Do Correctional Facilities Correct Our Youth?: Effects of Incarceration and Court-Ordered Community Service on Personality Development

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Abstract

Millions of individuals are currently incarcerated in the United States. However, little is known about the effects of incarceration on personality development, particularly during the critical life stage of adolescence. In a large longitudinal sample, adolescents and young adults ($N = 7,736$) regularly completed personality measures and assessments of court-ordered punishments over more than ten years. Using propensity score weighting and multilevel growth curve modeling, we found that personality prospectively predicted the likelihood of incarceration and court-ordered community service. Specifically, individuals who were higher in sensation seeking, impulsivity, and depressive symptoms were more likely to be incarcerated—results for community service youth mostly mirrored these findings. Mixed evidence was found for patterns of trait change. Incarcerated, community service, and non-offending youth were similar in several ways—all increased on sensation seeking and self-esteem and decreased on impulsivity over the 10-year period. However, between-person models found that incarcerated youth evidenced a greater decrease in depressive symptoms and a slower decrease in impulsivity, and youth assigned community service increased more quickly on sensation seeking than their non-offending peers. Within-person analyses also suggested personality differences, for example, sensation seeking was lower after incarceration while impulsivity was higher compared to before. Overall, this work highlights that personality predicts incarceration and court-ordered community service in youth and that personality changes linked with these experiences do not have a uniformly “corrective” pattern of change, with few effects observed overall and some in seemingly unfavorable directions.

Keywords: incarceration, community service, personality development

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A substantial portion of the United States population is incarcerated relative to people living in other parts of the world. In 2015, roughly 2 million individuals in the US were incarcerated in adult correctional facilities with another nearly 5 million on probation or parole (Kaeble, Glaze, Tsoutis, & Minton, 2016; US Bureau of Statistics, 2015). Adolescents are a particularly vulnerable population engaged with the criminal justice system, with the juvenile justice system handling approximately 1 million delinquency cases each year (Office of Juvenile Justice and Delinquency Prevention, 2020). Adolescence is a period with great implications for the judicial system, as researchers have noted the cognitive and emotional developments during this time influence whether individuals are capable of making reasoned decisions about their potentially illegal actions (Steinberg, 2005; Steinberg & Cauffman, 1996). Adolescence is also a developmental period wherein individuals are experiencing great fluctuations in self-concept and self-understanding (Klimstra, 2013; Meeus, 2016), and, thus, the role of social institutions may be greater with respect to an individual's personality and character development. Interaction with the juvenile justice system has well-documented life-long consequences in terms of labor and marriage markets (Charles & Luoh, 2010; Huebner, 2005; Kling, 2006). Less well known though are the psychological consequences of serving time during a formative developmental period.

The present study sought to understand the impact that experiences with correctional system institutions during adolescence have on personality development. Specifically, we examined both the predictive role of personality traits—specifically sensation seeking, impulsivity, depressive symptoms, and self-esteem—for being incarcerated or assigned

community service in adolescence, and how these traits may change following these experiences using a large, prospective, longitudinal design.

As we review below, past literature suggests four possible developmental trajectories among adolescents assigned incarceration or community service relative to their non-offending peers. *Normative maturation* posits that individuals assigned incarceration or community service will experience typical personality development. *Rehabilitation* posits that individuals assigned incarceration or community service, likely starting with unsatisfactory personality trait levels (e.g., higher impulsivity), will recalibrate to the personality levels of their non-offending peers. *Arrested development* posits that incarceration or community service individuals will experience no changes in their personality. Finally, *retrogression* posits that individuals assigned incarceration or community service will experience disruption in personality maturation, such as potential increases in impulsivity.

Adolescent Personality Development

Adolescence is an important period for self and identity development (e.g., Meeus, 2016). Critical progression of identity formation and narrative identity takes place as people advance through adolescence (Erikson, 1950; Klimstra, 2013; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2010). These developments can be seen as broadly adaptive for the transition to becoming an adult. In general, as people age into adulthood, their personalities can be described as becoming more mature and socially desirable, presumably a result of societal pressures toward trait profiles that lead to success in adult roles, such as work, marriage, and community engagement (Roberts, Wood, & Caspi, 2008). Indeed, mean-level increases in conscientiousness, agreeableness, and emotional stability are typically evidenced as individuals progress through

young adulthood into middle adulthood (e.g., Bleidorn, Klimstra, Denissen, Rentfrow, Potter, & Gosling, 2013; Roberts & Mroczek, 2008).

Though developmental literature suggests greater “maturation” from adolescence into adulthood, studies also characterize adolescence as a period of increased risk-taking and impulsivity (Romer, 2010). These patterns fit with studies that find little evidence for mean-level increases on maturity-related traits during adolescence (e.g., Hill, Allemand, Grob, Peng, Morgenthaler, & Käppler, 2013; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009), and even some suggestion of “disruption” in the form of modest declines on maturity-relevant traits during the adolescent years (Göllner, Roberts, Damian, Lüdtke, Jonkmann, & Trautwein, 2017; Soto, John, Gosling, & Potter, 2011; Soto & Tackett, 2015). Although studies suggest that adolescence may be a period of increasing emotional stability (Klimstra et al., 2009), research also points to adolescence as a period of potential risk for increases in depressive symptoms (Lewinsohn, Hops, Hyman, Seeley, & Andrews, 1993) and self-esteem issues (Harter, 2006; Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002). Indeed, multiple longitudinal studies suggest that self-esteem levels may decline during adolescence (e.g., Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991) though this is not always the case (Orth, Erol, & Luciano, 2018).

In sum, these studies seem to paint a picture of adolescence as a developmental period with increased variability in the likelihood of sensation seeking, impulsivity, depressive symptoms, and self-esteem issues. Put simply, individual differences are evident with respect to personality development during adolescence. What drives these developmental differences is less well known, though one possibility comes from the literature on delinquency, which has frequently considered these personality factors.

Does Personality Predict Incarceration or Community Service?: Selection Effects

A large body of literature identifies personality traits as risk factors for engaging in delinquent behaviors. For instance, across a slew of studies, impulsivity has been positively associated with criminal behaviors and arrests (Bechtold, Cavanagh, Shulman, & Cauffman, 2014; Burt, Sweeten, & Simons, 2014; Carroll, Hemingway, Bower, Ashman, Houghton, & Durkin, 2006; Dåderman, Wirsén, & Hallman, 2001; Gatti, Tremblay, & Vitaro, 2009; Krueger, Shmutter, Caspi, Moffitt, Campbell, & Silva, 1994; Sharma, Markon, & Clark, 2014; White, Moffitt, Caspi, Jeglum, Bartusch, Needles, & Stouthamer-Loeber, 1994). These findings may reflect that impulsive individuals are less likely to plan and think through consequences (e.g., theft, vandalism) and instead focus on immediate benefits over long-term considerations (Gottfredson & Hirschi, 1990), and that they will engage in activities that promote delinquent behavior (e.g., alcohol abuse, drug use). Similar to impulsivity, higher levels of sensation seeking have also been associated with more self-reported reckless and criminal behaviors among adolescents and young adults (Burt & Simons, 2013; Burt, Sweeten, & Simons, 2014). There is also evidence that in adolescence higher sensation-seeking scores predict later delinquent behavior (e.g., physically harming others, stealing, skipping school), but that greater delinquent behavior does not reliably predict higher sensation-seeking, hinting at a possible causal link between the two (Harden, Quinn, & Tucker-Drob, 2012). Notably, research suggests that sensation-seeking and impulsivity are stronger predictors of antisocial behaviors (e.g., stealing, damaging property, being arrested) than are other personality traits, like the Big Five (Mann et al., 2017).

Depressive symptoms in the general adolescent population are also related to an increased tendency to participate in delinquent behaviors (Beyers & Loeber, 2003; Chen & Simons-Morton, 2009; Kofler, McCart, Zajac, Ruggiero, Saunders, & Kipatrick, 2011; Wiesner

& Kim, 2006), and this is also true within juvenile justice populations (Mallett, Dare, & Seck, 2009). Among juvenile offenders, as many as 50% have reported moderate to severe depression via self-report measures (Domalanta, Risser, Roberts, & Risser, 2003; Ryan & Redding, 2004), with very few receiving treatment. Work on non-clinical levels also suggests that people experiencing depression, especially adolescent boys, are more likely to engage in aggressive behaviors (Dutton & Karakanta, 2013). Similar to depressive symptoms, research suggests that low self-esteem in adolescence is modestly associated with criminal behavior concurrently and longitudinally (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Mason, 2001; Mier & Ladny, 2018; Trzesniewski, Donnellan, Moffitt, Robins, Poulton, & Caspi, 2006). Various theories suggest that lower self-esteem weakens ties to societal norms and increases aggressive tendency, therefore increasing delinquent behaviors (Donnellan et al., 2005).

A central question remains, though, about the extent to which personality constructs should be viewed as predictors of later involvement in the criminal justice system (selection effects) or as developing in response to delinquent behavior in general or the social structures of the criminal justice system (socialization effects). It is necessary to disentangle these selection and socialization effects in order to develop interventions to reduce delinquent action before involvement in the justice system and also for understanding the potential for rehabilitation as a result of involvement with the justice system. To make these claims, studies must consider the multifarious constructs that impact an individual's likelihood for involvement in the juvenile justice system. Clearly several environmental, sociodemographic, and psychosocial factors impact likelihood for justice system engagement, and without accounting for these, biases will occur in the estimation of the selection effect of personality, as well as the extent to which personality changes due to involvement. Even though some studies above provide evidence for

selection effects, such findings may be more preliminary in nature without a full accounting of background variables. Moreover, limited work has considered socialization effects, which are essential to the discussion of whether correctional facilities in fact “correct” the proclivities that led youth to delinquency in the first place.

Does Incarceration Influence Personality Change in Adolescence?: Socialization Effects

Underscoring that the intent of most correctional facilities is to promote adjustment and positive self-change, the Federal Bureau of Prisons has as one of its missions to “provide work and other self-improvement opportunities to assist offenders in becoming law-abiding citizens” (Federal Bureau of Prisons, 2020). This mission suggests prison is not intended to be just a holding pen, but that incarceration should provide an intervention to improve the character and outcomes of its residents in order to one day adjust back to society. This *rehabilitation* emphasis would suggest that incarcerated youth who generally start off with a disadvantage should “catch up” with non-incarcerated youth, which is explicit in the phrase *correctional* facilities. However, the majority of prisoners return to prison following release within three years of their release (Durose, Cooper, & Snyder, 2014). Accordingly, it is worth considering whether correctional facilities do, in fact, serve as catalysts for personality change, which, if true, would in turn presumably reduce recidivism.

Correctional systems seemingly have several of the components likely essential for social institutions to enact personality change. Theories of personality change suggest that environments may press individuals into changing their traits in order to promote success in the given setting (Roberts & Jackson, 2008). Personality traits may also change as a consequence of social roles and relationships (Bleidorn et al., 2013; Lodi-Smith & Roberts, 2007). People’s personalities are thought to change in response to the expectations and demands of others

because people learn which behaviors are rewarded and which are punished in a context, eventually leading to long-term shifts in behavior. By definition, one would expect correctional systems to provide clear evidence of which behaviors are rewarded versus punished by society, which in turn should change the personality traits that are aligned with those punished behaviors (e.g., impulsivity, sensation seeking).

An analogous situation worth considering in this context is military experience. Though enlisting in the military differs from entry into correctional facilities insofar that military service is typically the individual's choice (at least currently in the United States), among other differences, both institutions drastically change the day-to-day lived environment of the person. Further, both provide clear directives regarding punished and rewarded behavior, and often involve a disproportionate number of adolescents and young adults relative to middle-to-older adults. Accordingly, it is valuable to note that past work has shown lasting effects of military service on personality change across a five-year period (Jackson, Thoemmes, Jonkmann, Lüdtkke, & Trautwein, 2012).

