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Characterizing trajectories of anxiety, depression, and criminal offending in male adolescents over the 5 years following their first arrest

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Abstract

Youth in the juvenile justice system evince high rates of mental health symptoms, including anxiety and depression. How these symptom profiles change after first contact with the justice system and—importantly—how they are related to re-offending remains unclear. Here, we use latent growth curve modeling to characterize univariate and multivariate growth of anxiety, depression, and re-offending in 1,216 male adolescents over 5 years following their first arrest. Overall, the group showed significant linear and quadratic growth in internalizing symptoms and offending behaviors over time such that levels decreased initially after first arrest followed by a small but significant upturn occurring a few years later. Crucially, multivariate growth models revealed strong positive relationships between the rates of growth in internalizing symptoms and offending behaviors such that improvements in mental health related to greater decreases in offending, and vice versa. These results highlight the reciprocal nature of internalizing and externalizing problems in adolescence, underscoring the importance of considering mental health alongside offending in the juvenile justice system.

Keywords

juvenile justice; anxiety; depression; offending; adolescent development

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Introduction

Youth in the juvenile justice system experience higher rates of internalizing symptoms such as anxiety and depression than their non-system-involved peers (Atkins et al., 1999; Cauffman, 2004; Dierkhising et al., 2013; Lemos & Faísca, 2015; Schubert, Mulvey, & Glasheen, 2011; Teplin, Abram, McClelland, Dulcan, & Mericle, 2002; Vermeiren, 2003; Wasserman, McReynolds, Schwalbe, Keating, & Jones, 2010). While justice-involved youth report higher rates of all mental health symptoms (Wasserman et al., 2010), rates of anxiety and depression in this population are especially concerning: nearly half of justice-involved youth screened from a national database meet clinical criteria for internalizing problems (Dierkhising et al., 2013), and roughly half of justice-involved males who experience mental health disorders while incarcerated continue to have these impairments once released (Teplin, Welty, Abram, Dulcan, & Washburn, 2012). Furthermore, mental health problems go hand-in-hand with criminological outcomes: individuals who continue offending after adolescence are nearly three times more likely to experience mental health problems (Reising, Ttofi, Farrington, & Piquero, 2019). Despite the high prevalence of persistent mental health concerns in this population, youth in the juvenile justice system rarely receive treatment (Zajac, Sheidow, & Davis, 2015).

Above-average rates of internalizing symptoms coupled with lack of treatment is itself a cause for concern for youth development, as untreated internalizing disorders in youth have been linked to increased risk for negative outcomes such as substance abuse, academic failure, and emotional disorders in adulthood (Child Mind Institute, 2018; Colman, Wadsworth, Croudace, & Jones, 2007; Essau, Lewinsohn, Lim, Ho, & Rohde, 2018). Moreover, the cumulative impact of externalizing behaviors (e.g., criminal offending) and internalizing symptoms can be especially detrimental for youth academic and global functioning (Lewinsohn, Rohde, & Seeley, 1995), leading to further justice system contact (Sampson & Laub, 2005) and increased risk for suicide (Perry & Morris, 2014; Ruchkin, Schwab-Stone, Koposov, Vermeiren, & King, 2003). Most psychiatric disorders onset during adolescence or young adulthood (Meyer & Lee, 2019), a period in which risk-taking behaviors such as offending peak as well (Moffitt, 2018; Sweeten, Piquero, & Steinberg, 2013). When considering the unique compounding vulnerabilities that justice-involved youth may also face—including the experience of being labeled as "delinquent" (McLeod, Uemura, & Rohrman, 2012) and incarceration (Barnert, Perry, & Morris, 2016)—the risk for atypical emotional development in these youth is further increased (Dmitrieva, Monahan, Cauffman, & Steinberg, 2012).

Developmental research has highlighted bidirectional associations between internalizing symptoms and externalizing behaviors from childhood to adolescence that help explain the high rates of mental health problems seen in justice-involved youth. Results from a longitudinal prospective study suggest a temporal cascade whereby conduct problems in childhood lead to negative social outcomes that contribute to depression in adolescence, which can then further contribute to delinquency in later adolescence by fostering a pessimistic outlook towards the future (Fontaine et al., 2019). In a community sample followed longitudinally for 6 years, youth exhibiting high depression symptoms were at risk for increasing disruptive behavior, and youth exhibiting high levels of disruptive behavior

were at risk for developing higher depression symptoms (Reinke, Eddy, Dishion, & Reid, 2012). A recent study of boys ages 11-16 found limited evidence that prior anxiety and depression predict later self-reported offending, and stronger evidence that self-reported offending predicts later anxiety and depression (Jolliffe et al., 2019), suggesting that anxiety and depression may develop as a result of the negative consequences of offending in early adolescence.

While such studies provide valuable information about bidirectional relationships over time, a key consideration missing from this body of work is whether symptom trajectories and offending trajectories change contemporaneously after youth enter the system. The high rates of mental health concerns experienced by system-involved youth demonstrate that challenges with mental health and offending behaviors are often linked, possibly through multiple mechanisms (Schubert & Mulvey, 2014). For instance, exposure to the juvenile justice system, by way of police interactions, court proceedings, and incarceration, can contribute to new or worsening mental health problems for system-involved youth (National Mental Health Associations, 2004). Similarly, mental health challenges have been associated with increased recidivism (Yampolskaya & Chuang, 2012), perhaps as a reaction to the negative feelings associated with anxiety and depression. Tracking the associations between these processes and their relation to recidivism in justice-involved youth is crucial for identifying key periods where intervention—for both mental health and recidivism—may be most efficacious.

Mental health needs have been studied alongside criminological needs in the risk-needs-responsivity (RNR) model, a correctional psychology framework aimed at assessing the risks and needs of a person related to reducing recidivism (Andrews, Bonta, & Hoge, 1990). In the RNR model, mental health symptoms do not themselves serve a causal role in the development of delinquency, but rather can moderate the efficacy of rehabilitation services aimed at decreasing recidivism (McCormick, Peterson-Badali, & Skilling, 2017). Consideration and treatment of mental health concerns may contribute to enhanced engagement in services; thus, an understanding of how mental health symptoms and offending behaviors develop in parallel is crucial for facilitating ideal rehabilitation. A close examination of how internalizing symptoms and offending behaviors develop in parallel after youth first enter the juvenile justice system is a crucial next step for identifying youths' mental health and rehabilitation needs and promoting healthy adolescent development.

The present study employed latent growth curve modeling of repeated assessments of adolescents' emotions and behavior to examine longitudinal trajectories of internalizing symptoms and criminal offending behaviors in 1,216 male adolescents across 3 cities in the United States over the five years following their first arrest. Crucially, latent growth curve modeling allows for examining individual starting points (intercepts) and rates of change (slopes) across different processes, as well as describing the multivariate growth of multiple processes in relation to one another. In Aim 1, we sought to characterize the average trajectories of internalizing symptoms and offending behaviors in this sample after first contact with the justice system, accounting for between-person differences in a range of key demographic variables. As the prevalence of mental health disorders tends to increase after first contact with the justice system (Wasserman et al., 2010), we hypothesized

that the group would show average increases in internalizing symptoms over time. Given the increase in offending behavior across adolescence and into young adulthood (Loeber, Stouthamer-Loeber, Tonry, & Morris, 1986), we also hypothesized increases in offending over time. In addition to these group trajectories, we expected there would be significant variability in starting points and growth patterns across participants, highlighting the role of individual differences in the development of internalizing and externalizing problems in youth after their first arrest, even after considering relevant demographic characteristics including age, race/ethnicity, neighborhood context, data collection location, and parental education.

In Aim 2, we sought to characterize the co-development of internalizing symptoms and offending behaviors over time by examining whether change in mental health is related to change in offending, and vice versa. Because little is known about trajectories of internalizing symptoms in this population, we investigated the role of depression and anxiety symptoms separately. We hypothesized that these constructs would develop together over time, such that worsening mental health symptoms would co-occur with greater criminal offending, highlighting the intertwined nature of internalizing and externalizing processes during adolescence and underscoring the importance of mental health when considering youth recidivism.

Methods

Participants

Data for this project were collected as part of the Crossroads Study, an on-going multisite longitudinal assessment of 1,216 male adolescents ages 13-18 at baseline (M_{Age} = 15.80, SD = 1.28; see Table 1 for full demographic information) who were arrested for moderate offenses (i.e., misdemeanors) in either Jefferson Parish, Louisiana (n = 151), Orange County, California (n = 532), or Philadelphia, Pennsylvania (n = 533). These study sites were selected to represent culturally and demographically distinct regions of the country (South, West, and East). Youth were enrolled in the study at the time of their first arrest for midrange, non-felony crimes such as theft of goods, simple battery (e.g., offensive physical contact such as punching), and vandalism (e.g., graffiti); these are distinct from felony-level offenses (e.g., armed robbery, homicide). Detailed information regarding sampling procedures and data collection methodology can be found via the study website: https://sites.uci.edu/crossroadsinfo/about-the-study/study-design/ and in prior publication (Cavanagh & Cauffman, 2017). Briefly, arrested youth with pending intake hearings were screened for eligibility (e.g., no prior arrests) by research associates and invited to participate in the study following informed consent and assent regarding study involvement. Youth were provided $50 for completion of the first interview; an additional $15 was provided at follow-up interviews as retention incentive up to $140. The current study focuses on data from the baseline interview following first official contact with the juvenile justice system and from eight follow-up interviews conducted over the next five years.

