

Archived version from NCDOCKS Institutional Repository <http://libres.uncg.edu/ir/asu/>



Catherine D. Marcum, Melissa L. Ricketts, EmmaLeigh E. Kirchner, George E. Higgins (2013)
"Impulsivity and Offending from Childhood to Young Adulthood in the United States: A
Developmental Trajectory Analysis" *International Journal of Criminal Justice Sciences* (ISSN:
0973-5089) Version of Record Available @ ([http://0-search.proquest.com.wncln.wncln.org/
publication/publications_55115?accountid=8337](http://0-search.proquest.com.wncln.wncln.org/publication/publications_55115?accountid=8337))



Impulsivity and Offending from Childhood to Young Adulthood in the United States: A Developmental Trajectory Analysis

George E. Higgins¹

University of Louisville, USA

EmmaLeigh E. Kirchner²

Indiana University of Pennsylvania, USA

Melissa L. Ricketts³

Shippensburg University of Pennsylvania, USA

Catherine D. Marcum⁴

Appalachian State University, USA

Abstract

The purpose of the present study was to provide an examination of the development of impulsivity through childhood and its link to offending in adolescence and young adulthood in the United States. Moffitt's (1993, 2003) dual taxonomy provides a framework for understanding this connection. Using data from the National Longitudinal Survey of Youth (1979), Child and Young Adult surveys (n=413), we show that three trajectory groups of impulsivity and offending best represent these data. The groups indicate relative stability in impulsivity in childhood and offending in adolescence and young adulthood. Further we show that high levels of impulsivity are connected with high and stable levels of offending.

Keywords: Impulsivity, Offending, development, Trajectories

Introduction

Criminologist study many different personality traits which could lead to later crime and delinquency. Researchers in psychology and clinical research focus on impulsivity as its own independent construct rather than part of a larger construct or idea (Rogers,

¹ Professor, Department of Justice Administration, University of Louisville, Louisville, KY 40292, USA. Email: Gehigg01@gwise.louisville.edu

² PhD Candidate, Department of Criminology, Indiana University of Pennsylvania, Wilson Hall, Room 200411 North Walk, Indiana, PA 15705, USA. Email: e.e.kirchner@iup.edu

³ Chair, Criminal Justice Department, Shippensburg University of Pennsylvania, 1871 Old Main Drive, Shippensburg, PA, USA. Email: mlricketts@ship.edu

⁴ Assistant Professor of Justice Studies, Department of Government & Justice Studies, Appalachian State University, 2013 Anne Belk Hall - Boone, NC, USA. Email: marcumcm@appstate.edu

Moeller, Swann, & Clark, 2010; Fischer, Smith, & Cyders, 2008; Miller, Campbell, Young, Lakey, Reidy, Zeichner, & Goodie, 2009; Whiteside & Lynam, 2001; Whiteside, Lynam, Miller, & Reynolds, 2005) for instance as a part of a scale to determine self control levels (Grasmick, Tittle, Bursik, & Arneklev, 1993). While this is a component of self control, impulsivity can be studied as its own characteristic which could develop later offending among adolescents. Moffitt (1993) argues impulsivity is one of the major characteristics which maintain antisocial behavior (including offending). Impulsivity is defined as the lack of ability to clearly think out ones actions before performing them (Hinslie & Shatzky, 1940). Impulsivity has been shown to reveal many fundamental cognitive, emotional and neurological problems among children (Barratt, 1965; Evenden, 1999; Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001; Patton, Stanford, & Barratt, 1995; Rogers et. al, 2010) that have led to behavioral problems and later problems in adulthood including substance abuse (Verdejo-Garcia, Lawrence, & Clark, 2008), pathological gambling (Blanco, Potenza, Kim, Ibanez, Zaninelli, Saiz-Ruiz, & Grant, 2009) and violent behavior (Komarovskaya, Loper, & Warren, 2007; Smith, Waterman, & Ward, 2007).