Regarding whether and how much impact incarceration has on personality development, it is valuable to consider the degree of influence that other experiences appear to have on personality change. On the one hand, a meta-analysis examining the impact of clinical interventions on personality change found that these interventions on average had a moderate influence on personality traits in as little as 8 weeks, with much larger rates of change for emotional stability (Roberts, Luo, Briley, Chow, Su, & Hill, 2017). This finding is particularly relevant for the current work, given that emotional stability is connected to all four constructs examined herein, particularly with respect to depressive symptoms. On the other hand, seemingly life-changing experiences have been shown to have modest impact on personality

development. For instance, entering parenthood has been shown to hold little-to-no long-term impact on personality change (Bleidorn et al., 2016; Denissen et al., 2018; van Scheppingen, Denissen, & Bleidorn, 2018; van Scheppingen, Jackson, Specht, Hutteman, Denissen & Bleidorn, 2016). As such, even major life role changes that radically influence individuals' responsibilities and daily activities may not hold much lasting impact on personality development. Given that incarceration provides an example of both a clinical intervention of sorts, and a significant change in roles and responsibilities, the literature is equivocal regarding whether this event may hold a lasting impact on personality development.

If incarceration has an influence on personality development, it is not clear which characteristics would be influenced, or even the direction of changes to expect. Despite the promise of a reward structure that promotes good behaviors and punishes bad behaviors, social learning theories emphasize that contact with others who hold positive beliefs about crime will maintain or further develop the character profile of a delinquent youth (Capece, 2015; Dobrow, 2015; Warr, 2002). That is, incarcerated youth may be encouraged to continue behaviors that involve criminal activities because their peers have similarly engaged in them (Bayer, Hjalmarsson, & Pozen, 2009). This suggests that incarceration may perpetuate higher levels of impulsivity and sensation seeking, two traits that predict criminal activity in the first place (Bechtold, Cavanagh, Shulman, & Cauffman, 2014; Burt & Simons, 2013), and possibly increase them, a process we will term *retrogression*, wherein the personality of incarcerated youth will experience the opposite of maturation or will “worsen.”

Not only might the environment and social interactions within a correctional facility influence personality development, but one also needs to consider the absence of environments that would have been otherwise typically experienced by adolescents. Adolescents traditionally

experience significant changes in employment and romantic relationships, in addition to the social and educational experiences that come with high school (Connolly & McIsaac, 2009; Graber, Brooks-Gunn, & Petersen, 1996; U.S. Department of Labor, 2000). These experiences are linked with increases in social maturation personality traits like impulse control (Bleidorn et al., 2013; Brandt, Mike, & Jackson, 2019), and their absence in the lives of incarcerated youth may stunt the typical personality development of adolescents and young adults. As incarceration withdraws or hinders adolescents from experiencing typical social roles like jobs and romantic relationships, social investment theory predicts incarcerated individuals will not mature at the rate of their non-incarcerated peers (Lodi-Smith & Roberts, 2007; Roberts, Wood, & Smith, 2005). General strain theory also emphasizes the role that missed opportunities can have on the emotional well-being of incarcerated youth, due to the discrepancy between what one has and what one should have (Agnew, 1992; Agnew, 2001). As many freedoms and opportunities are withheld while incarcerated, self-esteem and depression may experience *retrogression*, or in other words, be negatively impacted by the experience of incarceration due to missing out on these experiences.

Post-release, stigma surrounding their period of incarceration may continue to prevent people from participating in experiences such as employment. Past work generally supports a criminogenic effect of incarceration—that is, the harmful, negatively reinforcing nature of incarceration (Nagin, Cullen, & Jonson, 2009). Acquiring the label of “delinquent” or “incarcerated youth” may cement their personality or further encourage a less socially mature, delinquent personality (Bernburg & Krohn, 2003).

Few studies have longitudinally examined the impact of incarceration on personality traits. Indeed, it is possible that when statistically accounting for individual differences between

youth who are incarcerated and those who are not, that they both show typical, *normative maturation* of their personality that comes with the shift from adolescence to young adulthood. However, one study that comes close to effectively studying the socialization effects of incarceration longitudinally examined male adolescents who had been adjudicated of a crime, and its findings suggest that normative maturation is not the case (Dmitrieva, Monahan, Cauffman, & Steinberg, 2012). As a sample, male adolescents increased in psychosocial maturity, but spending time in a secure facility slowed the development of temperance, psychosocial maturity, and responsibility. In other words, their maturation was stunted, providing support for the *arrested development* pattern of psychosocial change. However, these effects were relatively short-term and are in comparison with the developmental trajectories of fellow adolescents who were adjudicated but not incarcerated. To understand the more long-term impact of incarceration on personality, it is necessary to include a more diverse sample (e.g., male and female adolescents) and to compare incarcerated youth to non-delinquent youth.

Does Court-Ordered Community Service Influence Personality Change in Adolescence?:

Socialization Effects

Incarceration may be the most commonly thought of form of punishment for individuals interacting with the juvenile justice system. However, there are alternative forms of punishment to consider, including court-ordered community service. Court-ordered community service typically involves having individuals complete a set number of hours of volunteering, as dictated by a judge overseeing their case (Bazemore & Maloney, 1994).

Past research suggests that the effects of community service in the general population are seemingly positive across a host of individual differences (Moore & Allen, 1996). Youth engaged in community service have shown lower rates of course failure, school suspension,

pregnancy, and school dropout, and better reading grades and self-concept than control groups. Psychological benefits include reduced feelings of isolation and greater self-esteem, self-acceptance, competence, responsibility, and reliability. When it comes to completing court-ordered community service, though, previous work is somewhat mixed; that said, it mostly suggests that community service is associated with lower recidivism rates compared to imprisonment, with a few studies showing no differences (Bouffard & Muftic, 2006; Killias, Aebi, & Ribeaud, 2000; Klement, 2015; Muiluvuori, 2001; Schneider, 1986; Wermink, Blokland, Nieuwbeerta, Nagin, & Tollenaar, 2010). Taken together, court-ordered community service appears to promote a mature, socially responsible individual, suggesting a *rehabilitation* pattern of personality development, or at minimum, a pattern of *normative maturation*. However, this work does not directly speak to the influence of court-ordered community service on personality development.

Although our focus is on how youth who experience the juvenile justice system differ from those who do not, it is helpful to note how community service is linked to personality development in order to gain a more holistic picture of the justice system's role in youth personality change and to build arguments for the different impacts that incarceration and community service may have on personality development. Whereas incarceration hinders adolescents from fully experiencing typical social roles like jobs and romantic relationships that promote maturation (Lodi-Smith & Roberts, 2007; Roberts et al., 2005), community service permits youth to stay integrated within their family, school, and community. Remaining integrated makes it more likely that normative experiences of high school, work, and relationships occur, which can have important implications on personality development (Bleidorn et al., 2013; Lehnart, Neyer, & Eccles, 2010). Completing community service also

allows for prosocial behaviors to be reinforced, which may encourage the development of a psychosocially mature personality. As such, investigations into the influence of community service, as well as incarceration, provides further clarity on whether personality development for these youth better reflect *rehabilitation* or *normative maturation* patterns.

Present Study

The present study examines personality and the experiences of incarceration and court-ordered community service in adolescence. Specifically, using a national, demographically diverse sample of 7,736 youth from the United States, we assess to what extent adolescent sensation seeking, impulsivity, depressive symptoms, and self-esteem predict incarceration and court-ordered community service. Further, we examine to what extent incarceration and court-ordered community service may influence the development of these traits in youth.

This is the first study to our knowledge that employs propensity score weighting to examine the personality development of incarcerated and court-ordered community service youth. To best infer the impact of incarceration and court-ordered community service on personality, random assignment to these experiences would be ideal. Considering logistical, practical, and ethical reasons, this is not possible. However, by using propensity score weighting, we are able to equate participants who were incarcerated or assigned court-ordered community service with those who experienced neither across a wide range of background variables, mimicking random assignment and the strengths of experimental design. Although non-experimental, controlling for many background variables provides a better description of how the experiences of incarceration and court-ordered community service (and not pre-existing conditions) correspond to personality and personality development compared to models that do not account for background factors.

First, we examine what personality traits predict involvement with the juvenile justice system, specifically spending time in a correctional facility and assignment to court-ordered community service (*selection effects*). Past research on personality and delinquent behaviors suggests that higher sensation seeking, impulsivity, and depressive symptoms, as well as lower self-esteem, will predict involvement with the juvenile justice system (Bechtold et al., 2014; Burt & Simons, 2013; Donnellan et al., 2005; Mallett et al., 2009). We do not make specific predictions regarding personality differences between whether that involvement is incarceration or court-ordered community service.

Second, we examine how the experiences of incarceration and court-ordered community service may affect *between-person* differences in the personality development of individuals (*socialization effects*). We propose four possibilities.

1. *Normative maturation*. Incarceration and community service individuals will experience personality development similar to the rest of the sample (i.e., no group differences in slopes).
2. *Rehabilitation*. Incarceration and community service individuals will “catch up” with the rest of the sample. That is, given that incarcerated and community service youth should start off with a disadvantage (higher sensation seeking, impulsivity, depressive symptoms; lower self-esteem), their slopes will be steeper such that by young adulthood, they will be indistinguishable from their peers.
3. *Arrested development*. Incarceration and community service individuals will experience no changes in sensation seeking, impulsivity, self-esteem, and depressive symptoms. That is, whereas other youth in the sample will show maturation (decreases in sensation

seeking, impulsivity, depressive symptoms; increases in self-esteem), they will show a flat line.

4. *Retrogression*. Incarceration and community service individuals' personalities will show the opposite of maturation or will "worsen." That is, sensation seeking, impulsivity, and depressive symptoms will increase, and self-esteem will decrease.

Third, we examine how the experiences of incarceration and court-ordered community service may affect *within-person* differences in personality development. These socialization effects complement and expand upon the between-person differences in trajectories by testing differences prior and post event (within incarceration or community service groups).

In addition to these three primary aims, in a set of exploratory analyses, we examine whether a host of demographic and life experience variables (e.g., corporal punishment, welfare) moderate changes in personality traits among adolescents assigned incarceration, community service, or neither.

Given the mixed literature described above, we do not make specific predictions for group differences in personality development. However, theories in psychology, sociology, and criminology do mostly suggest that incarceration will have negative effects on personality development—either through arrested development or retrogression patterns of development (e.g., Agnew, 2001; Bleidorn et al., 2013; Capece, 2015). If community service is indeed a positive experience as previous literature suggests, community service individuals should in contrast follow normative maturation or rehabilitation development (e.g., Moore & Allen, 1996). A preregistration of our hypotheses and analysis plan can be found on the Open Science Framework (<https://osf.io/vdpxf/>).

Methods

Participants

Participants were 7,736 US Americans who participated in the U.S. Bureau of Labor Statistics' (BLS) National Longitudinal Study of Youth (NLSY79) Children and Young Adults Study (NLSCYA). The NLSY79 is an ongoing longitudinal, nationally representative survey of more than 12,500 adults. The NLSCYA includes the biological children of women in the NLSY79 sample, and these children were the primary participants in the present study. Assessment was biennial beginning in 1986. Children 10 years and older in 1988 completed individual interviews, and children 15 years and older were administered a separate “young adult” interview and response set. For children under 10 years, the children’s mothers also reported on their behavior and were interviewed. As of 2016, data on 11,521 children born to 6,283 NLSY79 women had been collected (Harden & Tucker-Drob, 2011). The National Longitudinal Surveys data are publicly available, and the data procedures comply with U.S. federal law and the policies and guidelines of the U.S. Office of Management and Budget (OMB) and the U.S. BLS. Institutional Review Boards at the institutions that manage and conduct the surveys under contract with BLS also oversee the study. Those institutions are The Ohio State University and NORC at the University of Chicago. For a list of other publications using this expansive dataset, see <https://www.nlsinfo.org/bibliography-start>. Our analyses are unique from previous publications in that we examine personality development among youth who have been incarcerated or assigned court-ordered community service—past studies using the NLSCYA have not used this combination of variables. More information about the NLSCYA data is available at <https://www.nlsinfo.org/content/cohorts/nlsy79-children>.

