

Aging Out of Crime and Personality Development: A Review of the Research Examining the Role of Impulsiveness on Offending in Middle and Late Adulthood

James V Ray ¹, Shayne Jones²

¹Department of Criminal Justice, University of Central Florida, Orlando, FL, USA; ²School of Criminal Justice and Criminology, Texas State University, San Marcos, TX, USA

Correspondence: James V Ray, Email james.ray@ucf.edu

Abstract: Virtually everything we know about the relationship between impulsivity and offending is confined to adolescence and early adulthood. There is a paucity of research that examines impulsivity and offending in middle and late adulthood. What little is known is covered in this review. There are normative declines in offending, but it remains quite common in middle and late adulthood. This challenges the notion that the majority of offenders age out of crime by middle age. There are also normative declines in impulsivity, consistent with the maturity principle of personality development. While impulsivity is associated with offending (and other externalizing behaviors) in middle and late adulthood, precious little evidence exists that speaks to whether the declines in impulsivity are causally related to decreases in offending. Various suggestions are offered for future research that can better address this notable void in the literature.

Keywords: impulsivity, adulthood, crime, offending, development, personality

The term impulsivity is an elusive construct to define.¹ While we acknowledge this issue, in the current paper we rely on broad and inclusive conceptualizations that generally refer to acting on the spur of the moment for a perceived reward without much consideration of the associated costs. From a personality trait perspective, this is accurately captured as lack of deliberation/rashness. Much of the literature we cite is consistent with this idea, although terms such as sensation seeking or multidimensional constructs such as self-control and conscientiousness were included as well. We also review some studies that used lab tasks that assess cognitive deficits related to impulsiveness, as they speak to our main research questions.

Despite the varied conceptualizations of impulsivity, it is an important construct in the explanation of offending behavior as is evident in the incorporation of impulsivity into major theories of offending as well as the observed robust association between impulsivity and offending. For instance, one of the most well-known and tested criminological theories is Gottfredson and Hirschi's general theory of crime.² They identify self-control as the major and, ostensibly, only factor necessary for understanding individual differences in offending to which impulsivity is a component. Another theory that incorporates impulsivity as a factor contributing to offending is Moffitt's developmental taxonomy. Moffitt identifies impulsivity as a defining trait of life-course persistent offenders and might explain why some adolescent-limited offenders continue to offend well into adulthood.^{3,4} Steinberg's dual systems model is another theory that explains offending as a result of impulsivity. Steinberg suggests that there is a gap in the development of reward-seeking and impulse control that explains the heightened levels of offending behavior seen in mid-adolescence.⁵ In addition to "stand-alone" theories, scholars have integrated impulsivity into existing theories of offending. Impulsivity has also been identified as an important moderator of the association between theoretical constructs (eg, rational choice

and strain) and offending.^{6–8} In addition to theoretical claims, research has shown support for impulsivity as a robust predictor of offending.^{9–11}

Despite its theoretical relevance and the robust empirical association observed between impulsivity and offending, there has yet to be a comprehensive review of the existing literature regarding developmental association between impulsivity and offending beyond adolescence and emerging adulthood. That is, there has yet to be a review of the studies that have examined if there is parity in the development of impulsivity and offending across the life-course, particularly into later adulthood. This may be due to a lack of empirical studies examining the association between impulsivity and offending. This lack of research may be contributed to the perception that impulsivity becomes stable relatively early in the life-course and, in turn, would contribute little to our understanding of changes in offending that might occur in adulthood. In their original presentation, Gottfredson and Hirschi suggest that relative to others, one's level of self-control does not change and that any changes in behavior are the result of heterotypic continuity.² In other words, behavioral manifestations of low self-control change across the life-course but not the trait itself. However, there has yet to be a review of the research that has examined the association between impulsivity and offending in middle to late adulthood. A comprehensive review of this research, even if limited in volume, is important to get an understanding of the empirical status of the relationship between impulsivity and offending in middle to late adulthood.

In the current paper, we review the empirical literature that has examined cross-sectional and longitudinal associations between impulsivity and offending with a focus on middle and late adulthood. The goal of this review is threefold. The first goal is to provide a summary of what the existing research says about the association between impulsivity and offending beyond the often studied adolescent and early adulthood years. The second goal is to identify gaps in the existing body of research. The third and final goal is to provide future directions for researchers studying the impulsivity-offending relationship. We address these goals by first reviewing some of the theories of personality development in order to provide a definition for the different types of stability and continuity of impulsivity. We also review some of the major theories of offending that include impulsivity as an explanatory factor to provide a better understanding of the expected relationship between impulsivity and offending in middle to late adulthood. We then systematically review the existing research on impulsivity and offending primarily among samples that are ages 30 and greater. Specifically, we focus on research that has examined (1) the extent and nature of normative changes in offending and impulsivity across the life course, (2) whether any changes in impulsivity are related to changes in offending, and (3) if impulsiveness is related to offending in middle and late adulthood. It is our intention to summarize the research to date and to highlight the paucity of research testing the longitudinal link between impulsivity and offending, particularly among the middle and later years. Thus, this review will serve as a call for research that addresses questions regarding the relationship between impulsivity and offending over the life-course.