Measures

Demographic information—Participants self-reported demographic information regarding their age, parents' highest level of education (used as a proxy for socioeconomic status; Galobardes, Lynch, & Smith, 2007), and race/ethnicity. Prior research supports the validity of child report of parental education in adolescent samples (Lien, Friestad, & Klepp, 2001). In the current sample, 26.9% of participants had parents who had not graduated high school, 34.8% had parents with a high school diploma or GED, and 38.3% had parents who had pursued further education after high school. Participants in this sample self-reported their ethnicity as Latino (45.8%), Black (36.9%), White (14.8%), or Other (2.5%). Of note, approximately 78% of youth in California reported their ethnicity as Latino, while approximately 65% of youth in Pennsylvania reported their ethnicity as Black. Therefore, race/ethnicity and data collection site are confounded in this sample, so caution must be taken when interpreting results involving these variables.

Neighborhood quality—Neighborhood quality was assessed using a self-report questionnaire adapted for the Crossroads Study designed to assess observable signs of physical and social disorder in the participant's neighborhood (Sampson & Raudenbush, 1999). Youth reported on how frequently they observed both physical (9 items; e.g. *graffiti or tags, boarded up windows on buildings*) and social (12 items; e.g., *adults fighting or arguing loudly*) disorder in their neighborhood using a 4-point Likert scale ranging from 1 (*never*) to 4 (*often*). Average scores across both scales were used as a continuous index of overall neighborhood quality, where higher scores indicate worse neighborhood quality. Neighborhood quality scores for this sample of participants at baseline ranged from 1 to 3.95 ($M = 2.07$, $SD = 0.68$).

Internalizing symptoms—The Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) was used to measure internalizing symptoms associated with anxiety and depression. Anxiety was assessed using the Generalized Anxiety Disorder (GAD) subscale of the RCADS, which includes 6 items about worries (e.g., "I worry about what is going to happen."). Depression was assessed using the Major Depressive Disorder (MDD) subscale of the RCADS, which includes 10 items measuring depression symptoms such as feelings of worthlessness and anhedonia (e.g., "Nothing is much fun anymore."). Participants rated each item on a 4-point Likert scale ranging from 0 (*never*) to 3 (*always*) according to how often they experience each item. Items for each scale were summed to achieve overall indices of anxiety and depression symptomatology, with higher scores indicating more symptoms of anxiety (max score possible = 18) and depression (max score possible = 30). At baseline, participants scored an average of 5.25 on the GAD subscale ($SD = 3.73$, range: 0-18) and 5.80 on the MDD subscale ($SD = 4.66$, range: 0-30). Baseline anxiety and depression scores demonstrated a significant positive correlation ($r(1214) = .55$, $p < .001$).

Raw scores at baseline were converted to *t*-scores to assess clinical severity. On the RCADS, a *t*-score of 65 means that the score is roughly in the top 7% of scores of young people of the same age (deemed the "borderline clinical" range), while a *t*-score of 70 means that the score is in roughly the top 2% of scores of young people of the same age and would likely

merit a clinical diagnosis of anxiety or depression if assessed by a clinician. In this sample, 92.8% of youth scored in the normal range for anxiety, 7.2% scored in the borderline clinical to clinical range, and 5% scored at or above the clinical threshold, suggesting that anxiety symptoms were slightly higher in this sample than for average young people of the same age. Also, 93.2% of youth in this sample scored in the normal range for depression, 6.8% scored in the borderline clinical to clinical range, and 4.2% scored at or above the clinical threshold, suggesting that symptoms of depression were slightly lower than symptoms of anxiety in this sample, but there was a higher percentage of youth at or above the clinical threshold than expected for a typical group of adolescents.

Self-reported offending—Participants' offending behaviors were tracked using the Self-Report of Offending scale (SRO; Huizinga et al., 1991), a self-report measure in which participants indicated their involvement in 24 types of criminal activity ranging from selling drugs to homicide over the previous 6-month period. Responses were summed together to create variety scores (# of different types of criminal acts over the past six months/# of different types of criminal acts ever endorsed by participant), which are often used in criminological research as they correlate well with official reports of offending (Thornberry & Krohn, 2000) and are more resilient to recall bias than are self-reports of frequency of antisocial behavior (Eve, 1984; Osgood, McMorris, & Potenza, 2002). Variety scores are the preferred method for estimating overall offending because they take into account heterogeneity in crime types and seriousness of offense (Sweeten, 2012). Participants in this sample engaged in an average of 1.09 offenses for every 6-month period ($SD = 1.44$) after initial arrest.

Processing type—Once they were arrested, youth in this study were either formally or informally processed within the justice system. Informal processing involves youth being diverted from juvenile court and could include a probationary ("wait and see") status or community service. Formal processing, on the other hand, involved being sanctioned through the juvenile court system, and subsequently being placed on probation or referred to a juvenile correctional institution. Youth who are formally processed are required to attend a series of court hearings, and if they are sanctioned with community probation, they are required to check in with both the judge and a probation officer. As such, formal processing constitutes a more intensive form of juvenile justice system treatment. Initial processing decisions following arrest for each youth were obtained from official records from the probation department. In this study, 669 youth (55% of sample) were informally processed, while 547 youth (45% of sample) were formally processed.

Time in facility—Incarceration can reduce the opportunities an individual has to engage in criminal behavior (Piquero et al., 2001), and time spent incarcerated may also affect internalizing symptom severity. Therefore, we accounted for the proportion of each recall period in which participants reported they were in a secure institution, locked facility, detention, jail, or residential treatment center. On average, participants spent 5.31% of each recall period in a facility ($SD = 11.64\%$).

Official rearrest records—In addition to the self-reported offending data that were collected from participants, this study also obtained official records from the Department of Probation from all data collection sites to indicate the number of times that youth were rearrested for either misdemeanor or felony charges over the five years following their first arrest. A binary rearrest variable was created using these records to indicate which participants were rearrested at least once over the study period. Across the three data collection sites, 611 participants were rearrested at least once over the 5-year period, while 556 participants had no record of rearrest during the period of the study. Forty-nine participants were missing rearrest data entirely or lacked sufficient rearrest data to determine whether or not rearrest occurred.

Plan of Analysis

Latent growth curve analyses were employed in Mplus version 8.2 (Muthén & Muthén, 2017) to examine trajectories of internalizing symptoms and offending behaviors from baseline through the 8 follow-up interviews. Latent growth curve modeling allows for examination of abstract variables over time such as group starting points (intercepts) and growth factors (slopes), as well as their simultaneous growth over time. Furthermore, by modeling different processes explicitly and simultaneously, we can assess how development in one process relates to development in the other. Although anxiety and depression often co-occur and correlate positively in adolescents (Lewinsohn, Zinbarg, Seeley, Lewinsohn, & Sack, 1997), they are distinct disorders and, by modelling separate growth patterns, we were able to determine if there were differences in their influences on offending behaviors.

Univariate growth curve models were fit for each process of interest (anxiety, depression, offending) to assess average initial levels and trajectories over time. Good model fit for the internalizing univariate models was assessed using the following criteria (Hu & Bentler, 1999): comparative fit index (CFI) greater than or equal to .95, Tucker–Lewis index (TLI) greater than or equal to .95, root mean squared error of approximation (RMSEA) less than or equal to .06, and standardized root mean squared residual (SRMR) less than or equal to .08. Self-reported offending is a count variable with a right-skewed distribution, so a negative binomial model was specified in the offending growth models. Negative binomial regression is optimal for analyzing skewed dependent variables (which prevents the need to log-transform the dependent variable to address skew) and over-dispersed data (Long & Freese, 2001). As standard model fit indices are not provided in Mplus when using count variables, fit was assessed using the Akaike and Bayesian information criterion (AIC and BIC, respectively). Lower AIC and BIC values indicate better model fit. Once the functional form of the growth models (linear and/or quadratic growth) was established, demographic covariates were added into the model to examine the influence of age, neighborhood quality, race/ethnicity, and data collection site on developmental patterns. For models with both linear and quadratic growth factors, the linear slope describes initial growth patterns, while the quadratic slope describes any upturn or downturn that is not captured by the linear growth factor.

Associations between internalizing symptoms and offending behaviors over time were assessed using multivariate growth curve modeling (Duncan, Duncan, & Strycker, 2013).