The present study included data from a subsample of 7,736 NLSCYA participants who had at least one wave of measurement for *each* of the following: weighting variables (see online

materials; partial data allowed), grouping variables (indicating incarceration, community service, or neither during adolescence), and personality variables (Sensation Seeking, Impulsivity, Depressive Symptoms, and Self-Esteem). Our sample size for the present study was determined by the number of participants meeting these criteria. Of those participants, 3,525 (46%) youth identified as White, 2,515 (33%) as Black, and the remaining 1,696 (22%) as another race. Because children were assessed biennially, we split the sample into the following age categories: 10-11 year-olds, 12-13 year-olds, 14-15 year-olds, 16-17 year-olds, 18-19 year-olds, 20-21 year-olds, 22-23 year-olds, and 24-25 year-olds. For Sensation Seeking and Impulsivity, 255 participants had only 1 wave of data, 780 had 2 waves, 2,355 had 3 waves, 2,555 had 4 waves, 1,516 had 5 waves, and 282 had 6 waves. For Depressive Symptoms, 190 participants had only 1 wave, 646 had 2 waves, 1,408 had 3 waves, 1,778 had 4 waves, 407 had 5 waves, 1,500 had 6 waves, 1,195 had 7 waves, 581 had 8 waves, and 30 had 9 waves. Finally, for Self-Esteem, 1,820 participants had only 1 wave, 2,308 had 2 waves, 3,143 had 3 waves, 446 had 4 waves, and 8 had 5 waves. Because participants were first assessed for Self-Esteem at age 10, Depressive Symptoms at age 12, and Impulsivity and Sensation Seeking at age 14, participants with more waves tended to be older. The average year of birth was 1985 for those with five waves and 1991 for those with one wave.

Materials

Weighting variables. Weighting variables included 58 variables created from composite measures of a variety of individual, maternal, and household-level characteristics collected prior to age 14. A full list of the raw NLSY79 and NLSCYA variable names and a full list of the variables and their computation is available in the online materials (<https://osf.io/vdpxf/>).

Weighting characteristics were chosen due to theoretical interest as they were likely associated

with personality, incarceration, or early life experiences. These variables ranged from background characteristics, like race and birth order, to cognitive performance, such as nationally norm-referenced math and reading achievement tests. For tests of socialization effects but not selection effects, Sensation Seeking, Impulsivity, Depressive Symptoms, and Self-Esteem at age 14 were also included as weighting variables.

Personality. For Sensation Seeking and Impulsivity, we used the same 3-item question sets used in previous research (Brandt et al., 2019; Harden & Tucker-Drob, 2011). These self-reports were completed by youth 14 years and older. Sensation Seeking was measured with the items “I enjoy taking risks,” “I enjoy new and exciting experiences, even if they are a little frightening or unusual,” and “Life with no danger in it would be too dull for me.” Impulsivity was measured with the items “I often get in a jam because I do things without thinking,” “I think that planning takes the fun out things,” and “I have to use a lot of self-control to keep out of trouble.” These items were rated on a 4-point scale from 1 (“strongly disagree”) to 4 (“strongly agree”) with higher scores indicating greater Sensation Seeking and Impulsivity. Although all 6 items were originally intended to be part of a scale measuring general risk-taking, previous research indicates minimal overlap between the 3-item Sensation Seeking measure and 3-item Impulsivity measure (Harden & Tucker-Drob, 2011). Cronbach’s α estimates ranged from 0.59 (age 10) to 0.72 (age 20) for the Sensation Seeking measure and from 0.47 (age 16) to 0.58 (age 24) for the Impulsivity measure.

Depressive Symptoms was assessed using 7 items from the Center for Epidemiologic Studies Depression (CES-D) Scale (Andresen et al. 1994). An example item includes “I felt depressed” and was answered on a 4-point scale from 0 (“Rarely or none of the time (< 1 day)”) to 3 (“Most or all of the time (5-7 days)”) with higher scores indicating greater Depressive

Symptoms. We created composite scores for each item at each age. Cronbach's α estimates ranged from 0.66 (age 14) to 0.71 (age 24).

Self-Esteem was assessed using the 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965). Example items included "I am a person of worth" and "I am inclined to feel like a failure." The measure included 5 positively and 5 negatively keyed items. Positively keyed items were reverse-scored such that higher scores on the scale indicated higher Self-Esteem. Participants responded to each item on a 4-point scale from 0 ("strongly agree") to 3 ("strongly agree"). Cronbach's α estimates ranged from 0.85 (age 14) to 0.88 (age 22; see Table S1).

The scale reliabilities for Sensation Seeking, Impulsivity, and Depressive Symptoms were somewhat low, but inter-item correlations are what is standardly found in personality measures during adolescence. See online materials for information on measurement equivalence for these four personality traits.

Incarceration and community service. Individuals were placed into groups depending on whether they were ever incarcerated during adolescence (*Incarcerated*; $n = 399$; 24% female) or participated in court-ordered community service during adolescence (*Community Service*; $n = 241$; 41% female). The matched controls completed neither from ages 14 to 18 (*Neither*; $n = 7,096$; 51% female). Individuals who had been incarcerated and had completed court-ordered community service were included in the incarceration group. Incarceration during adolescence was measured using a constructed measure of a respondent's residence in a survey year that indicated the residence was "jail." Community Service during adolescence was assessed using the item "WAS ANY OF VOLUNTEER WORK R[respondent] HAS DONE COURT ORDERED?" Other participants were placed into the Neither group if they indicated neither

incarceration nor court-ordered community service. These items were also used to identify when participants entered into incarceration or community service.

Analysis Plan

The analysis phase consists of three main parts, with interim steps to link these together: multiple imputation, propensity score weighting, and multilevel models. All analyses were preregistered on the Open Science Framework website except where identified¹.

First, we used multiple imputation (Hill, 2004) to impute missing data for the weighting variables (see the online materials for the full list). Before doing so, we first created composites of our weighting variables across early childhood. We did this because of irregularities in survey construction (e.g., response options changed formats across years, question inclusion changed across years, etc.). Zero-order correlations of all weighting variables are available in the online materials as Figure S1, and missing data plots are in Figures S2 and S3. To ensure transparency, we conducted all analyses using the raw data downloaded directly from the National Longitudinal Surveys Navigator website, and all steps necessary to create the composites are documented in a spreadsheet (see the online materials) containing the item lists, text, and scales. We imputed 10 datasets using these weighting variable composites for use in propensity score weighting, which requires completely non-missing data. Multiple imputation was conducted using the `mi` (Su, Gelman, Hill, & Yajima, 2010) package in R (R Core Team, 2017).

Second, we used the multiply imputed data to calculate propensity score weights for each of the multiply imputed datasets. We used propensity score weighting to try to equate our three

¹ Prior to our primary analyses presented here, we conducted preliminary latent growth curve analyses on the data. These analyses tested selection effects and socialization effects of only incarceration for only impulsivity and sensation-seeking. The authors who conducted the preliminary analyses were not those who conducted the main analyses in order to make tests as blind as possible. See the preregistration on OSF for additional information on these analyses.

groups in the sample: Incarceration, Community Service, or Neither (Rosenbaum & Rubin, 1983; Thoemmes & Kim, 2011). Because the sample sizes of the Incarceration and Community Service groups are much smaller than the Neither group and because we had three groups, we used propensity score weighting, not matching. Propensity score weighting was done using the `twang` package in R (Ridgeway, McCaffrey, Morral, Griffin, & Burgette, 2017). We used 3000 trees and a stop method based on the average effect size. After completing the propensity score weighting, we examined the balance tables. Of particular interest were those variables for which any of our groups showed increased differences after weighting, especially those with small unweighted effect sizes. These variables are candidates for dropping, but we retained them if they were of theoretical interest. Balance tables (Table S3) and plots (Figures S4-S6) are available in the online materials.

Third, we merged the propensity score weights with the outcome (personality) data for use in multilevel models.² Multilevel growth modeling was chosen because multilevel models are more appropriate when there is unequal spacing between measurement occasions. We ran two sets of models. The first tested between-person differences in linear trajectories across groups using growth curve models. The second tested the within-person effects of contact with the justice system (i.e., either incarceration or community service). Both used `lme4` package in R, which allowed us to specify weights for the model (Bates, Mächler, Bolker, & Walker, 2015).

For the first set of models, our time variable, age, was centered at age 14, with years from 14 divided by five in order to rescale the variable so the coefficients are more interpretable (e.g., 10-11 age group is coded $-2/5$ whereas the 18-19 age group is coded $4/5$). As a result, a one-unit change in the rescaled Age variable is equivalent to change over five years. In addition, the

² See Tables S4-S7 in the online materials for test-retest consistency over age groups, as well as means and standard deviations at each age for each construct.

Neither group was considered the reference group. The linear model of the 3-group multilevel growth curve model with random slopes and intercept is as follows:

Level 1: (1)

$$Y_{ij} = \beta_{0j} + \beta_{1j} * age14_c_{ij} + \varepsilon_{ij}$$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01} * Incarceration_j + \gamma_{02} * Community\ Service_j + U_{0j}$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} * Incarceration_j + \gamma_{12} * Community\ Service_j + U_{1j}$$

The second set of models was not preregistered whereas all the previous analyses were. For the second set of models, we ran separate models for the Incarceration and Community Service groups because of suspected convergence issues with multiple time-varying and group membership covariates. Our time variable was each person's wave in the study, centered at the average wave of contact with the criminal justice system, and we additionally included a time-varying covariate that captured pre- and post-contact timing for individuals who had contact with the system. The model is as follows:

Level 1: (2)

$$Y_{ij} = \beta_{0j} + \beta_{1j} * wave_c_{ij} + \beta_{2j} * Contact_{ij} + \beta_{3j} * wave_c_{ij} * Contact_{ij} + \varepsilon_{ij}$$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01} * ContactEver_j + \gamma_{02} * age_{c_j} + \gamma_{03} * ContactAvg_j + U_{0j}$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} * ContactEver_j + \gamma_{12} * age_c_j + U_{1j}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30},$$

where $wave_c_{ij}$ is the wave of study centered at the average wave of contact, $Contact_{ij}$ is coded as 0 for all waves before contact and 1 after (thus, always 0 for the No-Contact group), $ContactEver_j$ is a dummy coded variable coded as 0 if participant j never had contact with the system and 1 if they did, and $ContactAvg_j$ is the sum of waves post contact. To account for

between-person differences in time spent in the system, γ_{30} is the person-average level contact. The critical term is γ_{20} , which captures the pre-post change of the contact group after contact, at the average wave and age of contact.

The multilevel models were fit for each of the predictors for each of the 10 multiply imputed datasets. For the time-varying models, we fit the models separately for each contact group. Once both sets of models were fit, we used Rubin's Rules (Rosenbaum & Rubin, 1983) to pool fixed effects and random effect variance terms. Pooled individual-level random effects were calculated by taking the average across the datasets for each person individually. For each model, we pooled the Conditional and Marginal R^2 using the R package *MuMIn* (Bartoń, 2017). For each model, we present the averaged simple slopes and averaged intercepts for each group (Preacher, Curran, & Bauer, 2006).

Finally, we also tested a series of nine moderator variables (gender, race, death of a parent, corporal punishment, years of remedial education, welfare, parental divorce, self-reported level of school challenge, and self-reported satisfaction with schooling) to assess whether a number of factors moderate personality trajectories and pre-post change in adolescence. We did these for the between-person growth models and the within-person pre-post change models. Our between-person growth models were preregistered and the within-person pre-post change models were not. The models were identical to those reported previously but with additional moderator terms added at level 2 to capture how group differences in change and pre-post change varied as a function of the moderator variables. Because these analyses were exploratory, they will be briefly reported herein with full results in the online materials.