Literature Review

Most scholars define personality as individual differences in the way that people view, interpret, and respond to their environment.¹² Impulsivity is often conceptualized as a personality construct in that it explains behavioral consistencies across different historical and situational contexts.¹³ Although multifaceted, impulsivity is often construed as a tendency to act on the spur of the moment and a failure to consider the (long term) consequences of one's action.^{14,15} Thus, there is a clear logical link between impulsivity and offending behavior. Given that offending behavior is often risky and offers immediate gratification, individuals with elevated impulsivity are more prone to offending opportunities and potentially take advantage of those opportunities when they arise. Offending behavior is often viewed as a behavioral manifestation of impulsivity and research has identified a robust association between impulsivity and offending.¹

A general consensus among scholars is that differences in temperament are observed in early childhood.¹⁶ However, there is limited agreement regarding at what point in the life-course these differences become set (or if they do at all). Upon reviewing the literature, Caspi and Roberts concluded that personality continues to develop until later in the life course (approximately age 50) when it becomes increasingly more stable.¹⁷ However, the extent to which personality, including impulsivity, is stable may depend on how stability is defined. Caspi and Roberts describe several different "types" of stability or continuity which include absolute, differential, and heterotypic continuity. Absolute continuity refers to within-individual consistency of impulsivity over time.¹⁸ That is, continuity is considered to exist if one's level

of impulsivity does not change from one point in time to previous or subsequent time points. Differential continuity refers to one's rank-ordering in the level of impulsivity among a sample of individuals. That is, while one's absolute level of impulsivity might change, they still remain relatively high, or low, compared to others within the sample over time. Heterotypic continuity refers mainly to the coherence in behavioral manifestations of impulsivity across time. For instance, children who impulsively hit, kick, or bite may be more likely to get into physical altercations during adolescence and more likely to engage in domestic violence as adults. Thus, heterotypic continuity focuses more on changes or continuity in the outcomes of impulsivity (eg, offending) rather than the trait itself.

In the current review, we are mainly concerned with relative and heterotypic continuity. This is because most developmental theories of offending are concerned with explaining relative proneness of engaging in offending behavior among developmentally similar individuals. That is, while developmental life-course theories distinguish between- and within-individual changes in offending, they do not mention or attempt to explain changes in impulsivity. Instead, impulsivity (and associated traits) is used to distinguish offenders from non-offenders. For instance, Gottfredson and Hirschi suggest that there may be some absolute change in self-control across the life-course as individuals age; however, those with low levels of self-control will always remain the lowest within their cohort and, in turn, the most likely to manifest antisocial behaviors across the life-course.² We would expect to see gradual declines in impulsivity as individuals age; however, they most likely would maintain their rank-order position on impulsivity compared to their peers. Additionally, in terms of the relationship between impulsivity and offending, most developmental theories of offending recognize heterotypic continuity in behaviors resulting from changing opportunities. For example, in referring to the group she identifies as the life-course persistent offenders, Moffitt suggests that while their underlying propensity (eg, impulsivity) toward offending remains the same, changing social opportunities result in different behavioral manifestations across development.³

Most developmental criminological theories do not explicitly mention the developmental patterns of traits. Gottfredson and Hirschi suggest that everyone is born lacking self-control and that it is acquired through socialization, namely parenting.² They go on to say that self-control becomes set around age 12 and remains relatively stable across the life-course. Moffitt mentions poor executive function as a marker for life-course persistent patterns of offending.³ While she does not directly address the degree of stability of these traits, she does suggest consistency in behavior from childhood to adulthood (ie, contemporary continuity) is due to stable underlying traits including impulsivity. Thus, one could assume that impulsivity is relatively stable across the life-course. Steinberg's dual systems model explains that the heightened level of delinquent behavior that occurs in adolescence is the result of an imbalance in the development of two brain systems: the socioemotional and cognitive-control networks.^{5,17} The former is responsible for reward processing and is highly sensitive during adolescence. In turn, adolescents are more prone to environmental influences (eg, peer influence) causing sharp increases in risk taking, including delinquency, during this period. The latter system is responsible for the development of executive functioning and, among other things, enhances impulse control. An adequately developed cognitive control network would enhance decision-making even in the face of environmental pressures. However, the latter system is much slower to develop and is said to not be fully formed until the mid to late 20s, resulting in adolescents being much more prone to risky behavior. Thus, the implication of the dual systems model for the development of impulsivity is that it gradually decreases from childhood well into early adulthood (approximately age 25).

A developmental life course theory that explicitly underscores the importance of desistance from offending is Sampson and Laub's age-graded theory of informal social control. Focusing on measures of temperament (which include but are not limited to impulsivity) and temper tantrums in early childhood, they acknowledge the influence of criminal propensity on offending. However, they argue that changes in propensity are not a defining component to explain desistance. Instead, they suggest that informal social control tied to key structural institutions (eg, marriage, employment, military service) explains why individuals desist from offending.¹⁹ Relying on a subsample of the original 1000 participants from the Glueck's data, they interviewed 52 men that were then about 70 years old.²⁰ In addition to the original emphasis on informal social controls explaining desistance (or lack thereof), they added that changes in routine activities and human agency also helped to explain why individuals desist from offending. In essence, while Sampson

and Laub do not summarily discount the importance of criminal propensity (which includes impulsivity), they are quite clear that changes in these traits are not a major reason for desistance.

To the extent that impulsivity and offending are linked across the life-course this also limits our understanding of the longitudinal association between impulsivity and offending. Several theories exist that have identified individual differences or criminal propensities in offending. Impulsiveness is one of several traits identified by theories as characterizing individuals who are more prone to offending. It has been suggested that the decision to offend is based on a cost–benefit analysis and that those who are more impulsive are biased in their decision-making because they give more weight to the immediate rewards of offending and fail to consider the long-term consequences.⁷ In turn, if impulsivity decreases with age one would expect that offending would also decrease with age as well.¹⁷ Therefore, implicit in most theories that draw on impulsivity as an explanatory factor in offending is that at some point impulsivity becomes set and does not change or that individuals gradually become less impulsive (but maintain their rank-order position) and, in turn, are still more likely to engage in offending than their peers (between-individual change) but may “calm down” and engage in less offending than they did previously (within-individual change).