Multivariate growth models provide estimates of the covariation among individual differences in initial levels of each variable, covariation in rates of change (both linear and quadratic), and the predictive associations between initial levels in one variable and subsequent change in another (Duncan et al., 2013). The intercept indicates the status immediately after first arrest and first contact with the justice system, while growth coefficients indicate the change that occurred in 1-year increments after arrest. The first 6 follow-up visits occurred in 6-month increments, after which visits were spaced by one year. Therefore, time points were specified as follows: 0, .5, 1, 1.5, 2, 2.5, 3, 4, 5. Correlations between anxiety, depression, and offending at each timepoint are displayed in Table 2.

Missing data handling—Maximum likelihood estimation with robust standard errors was used to account for missing data in anxiety, depression, and offending, a technique that uses all available data to identify highly probable parameter estimates for a particular data set and reduces sample bias related to attrition (Baraldi & Enders, 2010). Mplus does not allow for missing values in covariates; therefore, multiple imputation (10 imputations) was used to account for missing parental education ($n = 50$) and rearrest ($n = 49$) data.

Internalizing, offending, and rearrest—To probe whether baseline levels in mental health symptoms and self-reported offending behaviors predicted risk of official rearrest over the study period, the binary rearrest variable (rearrested at least once vs. not rearrested over the study period) was added to the multivariate growth model and regressed on the growth model intercepts for anxiety, depression, and offending, as well as age, neighborhood quality, parental education, processing type, data collection site, and race/ethnicity.

Results

Unconditional growth models

Anxiety—An initial unconditional growth model for anxiety symptoms with only an intercept and linear growth factor was fit to examine the overall trajectory of anxiety symptom development over the 5 years following first arrest. While anxiety symptoms showed a significant linear decrease over the 5-year period (mean linear slope = −0.052, $p < .05$), the model did not fit the data well ($\chi^2(40, N = 1216) = 351.31$, $p < .001$; RMSEA = 0.08; CFI = 0.92, TLI = 0.93; SRMR = 0.11). A quadratic growth factor was added to the model, significantly improving model fit ($\chi^2(36, N = 1216) = 188.30$, $p < .001$; RMSEA 0.06; CFI = 0.96, TLI = 0.96; SRMR = 0.07).

As Table 3 indicates, the current sample demonstrated significant linear and quadratic change in anxiety symptoms over time such that anxiety declined initially after first arrest, followed by an upwards turn occurring a few years after first arrest. Furthermore, the intercept and each growth factor demonstrated significant variance across participants, highlighting significant individual variability in both starting points and growth trajectories of anxiety in this population. There was significant covariance between the intercept and the quadratic slope factor and between the slope factors; however, the intercept did not significantly covary with the linear slope. This suggests that starting points for anxiety were not significantly related to linear change but were related to quadratic change in anxiety over time.

Depression—Next, an initial unconditional growth model for depression symptoms with only an intercept and linear growth factor was fit to examine the overall trajectory of depression symptom development over the 5 years following first arrest. Unlike anxiety, depression did not show significant linear change on average (mean linear slope = 0.002, p = .95). Additionally, the model did not fit the data well (χ^2(40, N = 1216) = 323.15, $p <$ .001; RMSEA = 0.08; CFI = 0.93, TLI = 0.94; SRMR = 0.11). A quadratic growth factor was added to the model, significantly improving model fit (χ^2(36, N = 1216) = 181.04, $p <$ .001; RMSEA 0.06; CFI = 0.96, TLI = 0.96; SRMR = 0.07).

As Table 4 indicates, the current sample demonstrated significant linear and quadratic change in depression symptoms over time such that depression declined initially after first arrest, followed by an upwards turn occurring a few years after first arrest. Furthermore, the intercept and each growth factor demonstrated significant variance across participants, highlighting significant individual variability in both starting points and growth trajectories of depression in this population. There was significant covariance between the intercept and the quadratic slope factor and between the slope factors; however, the intercept did not significantly covary with the linear slope. This suggests that starting points for depression were not significantly related to linear change but were related to quadratic change in depression over time, perhaps suggesting that internalizing starting points relate to long-term (rather than short-term) change in development following first arrest.

Offending—Next, an initial unconditional growth model for offending behaviors with only an intercept and linear growth factor was fit to examine the overall trajectory of offending development over the 5 years following first arrest. We also accounted for the proportion of time in each recall period participants spent in a secure facility by regressing offending at each time point on time spent in facility. Offending showed a significant linear decrease on average (mean linear slope = −.27, $p <$ .001; AIC = 24756.97, BIC = 24874.35). A quadratic growth factor was next added to the model, improving model fit (AIC = 24507.06, BIC = 24644.85).

As Table 5 indicates, the current sample demonstrated significant linear and quadratic change in offending behaviors over time such that offending declined steeply after first arrest, followed by an upwards turn occurring a few years after first arrest. Furthermore, the intercept and each growth factor demonstrated significant variance across participants, highlighting significant individual variability in both starting points and growth trajectories of offending in this population. Offending intercepts demonstrated significant covariance with linear and quadratic growth factors, suggesting that offending behaviors at the time of first arrest are related to growth trajectories over time.

Conditional growth models

Anxiety—Covariates were next added to the anxiety growth model to examine effects of demographic variables on starting points (intercepts) and growth (linear and quadratic slopes) in anxiety over time (Table 6; Figure 1). Specifically, the latent factors were regressed on the following covariates: age at baseline, neighborhood quality, parental education, processing type, data collection site, and race/ethnicity. Model fit indices

demonstrated that the conditional model fit the data better than the unconditional model (χ^2(90, N = 1216) = 244.87, $p < .001$; RMSEA = 0.04; CFI = 0.96, TLI = 0.95; SRMR = 0.05). Age at baseline and neighborhood quality were significantly related to anxiety intercepts such that older age and worse neighborhood quality were associated with higher anxiety symptoms at baseline. None of the covariates significantly predicted linear or quadratic slopes. After inclusion of demographic factors in the conditional model, the covariance between anxiety intercepts and slopes was no longer significant, suggesting that intercepts were related to slopes in the unconditional model through the influence of shared demographic factors.

Depression—Covariates were also added to the depression growth model (Table 7; Figure 2). Specifically, the latent factors were regressed on the following covariates: age at baseline, neighborhood quality, parental education, processing type, data collection site, and race/ethnicity. Model fit indices demonstrated that the conditional model fit the data better than the unconditional model (χ^2 (90, N = 1216) = 249.58, $p < .001$; RMSEA = 0.04; CFI = 0.96, TLI = 0.95; SRMR = 0.05). Neighborhood quality, processing type, and race/ethnicity were all significantly related to depression intercepts such that worse neighborhood quality and formal processing were related to higher baseline depression, while Black youth (as compared to White youth) demonstrated lower depression at baseline. Race/ethnicity was also related to depression linear slopes, with Latino youth (as compared to White youth) demonstrating greater decreases in depression over time. After inclusion of demographic factors in the conditional model, the covariance between depression intercepts and slopes was no longer significant, suggesting that intercepts were related to slopes in the unconditional model through the influence of shared demographic factors.

Offending—Covariates were also added to the offending growth model (Table 8; Figure 3). Specifically, the latent factors were regressed on the following covariates: age at baseline, neighborhood quality, parental education, processing type, data collection site, and race/ethnicity. Model fit indices suggested that the conditional model fit the data better than the unconditional model (AIC = 24326.53, BIC = 24602.11). Neighborhood quality, parental education, data collection site, and race/ethnicity were all significantly related to offending intercepts. Specifically, worse neighborhood quality and higher parental education were related to greater offending at baseline, while youth living in Pennsylvania (as compared to youth in California) and Black and Latino youth (as compared to White youth) demonstrated lower offending at baseline. Age at baseline and processing type predicted changes in offending over time, with older age and informal processing predicting steeper declines in offending after first arrest. Average offending trajectories for different ages and processing types are visualized in Figures 4a and 4b, respectively.

Multivariate growth models

Finally, anxiety, depression, and offending growth models were combined in a multivariate growth model to examine the development of internalizing symptoms and offending behaviors in relation to one another. As anxiety and depression are highly related processes and scores are derived from the same measure, we accounted for the similarity between the

two by allowing values to covary at each time point. Average group trajectories for anxiety, depression, and offending are displayed together in Figure 5.

To assess the relationships between the different processes in our multivariate latent growth curve model, we first added paths from each intercept to the slope growth factors for all 3 processes, after which we examined the magnitude and direction of the covariance and correlation parameters between slope growth factors. Covariance between factors indicates the extent to which two random variables change in tandem. Therefore, a significant covariance between growth factors suggests that the two constructs change together over time. Correlation between factors indicates how growth across different processes relates to one another on a standard scale. It is important to note that these modeling procedures explain overall growth in a process; as such, linear and quadratic trajectories need to be interpreted simultaneously. Results from the multivariate growth models are reported both with and without covariates to control for the confounding effects of external factors such as neighborhood quality that can influence both internalizing and offending processes.