Results

Does Personality Predict Incarceration or Community Service?: Selection Effects

First, we tested whether there were group differences in personality at age 14 for individuals who ended up in the Incarceration, Community Service, or Neither groups for Sensation Seeking, Impulsivity, Depressive Symptoms, and Self-Esteem (see Table 1), both with and without weighting. Including the unweighted models as a comparison elucidates whether selection effects are attenuated when using the weighted-on-background-covariates sample. If both weighted and unweighted models show similar-sized effects, it suggests that there are no confounds that drive the association between personality and Incarceration or Community Service. Alternatively, background differences (e.g., home environment) associated with the likelihood of Incarceration or Community Service may influence both personality ratings (e.g., Self-Esteem) and Incarceration. If that is the case, then personality should not be thought of as a risk factor for future Incarceration and Community Service involvement.

Table 1

Unweighted and Weighted Effects of Baseline Personality at Age 14 on the Probability of Experiencing Incarceration or Community Service

Trait	Incarceration		Community Service	
	Unweighted OR [95% CI]	Weighted OR [95% CI]	Unweighted OR [95% CI]	Weighted OR [95% CI]
Sensation Seeking	1.39 [1.16, 1.67]	1.54 [1.30, 1.84]	1.43 [1.14, 1.80]	1.41 [1.16, 1.71]
Impulsivity	1.81 [1.49, 2.20]	1.37 [1.19, 1.58]	1.46 [1.15, 1.86]	1.07 [0.87, 1.30]
Depressive Symptoms	1.48 [1.13, 1.95]	1.64 [1.39, 1.94]	1.67 [1.20, 2.32]	1.48 [1.09, 2.02]
Self-Esteem	0.59 [0.41, 0.87]	0.81 [0.56, 1.15]	0.63 [0.39, 1.01]	1.20 [0.82, 1.76]

Note. The reference group was individuals neither in the Incarceration nor Community Service groups.

Bolded values represent estimated ORs whose CIs do not overlap with 1. OR = Odds ratio; CI = Confidence interval.

In the unweighted sample, Sensation Seeking (Incarceration: $OR = 1.39$, 95% CI [1.16, 1.67]; Community Service: $OR = 1.43$, 95% CI [1.14, 1.80]), Impulsivity (Incarceration: $OR = 1.81$, 95% CI [1.49, 2.20]; Community Service: $OR = 1.46$, 95% CI [1.15, 1.86]), and Depressive Symptoms (Incarceration: $OR = 1.48$, 95% CI [1.13, 1.95]; Community Service: $OR = 1.67$, 95% CI [1.20, 2.32]) were positive predictors of both Incarceration and Community Service (see Table 1). Self-Esteem predicted lower odds of Incarceration (Incarceration: $OR = 0.59$, 95% CI [0.41, 0.87]) but not Community Service (Community Service: $OR = 0.63$, 95% CI [0.39, 1.01]).

In the weighted models, Sensation Seeking (Incarceration: $OR = 1.54$, 95% CI [1.30, 1.84]; Community Service: $OR = 1.41$, 95% CI [1.16, 1.71]) and Depressive Symptoms (Incarceration: $OR = 1.64$, 95% CI [1.39, 1.94]; Community Service: $OR = 1.48$, 95% CI [1.09, 2.02]) predicted both Incarceration and Community Service. Impulsivity predicted higher odds of incarceration (Incarceration: $OR = 1.37$, 95% CI [1.49, 1.58]) but not Community Service (Community Service: $OR = 1.07$, 95% CI [0.87, 1.30]), and Self-Esteem predicted neither Incarceration (Incarceration: $OR = 0.81$, 95% CI [0.41, 1.15]) nor Community Service (Community Service: $OR = 1.20$, 95% CI [0.39, 1.76]).

Do Incarceration and Community Service Influence Personality Change in Adolescence?: Between-Person Socialization Effects

Next, we examined between-person socialization effects—that is, whether personalities of individuals in the Incarceration and Community Service groups changed differently than those in the Neither group. Table 2 presents the propensity score weighted group slopes for each personality change as well as the effect size of differences in slope change with the neither

group. The unweighted results are in the online materials³. To best describe the patterns of change over time and differences in those patterns across groups, we will provide the multilevel growth model coefficient estimates of differences in slopes between the Neither group and either the Incarceration (γ_{11}) or Community Service groups (γ_{12}) in Table 2, as well as the estimated slopes for each group derived either from model coefficients for the Neither group (γ_{01}) or linear combinations of model coefficients for the Incarceration ($\gamma_{10} + \gamma_{11}$) and Community Service ($\gamma_{10} + \gamma_{12}$) groups in the text and in Table 3.

Table 2

Differences in Mean Personality Trait Change for Incarceration, Court-Ordered Community Service, and Neither Participants

Trait	Neither vs. Incarceration		Neither vs. Community Service	
	γ_{11} [95% CI]	d	γ_{12} [95% CI]	d
Sensation Seeking	0.01 [-0.02, 0.03]	0.06	0.04 [0.00, 0.07]	0.35
Impulsivity	0.04 [0.01, 0.07]	0.48	0.02 [-0.01, 0.06]	0.28
Depressive Symptoms	-0.05 [-0.07, -0.02]	-0.36	0.01 [-0.02, 0.04]	0.08
Self-Esteem	0.01 [-0.02, 0.03]	0.05	0.02 [-0.00, 0.05]	0.21

Note. Results are for weighted models. The reference group was individuals neither in the Incarceration

and Community Service groups. Cohen's d s reflect the difference between groups, calculated by dividing the difference in mean slope between groups by the standard deviation of the random intercepts of Neither group personality scores at age 14. Bolded values represent estimated mean differences in change between groups whose CIs do not overlap with 0. CI = confidence interval.

³ In addition to weighted versus unweighted, we also include results where Cohen's d was calculated using raw baseline values versus model-estimated pooled values. Weighted models using raw baseline values are in Table S10, while unweighted models using model-estimated pooled values and raw values are in Tables S8 and S9, respectively. Model-estimated results on the random intercepts and slopes of the unweighted and weighted models are in Table S14. In addition, we also include raw baseline values, weighted random intercept values, and unweighted random intercept values broken down by Contact group in Table S16.

Table 3

Mean Personality Trait Change for Incarceration, Court-Ordered Community Service, and Neither Participants

Trait	Neither	Incarceration	Community Service
	γ_{10} [95% CI]	$\gamma_{10} + \gamma_{11}$ [95% CI]	$\gamma_{10} + \gamma_{12}$ [95% CI]
Sensation Seeking	0.02 [0.01, 0.03]	0.03 [0.00, 0.05]	0.06 [0.03, 0.09]
Impulsivity	-0.11 [-0.11, -0.10]	-0.07 [-0.09, -0.04]	-0.08 [-0.11, -0.05]
Depressive Symptoms	-0.02 [-0.02, -0.01]	-0.06 [-0.08, -0.04]	-0.00 [-0.03, 0.02]
Self-Esteem	0.05 [0.04, 0.05]	0.05 [0.03, 0.07]	0.07 [0.05, 0.10]

Note. Results are for weighted models. Neither group estimates are the γ_{10} term from the multilevel growth models, while Incarceration ($\gamma_{10} + \gamma_{11}$) and Community Service ($\gamma_{10} + \gamma_{12}$) group slope estimates and intervals are the linear combination of terms. Bolded values represent estimated slopes for each trait by group when CIs do not overlap with 0. CI = confidence interval.

Individuals in both the Incarceration and Community Service groups exhibited socialization effects. Relative to those in the Neither group (Neither slope *est.* = -0.11, 95% CI [-0.11, -0.10]), individuals in the Incarceration group (Incarceration slope *est.* = -0.07, 95% CI [-0.09, -0.04]) decreased less in Impulsivity. In addition, individuals in the Incarceration group decreased more in Depressive Symptoms than individuals in the Neither group, such that individuals in the Incarceration group decreased in Depressive Symptoms over adolescence (Incarceration slope *est.* = -0.06, 95% CI [-0.08, -0.04]), while individuals in the Neither group showed slower declines in Depressive Symptoms (Neither slope *est.* = -0.02, 95% CI [-0.02, -0.01]). At the same time, individuals in the Community Service group (Community Service slope *est.* = 0.06, 95% CI [0.03, 0.09]) increased in Sensation Seeking more than those in the Neither group (Neither slope *est.* = 0.02, 95% CI [0.01, 0.03]). There were no socialization effects for Self-Esteem for individuals in the Incarceration and Community Service groups. See Figure 1 for

a summary of these propensity score weighted mean-level changes by group, and Figure S11 in the online materials for unweighted mean-level changes across groups.⁴

⁴ Figures S13 and S14 in the online materials also include weighted and unweighted group trajectories along with a subset of random (participant-level) trajectories within each group.

Figure 1

Mean-Level Change in Personality Traits as a Function of Age (10 to 24) and Group (Incarceration, Community Service, and Neither).

Note. Point estimates and intervals are based on model predictions across groups and ages. 95% confidence band is included around each estimate.

Do Incarceration and Community Service Influence Personality Change in Adolescence?:

Within-Person Socialization Effects

Because previous analyses were focused on whether personality trajectories across adolescence differed for those who had contact with the criminal justice system relative to those who did not, we next tested how the timing of contact corresponded with levels of personality

characteristics (see Equation 2). Our goal with this approach was to examine *levels* of personality in the no-contact group who had no incarceration or community service contact with the justice system (No-Contact; γ_{00}) centered at the average age after contact, each contact group just before contact (Pre-Contact; $\gamma_{00} + \gamma_{01}$), and each contact group just after contact (Post-Contact; $\gamma_{00} + \gamma_{01} + \gamma_{20}$). The main comparison we were interested in was the pre-post level difference for those in contact with the criminal justice system (either Incarceration or Community Service; γ_{20}).⁵

Coefficient estimates of differences between pre- and post-contact and no contact levels are presented in Table 4, while full model estimates are presented in Table 5. Figure 2 presents the propensity score weighted trajectories for Pre-Contact and Post-Contact Incarceration and Community Service groups compared to the No-Contact group. The equivalent unweighted results are in Figure S12 and Table S9 in the online materials.

⁵ This model also included comparisons between the pre-contact level (i.e., before incarceration or community service) vs. no-contact average level (γ_{01}) to test pre-contact between-group differences, and between the post-contact level (i.e., after incarceration or community service) vs. no-contact level at average post-contact age ($\gamma_{01} + \gamma_{20}$) to test between-group differences after contact. See online materials for more on these results.

Table 4

Weighted Estimated Differences in Levels Between Groups and Across Contact Points at Average Age and Wave of Contact

Term	Sensation Seeking Difference	Impulsivity Difference	Depressive Symptoms Difference	Self-Esteem Difference
	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]
Incarceration				
Pre- vs. No-Contact (γ_{01})	0.22 [0.15, 0.28]	0.23 [0.17, 0.30]	0.03 [-0.07, 0.13]	-0.15 [-0.20, -0.09]
Post- vs. No-Contact ($\gamma_{01} + \gamma_{20}$)	0.14 [0.07, 0.22]	0.38 [0.31, 0.45]	0.10 [-0.00, 0.21]	-0.17 [-0.24, -0.11]
Pre- vs. Post-Contact (γ_{20})	-0.07 [-0.11, -0.03]	0.15 [0.11, 0.19]	0.07 [0.04, 0.11]	-0.02 [-0.06, 0.01]
Community Service				
Pre- vs. No-Contact (γ_{01})	0.12 [0.05, 0.19]	0.22 [0.15, 0.29]	0.15 [0.03, 0.26]	-0.21 [-0.27, -0.14]
Post- vs. No-Contact ($\gamma_{01} + \gamma_{20}$)	0.10 [0.02, 0.19]	0.14 [0.06, 0.22]	0.13 [0.01, 0.25]	-0.19 [-0.27, -0.12]
Pre- vs. Post-Contact (γ_{20})	-0.02 [-0.06, 0.02]	-0.09 [-0.13, -0.05]	-0.02 [-0.05, 0.01]	0.01 [-0.02, 0.05]

Note. The columns indicate estimated differences in average levels. The formula terms in parentheses are the part of the equation that corresponds to the estimated difference reported on that row. The "Pre- vs. No-Contact" row indicates the difference between the no contact and contact groups at the average age and wave of contact before contact, "Post- vs. No-Contact" indicates the difference between the no contact and contact groups after contact, and the "Pre- vs. Post-Contact" row indicates differences in the contact group before and after contact. Bold values in the Difference Column indicate 95% confidence intervals do not overlap with 0. CI = confidence interval.