Current Review of the Literature

While there is strong empirical evidence that impulsivity is a risk factor for offending during adolescence and early adulthood, there are several remaining questions. First, are there normative declines in offending that reflect aging out? Are there normative declines in impulsivity that represent the maturation? Is impulsivity related to offending in middle and later adulthood like it is in younger populations? Are declines in impulsivity responsible for declines in offending? What follows is review of the literature that speaks to these questions.

Are There Normative Declines in Offending That Reflect Aging Out?

In general, there is compelling evidence of a relationship between age and offending such that there is a marked increase during adolescence, a peak in late adolescence, and a precipitous decline thereafter.¹⁸ This so-called aging out of offending is typically reported in early adulthood when individuals assume more adult roles.^{21,22} However, this general trend obscures unique patterns of offending by different groups. For instance, there is robust evidence of a high-rate offending group that escalates during adolescence and remains high into middle (age 48) and late adulthood (age 61–age 72).^{23–25} This group has been referred to as life-course-persistent offenders.² Thus, while there are normative declines in offending across the life course, there are some individuals who continue to offend late in the life course who deserve more attention.

Although most analyses focus on early adulthood, other evidence of the aging out of crime clearly indicates that offending occurs well beyond the 20s and 30s. Information about age and crime can be gathered from the National Incident-Based Reporting System (NIBRS; <https://cde.ucr.cjis.gov/LATEST/webapp/#/pages/home>). These data include all crimes reported to the police in the United States (for 2021). Although offending among middle and later adulthood is rarely examined, older age groups commit a non-trivial amount of crime. For violent crime, those 40 and older commit 24.23% of all violent crime, those 50 and older commit 11.43% of all violent crime, with 3.54% of all violent crime committed by individuals 60 and older. Similar patterns exist when examining property crimes. Individuals 40 and older commit 28.96% of all property crime, those 50 and older commit 13.46% of all property crime, with 3.55% of all property crime committed by individuals 60 and older. Importantly, the age of the offender is not always known: 15% and 33% of violent and property crimes, respectively, are committed by an offender of unknown age. These data clearly indicate that while offending is more common among younger populations, individuals in middle and late adulthood continue to offend. Longitudinal evidence also corroborates that offending (violence in particular) in middle and late adulthood is more common than often assumed (up to age 61).²⁴ It is also important to point out the possibility that more persistent offenders tend to be removed from the offending pool earlier in the life-course due to long-term incarceration and death due to their affinity for risky and criminal lifestyles.²⁵ The available evidence challenges the notion that offenders age-out by their 40s.

Are There Normative Declines in Impulsivity That Represent Developmental Maturation?

While theoretical explanations of the development of impulsivity are consistent in terms of the direction in which impulsivity develops, they differ in terms of the timing at which impulsivity becomes stable. For instance, Charles et al observed gradual increases in impulsivity from ages 11 to 15.²⁶ Another study by Liu et al found that, on average, there was a decrease in impulsive traits from age 11 to 15; however, they also found considerable variation in both the direction and rate of change among their sample.²⁷ That is, some individuals increased in impulsivity, while others followed the general decreasing trend but did so at a much slower rate. Others have observed a decline in impulsivity from age 12 until about age 20 where it stabilized until age 25 (the furthest point into the life-course that impulsivity was measured).^{28,29} Similarly, Wojciechowski observed very small increases in mean levels of impulse control and small decreases in risk taking from age 14 to age 24 – both seemed to plateau in the early 20s.³⁰ However, other studies have observed changes in (declines) in impulsivity into the mid 20s. For example, Connolly et al found that impulsivity declined from adolescence (ages 16–17) to early adulthood (ages 22–23) and Kasen et al reported slight increases in impulsivity from age 10 to 15 where it decreased through age 25.^{31,32} Importantly, few of these studies, if any, extend observation periods further into adulthood, beyond age 25.

Longitudinal research on personality that extends well into middle and late adulthood sheds some light on impulsiveness. Conscientiousness (ie, self-controlled, rule-abiding, responsible, dedicated) shares considerable overlap with measures of impulsivity and self-control.^{1,33} Most research suggests conscientiousness generally increases with age, with the rates of change (ie, increases) most pronounced in early adulthood.³⁴ Roberts et al found that conscientiousness was stable during adolescence but demonstrated consistent increases from ages 20 through 70.³⁵ Other studies noted that conscientiousness increases across the life course and becomes more stable, particularly after age 50 or decreases in late adulthood perhaps due to general cognitive decline.^{36,37} Collectively, the research indicates that there are normative decreases in impulsiveness throughout much of the life course consistent with the maturity principle of personality development.^{38,39}

Is Impulsivity Related to Offending in Middle and Later Adulthood Like It is in Younger Populations?

Numerous empirical studies have demonstrated relationships between impulsive traits and offending among adolescent and early adulthood samples,^{4,40,41} but virtually none extend to middle and late adulthood.⁴² The few studies that have examined the association between impulsive traits and criminal behaviors among adults have employed cross-sectional research designs.

For example, Wolfe et al examined the cross-sectional association between a measure of risk seeking and impulsivity among a sample of older adults (60 years or older). Controlling for various other factors (eg, negative emotions, family ties, demographic characteristics) they found that self-control was associated with offending outcomes.⁴³ Additionally, they observed that this association was robust across different age groups (60–72, 73–79, and 80 and older). In a similar study, Hirtenlehner and Kunz examined if low self-control was associated with offending among a sample of individuals between the ages of 50 and 80.⁴⁴ Similar to Wolfe et al, they found that low self-control was positively related to offending and this association persisted when controlling for opportunity, moral beliefs, and criminal associations. In another study, Hirtenlehner and Baier examined if impulsive and risk-seeking traits predicted offending behavior among a sample of individuals who were 50 years or older.⁴⁵ They found that both impulsiveness and risk seeking (measured separately) were positively related to criminal behavior among older adults even when included in the same model with measures of criminal opportunity, criminal associations, and social status.