Associations between intercepts and slopes with and without the effects of covariates are displayed in Figures 6a and 6b, respectively. Higher levels of self-reported offending at baseline predicted less declines in offending behaviors over time, while higher levels of depression at baseline predicted a greater upturn in offending behaviors later in development (Figure 6a). After accounting for demographic covariates, higher levels of self-reported offending at baseline predicted less declines in offending, anxiety, and depression over time, while higher anxiety and depression at baseline only predicted change in anxiety and depression symptoms over time (Figure 6b), suggesting that baseline offending can predict internalizing outcomes, but not vice versa.

The covariance and residual covariance (after accounting for demographic covariates) matrices for the slope growth factors are displayed in Tables 9a and 9b, respectively. We found significant associations between the slopes of all 3 processes such that change in one process related to similar change in the others in magnitude and direction (i.e., greater improvements in internalizing symptoms related to greater decreases in offending, and vice versa). After accounting for demographic covariates, growth in offending behaviors was still associated with growth in anxiety and depression, highlighting that offending and internalizing change together over time, over and above the influence of starting values and demographic covariates.

Finally, correlation and residual correlation matrices for the slope growth factors are displayed in Tables 10a and 10b, respectively. We found significant correlations between the slopes for all 3 processes both before and after accounting for demographic covariates, highlighting the tight links between mental health and offending in this population.

Predictors of youth rearrest

Results from the rearrest model are displayed in Figure 7. Higher baseline **self-reported offending** predicted greater chance of **official rearrest** over the study period, while higher baseline anxiety predicted lower chance of rearrest over the study period. Baseline depression was not significantly related to rearrest outcomes. Youth reporting lower parental

education, youth who were formally processed, and Black and Latino youth were at greater risk of being rearrested, regardless of their baseline offending frequency or mental health symptoms. Self-reported offending trajectories covaried with rearrest outcomes such that youth who were not rearrested evinced greater declines offending after their first arrest.

Discussion

Mental health problems such as anxiety and depression are common in the juvenile justice system (Dierkhising et al., 2013), tend to increase at each stage of system processing (Wasserman et al., 2010), and have been linked to continued offending into adulthood (Reising, Ttofi, Farrington, & Piquero, 2019). Despite the high symptom burden among justice-involved youth and the potential relevance of mental health for healthy rehabilitation, very little research has examined how anxiety and depression change after youth enter the justice system, and—importantly—how symptom trajectories may be related to re-offending patterns over time. Results from the current study indicate that anxiety and depression change alongside offending behaviors in male adolescents after their first arrest, such that greater improvements in mental health relate to greater decreases in offending, and vice versa. These findings highlight the intertwined nature of internalizing symptoms and externalizing behaviors in adolescence and underscore the importance of considering mental health in studies of juvenile recidivism.

Trajectories of internalizing symptoms among justice-involved youth

While the high prevalence of internalizing disorders among youth in the justice system has been well established in the current literature (Atkins et al., 1999; Dierkhising et al., 2013; Lemos & Faísca, 2015; Schubert, Mulvey, & Glasheen, 2011; Teplin, Abram, McClelland, Dulcan, & Mericle, 2002; Vermeiren, 2003; Wasserman, McReynolds, Schwalbe, Keating, & Jones, 2010), less is known about how subclinical internalizing symptoms change once youth enter the system, or how individual differences may influence symptom trajectories over time. In the current sample of 1,216 male adolescent first-time offenders tracked over five years, we report initial decreases in anxiety and depression following first arrest followed by an increase in symptoms a few years later.

The initial decline in anxiety and depression observed in this sample was contrary to our hypotheses; we had hypothesized increases in internalizing symptoms over time, as the prevalence of mood and anxiety disorders increases from adolescence into young adulthood (Merikangas et al., 2010), and youth in the justice system may be especially affected. However, the uptick in symptom severity we observed after the initial decline suggests that justice system involvement may influence symptom trajectories and relate to worsening symptoms as youth continue developing. Furthermore, youth were assessed every six months for the first 3 years of study participation, after which interviews were spaced annually. As the uptick in symptom severity occurred around the time that interviews were spaced further apart, it is possible that frequent check-ins through study participation had a positive effect on mental health, and greater changes occurred once visits were spaced more infrequently.

Despite significant group-level trajectories in internalizing symptom development over the 5-year period, there was significant variability in starting points and growth of both anxiety and depression across participants. Individual differences in demographic factors played a role in this variability: at baseline, older youth reported higher baseline anxiety but not depression, replicating previous work suggesting that youth in transition from adolescence to young adulthood may be at higher risk for anxiety disorders (Abuse, 2012; Teplin et al., 2002; Zajac et al., 2015). On the other hand, justice system processing was related to baseline depression but not anxiety such that youth who were formally processed after their first arrest experienced more depression symptoms at baseline. Poorer neighborhood quality was associated with greater severity in both anxiety and depression, which is in line with previous work highlighting that neighborhood disorganization and exposure to violence can increase risk for mental health problems in adolescents (Kerig, Ward, Vanderzee, & Arnzen Moeddel, 2009). Black youth also reported lower baseline depression than White youth, and Black and Latino youth demonstrated greater linear declines in depression than White youth over time. When interpreting these results, it is important to be mindful that ethnic minority youth may face additional burdens to reporting and receiving treatment for mental health concerns (Planey, Smith, Moore, & Walker, 2019), and further research is needed to probe the mechanisms driving internalizing symptom development within diverse populations. Consideration of key demographic variables such as age and neighborhood context will be crucial for identifying at-risk youth. Mental health screenings, especially for older youth who report worse living conditions, may help target limited mental health resources toward those most in need. Providing such support can help improve mental health, which may lead to improved justice system outcomes as well.

Trajectories of offending behaviors among justice-involved youth

In addition to symptoms of anxiety and depression, youth also reported on their frequency of engaging in a variety of criminal offending behaviors at each study timepoint. Over the five years following their first arrest, youth reported steep initial declines in self-reported offending behavior, but an uptick in offending a few years later. This overall decline in offending is hopeful and suggestive of justice system involvement deterring recidivism; these results are also in line with recent work showing declines in juvenile offending, particularly for males (Becker, Kerig, Lim, & Ezechukwu, 2012; Snyder & Office of Justice Programs, 2008). However, just as with the internalizing results, the increase in offending observed years after first arrest could signify the negative impact of extended time in the juvenile justice system.

Despite these significant group patterns in offending behaviors over time, there was significant variability in starting points and growth of offending across participants. Greater offending at baseline was associated with smaller declines in offending over time, suggesting that offending frequency at the time of first arrest may be predictive of fluctuations in offending over the following years. Numerous demographic factors were related to baseline levels of offending and offending trajectories in the current sample: worse neighborhood quality and higher parental education were associated with greater baseline offending, while Black and Latino (compared to White) youth and youth in Pennsylvania (compared to California) evinced lower baseline offending. Developmental trends emerged

in offending trajectories such that older youth demonstrated greater declines in offending following first arrest. This replicates prior work suggesting that youth who are arrested at a young age more likely to recidivate than older youth (Becker et al., 2012) and highlights the unique challenges facing youth who enter the justice system at an earlier developmental stage. Offending trajectories also showed differences based on justice system processing: youth who were formally processed showed less declines in offending after first arrest. As with the internalizing results, the significant relationships between demographic variables and offending trajectories suggest that individualized attention is crucial for supporting justice-involved youth.

It is notable that poor neighborhood quality was related to higher baseline anxiety, depression, and offending. Justice-involved youth often live in disorganized neighborhoods with high rates of poverty and violence that increase their risk for developing mental health problems in adolescence and influence criminogenic outcomes (Gorman-Smith & Loeber, 2005; Ingoldsby & Shaw, 2002; Kirk, 2008). While worse neighborhood quality was related to higher baseline levels of anxiety, depression, and offending in this sample, it did not directly influence mental health or offending trajectories over time, suggesting that neighborhood quality may be especially important for youth development prior to entering the juvenile justice system. This is in line with previous work suggesting that middle childhood may be a sensitive period for effects of neighborhood context on youth development (Ingoldsby & Shaw, 2002) and highlights a need for community-based care for youth living in disorganized or dangerous neighborhoods.

Cross-domain associations between mental health and offending

In the current sample of participants, internalizing symptoms and offending behaviors were positively correlated at time of first arrest such that youth displaying higher baseline levels of anxiety and depression also showed high levels of offending at baseline. After accounting for individual differences in demographic factors, offending frequency at baseline predicted development of both anxiety and depression symptoms over the following five years such that those who offended the most at baseline showed less declines in internalizing symptoms after first arrest. In contrast, neither baseline anxiety nor baseline depression was associated with change in offending behaviors over time, suggesting that while high baseline offending may directly impact some aspects of internalizing symptom development, baseline internalizing symptoms do not directly predict offending development. Prior work examining the directionality in the relationship between offending and internalizing has similarly demonstrated that, for males adolescents specifically, earlier offending behaviors predict later depression symptoms (Jolliffe et al., 2019; Kim, Gilman, Kosterman, & Hill, 2019) and anxiety symptoms (Jolliffe et al., 2019) rather than the inverse. Our results also highlight the importance of screening across multiple dimensions of mental health as our observed relationships were specific to depression and not anxiety, though this may vary across youth.