Table 5*All Weighted Coefficients for Within-Person Growth Models*

Term	Sensation Seeking	Impulsivity	Depressive Symptoms	Self-Esteem
	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]
Incarceration				
Intercept				
No Contact (γ_{00})	2.56 [2.54, 2.58]	2.23 [2.21, 2.25]	0.66 [0.65, 0.68]	3.26 [3.25, 3.27]
No Contact vs. Contact (γ_{01})	0.22 [0.15, 0.28]	0.23 [0.17, 0.30]	0.03 [-0.07, 0.13]	-0.15 [-0.20, -0.09]
Pre-Post Contact (γ_{20})	-0.07 [-0.13, -0.02]	0.15 [0.08, 0.21]	0.07 [0.02, 0.13]	-0.02 [-0.06, 0.02]
Slope				
No Contact (γ_{03})	-0.00 [-0.01, -0.00]	-0.02 [-0.02, -0.02]	-0.01 [-0.01, -0.01]	0.00 [0.00, 0.01]
No Contact vs. Contact (γ_{11})	0.02 [0.01, 0.03]	0.00 [-0.01, 0.01]	-0.00 [-0.01, 0.01]	0.01 [0.00, 0.02]
Pre-Post Contact (γ_{30})	-0.03 [-0.04, -0.02]	-0.02 [-0.03, -0.01]	-0.01 [-0.02, 0.00]	-0.01 [-0.02, 0.00]
Average Age at Contact x Time (γ_{12})	-0.00 [-0.00, -0.00]	-0.00 [-0.00, -0.00]	-0.00 [-0.00, 0.00]	-0.00 [-0.00, -0.00]
Covariate				
Average Age at Contact (γ_{02})	-0.01 [-0.01, -0.01]	-0.01 [-0.02, -0.01]	0.01 [0.00, 0.02]	0.01 [0.00, 0.02]
Cumulative Contact Time (γ_{03})	-0.01 [-0.03, 0.02]	-0.02 [-0.04, 0.01]	0.02 [-0.01, 0.04]	0.03 [0.01, 0.05]
Community Service				
Intercept				
No Contact (γ_{00})	2.56 [2.54, 2.58]	2.20 [2.18, 2.22]	0.65 [0.64, 0.66]	3.26 [3.25, 3.27]
No Contact vs. Contact (γ_{01})	0.12 [0.05, 0.19]	0.22 [0.15, 0.29]	0.15 [0.03, 0.27]	-0.21 [-0.27, -0.14]
Pre-Post Contact (γ_{20})	-0.02 [-0.09, 0.05]	-0.09 [-0.16, -0.01]	-0.02 [-0.07, 0.03]	0.01 [-0.04, 0.06]
Slope				
No Contact (γ_{03})	-0.00 [-0.01, -0.00]	-0.02 [-0.02, -0.02]	-0.01 [-0.01, -0.01]	0.00 [0.00, 0.01]
No Contact vs. Contact (γ_{11})	0.01 [0.00, 0.03]	0.02 [0.01, 0.02]	-0.00 [-0.01, 0.01]	-0.00 [-0.01, 0.01]
Pre-Post Contact (γ_{30})	-0.02 [-0.04, -0.01]	-0.02 [-0.03, -0.01]	0.01 [0.00, 0.02]	0.01 [-0.00, 0.02]
Average Age at Contact x Time (γ_{12})	-0.00 [-0.00, -0.00]	-0.00 [-0.00, -0.00]	0.00 [-0.00, 0.00]	-0.00 [-0.00, -0.00]
Covariate				
Average Age at Contact (γ_{02})	-0.02 [-0.02, -0.01]	-0.01 [-0.02, -0.01]	0.01 [0.00, 0.02]	0.01 [0.00, 0.02]
Cumulative Contact Time (γ_{03})	0.00 [-0.03, 0.03]	-0.01 [-0.04, 0.02]	-0.00 [-0.03, 0.02]	0.04 [0.01, 0.06]

Note. Bolded values represent coefficients whose CIs do not overlap with 0. CI = confidence interval.

Figure 2

Trajectory of Change in Pre-Contact and Post-Contact for Incarceration and Community

Service Groups as Compared to the No-Contact Group Trajectory

Among those who made contact, the within-person change model allows us to examine changes in their personality level pre- and post-contact (Table 4). These within-person models identified a number of associations for both incarceration and community service. For example, individuals increased in Depressive Symptoms after being incarcerated (Post-Contact *est.* = 0.77, 95% CI [0.66, 0.87]) compared to their prior levels (Pre-Contact *est.* = 0.69, 95% CI [0.59, 0.80]). Similarly, impulsivity increased within-person for the incarcerated group (Pre-Contact *est.* = 2.46, 95% CI [2.39, 2.53]; Post-Contact *est.* = 2.61, 95% CI [2.53, 2.68]). In contrast, impulsivity was the only pre-post effect for community service, but in the opposite direction of incarceration. Individuals declined in impulsivity after completing Community Service (Post-Contact *est.* = 2.34, 95% CI [2.25, 2.42]) compared to their prior levels (Pre-Contact *est.* = 2.42, 95% CI [2.35, 2.50]).

What Moderates Personality Change Among Adolescents Who Experience Incarceration or Community Service?: Exploratory Analyses

Given individual differences in personality change over adolescence, we next tested a series of moderating variables to better understand these differing patterns in a set of exploratory analyses. First, we report moderators of linear personality change for both Incarceration and Community Service groups relative to those who experienced neither. That is, are certain experiences shared by a group associated with differences in personality change? Second, we report moderators of changes in personality immediately following contact with the criminal justice system within the Incarceration and Community Service groups. That is, are there factors that may mitigate or exaggerate the effects of contact?

Because of the number of analyses performed, we will report all test statistics in tables and detail a smaller subset of them here. Also, given the number of exploratory analyses, results

should be interpreted with caution. More details on simple effects tables and figures are available in the online materials.

Moderators of Between-Person Personality Change

First, there were several moderators of propensity score weighted personality change differences across groups (see Table 6). The unweighted results are available in Table S17, and unweighted and weighted simple effects tables are available in Tables S18 and S19. Unweighted simple effects figures are Figures S51 to S59, and weighted simple effects are Figures S60 to S68. Of the 88 key comparisons (11 levels of moderators x 4 traits x 2 contact groups), 20 (22.7%) were significant. For example, race⁶, when defined as White vs. another race (Other), moderated differences in change in Sensation Seeking between the Neither group and both the Incarceration group ($\gamma_{15} = -0.12$, 95% CI [-0.18, -0.05]) and the Community Service group ($\gamma_{16} = -0.10$, 95% CI [-0.19, -0.02]). Individuals in the Other group (Incarceration, Other slope *est.* = -0.05, 95% CI [-0.14, 0.03]; Community Service, Other slope *est.* = -0.04, 95% CI [-0.15, 0.07])

⁶ The basic moderator model is an extension of the between-person growth model, with additional terms to capture differences in across groups and moderator levels as follows:

Level 1:

(3)

$$Y_{ij} = \beta_{0j} + \beta_{1j} * age14_c_{ij} + \epsilon_{ij}$$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01} * Inc_j + \gamma_{02} * CS_j + \gamma_{03} * Moderator_j + \gamma_{04} * Moderator_j * Inc_j + \gamma_{05} * Moderator_j * CS_j + U_{0j}$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} * Inc_j + \gamma_{12} * CS_j + \gamma_{13} * Moderator_j + \gamma_{14} * Moderator_j * Inc_j + \gamma_{15} * Moderator_j * CS_j + U_{1j}$$

, where the critical terms are γ_{14} and γ_{15} , which capture the differences in the difference between Neither and Incarceration and Community Service groups, respectively, across levels of the moderator.

The only exceptions to this are the race and death of parent moderators, which were three level nominal variables. Race was coded as 0 = White / Caucasian, 1 = Black / African American, 2 = Other, and death of a parent was coded as 0 = none, 1 = one, and 2 = two. This resulted in six additional model terms for intercepts (γ_{06} , γ_{07} , γ_{08}) and slopes (γ_{16} , γ_{17} , γ_{18}), with the critical terms being γ_{17} and γ_{18} , which capture differences in the difference between the Neither and Incarceration and Community Service groups, respectively, between the first and third levels of the moderator.

Thus, when estimates of group slopes are provided in text, they are linear combinations of model terms and will be descriptively labeled. As an example of the linear combinations, individuals in the Neither group at average levels of a continuous moderator would simply be γ_{10} , but individuals in the Neither group 1 standard deviation above the mean of a continuous moderator would be $\gamma_{10} + \gamma_{13}$. Similarly, individuals in the Incarceration group at average levels of a continuous moderator would be $\gamma_{10} + \gamma_{12}$, but individuals in the Incarceration group 1 standard deviation above the mean of a continuous moderator would be $\gamma_{10} + \gamma_{13} + \gamma_{12} + \gamma_{14}$.

decreased more in Sensation Seeking than White individuals (Incarceration, White slope *est.* = 0.05, 95% CI [-0.00, 0.11]; Community Service, White slope *est.* = 0.07, 95% CI [0.01, 0.14]). Race, when defined as White vs. Black, also moderated the differences in change between the Neither and Incarceration groups for Depressive Symptoms ($\gamma_{13} = 0.10$, 95% CI [0.04, 0.16], such that White individuals decreased in Depressive Symptoms regardless of contact (Incarceration, White slope *est.* = -0.10, 95% CI [-0.15, -0.05]; Neither, White slope *est.* = -0.02, 95% CI [-0.04, -0.00]), while Black individuals increased in Depressive Symptoms if they were incarcerated (Incarceration, Black slope *est.* = 0.10, 95% CI [0.02, 0.17]) and showed no change if they were not incarcerated (Neither, Black slope *est.* = 0.00, 95% CI [-0.02, 0.02]).

For individuals who were incarcerated, having a parent who received welfare was a consequential moderator of differences in change for all four personality traits (see Table 6). Specifically, individuals whose parents did not receive welfare and who were incarcerated were the only group who did not decrease in Impulsivity (Incarceration, No welfare slope *est.* = 0.02, 95% CI [-0.04, 0.07]), but those who did receive welfare and were incarcerated increased more (Incarceration, Welfare slope *est.* = -0.24, 95% CI [-0.31, -0.17]) than those who had no contact with the justice system, regardless of welfare (Neither, No welfare slope *est.* = -0.12, 95% CI [-0.13, -0.10]; Neither, Welfare slope *est.* = -0.11, 95% CI [-0.12, -0.09]). In addition, incarcerated individuals who received welfare increased more in Depressive Symptoms (Incarceration, Welfare slope *est.* = 0.06, 95% CI [-0.01, 0.12]) and Self-Esteem (Incarceration, Welfare slope *est.* = 0.13, 95% CI [0.08, 0.19]) than those who had no contact with the system, who instead decreased in Depressive Symptoms (Neither, No welfare slope *est.* = -0.03, 95% CI [-0.05, -0.01]; Neither, Welfare slope *est.* = -0.01, 95% CI [-0.03, -0.00]) and increased less in Self-Esteem (Neither, No welfare slope *est.* = 0.05, 95% CI [0.03, 0.07]; Neither, Welfare slope *est.* =

0.05, 95% CI [0.04, 0.06]). Finally, incarcerated individuals who received welfare (Incarceration, Welfare slope *est.* = -0.06, 95% CI [-0.13, 0.02]) were the only group, regardless of contact, who did not increase in Sensation Seeking (Incarceration, No welfare slope *est.* = 0.11, 95% CI [0.05, 0.17]; Neither, Welfare slope *est.* = 0.02, 95% CI [0.00, 0.03]; Neither, No welfare, slope *est.* = 0.05, 95% CI [0.03, 0.07]). As shown in Table 6, there were a small number of other statistically significant moderators, which are discussed in further detail in the online materials.