The major limitation of these studies is that due to their cross-sectional nature, causal associations are not certain. Very few longitudinal studies that focus on offending extend into middle and late adulthood. In a recent study examining the offender typologies in 14 prospective studies, only 3 (21%) contained offending data beyond the 30s.⁴⁶ Studies that also included an analysis of the role of impulsivity on offending in middle and older age are practically nonexistent. What does exist indicates that early impulsiveness (measured during childhood and adolescence) is related to offending in the

30s and middle age (ie, in the 50s) and 60s (cite to new article).^{47–51} Impulsivity, and a related impulsive trait of daring, measured at age 10 also predicts intimate partner violence at ages 32 and 48.⁵²

Meta-analytic evidence provides some insights, although it remains limited. Focusing on the Five-Factor Model facets and UPPS model of impulsive traits, Urgency, (lack of) Perseverance, (lack of) Premeditation, and Sensation Seeking are positively related to offending and aggression (with the exception of the Sensation Seeking – Aggression relationship).^{1,53} Moreover, there is evidence that age moderates the relationship between conscientiousness and anti-social behavior and aggression, indicating that these relationships are stronger among younger samples.¹⁰ However, others have failed to identify age as a moderator of the relationship between impulsive traits and aggression. Using the UPPS model of impulsive traits, each impulsive trait was related to various manifestations of aggression (with a few exceptions),⁹ and various indicators of drinking alcohol (eg, quantity, bingeing),⁵⁴ but these relationships were not moderated by age.

Another meta-analysis examined impulsiveness and problem gambling. Unlike the previous meta-analyses that assessed impulsiveness via personality traits, this meta-analysis focused on lab tasks, including Stroop attentional inhibition, Go/No-Go deficits, Stop signal task, discounting, and decision-making tasks. Each type of lab task was related to problematic gambling (typically defined as Gambling Disorder). However, there was insufficient variation in age for some of the tasks, precluding any moderator analyses. When there was sufficient variation, the effects of Go/No-Go deficits and decision-making tasks on problem gambling were not moderated by age. Conversely, the relationship between higher discounting scores and problem gambling was stronger among adult studies.⁵⁵

These meta-analyses offer limited insight into the questions we seek to answer. While there were exceptions, the bulk of these studies suggest that the effect of impulsiveness on offending (or antisocial, aggression, or problem gambling) behavior is consistent across age. A notable limitation of the meta-analyses reviewed here is that most did not include many studies with middle and late adulthood samples. Instead, the samples are predominantly early adulthood.

Are Declines in Impulsivity Responsible for Declines in Offending?

The short answer is that there is not sufficient research to address this question. The studies that are best suited to address this question focus on alcohol use. There are normative declines in alcohol use, and research suggests that those higher and/or more stable on impulsivity (measured as traits that appear to be tapping into lack of premeditation) are the least likely to show a decline in alcohol use up to age 35.⁵⁶ Other research indicates that normative changes in impulsivity (among other factors) are associated with changes in alcohol use up to age 35.⁵⁷ Moreover, cross-sectional correlations indicate that impulsivity is consistently related to problematic alcohol involvement from ages 18 to 35.⁵⁷ While these studies indicate that maturing out of alcohol use is related to the normative decreases in impulsive traits, they are limited to the early 30s and to alcohol use only. Very little research has examined the relationship between impulsivity and substance use in middle and older adulthood samples.⁴¹ Whether such patterns would continue to be observed into middle and later adulthood, as well as generalize to offending (or other externalizing behaviors), remains to be seen.

Discussion

As noted in this review, there are very few studies that address the role of changes in impulsivity that might explain the aging or maturing out of offending. Most studies examine offending among adolescents and young adults (age 25). Additionally, very few studies have examined the development of impulsivity beyond adolescence.⁵⁸ Researchers have consistently observed that impulsiveness, measured in various ways and tapping into unique but related conceptualizations (eg, premeditation, sensation seeking), is associated with offending among younger samples (ie, childhood through late adolescence).^{26,40,59,60} Beyond this relatively brief period in the life course, very little is known about offending and its development. It is even rarer to find studies that examine offending among middle and late adulthood that also examine the role of impulsivity. To our knowledge, there are no studies that examine if changes in impulsivity are associated with changes in criminal behavior beyond age 35.

The closest studies that began to address the question measured impulsive traits and alcohol use longitudinally.⁵⁵ However, in addition to alcohol use not falling under the definition of criminal, this analysis only followed participants to age 35. Most of the remaining research is suggestive. For instance, it is well established that impulsiveness declines

throughout adulthood.⁵⁶ It is also clear that offending begins a precipitous decline after age 25,⁶¹ but we were unable to locate any study that measured these declines simultaneously. Instead, there is evidence that impulsivity measured earlier in the life course (eg, adolescence, young adulthood) is related to offending in middle age.⁶² Thus, to more thoroughly address the question of what role declines in impulsivity play in the maturing out of offending future research will be necessary. Specifically, research is needed that tracks both impulsivity and offending across multiple time points into late adulthood in order to enable analytic procedures that produce estimates of both within- and between-individual change (eg, random intercept cross-lagged panel modeling).