Anxiety, depression, and offending were positively associated in the current sample at baseline; even further, internalizing symptoms and offending behaviors fluctuated together over time such that greater declines in offending were mirrored by greater declines in

internalizing, and vice versa. While previous work examining the association between internalizing symptoms and risk-taking behaviors in adolescence is mixed, the positive relationships between anxiety, depression, and offending over time suggests that increases in anxiety and depression were associated with increases in offending. Factors such as poor neighborhood quality have been associated with both recidivism and internalizing disorders, which could indicate that such demographic factors may account for the association between externalizing and internalizing problems. However, the associations between internalizing and offending observed in this sample remained even when accounting for demographic factors, indicating that the associations between internalizing symptoms and offending behaviors were not solely due to outside influences.

The concurrent development of internalizing symptoms and offending behaviors observed in this sample suggests that the mental health needs of justice involved youth are inextricable from their rehabilitation needs. These findings give further support for the consideration of mental health needs within the risk-needs-responsivity framework, by considering mental health symptoms in conjunction with other factors relating to recidivism. By treating mental health concerns alongside criminogenic concerns, practitioners can address factors that might otherwise preclude sufficient engagement in treatments addressing criminogenic needs (McCormick, Peterson-Badali, & Skilling, 2015) leading to potential reductions in recidivism rates and time to recidivism (Zeola, Guina, & Nahhas, 2017). In addition, even if treatment for mental health concerns does not directly reduce recidivism, supporting healthy mental health development is an important goal in and of itself (Jolliffe et al., 2019), and is crucial for youth rehabilitation and well-being in the transition from adolescence into adulthood.

Previous research among serious adolescent offenders has found no direct association between mental health symptoms and risk for rearrest in male youth (El Sayed et al., 2016; Schubert et al., 2011). However, among the current sample of male adolescents arrested for moderate crimes, higher anxiety at baseline was associated with decreased risk for rearrest, while higher offending at baseline was associated with increased risk for rearrest over the 5-year study period. This suggests that among youth arrested for moderate crimes, baseline anxiety symptoms may serve to assist in avoiding arrest—perhaps due to a fear of punishment. On the other hand, depression symptoms at baseline were not associated with risk of rearrest over the study period, suggesting that baseline depression may not play a role in future rearrest over and above baseline offending behaviors.

Perhaps unsurprisingly, individual differences in offending trajectories were also associated with youth rearrest outcomes in this sample: youth who were rearrested at least once demonstrated greater offending at baseline and showed the smallest declines in offending behaviors over time. This association warrants further investigation into the factors driving recidivism in this subset of rearrested youth and suggests that the level of involvement youth have with the juvenile justice system may relate to changes in their tendency to offend. As this study only examined male juvenile offenders, it is unclear whether other genders would demonstrate the same pattern.

Even after accounting for individual differences in offending frequency and mental health symptoms, multiple demographic variables predicted risk of rearrest. Specifically, youth with lower parental education, Black and Latino youth, and youth who were formally processed were at higher risk of being rearrested at least once over the study period. Of note, lower parental education and race/ethnicity were related to lower offending at baseline, yet still predicted risk of rearrest. These findings highlight multiple types of disparities within justice system involvement, as youth from low-income backgrounds and minority youth are more likely to be rearrested, even after accounting for offending behaviors. Further, this suggests that formal processing may not effectively reduce recidivism in juvenile offenders.

It is important to acknowledge the limitations of the current study. Firstly, as this study consisted of an all-male cohort, we cannot generalize these results to other genders. Furthermore, anxiety and depression were measured via self-report as opposed to full clinical interviews, and therefore should not be used to diagnose clinical anxiety and depression. Nevertheless, youth in the juvenile justice system—and especially males—report more symptoms via self-report compared to clinical interviews (Vermeiren, Jespers, & Moffitt, 2006), suggesting that data from clinical interviews may underestimate youths' symptom burden. Relatedly, while youth were ensured that their records would remain anonymous and protected from law enforcement subpoena through a Certificate of Confidentiality, it is possible that youth did not disclose the full extent of their offending for fear of punishment. Finally, previous research has implicated factors in driving mental health problems and later re-offending; however, in this study, we do not probe factors mediating this process, and therefore cannot speak to the mechanisms driving changes in mental health and offending at each time point.

While model fit statistics in the current study indicated that a model with both linear and quadratic growth factors fit the data best, it is also important to mention the downsides of including quadratic growth in models of development. Including both linear and quadratic growth factors in the model can make results more difficult to interpret, as both the linear and quadratic slopes affect the rate of change in different ways and at different timepoints (Grimm, Ram, & Hamagami, 2011). Therefore, the linear and quadratic growth factors and associated results should be interpreted simultaneously. Future work using more fine-tuned modeling may more accurately capture developmental change.

This project advances past work by examining both internalizing and externalizing trajectories in youth after their first arrest. The analytic framework allows us to examine how internalizing symptoms and offending behaviors change together over time, rather than focusing exclusively on the predictive validity of either, as is typically done in the literature. Here, we showcase the reciprocal relationship between internalizing and offending in adolescence and highlight that even amongst male offenders—who typically express fewer internalizing symptoms than female offenders—subclinical internalizing symptomatology may increase risk for recidivism, even after accounting for relevant demographic factors. Taken together, these results underscore the importance of considering both mental health and criminogenic concerns in decisions regarding how youth are treated in the juvenile justice system and highlight the importance of addressing the mental health needs of youth in order to reduce their risk for future antisocial behavior and offending.

Acknowledgements:

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Figure 1.
Trajectories of anxiety following youths' first arrest. A) Conditional anxiety growth model. Note: only covariates with significant effects are shown. Hood = neighborhood quality; BL = baseline; FU = follow-up; μ = estimated mean derived from model. *p < .05, **p < .01, ***p < .001. B) Visual depiction of anxiety symptoms over time. Grey lines depict individual growth trajectories in anxiety with the average group trajectory overlayed in black.

