

	Females			Males			χ^2	<i>p</i>
	Desister n = 127	Persister n = 40	<i>p</i>	Desister n = 56	Persister n = 77	Increaser n=28		
Had a child	70.1%	67.5%	.094	60.7%	50.7%	64.3%	2.17	.338
Married	18.1%	10%	1.476	8.9%	7.8%	7.1%	.096	.953
Employment	94.5%	85%	3.815	81.1%	96.1%	78.6%	9.09	.011
Full time @ 40 hrs/wk	33.9%	15%	5.218	28.6%	38.9%	14.3%	6.09	.042
Completed High School	58.3%	42.5%	3.049	64.3%	68.8%	67.8%	0.31	.855
Applied to College	29.1%	17.5%	2.122	26.8%	29.9%	28.6%	0.15	.927

Note: Bolded items indicate significant findings.