There are other lingering questions that need to be addressed as well. First and foremost is whether the decline in offending actually exists. Because there are so few studies that include older samples, this question remains unanswered. What is clear based on the available data, offending in middle and late adulthood is far more common than many assume. There is evidence that offending occurs among middle age samples and some individuals continue to offend at relatively higher rates (eg, life-course persistent offending).^{47,62,63} However, these studies typically assess offending the same way as it is assessed in adolescence and young adulthood (eg, assault, burglary, theft, etc.). It remains possible, but yet unknown, that criminality changes in its manifestation.^{64,65} For instance, Massoglia observed that the same individuals who engaged in violence and vandalism during adolescence shifted their focus to drug use in early adulthood.⁶⁴ Heterotypic continuity, in the current context, describes how externalizing behaviors that are manifestations of the same underlying trait (ie, impulsivity) change in their appearance. Perhaps young adult offenders do in fact largely stop engaging in acts such as robbery, assault, theft, etc., but different behaviors emerge. Certainly, substance use and intimate partner violence still occur in middle adulthood.^{64,66,67} Other criminal behavior that may continue into the middle and later years include white collar offenses (eg, credit card fraud, embezzlement, identity theft, etc.) and traffic violations (eg, driving under the influence, reckless driving, hit and run, etc.).

Another area for future explorations is studying aggression in middle and late adulthood. Perhaps physical aggression declines with age, but there are various other forms of aggression that might remain more prevalent later in the life course. Verbal aggression, anger, hostility, and indirect aggression (Aggression Questionnaire (AQ)⁶⁸) might be more prevalent than typical street crimes. For instance, Temcheff et al observed that aggression measured in childhood (grades 1, 4, and 7) was predictive of family violence (ie, spousal and child abuse) in adulthood (mean age 34).⁶⁹ Additionally, in a review of the literature Piquero et al concluded a great deal of stability in aggression from childhood to mid-adulthood.⁷⁰ Thus, instead of focusing on offending or traditional street crimes more widely observed earlier in the life course, it might be beneficial to broaden to a wider set of externalizing behaviors that might be age-graded.

It seems somewhat surprising that more research has not focused on offending (or related behaviors) in middle and late adulthood. This is probably because offending (as typically measured) is more prevalent among adolescent and young adult samples. Thus, it is simply easier to capture a sufficient range earlier in the life course. But as suggested above, maybe it would be wise to examine different manifestations of offending. Crimes such as passing bad checks, tax fraud, child abuse, workplace theft, embezzlement, and bribery might be more common among adults. Further, some white-collar crimes virtually require the offender to be older when they need to be in a position of power to commit the crimes.

This means that it is necessary for researchers studying the association between impulsivity and offending across the life-course to utilize methodologies that account for heterotypic continuity in offending. For example, it may be necessary to include measures that include “age-appropriate” measures of offending. Likewise, it is important to ensure that existing measures of impulsivity are invariant across age.⁵⁸ For example, Argyriou et al examined the measurement invariance of the UPPS-P across age (young, middle, and older adulthood).^{1,71} They found that three items displayed differential item functioning and were less representative of the underlying trait among older age groups.

Understanding the mechanisms of changes in impulsivity is another area for future research. While difficult and resource intensive, there are studies that have found that links between various brain regions and processes that are associated with impulsiveness.⁷²⁻⁷⁴ It remains unclear, however, whether these changes are part of a normal maturation process or instead (or in addition to) are influenced by experiences.⁷⁵ Thus, impulsivity might change as a function of neural development, but can also be affected by events that a person is subjected to.

The sociogenomic model of personality provides a framework for understanding how both genetics and the environment can influence trait expressions over time.⁷⁶ Although impulsivity certainly has a genetic basis, evolutionary forces

allow flexibility to changing environments. In this model, there is an emphasis on states, elastic systems, and pliable systems. States are transitory reactions to environmental stimuli. Elastic systems allow for changes in trait expression over a significant period of time (eg, months or even years) that are responding to some environmental change, but then the trait expression returns to previous levels. Pliable systems entail permanent changes in trait expression due to changes in the environment. Using impulsivity as an example, the underlying genotype produces variations in this trait. Episodic or situation-specific factors can lead a person to be more or less impulsive in the moment. More enduring, but still time limited, environmental changes can lead to changes in impulsivity but will come back to previous levels when that environmental factor is no longer present. Yet still, there can be environmental factors that result in sudden and permanent changes in the expression of impulsiveness. It remains to be determined what environmental factors produce changes, especially for pliability and elasticity, and whether there are key developmental times that are more or less important.

In sum, it would be premature to draw conclusions about the causal link between impulsivity and criminal offending as it pertains to middle and late adulthood. With that being said, a small number of studies to date suggest that impulsivity continues to play a role in offending even among older adults. However, much more research is needed before we can have confidence in drawing this conclusion. More specifically, accessing older samples, expanding the range and types of antisocial behaviors, exploring cross-sectional and longitudinal assessments of both offending and impulsivity, and age-invariant measures will be required before a more definitive statement can be made about the role of impulsivity and the maturing out (or lack thereof) of offending. In addition, future research should begin to examine biological (eg, brain development) and social (eg, marriage, job attainment, parenthood) changes as they occur in middle to late adulthood that might alter impulsivity and its impact on offending.

Disclosure

The authors report no conflicts of interest in this work.

References

*indicates studies that were included in the review to address the proposed research questions.