Figure 2.
Trajectories of depression following youths' first arrest. A) Conditional depression growth model. Note: only covariates with significant effects are shown. Hood = neighborhood quality; Process = formal processing; BL = baseline; FU = follow-up; μ = estimated mean derived from model. Reference group for race: White. *p < .05, **p < .01, ***p < .001. B) Visual depiction of depression symptoms over time. Grey lines depict individual growth trajectories in depression with the average group trajectory overlayed in black.
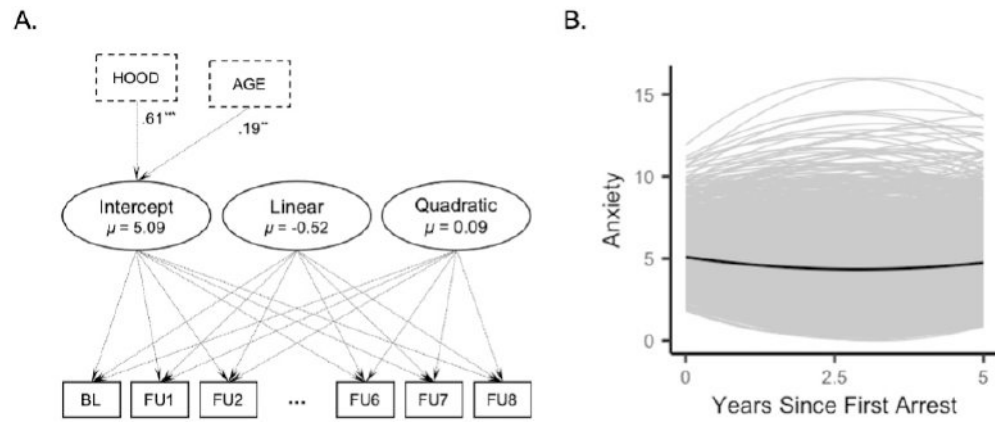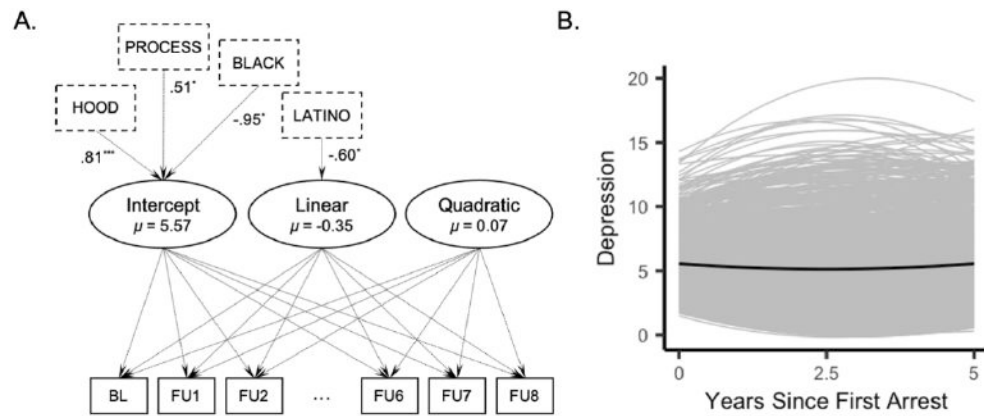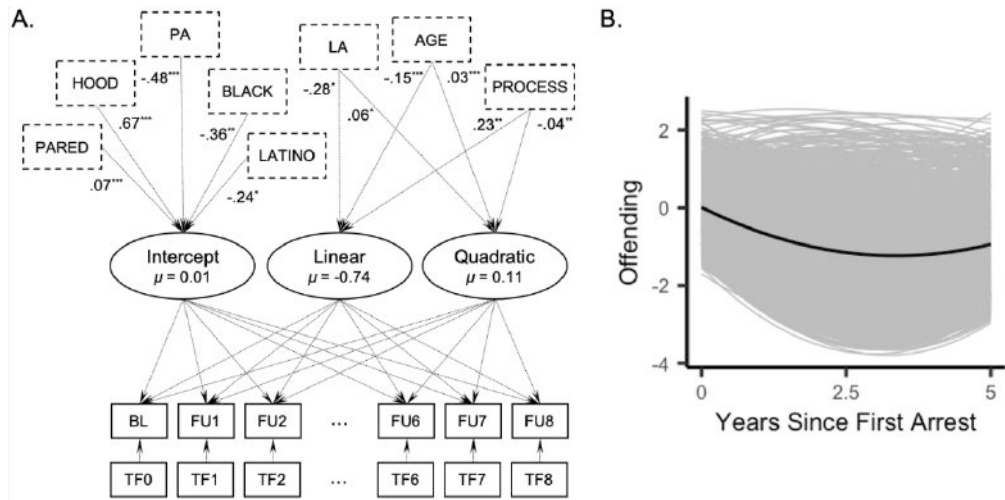
Figure 3.
Trajectories of offending following youths' first arrest. A) Conditional offending growth model. Note: only covariates with significant effects are shown. Pared = parental education; Hood = neighborhood quality; PA = Pennsylvania; LA = Louisiana; Process = formal processing; BL = baseline; FU = follow-up; TF = time in facility; μ = estimated mean derived from model. Reference groups for data collection site and race: California and White. *p < .05, **p < .01, ***p < .001. B) Visual depiction of offending behaviors over time. Grey lines depict individual growth trajectories in depression with the average group trajectory overlayed in black.
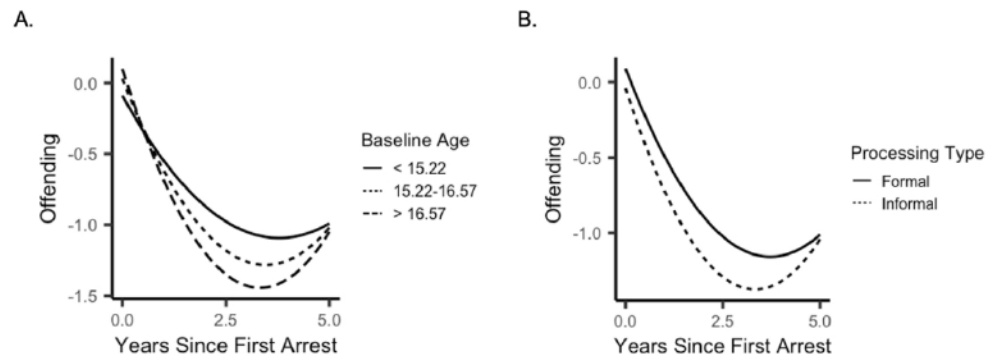
Figure 4.
Average offending trajectories by age group and processing type. A) Visual depiction of offending trajectories by age group at baseline. Older participants demonstrated greater declines in offending after first arrest. B) Visual depiction of offending trajectories by processing type. Informal processing predicted more declines in offending after first arrest.
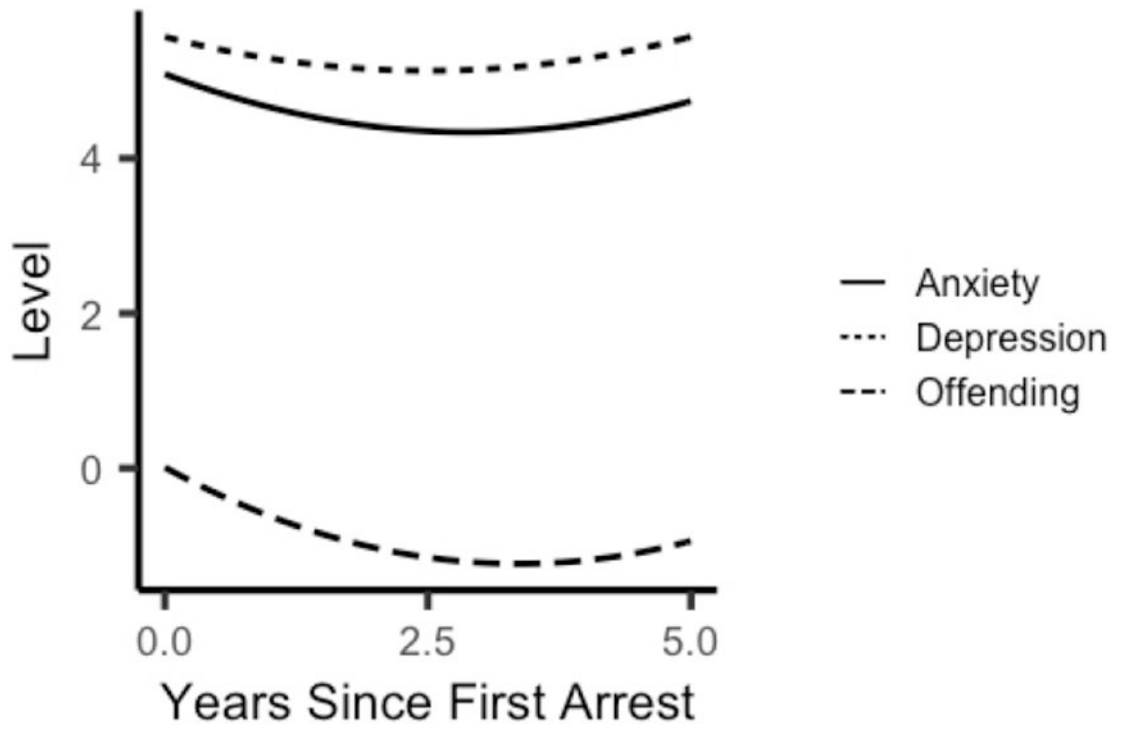
Figure 5.
Average group trajectories of anxiety, depression, and offending.
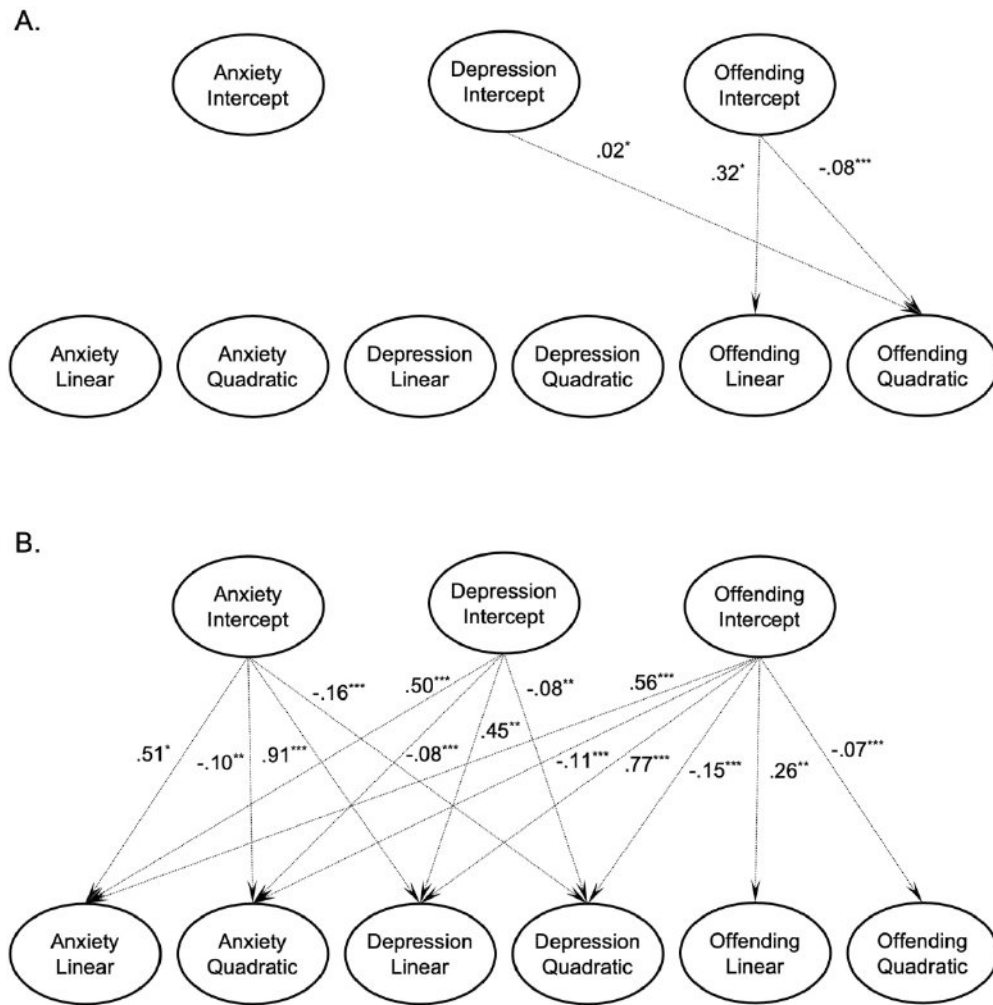
Figure 6.