Table 6*Moderators of Between-Person Personality Change for Weighted Models*

Moderator	Groups	Sensation Seeking	Impulsivity	Depressive Symptoms	Self-Esteem
		<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]
Neither vs. Incarceration					
Sex	Male vs. Female	-0.04 [-0.10, 0.02]	0.05 [-0.01, 0.10]	-0.09 [-0.15, -0.03]	0.02 [-0.03, 0.07]
Race	White vs. Black	-0.01 [-0.07, 0.06]	0.02 [-0.04, 0.08]	0.10 [0.04, 0.16]	0.01 [-0.04, 0.06]
	White vs. Other	-0.12 [-0.18, -0.05]	-0.03 [-0.09, 0.04]	0.02 [-0.04, 0.08]	0.07 [0.02, 0.13]
Corporal Punishment	No vs. Yes	-0.01 [-0.07, 0.05]	0.03 [-0.03, 0.09]	0.00 [-0.06, 0.05]	-0.01 [-0.06, 0.04]
Remedial Education	Years	-0.01 [-0.07, 0.04]	0.03 [-0.03, 0.08]	0.00 [-0.06, 0.05]	0.01 [-0.04, 0.05]
Parent Died	None vs. One	0.06 [0.00, 0.12]	-0.03 [-0.08, 0.03]	0.04 [-0.01, 0.09]	-0.01 [-0.05, 0.03]
	None vs. Two	0.04 [-0.09, 0.18]	-0.04 [-0.17, 0.09]	-0.01 [-0.14, 0.13]	0.04 [-0.07, 0.15]
Welfare	No vs. Yes	-0.07 [-0.13, -0.01]	-0.13 [-0.19, -0.08]	0.07 [0.02, 0.13]	0.09 [0.04, 0.14]
Parental Divorce	No vs. Yes	0.02 [-0.04, 0.08]	0.02 [-0.03, 0.07]	0.01 [-0.05, 0.06]	-0.01 [-0.05, 0.03]
School Challenging	Continuous	0.01 [-0.07, 0.09]	0.01 [-0.06, 0.09]	0.02 [-0.06, 0.09]	-0.06 [-0.11, -0.00]
School Satisfaction	Continuous	-0.01 [-0.07, 0.05]	0.02 [-0.04, 0.08]	-0.01 [-0.07, 0.05]	0.00 [-0.04, 0.05]
Neither vs. Community Service					
Sex	Male vs. Female	0.01 [-0.06, 0.08]	0.01 [-0.06, 0.07]	-0.02 [-0.08, 0.04]	0.00 [-0.06, 0.06]
Race	White vs. Black	-0.01 [-0.08, 0.07]	0.07 [-0.00, 0.15]	0.00 [-0.08, 0.07]	0.02 [-0.04, 0.09]
	White vs. Other	-0.10 [-0.19, -0.02]	-0.07 [-0.15, 0.01]	0.03 [-0.05, 0.10]	0.02 [-0.05, 0.09]
Corporal Punishment	No vs. Yes	-0.03 [-0.11, 0.05]	0.00 [-0.08, 0.08]	0.09 [0.01, 0.17]	0.01 [-0.05, 0.07]
Remedial Education	Years	-0.05 [-0.12, 0.02]	0.01 [-0.06, 0.07]	-0.05 [-0.12, 0.02]	0.06 [0.00, 0.12]
Parent Died	None vs. One	-0.01 [-0.08, 0.06]	-0.02 [-0.08, 0.05]	-0.07 [-0.13, -0.00]	0.09 [0.03, 0.15]
	None vs. Two	0.20 [0.03, 0.36]	0.15 [0.00, 0.31]	0.00 [-0.15, 0.15]	-0.03[-0.16, 0.11]
Welfare	No vs. Yes	0.00 [-0.07, 0.07]	-0.04 [-0.11, 0.03]	0.03 [-0.04, 0.09]	0.03 [-0.04, 0.09]
Parental Divorce	No vs. Yes	-0.05 [-0.12, 0.02]	-0.01 [-0.08, 0.06]	0.04 [-0.03, 0.10]	0.03 [-0.02, 0.09]
School Challenging	Continuous	-0.04 [-0.13, 0.04]	-0.11 [-0.20, -0.02]	0.03 [-0.04, 0.11]	-0.08 [-0.16, -0.01]
School Satisfaction	Continuous	-0.08 [-0.16, 0.01]	-0.01 [-0.09, 0.06]	0.10 [0.03, 0.18]	-0.03 [-0.10, 0.04]

Note. Estimates are the interaction terms for the between-person personality change for weighted models. Estimates for differences

between the Neither and Incarceration groups in the top half of the table represent the terms γ_{14} for continuous and two-level nominal

moderators and γ_{14} and γ_{17} for three-level nominal moderators. Estimates for differences between the Neither and Community Service groups in the bottom half of the table represent the terms γ_{15} for continuous and two-level nominal moderators and γ_{15} and γ_{18} for three-level nominal moderators. Bold values indicate the 95% confidence intervals do not overlap with 0. CI = confidence interval.

Moderators of Within-Person Personality Change

Next, we examined more immediate effects of contact with the criminal justice system using a series of time-varying models that tested whether each of our moderators was associated with different degrees of change in personality following contact (i.e., pre-post change).⁷ There were also a number a moderators of propensity score weighted pre-post change, as shown in Table 7 (unweighted results are in Table S20 in the online materials. Weighted (Figures S33 to S50; Table S22) and unweighted (Figures S15 to S32; Table S21) figures and tables of simple effects for all moderators are available in the online materials.

⁷ The moderator test of within-person differences was an extension of the within-person growth model as follows:
Level 1:

$$Y_{ij} = \beta_{0j} + \beta_{1j} * wave_c_{ij} + \beta_{2j} * Contact_{ij} + \beta_{3j} * wave_c_{ij} * Contact_{ij} + \varepsilon_{ij} \quad (4)$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01} * ContactEver_j + \gamma_{02} * age_c_j + \gamma_{02} * Moderator_j + \gamma_{03} * ContactEver_j * Moderator_j + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} * ContactEver_j + \gamma_{12} * age_c_j + \gamma_{12} * Moderator_j + \gamma_{13} * ContactEver_j * Moderator_j + U_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21} * Moderator_j$$

$$\beta_{3j} = \gamma_{30},$$

where the critical term is γ_{21} , which indicates the difference in pre-post change of the contact group across levels of the moderator.

In the text, we will present the moderators of pre-post differences using their model terms (γ_{21}), and estimated levels pre- and post-contact using linear combinations. For example, individuals at average levels of a continuous moderator before contact would be $\gamma_{00} + \gamma_{01}$ and after contact would be $\gamma_{00} + \gamma_{01} + \gamma_{20}$. At one standard deviation above the moderator, pre-contact would be $\gamma_{00} + \gamma_{01} + \gamma_{02} + \gamma_{03}$ and post-contact would be $\gamma_{00} + \gamma_{01} + \gamma_{02} + \gamma_{03} + \gamma_{20} + \gamma_{21}$.

Table 7*Moderators of Within-Person Pre-Post Change for Weighted Models*

Moderator	Groups	Sensation Seeking	Impulsivity	Depressive Symptoms	Self-Esteem
		<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]	<i>est.</i> [95% CI]
Incarceration					
Sex	Male vs. Female	0.15 [0.06, 0.25]	0.17 [0.06, 0.27]	0.01 [-0.11, 0.14]	0.00 [-0.10, 0.10]
Race	White vs. Black	0.00 [-0.18, 0.17]	0.07 [-0.04, 0.19]	0.13 [0.01, 0.25]	0.13 [0.05, 0.22]
	White vs. Other	0.11 [-0.04, 0.25]	0.21 [0.07, 0.36]	0.07 [-0.07, 0.20]	0.07 [-0.03, 0.17]
Corporal Punishment	No vs. Yes	-0.05 [-0.16, 0.06]	-0.02 [-0.13, 0.10]	0.06 [-0.05, 0.18]	0.08 [-0.03, 0.19]
Remedial Education	Years	0.03 [-0.07, 0.12]	0.06 [-0.03, 0.16]	0.13 [0.04, 0.23]	0.02 [-0.07, 0.11]
Parent Died	None vs. One	0.09 [-0.03, 0.20]	-0.25 [-0.39, -0.11]	-0.18 [-0.27, -0.08]	0.02 [-0.07, 0.10]
	None vs. Two	0.31 [0.02, 0.59]	-0.60 [-0.84, -0.37]	-0.40 [-0.65, -0.16]	0.04 [-0.13, 0.22]
Welfare	No vs. Yes	0.00 [-0.12, 0.12]	0.04 [-0.10, 0.18]	0.00 [-0.09, 0.09]	0.12 [0.03, 0.20]
Parental Divorce	No vs. Yes	0.21 [0.11, 0.31]	-0.04 [-0.17, 0.08]	0.04 [-0.06, 0.13]	0.08 [-0.01, 0.16]
School Challenging	Continuous	-0.06 [-0.23, 0.10]	0.01 [-0.18, 0.19]	0.04 [-0.09, 0.18]	-0.10 [-0.23, 0.03]
School Satisfaction	Continuous	-0.21 [-0.35, -0.08]	0.03 [-0.14, 0.21]	-0.14 [-0.28, -0.00]	-0.04 [-0.17, 0.08]
Community Service					
Sex	Male vs. Female	0.43 [0.26, 0.59]	-0.04 [-0.19, 0.12]	-0.02 [-0.11, 0.08]	-0.08 [-0.17, 0.02]
Race	White vs. Black	0.09 [-0.08, 0.26]	-0.19 [-0.35, -0.03]	0.00 [-0.13, 0.13]	0.00 [-0.11, 0.11]
	White vs. Other	-0.12 [-0.28, 0.03]	-0.21 [-0.34, -0.07]	0.11 [0.01, 0.21]	0.16 [0.05, 0.27]
Corporal Punishment	No vs. Yes	0.09 [-0.05, 0.24]	-0.06 [-0.17, 0.06]	0.17 [0.04, 0.31]	-0.17 [-0.27, -0.06]
Remedial Education	Years	-0.06 [-0.21, 0.09]	0.20 [0.09, 0.31]	-0.15 [-0.33, 0.03]	-0.11 [-0.21, -0.00]
Parent Died	None vs. One	-0.05 [-0.26, 0.16]	-0.01 [-0.17, 0.14]	-0.04 [-0.14, 0.06]	0.00 [-0.11, 0.12]
	None vs. Two	0.27 [-0.17, 0.71]	-0.03 [-0.40, 0.34]	-0.42 [-0.76, -0.09]	-0.53 [-0.82, -0.24]
Welfare	No vs. Yes	0.05 [-0.13, 0.23]	-0.17 [-0.34, 0.00]	-0.05 [-0.16, 0.06]	-0.10 [-0.19, -0.01]
Parental Divorce	No vs. Yes	0.15 [0.01, 0.29]	0.11 [-0.05, 0.27]	-0.02 [-0.13, 0.09]	0.02 [-0.10, 0.14]
School Challenging	Continuous	0.29 [0.07, 0.51]	-0.25 [-0.38, -0.11]	0.04 [-0.16, 0.24]	-0.13 [-0.22, -0.03]
School Satisfaction	Continuous	-0.35 [-0.64, -0.06]	0.13 [-0.11, 0.36]	-0.08 [-0.18, 0.03]	0.15 [0.05, 0.26]

Note. Estimates are the interaction terms for the within-person pre-post change for weighted models. Estimates are γ_{21} coefficients from continuous and 2-level moderators and γ_{21} and γ_{22} for 3-level moderators. Bold values indicate the 95% confidence intervals do not overlap with 0. CI = confidence interval.