- Whiteside SP, Lynam DR. The five factor model and impulsivity: using a structural model of personality to understand impulsivity. *Pers Individ Dif*. 2001;30(4):669–689. doi:10.1016/S0191-8869(00)00064-7
- Gottfredson MR, Hirschi T. *A General Theory of Crime*. Stanford, CA: Stanford University Press; 1990. doi:10.1521/pedi.1990.4.4.362
- Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: a developmental taxonomy. *Psychol Rev*. 1993;100(4):674–701. doi:10.1037/0033-295X.100.4.674
- Moffitt TE, Caspi A, Harrington H, Milne BJ. Males on the life-course-persistent and adolescence-limited antisocial pathways: follow-up at age 26 years. *Dev Psychopathol*. 2002;14(1):179–207. doi:10.1017/s0954579402001104
- Steinberg L. A dual systems model of adolescent risk-taking. *Dev Psychobiol*. 2010;52(3):216–224. doi:10.1002/dev.20445
- Agnew R, Brezina T, Wright JP, Cullen FT. Strain, personality traits, and delinquency: extending general strain theory. *Crim*. 2002;40(1):43–72. doi:10.1111/j.1745-9125.2002.tb00949.x
- Nagin DS, Pogarsky G. Integrating celerity, impulsivity, and extralegal sanction threats into a model of general deterrence: theory and evidence. *Crim*. 2001;39(4):865–892. doi:10.1111/j.1745-9125.2001.tb00943.x
- Wright BR, Caspi A, Moffitt TE, Paternoster R. Does the perceived risk of punishment deter criminally prone individuals? Rational choice, self-control, and crime. *J Res Crime Delinquency*. 2004;41(2):180–213. doi:10.1177/0022427803260263
- *9. Bresin K. Impulsivity and aggression: a meta-analysis using the UPPS model of impulsivity. *Aggress Violent Behav*. 2019;2019(48):124–140. doi:10.1016/j.avb.2019.08.003
- Jones SE, Miller JD, Lynam DR. Personality, antisocial behavior, and aggression: a meta-analytic review. *J Crim Justice*. 2011;39(4):329–337. doi:10.1016/j.jcrimjus.2011.03.004
- Vazsonyi AT, Mikuška J, Kelley EL. It's time: a meta-analysis on the self-control-deviance link. *J Crim Justice*. 2017;48:48–63. doi:10.1016/j.jcrimjus.2016.10.001
- Costa PT, McCrae RR. Personality disorders and the five-factor model of personality. *J Pers Disord*. 1990;4(4):362–371. doi:10.1521/pedi.1990.4.4.362
- Eysenck HJ. The nature of impulsivity. In: McCown WG, Johnson JL, Shure MB editors. *The Impulsive Client: Theory, Research, and Treatment*. American Psychological Association; 1990:57–69. doi:10.1037/10500-004
- Moeller FG, Barratt ES, Dougherty DM, Schmitz JM, Swann AC. Psychiatric aspects of impulsivity. *Am J Psychiatry*. 2001;158(11):1783–1793. doi:10.1176/appi.ajp.158.11.1783
- Sharma L, Markon KE, Clark LA. Toward a theory of distinct types of “impulsive” behaviors: a meta-analysis of self-report and behavioral measures. *Psychol Bull*. 2014;140(2):374–408. doi:10.1037/a0034418
- Caspi A, Roberts BW. Personality development across the life course: the argument for change and continuity. *Psychol Inq*. 2001;12(2):49–66. doi:10.1207/S15327965PLI1202_01