Cross-domain associations between the intercepts and slopes for anxiety, depression, and offending before and after accounting for demographic covariates. A) Before accounting for demographic covariates, levels of offending at baseline predict development of offending behaviors, while levels of depression at baseline predict quadratic growth in offending. B) After accounting for demographic covariates, levels of offending at baseline predict development of offending behaviors and anxiety and depression symptoms over time, while levels of anxiety and depression at baseline only predict development of anxiety and depression over time. Note: only significant paths are shown. *p < .05, **p < .01, ***p < .001.
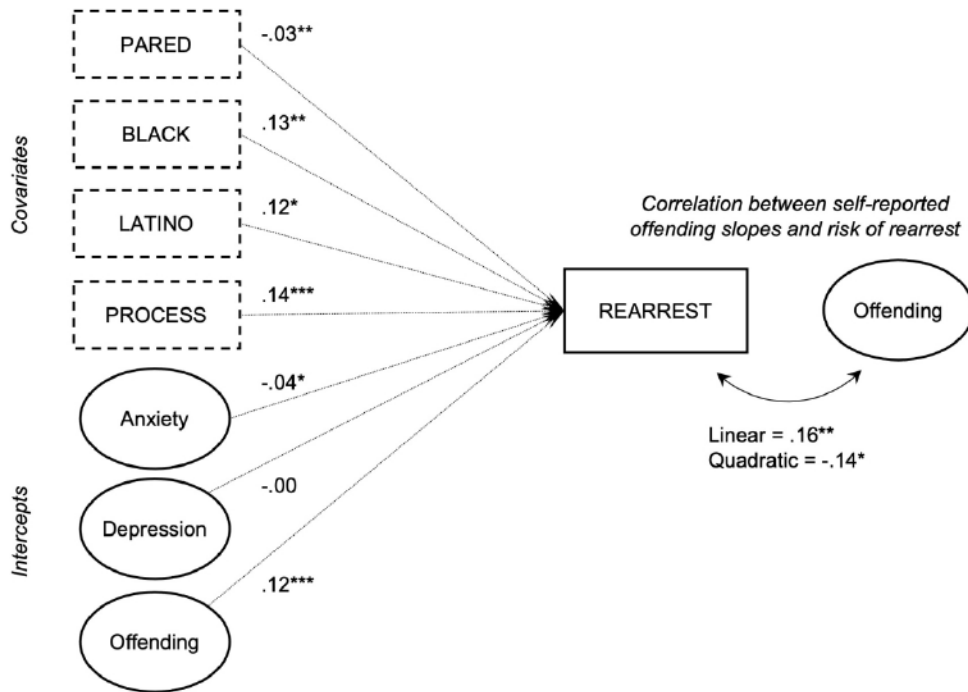
Figure 7.
Predictors of youth rearrest over the study period. Youth reporting lower parental education, youth who were formally processed, and Black and Latino youth were at higher risk of being rearrested. Higher baseline offending predicted higher risk of rearrest, while higher baseline anxiety predicted lower chance of rearrest. Changes in self-reported offending behaviors over time were associated with rearrest risk such that youth who were rearrested during the study period also showed less declines in offending after their first arrest. Note: only covariates with significant effects are shown. Pared = parental education; Process = formal processing. Reference group for race: White. *p < .05, **p < .01, ***p < .001.

Table 1.

Participant descriptive statistics

	Mean (SD)	Frequency (%)
Age at baseline	15.80 (1.28)	
Neighborhood quality	2.07 (0.68)	
Parental education		
Completed high school		719 (61.7)
Pursued further education		447 (38.3)
Race/ethnicity		
White		180 (14.8)
Black		449 (36.9)
Latino		557 (45.8)
Other		30 (2.5)
Data collection site		
California		532 (43.8)
Pennsylvania		533 (43.8)
Louisiana		151 (12.4)
Processing type		
Formal		547 (45)
Informal		669(55)
Official rearrest records		
Rearrested once		637 (52.4)
Not rearrested		579 (47.6)
Anxiety		
Baseline	5.25 (3.73)	
Follow-up 1	4.74 (3.61)	
Follow-up 2	4.65 (3.61)	
Follow-up 3	4.47 (3.62)	
Follow-up 4	4.44 (3.62)	
Follow-up 5	4.44 (3.60)	
Follow-up 6	4.28 (3.59)	
Follow-up 7	4.67 (3.93)	
Follow-up 8	4.75 (3.96)	
Depression		
Baseline	5.80 (4.66)	
Follow-up 1	5.27 (4.46)	
Follow-up 2	5.35 (4.66)	
Follow-up 3	5.14 (4.56)	
Follow-up 4	5.08 (4.52)	
Follow-up 5	5.29 (4.84)	
Follow-up 6	5.09 (4.94)	
Follow-up 7	5.45 (5.18)	

	Mean (SD)	Frequency (%)
Follow-up 8	5.49 (4.92)	
Self-reported offending		
Baseline	1.49 (2.12)	
Follow-up 1	1.39 (2.26)	
Follow-up 2	1.20 (2.22)	
Follow-up 3	1.01 (1.98)	
Follow-up 4	0.91 (1.93)	
Follow-up 5	0.88 (1.97)	
Follow-up 6	0.79 (1.83)	
Follow-up 7	0.88 (1.83)	
Follow-up 8	0.91 (1.70)	

Table 2.

Correlations between main study variables at each timepoint

	Estimate	S.E.	p-value
Anxiety with Depression:			
Baseline	.555	0.016	.000
Follow-up 1	.623	0.015	.000
Follow-up 2	.623	0.014	.000
Follow-up 3	.635	0.014	.000
Follow-up 4	.646	0.014	.000
Follow-up 5	.665	0.014	.000
Follow-up 6	.677	0.012	.000
Follow-up 7	.699	0.012	.000
Follow-up 8	.642	0.015	.000
Anxiety with Offending:			
Baseline	.070	0.022	.001
Follow-up 1	.270	0.022	.000
Follow-up 2	.257	0.023	.000
Follow-up 3	.229	0.026	.000
Follow-up 4	.279	0.022	.000
Follow-up 5	.250	0.025	.000
Follow-up 6	.230	0.025	.000
Follow-up 7	.272	0.024	.000
Follow-up 8	.219	0.023	.000
Depression with Offending:			
Baseline	.084	0.024	.000
Follow-up 1	.295	0.021	.000
Follow-up 2	.257	0.023	.000
Follow-up 3	.181	0.024	.000
Follow-up 4	.232	0.025	.000
Follow-up 5	.228	0.025	.000
Follow-up 6	.234	0.023	.000
Follow-up 7	.245	0.026	.000
Follow-up 8	.290	0.025	.000

Table 3.

Unconditional anxiety growth model

	Estimate	S.E.	p-value
Intercept			
Mean	5.092^A	0.092	.000
Variance	4.335^B	0.441	.000
Linear slope			
Mean	-0.518^C	0.072	.000
Variance	1.472^B	0.281	.000
Quadratic slope			
Mean	0.093^D	0.014	.000
Variance	0.050^B	0.010	.000
Linear slope with:			
Intercept	0.304^E	0.286	.287
Quadratic slope with:			
Intercept	-0.108^E	0.051	.036
Linear slope	-0.249^E	0.052	.000

*A.*Average value of anxiety when Time = 0.

*B.*Does the parameter vary significantly across individuals?

*C.*Average linear change in anxiety for one year of Time.

*D.*Average quadratic change in anxiety for one year of Time.

*E.*Covariance between growth factors.

Table 4.

Unconditional depression growth model

	Estimate	S.E.	p-value
Intercept			
Mean	5.571^A	0.113	.000
Variance	7.060^B	0.674	.000
Linear slope			
Mean	-0.348^C	0.090	.000
Variance	2.565^B	0.434	.000
Quadratic slope			
Mean	0.069^D	0.017	.000
Variance	0.091^B	0.016	.000
Linear slope with:			
Intercept	0.637^E	0.428	.136
Quadratic slope with:			
Intercept	-0.159^E	0.077	.040
Linear slope	-0.448^E	0.081	.000

[A.] Average value of depression when Time = 0.

[B.] Does the parameter vary significantly across individuals?