As with between-person differences in change, race moderated pre-post change for a number of personality characteristics. First, race (both definitions) moderated pre-post in Impulsivity for both the Incarceration (White vs. Other: $\gamma_{22} = 0.21$, 95% CI [0.07, 0.36]) and Community Service (White vs. Black: $\gamma_{21} = -0.19$, 95% CI [-0.35, -0.03]; White vs. Other: $\gamma_{22} = -0.21$, 95% CI [-0.34, -0.07]) groups. For Community Service, Black individuals (Community Service: Black, Pre-Contact Level *est.* = 2.57, 95% CI [2.41, 2.72]; Black, Post-Contact Level *est.* = 2.38, 95% CI [2.24, 2.53]) and the Other group individuals (Community Service: Other, Pre-Contact Level *est.* = 2.47, 95% CI [2.31, 2.63]; Other, Post-Contact Level *est.* = 2.28, 95% CI [2.13, 2.43]) decreased on Impulsivity after contact, while White individuals (Community Service: White, Pre-Contact Level *est.* = 2.30, 95% CI [2.15, 2.44]; White, Post-Contact Level *est.* = 2.31, 95% CI [2.17, 2.45]) did not. In contrast, incarcerated individuals in the Other group (Incarceration: Other, Pre-Contact Level *est.* = 2.37, 95% CI [2.24, 2.50]; Other, Post-Contact Level *est.* = 2.64, 95% CI [2.51, 2.77]) increased more in Impulsivity than did White individuals (Incarceration: White, Pre-Contact Level *est.* = 2.39, 95% CI [2.27, 2.51]; White, Post-Contact Level *est.* = 2.45, 95% CI [2.33, 2.56]). In addition, individuals in the Other group who engaged in community service increased in Depressive Symptoms (Community Service: Other, Pre-Contact Level *est.* = 0.72, 95% CI [0.59, 0.85]; Other, Post-Contact Level *est.* = 0.77, 95% CI [0.65, 0.89]) and Self-Esteem (Incarceration: Other, Pre-Contact Level *est.* = 3.01, 95% CI [2.89, 3.12]; Other, Post-Contact Level *est.* = 3.16, 95% CI [3.05, 3.27]), while White individuals showed no change in either Depressive Symptoms (Incarceration: White, Pre-Contact Level *est.* = 0.76, 95% CI [0.67, 0.85]; White, Post-Contact Level *est.* = 0.74, 95% CI [0.66, 0.84]) or Self-Esteem (Incarceration: White, Pre-Contact Level *est.* = 3.06, 95% CI [2.97, 3.15]; White, Post-Contact Level *est.* = 3.14, 95% CI [3.06, 3.22]). In contrast, Black individuals who were

incarcerated increased more in Depressive Symptoms (Incarceration: Black, Pre-Contact Level *est.* = 0.70, 95% CI [0.58, 0.81]; Black, Post-Contact Level *est.* = 0.85, 95% CI [0.76, 0.95]) and Self-Esteem (Incarceration: Black, Pre-Contact Level *est.* = 3.09, 95% CI [3.00, 3.19]; Black, Post-Contact Level *est.* = 3.17, 95% CI [3.09, 3.25]) than White individuals, who showed no change in Depressive Symptoms (Incarceration: White, Pre-Contact Level *est.* = 0.71, 95% CI [0.64, 0.79]; White, Post-Contact Level *est.* = 0.79, 95% CI [0.72, 0.86]) and a decrease in Self-Esteem (Incarceration: White, Pre-Contact Level *est.* = 3.17, 95% CI [3.10, 3.24]; White, Post-Contact Level *est.* = 3.17, 95% CI [3.11, 3.23]).

Losing a parent also moderated pre-post change in personality. Among incarcerated individuals, losing one or both parents moderated pre-post change for both Impulsivity (None vs. one parent: $\gamma_{21} = -0.25$, 95% CI [-0.39, -0.11]; None vs. two parents: $\gamma_{22} = -0.60$, 95% CI [-0.84, -0.37]) and Depressive Symptoms (None vs. one parent: $\gamma_{21} = -0.18$, 95% CI [-0.27, -0.08]; None vs. two parents: $\gamma_{22} = -0.40$, 95% CI [-0.65, -0.16]). Indeed, those who lost one parent did not change in Impulsivity (Incarceration: One parent, Pre-Contact Level *est.* = 2.54, 95% CI [2.42, 2.66]; One parent, Post-Contact Level *est.* = 2.54, 95% CI [2.44, 2.65]) or Depressive Symptoms (Incarceration: One parent, Pre-Contact Level *est.* = 0.87, 95% CI [0.76, 0.97]; One parent, Post-Contact Level *est.* = 0.85, 95% CI [0.76, 0.93]), while those who lost two parents decreased in Impulsivity (Incarceration: Two parents, Pre-Contact Level *est.* = 2.84, 95% CI [2.55, 3.12]; Two parents, Post-Contact Level *est.* = 2.49, 95% CI [2.25, 2.73]) and Depressive Symptoms (Incarceration: Two parents, Pre-Contact Level *est.* = 1.11, 95% CI [0.82, 1.41]; Two parents, Post-Contact Level *est.* = .87, 95% CI [0.65, 1.09]) and those who lost no parents increased in Impulsivity (Incarceration: None, Pre-Contact Level *est.* = 2.41, 95% CI [2.29, 2.52]; None, Post-Contact Level *est.* = 2.66, 95% CI [2.54, 2.78]) and Depressive Symptoms (Incarceration:

None, Pre-Contact Level *est.* = 0.73, 95% CI [0.64, 0.82]; None, Post-Contact Level *est.* = 0.89, 95% CI [0.80, 0.98]). In addition, among incarcerated individuals, losing both parents vs. no parents moderated pre-post change in Sensation Seeking (None vs. two parents: $\gamma_{22} = 0.31$, 95% CI [0.02, 0.59]). Incarcerated individuals who lost both parents increased in Sensation Seeking (Incarceration: Two parents, Pre-Contact Level *est.* = 2.61, 95% CI [2.31, 2.91]; Two parents, Post-Contact Level *est.* = 2.81, 95% CI [2.56, 3.07]) relative to those who lost none, who instead decreased in Sensation Seeking (Incarceration: None, Pre-Contact Level *est.* = 2.79, 95% CI [2.67, 2.91]; None, Post-Contact Level *est.* = 2.68, 95% CI [2.56, 2.81]).

Among those who engaged in community service, losing both parents vs. no parents moderated pre-post change for both Self-Esteem (None vs. two: $\gamma_{22} = -0.53$, 95% CI [-0.82, -0.24]) and Depressive Symptoms (None vs. two: $\gamma_{22} = -0.42$, 95% CI [-0.76, -0.09]). Those who lost both parents decreased in Self-Esteem (Community Service: Two, Pre-Contact Level *est.* = 3.33, 95% CI [3.05, 3.61]; Two, Post-Contact Level *est.* = 2.88, 95% CI [2.65, 3.10]), while those who lost no parents increased (Community Service: None, Pre-Contact Level *est.* = 3.09, 95% CI [3.00, 3.19]; None, Post-Contact Level *est.* = 3.16, 95% CI [3.07, 3.26]). Finally, youth who lost two parents decreased more in Depressive Symptoms (Community Service: Two, Pre-Contact Level *est.* = 1.37, 95% CI [0.96, 1.58]; Two, Post-Contact Level *est.* = 0.84, 95% CI [0.59, 1.10]) than did those who lost no parents, who instead showed no change in Depressive Symptoms (Community Service: None, Pre-Contact Level *est.* = 0.80, 95% CI [0.70, 0.91]; None, Post-Contact Level *est.* = 0.79, 95% CI [0.69, 0.90]).

Discussion

Though approaches to address juvenile delinquency and reduce recidivism through incarceration or community service often are described in terms of shaping the individual's

dispositional characteristics, such as efforts to “build character,” limited research has investigated whether these programs change adolescents’ personality traits. Through the most empirically rigorous examination to date, the current research tested whether adolescent personality is shaped by incarceration or court-ordered community service experiences, when accounting for adolescents’ initial dispositional and demographic characteristics prior to these experiences, as well as more focused within-person changes following these experiences. Overall, the current study provides limited evidence that incarceration or community service shape youth personality. Across between-person and within-person analyses, we found these experiences had limited effects on youth personality. Findings are discussed below with respect to antecedents that were prospectively associated with correctional facility or community service involvement, the effects of these programs on the personality of the adolescent offenders, and the implications for future efforts to reduce recidivism and promote maturation on these traits.

Selection Effects of Incarceration and Community Service

Several traits prospectively predicted the likelihood of being assigned incarceration and community service. Sensation seeking, impulsivity, and depressive symptoms presented as risk factors for incarceration and community service in adolescence. These findings extend past literature by illustrating that not only do these traits predict delinquent behaviors (e.g., Burt, Sweeten, & Simons, 2014; Kofler, McCart, Zajac, Ruggiero, Saunders, & Kipatrick, 2011; Krueger, Shmutte, Caspi, Moffitt, Campbell, & Silva, 1994), but they prospectively predict incarceration as well. By using propensity score weighting, we were able to account for a host of background risk factors, such as gender, family makeup, and socioeconomic status, to strengthen the claim that personality—regardless of these pre-existing factors—predicted incarceration. Previous work has downplayed the potential longitudinal relevance of personality when studies

fail to account for a broad range of socioeconomic and background factors (Bailey, Duncan, Watts, Clements, & Sarama, 2018; Watts, Duncan & Quan, 2018). The present data show that personality traits remain prospective risk factors of incarceration and community service even after accounting for a broad range of background variables.

Counter to previous studies linking lower self-esteem and criminal behaviors (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Mason, 2001; Mier & Ladny, 2017; Trzesniewski, Donnellan, Moffitt, Robins, Poulton, & Caspi, 2006), self-esteem did not predict either incarceration or community service. The lack of a relationship may be partially explained by our use of propensity score weighting. In controlling for a large set of background variables, we provide a more rigorous test of self-esteem's predictive role. It is important to note that this does not preclude self-esteem from still being a valuable predictor or consequence of criminal behavior. A recent meta-analysis indicates a larger association between self-esteem and *delinquent behavior* (i.e., problematic and antisocial behaviors considered illegal when committed by juveniles) compared to self-esteem and *criminal behavior* (i.e., anything against the law and punishable; Mier & Ladny, 2017). Along these lines, it may be the case that self-esteem is more relevant for less severe criminal-like behavior that may not result in incarceration or court-ordered community service. Given the shortage of longitudinal studies using a large and representative sample with validated measures (Mier & Ladny, 2018) that also account for background factors, future work is needed to better establish how and why self-esteem and criminal outcomes are linked.

Socialization Effects of Incarceration and Community Service

To understand the socialization effects associated with incarceration and community service, we followed youth who completed incarceration or community service at any point

across a 10-year period versus youth who did not. To examine socialization effects, we tested both between-person models—comparing the non-offending group with both the incarcerated and community service groups—and within-person models—comparing personality levels before and after contact for individuals who were incarcerated or doing community service. Each of these analyses provides a different perspective by which contact with incarceration or community service may impact personality development. The between-person models demonstrated that even after being weighted on a number of background characteristics, some group differences in personality change exist. These differences potentially reflect the influence of incarceration or community service or of experiences that are associated with the contact. The within-person models further helped to examine personality changes by youth acting as their own control and by providing a better sense of when these changes may have occurred. However, across different tests, traits, and types of involvement with the system, there were not consistent, widespread socialization effects.