17. Steinberg L. Risk taking in adolescence: new perspectives from brain and behavioral science. *Curr Dir Psychol Sci.* 2007;16(2):55–59. doi:10.1111/j.1467-8721.2007.00475.x
18. Farrington DP. Age and crime. *Crime Justice.* 1986;7:189–250. doi:10.1086/449114
- *19. Laub JH, Sampson RJ. Turning points in the life course: why change matters to the study of crime. *Criminology.* 1993;31(3):301–325. doi:10.1111/j.1745-9125.1993.tb01132.x
20. Sampson RJ, Laub JH. Life-course desisters? Trajectories of crime among delinquent boys followed to age 70. *Criminology.* 2003;41(3):555–592. doi:10.1111/j.1745-9125.2003.tb00997.x
21. Bekbolatkyzy DS, Yerenatovna DR, Maratuly YA, Makhatovna AG, Beaver KM. Aging out of adolescent delinquency: results from a longitudinal sample of youth and young adults. *J Crim Justice.* 2019;60:108–116. doi:10.1016/j.jcrimjus.2018.09.001
- *22. Massoglia M, Uggen C. Settling down and aging out: toward an interactionist theory of desistance and the transition to adulthood. *Am J Sociol.* 2010;116:543–642. doi:10.1086/653835
- *23. Farrington DP, Ttofi MM, Coid JW. Development of adolescence-limited, late-onset, and persistent offenders from age 8 to age 48. *Aggress Behav.* 2009;35:150–163. doi:10.1002/ab.20296
24. Farrington DP. The development of violence from age 8 to 61. *Aggress Behav.* 2019;45:365–376. doi:10.1002/ab.21831
- *25. Blokland AA, Nagin D, Nieuwebeerta P. Life span offending trajectories of a Dutch conviction cohort. *Criminology.* 2005;43(4):919–954. doi:10.1111/j.1745-9125.2005.00029.x
- *26. Charles NE, Ryan SR, Bray BC, Mathias CW, Acheson A, Dougherty DM. Altered developmental trajectories for impulsivity and sensation seeking among adolescent substance users. *Addict Behav.* 2016;60:235–241. doi:10.1016/j.addbeh.2016.04.016
- *27. Liu W, Lee GP, Goldweber A, et al. Impulsivity trajectories and gambling in adolescence among urban male youth. *Addiction.* 2013;108(4):780–788. doi:10.1111/add.12049
- *28. Harden KP, Tucker-Drob EM. Individual differences in the development of sensation seeking and impulsivity during adolescence: further evidence for a dual systems model. *Dev Psychol.* 2011;47(3):739. doi:10.1037/a0023279
- *29. Quinn PD, Harden KP. Differential changes in impulsivity and sensation seeking and the escalation of substance use from adolescence to early adulthood. *Dev Psychopathol.* 2013;25(1):223–239. doi:10.1017/S0954579412000284
- *30. Wojciechowski T. The relevance of the dual systems model of self-control for age-related deceleration in offending variety among juvenile offenders. *J Crim Justice.* 2020;70:101716. doi:10.1016/j.jcrimjus.2020.101716
- *31. Connolly EJ, Cooke EM, Beaver KM, Brown W. Do developmental changes in impulsivity and sensation seeking uniquely predict violent victimization? A test of the dual systems model. *J Crim Justice.* 2020;66:101639. doi:10.1016/j.jcrimjus.2019.101639
- *32. Kasen S, Cohen P, Chen H. Developmental course of impulsivity and capability from age 10 to age 25 as related to trajectory of suicide attempt in a community cohort. *Suicide Life-Threatening Behav.* 2011;41(2):180–192. doi:10.1111/j.1943-278X.2011.00017.x
- *33. Jones S. Does choice of measure matter? Assessing similarities and differences among self-control scales. *J Crim Justice.* 2017;50:78–85. doi:10.1016/j.jcrimjus.2017.04.005
34. Costa PT, McCrae RR, Löckenhoff CE. Personality across the life span. *Annu Rev Psychol.* 2019;70:423–448. doi:10.1146/annurev-psych-010418-103244
- *35. Roberts BW, Walton KE, Viechtbauer W. Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychol Bull.* 2006;132:1–25. doi:10.1037/0033-2909.132.1.1
- *36. Specht J, Egloff B, Schmukle SC. Stability and change of personality across the life course: the impact of age and major life events on mean-level and rank-order stability of the Big Five. *J Pers Soc Psychol.* 2011;101:862–882. doi:10.1037/a0024950
- *37. Bleidorn W, Schwaba T, Zheng A, et al. Personality stability and change: a meta-analysis of longitudinal studies. *Psychol Bull.* 2022;148(7–8):588–619. doi:10.1037/bul0000365
- *38. Caspi A, Roberts BW, Shiner RL. Personality Development: stability and change. *Annu Rev Psychol.* 2005;56:453–484. doi:10.1146/annurev-psych.55.090902.141913
- *39. Roberts BW, Wood D, Caspi A. Development of personality traits in adulthood. In: John OP, Robins RW, Pervin LA, editors. *Handbook of Personality: Theory and Research.* Guilford; 2008:375–398.
- *40. Forrest W, Hay C, Widdowson AO, Rocque M. Development of impulsivity and risk-seeking: implications for the dimensionality and stability of self-control. *Criminology.* 2019;57(3):512–543. doi:10.1111/crim.2019.57.issue-3/issue-toc
41. Higgins GE, Kirchner EE, Ricketts ML, Marcum CD. Impulsivity and offending from childhood to young adulthood in the United States: a developmental trajectory analysis. *Int J Criminal Justice Sci.* 2013;8(2):56.
42. Argyriou E, Um M, Carron C, Cyders MA. Age and impulsive behavior in drug addiction: a review of past research and future directions. *Pharmacol Biochem Behav.* 2018;164:106–117. doi:10.1016/j.pbb.2017.07.013
43. Wolfe SE, Reisig MD, Holtfreter K. Low self-control and crime in late adulthood. *Res Aging.* 2016;38(7):767–790. doi:10.1177/0164027515604722
- *44. Hirtenlehner H, Kunz F. Can self-control theory explain offending in late adulthood? Evidence from Germany. *J Crim Justice.* 2017;48:37–47. doi:10.1016/j.jcrimjus.2016.12.001
- *45. Hirtenlehner H, Baier D. Self-control and offending in late adulthood. Investigating self-control's interaction with opportunities and criminal associations in advanced age. *J Crim Justice.* 2019;60(C):117–129. doi:10.1016/j.jcrimjus.2018.09.002
- *46. Jolliffe D, Farrington DP, Piquero AR, MacLeod JF, Van de Weijer S. Prevalence of life-course-persistent, adolescence-limited, and late-onset offenders: a systematic review of prospective longitudinal studies. *Aggress Violent Behav.* 2017;33:4–14. doi:10.1016/j.avb.2017.01.002
47. Moffitt TE, Arseneault L, Belsky D, et al. A gradient of childhood self-control predicts health, wealth, and public safety. *Proc National Acad Sci.* 2011;108: 2693–2698. doi:10.1073/pnas.1010076108
48. Farrington DP, Coid JW, Harnett L, et al. *Criminal Careers Up to Age 50 and Life Success Up to Age 48: New Findings from the Cambridge Study in Delinquent Development.* Vol. 94. London, UK: Home Office Research, Development and Statistics Directorate; 2006.
- *49. Piquero AR, Farrington DP, Nagin DS, Moffitt TE. Trajectories of offending and their relation to life failure in late middle age: findings from the Cambridge Study in Delinquent Development. *J Res Crime Delinquency.* 2010;47(2):151–173. doi:10.1177/0022427809357713
- *50. Farrington DP, Piquero AR, Jennings WG. *Offending from Childhood to Late Middle Age.* New York, NY: Springer; 2013. doi:10.1007/978-1-4614-6105-0