[C.] Average linear change in depression for one year of Time.

[D.] Average quadratic change in depression for one year of Time.

[E.] Covariance between growth factors.

Table 5.

Unconditional offending growth model

	Estimate	S.E.	p-value
Intercept			
Mean	0.013^A	0.042	.756
Variance	0.863^B	0.066	.000
Linear slope			
Mean	-0.743^C	0.051	.000
Variance	0.638^B	0.075	.000
Quadratic slope			
Mean	0.108^D	0.011	.000
Variance	0.021^B	0.003	.000
Linear slope with:			
Intercept	0.157^E	0.051	.002
Quadratic slope with:			
Intercept	-0.043^E	0.010	.000
Linear slope	-0.109^E	0.014	.000
Offending on Time in Facility			
Baseline	2.036	0.711	.004
Follow-up 1	1.087	0.289	.000
Follow-up 2	0.534	0.173	.002
Follow-up 3	0.192	0.170	.260
Follow-up 4	−0.044	0.182	.807
Follow-up 5	0.057	0.182	.755
Follow-up 6	−0.096	0.253	.704
Follow-up 7	0.606	0.273	.027
Follow-up 8	−0.077	0.234	.742

[A.] Average value of offending when Time = 0.

[B.] Does the parameter vary significantly across individuals?

[C.] Average linear change in offending for one year of Time.

[D.] Average quadratic change in offending for one year of Time.

[E.] Covariance between growth factors.

Table 6.

Conditional anxiety growth model

	Estimate	S.E.	p-value
Mean when covariates = 0^G			
Intercept	5.406	0.288	.000
Linear slope	−0.425	0.230	.065
Quadratic slope	0.086	0.043	.047
Intercept on:			
Age	0.187	0.072	.009
Neighborhood quality	0.612	0.148	.000
Parental education	−0.048	0.046	.297
Formal processing	−0.140	0.185	.447
Data collection site			
Pennsylvania	−0.509	0.272	.061
Louisiana	−0.099	0.344	.774
Race/ethnicity			
Black	−0.139	0.311	.656
Latino	0.096	0.297	.746
Other	−0.422	0.617	.492
Linear slope on:			
Age	−0.025	0.057	.667
Neighborhood quality	0.005	0.118	.963
Parental education	0.015	0.036	.689
Formal processing	0.177	0.147	.227
Data collection site			
Pennsylvania	0.035	0.217	.873
Louisiana	−0.158	0.275	.567
Race/ethnicity			
Black	−0.208	0.248	.403
Latino	−0.222	0.237	.348
Other	0.370	0.485	.446
Quadratic slope on:			
Age	−0.011	0.011	.297
Neighborhood quality	0.002	0.022	.913
Parental education	−0.004	0.007	.601
Formal processing	−0.009	0.028	.758
Data collection site			
Pennsylvania	0.004	0.041	.919
Louisiana	0.015	0.052	.769
Race/ethnicity			
Black	0.018	0.047	.699
Latino	0.006	0.045	.887

	Estimate	S.E.	p-value
Other	−0.104	0.091	.253

*A.*Age, parental education, and neighborhood quality are centered at the group mean. Reference group for categorical variables: Site: California, Race: White.

Table 7.

Conditional depression growth model

	Estimate	S.E.	p-value
Mean when covariates = 0[G]			
Intercept	6.101	0.356	.000
Linear slope	0.177	0.289	.539
Quadratic slope	−0.008	0.054	.886
Intercept on:			
Age	0.020	0.089	.819
Neighborhood quality	0.812	0.183	.000
Parental education	0.055	0.057	.333
Formal processing	0.508	0.228	.026
Data collection site			
Pennsylvania	−0.446	0.336	.183
Louisiana	−0.180	0.425	.673
Race/ethnicity			
Black	−0.949	0.384	.014
Latino	−0.393	0.367	.284
Other	−0.506	0.762	.507
Linear slope on:			
Age	0.044	0.072	.544
Neighborhood quality	0.087	0.147	.553
Parental education	−0.010	0.046	.829
Formal processing	−0.135	0.184	.462
Data collection site			
Pennsylvania	0.038	0.273	.890
Louisiana	−0.001	0.345	.998
Race/ethnicity			
Black	−0.556	0.311	.074
Latino	−0.595	0.297	.045
Other	−0.103	0.607	.866
Quadratic slope on:			
Age	−0.018	0.013	.185
Neighborhood quality	−0.015	0.028	.576
Parental education	0.002	0.009	.830
Formal processing	0.034	0.035	.331
Data collection site			
Pennsylvania	0.005	0.051	.927
Louisiana	−0.001	0.065	.990
Race/ethnicity			
Black	0.089	0.059	.127
Latino	0.060	0.056	.278

	Estimate	S.E.	p-value
Other	−0.041	0.114	.722

A. Age, parental education, and neighborhood quality are centered at the group mean. Reference group for categorical variables: Site: California, Race: White.

Table 8.

Conditional offending growth model

	Estimate	S.E.	p-value
Mean when covariates = 0 [A]			
Intercept	0.410	0.105	.000
Linear slope	−0.822	0.114	.000
Quadratic slope	0.115	0.023	.000
Intercept on:			
Age	0.047	0.027	.080
Neighborhood quality	0.671	0.055	.000
Parental education	0.071	0.017	.000
Formal processing	0.121	0.069	.080
Data collection site			
Pennsylvania	−0.479	0.102	.000
Louisiana	0.077	0.115	.504
Race/ethnicity			
Black	−0.363	0.110	.001
Latino	−0.240	0.110	.029
Other	−0.327	0.235	.163
Linear slope on:			
Age	−0.148	0.031	.000
Neighborhood quality	−0.092	0.056	.101
Parental education	0.006	0.019	.765
Formal processing	0.232	0.076	.002
Data collection site			
Pennsylvania	−0.048	0.110	.662
Louisiana	−0.281	0.138	.042
Race/ethnicity			
Black	−0.006	0.120	.963
Latino	0.054	0.110	.624
Other	0.337	0.224	.132
Quadratic slope on:			
Age	0.025	0.006	.000
Neighborhood quality	0.008	0.012	.489
Parental education	−0.001	0.004	.855
Formal processing	−0.042	0.015	.005
Data collection site			
Pennsylvania	0.035	0.021	.092
Louisiana	0.057	0.027	.033
Race/ethnicity			
Black	−0.011	0.023	.645
Latino	−0.013	0.022	.540

	Estimate	S.E.	p-value
Other	−0.066	0.041	.106

A. Age, parental education, and neighborhood quality are centered at the group mean. Reference group for categorical variables: Site: California, Race: White.

Table 9.

Estimated covariance and residual covariance matrices for the slope growth factors

		Linear			Quadratic		
		Anx	Dep	Off	Anx	Dep	Off
Linear	Anx	1.45***					
	Dep	1.41***	2.53***				
	Off	0.57***	0.67***	0.54***			
Quadratic	Anx	−0.25***	−0.26***	−0.09***	0.05***		
	Dep	−0.23***	−0.44***	−0.10***	0.05***	0.09***	
	Off	−0.10***	−0.13***	−0.10***	0.02***	0.02***	0.02***

A. Estimated covariance matrix. Anx = anxiety; Dep = depression; Off = offending. ***$p < .001$.

		Linear			Quadratic		
		Anx	Dep	Off	Anx	Dep	Off
Linear	Anx	−0.49					
	Dep	1.22	−0.70				
	Off	0.32*	0.41*	0.56***			
Quadratic	Anx	0.08	0.19	−0.051†	0		
	Dep	0.21	0.11	−0.061†	−0.03	0	
	Off	−0.07*	−0.10**	−0.09***	0.01*	0.02*	0.02***

B. Estimated residual covariance matrix. Anx = anxiety; Dep = depression; Off = offending. †**** $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 10.

Estimated correlation and residual correlation matrices for the slope growth factors

		Linear			Quadratic		
		Anx	**Dep**	**Off**	**Anx**	**Dep**	**Off**
Linear	*Anx*	1					
	Dep	0.74***	1				
	Off	0.64***	0.58***	1			
Quadratic	*Anx*	−0.92***	−0.73***	−0.55***	1		
	Dep	−0.65***	−0.93***	−0.46***	0.75***	1	
	Off	−0.68***	−0.65***	−0.94***	0.65***	0.59***	1

A. Estimated correlation matrix. Anx = anxiety; Dep = depression; Off = offending. *** $p < .001$

		Linear			Quadratic		
		Anx	**Dep**	**Off**	**Anx**	**Dep**	**Off**
Linear	*Anx*	1					
	Dep	0.52***	1				
	Off	0.53***	0.47***	1			
Quadratic	*Anx*	−0.91***	−0.58***	−0.43***	1		
	Dep	−0.48***	−0.93***	−0.45***	0.64***	1	
	Off	−0.55***	−0.55***	−0.94***	0.52***	0.49***	1

B. Estimated residual correlation matrix. Anx = anxiety; Dep = depression; Off = offending. *** $p < .001$.