Incarceration

Both our between-group and within-group analyses for incarcerated youth painted a muddy picture of incarceration's possible impact on youth personality. Although both incarcerated and non-offending youth decreased on depressive symptoms, incarcerated youth decreased more than non-offending youth in our between-person models. This, along with the finding that incarcerated youth were lower in sensation-seeking after incarceration compared to before, provides evidence for more adaptive personality changes. However, the declines in depression did not replicate in the within-person models, nor did the declines in sensation seeking replicate in the between-person models.

Seemingly unfavorable changes were also evident across some analyses. Although everyone decreased on impulsivity, the decline for incarcerated youth was somewhat slower compared to non-offending youth. In addition, compared to their personality levels before incarceration, youth were higher in impulsivity and depressive symptoms, though the post-contact slopes in Figure 2 suggest these differences may be short-lived. The magnitude of these observed changes was also quite modest.

There were many ways in which incarcerated youth developed similarly to their non-offending peers. Both increased on sensation seeking and self-esteem and both decreased on impulsivity and depressive symptoms over the 10-year period. Despite the dramatic change in living situation and daily life, the personality of incarcerated youth in many ways mirrored that of their non-offending peers.

Although selection effects showed a personality profile of incarcerated youth that is less mature, the pre-post personality change findings suggest these personality traits only partially remain distinguishing variables for these youth following incarceration. Specifically, although impulsivity levels were higher after incarceration compared to before, sensation seeking levels were actually lower, providing conflicting information about whether the delinquent personality profile “strengthened” for these youth. Social learning theories would suggest that youth would mimic their peers’ criminal behaviors and positive beliefs toward crime (Bayer, Hjalmarsson, & Pozen, 2009; Capece, 2015; Dobrow, 2015; Warr, 2002), possibly leading to increases in impulsivity and sensation seeking, which was not the case in our sample.

Community Service

Analyses for community service youth also indicated mixed findings regarding personality change. Community service youth were lower in impulsivity after community service

compared to before, suggesting seemingly mature personality changes. However, again the story was not uniformly positive or corrective in nature. Although all youth increased in sensation seeking, including community service youth, their increase was somewhat greater compared to non-offending youth in the between-person models. With that said, in many ways community service youth were similar to non-offending youth—over the 10-year period both groups increased on sensation seeking and self-esteem and decreased on impulsivity.

It is noteworthy and unfortunate that community service did not function more as rehabilitation for these youth, with greater decreases in sensation seeking, impulsivity, and depressive symptoms, and greater increases in self-esteem. Given the number of positive outcomes linked to community service such as fewer school dropouts and greater self-acceptance (Moore & Allen, 1996), it would be reasonable to expect more positive growth in personality. However, findings were mixed insofar that between-person models indicated community service was associated with greater increases in sensation seeking, and the within-person models suggested that community service was associated with decreases in impulsivity. Ideally, community service would serve as an explicitly positive intervention and go beyond what normative changes might provide, a notion for which the current study found limited support. As youth assigned to community service are still able to engage in normative life experiences, which are presumably valuable for maturation (Lodi-Smith & Roberts, 2007; Roberts, Wood, & Smith, 2005), future work may attempt to better understand and leverage the holistic experience of court-ordered community service for more universally positive personality change.

Certain aspects of community service could be encouraged to promote more positive personality development. For example, participation in structured (vs. unstructured) activities has been linked to positive outcomes like fewer risky and antisocial behaviors (e.g., underage

drinking, drug use, fighting, stealing) in adolescents (Eccles, Barber, Stone, & Hunt, 2003; Mahoney & Stattin, 2000). Additional buffers against antisocial tendencies come from the positive connections built with others and the strengthening of existing skills and interests that comes from these activities (Jones & Offord, 1989; Mahoney, 2000; Mahoney & Stattin, 2000). Community service also generally demands and reinforces socially mature behaviors such as commitment to an organization, project completion, and reliability. These expectations mimic tasks and social roles linked with increased maturation in young adulthood, such as employment (Bleidorn, 2015), and emphasizing them may encourage positive personality development (Hill & Jackson, 2016).

Theoretical Contributions

At a broader level, the current study contributes to a growing literature on personality trait development during adolescence, which is still in relative infancy compared to the adult personality literature. In particular, it is uncommon for longitudinal investigations to simultaneously investigate selection and socialization effects regarding life events in adolescence, and to do so using propensity score weighting. Accordingly, the current study provides a valuable addition to the literature by using rigorous methods to show the normative trends for thousands of youth during childhood and adolescence with respect to the four dispositional characteristics of interest. Beyond examining the role of incarceration and community service, the current findings provide some of the strongest investigations to date on the developmental patterns of sensation seeking, impulsivity, depressive symptoms, and self-esteem during adolescence.

These findings present the case that depressive symptoms may be relatively stable during the adolescent years. Although adolescence is a period of heightened risk for clinical rates of

depression (Hammen, 2009; Petersen, Compas, Brooks-Gunn, Stemmler, Ey, & Grant, 1993), youth in the current study, on average, reported small declines and consistent levels of depressive symptoms across this seemingly turbulent developmental period. The evidenced trajectories here for self-esteem also correspond with recent meta-analytic evidence that self-esteem trajectories are flat in early adolescence and then increase into early adulthood (Orth, Erol, & Luciano, 2018). Past work has described trends in impulsivity and sensation seeking with portions of this sample (Harden & Tucker-Drob, 2011), and the current findings advance that work to show differences in these trends may somewhat depend on interactions with the juvenile justice system.

In addition to describing these normative trends, the present findings address inter-individual variability by showing that youth clearly differ in their patterns of change across all four traits. Often these differences are discussed within the context of personality maturation, with the expectation that youth will normatively show presumably adaptive personality trait change during the transition into adulthood (Bleidorn et al., 2013; Roberts & Mroczek, 2008). However, studies have shown significant variability in that some adolescents “mature,” whereas others do not (e.g., Orth et al., 2018). The current findings buttress this claim by demonstrating that though there are some normative trends of maturation in the sample as a whole, such as decreases in impulsivity, there is also inter-individual variability around this mean-level increase, as these decreases were not uniform across all groups. Pre-post within-person analyses even suggest changes counter to group trends, showing that depressive symptoms and impulsivity may at least temporarily increase and sensation seeking decrease following incarceration. Demonstrations of heterogeneity in slopes provides the important first step for learning what ultimately predicts these differences.

Exploratory moderation analyses provide some preliminary insight into what other variables may factor into these personality changes. For example, race was a moderator for trajectories of change for multiple traits. Whereas White youth decreased in depressive symptoms regardless of contact with the criminal justice system, Black youth who were incarcerated showed increases in depressive symptoms. For Black youth and other non-White races, impulsivity decreased when engaged in community service, whereas impulsivity for White youth did not change, and impulsivity among youth in community service increased more for Other races than for White youth. Taken together, individuals appear to respond differently to experiences of incarceration and community service. Follow-up work is necessary to determine whether these differences are due to day-to-day experiences that differ between races or something else. This is especially warranted given that Black, Indigenous, and Persons of Color are more likely to be incarcerated than their White counterparts: In 2017, Black, Hispanic, and American Indian youth were incarcerated at 1.42, 2.83, and 4.61 times the rate of White youth (Sickmund, Sladky, Kang, & Puzzanchera, 2019).

Finally, in contrast with much work on delinquent youth, our sample included a considerable number of women. As delinquency and incarceration are generally more common among boys and men (Glaze & Parks, 2011), it can be difficult to have a large enough sample of girls and women, both for generalizability and assessment of gender differences. Our exploratory moderator analyses (Tables 6 and 7) suggest a few gender differences for incarceration and community service that warrant future research and greater care in collecting representative samples.

Practical Contributions

The present work highlights that the current treatment of youth who are incarcerated or engaged in court-ordered community service is not prompting particularly positive personality change. Although many of the observed changes were normative and a few were positive, correctional facilities and court-ordered community service did not overtly “correct” the personalities of these youth. This is unfortunate when considering the high costs involved with incarceration and the opportunity that these experiences hold to intervene on the lives of these youth. Given the personality changes in the present study, decisions to arrest, charge, assign community service, and incarcerate youth should not be taken lightly. The personality changes reported here point to a criminal justice system that does not uniformly promote positive changes in the personalities of delinquent youth. Moreover, given the exploratory moderation findings, this issue is especially concerning given the racial disparities in incarcerating youth (Office of Juvenile Justice and Delinquency Prevention, 2020).

Limitations

While this is the largest and longest investigation of personality and incarceration in adolescents to date, noteworthy limitations remain. Although propensity score weighting accounts for numerous background variables and mimics experimental design, it still does not allow us to make causal inferences. However, given the questionable ethics of randomly assigning youth to incarceration, community service, or neither, our findings present what is likely the most rigorous test of these experiences on personality development.

The present study’s findings show relatively small effects. Visually, this is evident in Figure 1 where the trajectories for incarcerated, community service, and non-offending youth are not dramatically distinguishable. Although these four dispositional characteristics correspond with impactful daily and long-term outcomes, we do not know that the magnitude of the changes

and differences observed in our analyses correspond with meaningful differences across these groups. Following these participants as they continue through adulthood, integrating into society and experiencing typical and atypical life events, will provide clearer insight into the significance of these differences. Until then, caution should be used when interpreting the impact of these personality changes.

These results also only speak to relatively short-term personality changes during adolescence and young adulthood, and even shorter for the within-person analyses as the effects appear to decline with time. As previously stated, our study does not address the long-term impact of incarceration and community service experiences on personality. As the sample used in the present study continues to add biennial assessments of participants, future researchers will be well-suited to address how incarceration and community service may influence the personality trajectories and outcomes of these participants over a longer time period with these data. However, it is worth noting that even short-term changes in personality are consequential. As an example, research with self-control, a construct conceptually linked to impulsivity and sensation seeking, found that how individuals changed over a four-year period during adolescence predicted work and relationship outcomes two decades later, even when accounting for initial levels (Allemand, Job, & Mroczek, 2019). As such, although we cannot ascertain whether the personality differences between incarcerated, community service, and non-offending youth hold lasting influence on personality characteristics, even the shorter-term changes may influence later adult success.

We also do not have adequate information on the specific incarceration or community service experiences of these participants to directly understand the mechanisms through which change takes place. Some correctional facilities may be more or less geared toward

rehabilitation, which may prompt important differences in short-term developmental trajectories. Previous work suggests that facility type (e.g., secure vs. residential) is linked to different outcomes (Dmitrieva et al., 2012). Those that emphasize rehabilitation over punishment tend to show more positive developmental outcomes for its youth. By testing contextual elements such as these as moderators, we can better understand how to alter incarceration and community service experiences in order to make them most beneficial for personality change.

Finally, it is difficult to pinpoint exactly when the observed personality changes may be occurring. For example, the within-person analyses for depressive symptoms suggest that they are higher for incarcerated youth after contact. However, it is unclear whether this increase in depressive symptoms occurs soon after being incarcerated or more proximal to the release from incarceration, which is further complicated by the visually noticeable negative slope after incarceration in Figure 2. Future work will need more frequent personality assessments to track exactly when these changes are occurring and how long-lasting they are.

Conclusions

Using a large, longitudinal dataset of US American youth, the present research shows that personality predicts the likelihood of incarceration and court-ordered community service in adolescence. Further, these experiences are associated with some personality changes, though these changes are relatively small and their pattern inconsistent. For such a vulnerable demographic, it is unfortunate that incarceration and court-ordered community service do not consistently show explicitly positive or rehabilitative personality changes among delinquent youth. This study not only informs personality development research, specifically on youth interacting with the criminal justice system, but it also urges researchers, advocates, and

judiciary members to better understand the impact of sentencing and to advance more growth-oriented practices.

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