- *51. Farrington DP, Aguilar-Carceles M. The life course of impulsive males from childhood to adulthood. *J Criminal Psychol*. 2023. doi:10.1108/JCP-12-2022-0036/full/html
- *52. Theobald D, Farrington DP. Child and adolescent predictors of male intimate partner violence. *J Child Psychol Psychiatry*. 2012;53(12):1242–1249. doi:10.1111/j.1469-7610.2012.02577.x
- *53. Costa PT, McCrae RR. Four ways five factors are basic. *Pers Individ Dif*. 1992;13(6):653–665. doi:10.1016/0191-8869(92)90236-I
54. Coskunpinar A, Dir AL, Cyders MA. Multidimensionality in impulsivity and alcohol use: a meta-analysis using the UPPS model of impulsivity. *Alcohol Clin Exp Res*. 2013;37(9):1441–1450. doi:10.1111/acer.12131
- *55. Ioannidis K, Hook R, Katie Wickham JE. Chamberlain. “Impulsivity in gambling disorder and problem gambling: a meta-analysis”. *Neuropsychopharmacology*. 2019;44(8):1354–1361. doi:10.1038/s41386-019-0393-9
- *56. Littlefield AK, Sher KJ, Steinley D. Developmental trajectories of impulsivity and their association with alcohol use and related outcomes during emerging and young adulthood I. *Alcohol Clin Exp Res*. 2010;34(8):1409–1416. doi:10.1111/j.1530-0277.2010.01224.x
- *57. Littlefield AK, Sher KJ, Wood PK. Is “maturing out” of problematic alcohol involvement related to personality change? *J Abnorm Psychol*. 2009;118(2):360. doi:10.1037/a0015125
- *58. Liu M, Argyriou E, Cyders MA Developmental Considerations for Assessment and Treatment of Impulsivity in Older Adults. *Curr Top Behav Neurosci*. 2020;47. doi: 10.1007/7854_2019_124.
59. Bechtold J, Cavanagh C, Shulman EP, Cauffman E. Does mother know best? Adolescent and mother reports of impulsivity and subsequent delinquency. *J Youth Adolesc*. 2014;43:1903–1913. doi:10.1007/s10964-013-0080-9
60. Huijsmans T, Nivette AE, Eisner M, Ribeaud D. Social influences, peer delinquency, and low self-control: an examination of time-varying and reciprocal effects on delinquency over adolescence. *Eur J Criminol*. 2021;18(2):192–212. doi:10.1177/1477370819838720
61. Loeber RE, Farrington DP, Stouthamer-Loeber ME, White HRE. *Violence and Serious Theft: Development and Prediction from Childhood to Adulthood*. Routledge/Taylor & Francis Group; 2008.
62. Farrington DP, Loeber R, Van Kammen WB. Long-term criminal outcomes of hyperactivity-impulsivity-attention deficit and conduct problems in childhood. In: Robins LN, Rutter M, editors. *Straight and Devious Pathways from Childhood to Adulthood*. Cambridge University Press; 1990:62–81.
63. Moffitt TE. Life-course-persistent versus adolescence-limited antisocial behavior. In: *Developmental and Life-Course Criminological Theories*. Routledge; 2017:75–103.
64. Massoglia M. Desistance or displacement? The changing patterns of offending from adolescence to young adulthood. *J Quant Criminol*. 2006;22:215–239. doi:10.1007/s10940-006-9009-8
65. Nagin DS, Tremblay RE. Parental and early childhood predictors of persistent physical aggression in boys from kindergarten to high school. *Arch Gen Psychiatry*. 2001;58(4):389–394. doi:10.1001/archpsyc.58.4.389
66. Han B, Gfroerer JC, Colliver JD, Penne MA. Substance use disorder among older adults in the United States in 2020. *Addiction*. 2009;104(1):88–96. doi:10.1111/j.1360-0443.2008.02411.x
67. Knight L, Hester M. Domestic violence and mental health in older adults. *Int Rev Psychiatry*. 2016;28(5):464–474. doi:10.1080/09540261.2016.1215294
68. Buss AH, Warren WL. *Aggression Questionnaire:(AQ)*. Torrance, CA: Western Psychological Services; 2000.
69. Temcheff CE, Serbin LA, Martin-Storey A, et al. Continuity and pathways from aggression in childhood to family violence in adulthood: a 30-year longitudinal study. *J Fam Violence*. 2008;23:231–242. doi:10.1007/s10896-007-9147-2
70. Piquero AR, Carriaga ML, Diamond B, Kazemian L, Farrington DP. Stability in aggression revisited. *Aggress Violent Behav*. 2012;17(4):365–372. doi:10.1016/j.avb.2012.04.001
71. Argyriou E, Um M, Wu W, Cyders MA. Measurement invariance of the UPPS-P impulsive behavior scale across age and sex across the adult life span. *Assessment*. 2020;27(3):432–453. doi:10.1177/1073191119832660
72. Inuggi A, Sanz-Arigita E, González-Salinas C, Valero-García AV, García-Santos JM, Fuentes LJ. Brain functional connectivity changes in children that differ in impulsivity temperamental trait. *Front Behav Neurosci*. 2014;8:156. doi:10.3389/fnbeh.2014.00156
73. Silveri M, Sneider M, Crowley JT, Covell DJ, Acharya MJ, Rosso D. Frontal lobe γ -aminobutyric acid levels during adolescence: associations with impulsivity and response inhibition. *Biol Psychiatry*. 2013;74:296–304. doi:10.1016/j.biopsych.2013.01.033
74. Ziegler G, Hauser T, Moutoussis M, et al. Compulsivity and impulsivity traits linked to attenuated developmental frontostriatal myelination trajectories. *Nature Neuroscience*. 2019;22:992–999. doi:10.1038/s41593-019-0394-3
75. Romer D. Adolescent risk taking, impulsivity, and brain development: implications for prevention. *Dev Psychbio*. 2010;52:263–276. doi:10.1002/dev.20442
76. Roberts NW. A revised sociogenomic model of personality traits. *J Pers*. 2018;86:23. doi:10.1111/jopy.12323

Psychology Research and Behavior Management

Dovepress

Publish your work in this journal

Psychology Research and Behavior Management is an international, peer-reviewed, open access journal focusing on the science of psychology and its application in behavior management to develop improved outcomes in the clinical, educational, sports and business arenas. Specific topics covered in the journal include: Neuroscience, memory and decision making; Behavior modification and management; Clinical applications; Business and sports performance management; Social and developmental studies; Animal studies. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/psychology-research-and-behavior-management-journal>