The purpose of the present study is to contribute to our understanding by exploring the intersection between impulsivity and offending trajectories to address Moffitt's (1993) Developmental Taxonomy. The previous research on impulsivity and offending takes one of three forms. First, researchers have assumed that impulsivity remains stable and did not examine multiple points in time of impulsivity to capture changes in the trait (Caspi, 2000; Caspi, Henry, McGee, Moffitt & Silva, 1995; Masse & Tremblay, 1997). Second, when researchers have examined the changes that have occurred in impulsivity, they have used classification schemes to achieve this purpose (Caspi & Roberts, 1999). These two methods are flawed because either they do not acknowledge change in impulsivity or they impose a false form of classifying individuals into groups. Cote, Tremblay, Nagin, Zoccolillo, and Vitaro (2002) addressed this issue by using a statistical process that allowed them to show that groups of impulsivity and offending are possible for males and females. Our purpose is to add to this knowledge base by using an American national probability sample of individuals. In addition, we make use of impulsivity theory and Moffitt's (1993, 2003) developmental taxonomy as frameworks for understanding our results. To our knowledge, no research of this sort exists that is devoid of parts of hyperactivity. Thus, our study is unique to the impulsivity and offending literatures.

To accomplish the purpose of the present study, we discuss several topics. The study first introduces the construct of impulsivity. From there a review of the relevant literature on impulsivity is presented. This is followed by an introduction of Moffitt's Developmental Taxonomy of offending. We then present our research questions. Next, we present the methods of the current study and the analysis of our research as well as its results and implications.

Impulsivity

Personality-based researchers have used personality traits to predict and explain crime (Vazsonyi, Cleveland, & Wiebe, 2006). Within this field of research, many different terms are used for the inability to delay gratification, have poor confidence control, or having high instances of negative emotionality. Some of these terms include: weak constraints (Caspi, Moffitt, Silva, Stouthamer-Loeber, Krueger, & Schmutte, 1994), low self-control (Pulkkinen, 1982, 1986; Gottfredson & Hirschi, 1990), sensation seeking (Zuckerman,

1994; Zuckerman, Bone, Neary, Magelsdorff, & Brustman, 1972) or impulsivity (Eysenck, 1977; Wilson & Herrnstein, 1985), all of which have shown a direct link to later offending among those who have the trait at a young age.

According to Robinson, Smith, Miller, and Brownell (1999), those individuals who showed behavioral problems at an early age were more likely to suffer from low self-control, hyperactivity, hostility, inattentiveness, disrespect toward authority, and impulsivity. Psychological research has found that children who show deficits in cognitive and motor skills are more prone to demonstrate signs of impulsivity later in youth (Bruce, Steiger, Ng Ying Kin, & Israel, 2006). Although this study does not focus on the biological aspects of impulsivity, some recent research focuses on this link. For instance, higher serotonin levels within the serotonin transporter (5HTT) have been shown to correlate with higher cases of impulsivity in many different studies with both humans and rats (Dalley, Theobald, Pereira, Li, & Robbins, 2002; Lindstrom, Ryding, Bosson, Ahnslide, Rosen, & Traskman-Bendz, 2004; Sesia, Bulthuis, Tan, Lim, Vlamings, Blokland, Steinbusch, Sharp, Visser-Vandewalle, & Temel, 2010; Walderhaug, Herman, Magnusson, Morgan, & Landro, 2010) and others have argued that impulsivity has a neurobiological component (see Gray, 1987 for more information).

Although some have shown that impulsivity is related to biology, the majority of the research with impulsivity and offending is more concerned with stability and classification. For instance, researchers have consistently assumed that impulsivity remains relatively stable over time (Caspi, 2000; Caspi et al., 1995; Masse & Tremblay, 1997). Taking this stance has allowed researchers to use a single measure of impulsivity at one point in time to predict offending behaviors later in life. This does not diminish the contribution of these studies, but it does illuminate that their purpose was not to advance our understanding of the stability and changes of impulsivity over early and middle childhood years.

Caspi and Roberts (1999) provide a review of the literature that shows that some researchers have taken a different perspective in showing how impulsivity changes through early and middle childhood years. These studies tend to use an ineffective process to produce these studies. Specifically, these studies use classification schemes to develop two types groups: mean-level and rank-order. Researchers have argued and shown that rank-order describes a group that remains at the same distribution on a trait over time, and that mean-level describes the group's average change over time that may be an increase or decrease (Roberts & DelVecchio, 2000).

Along with the links to behavioral problems among young children, researchers have also found links to impulsivity and behavioral problems in adolescents and young adults. Loeber (1990) found that impulsivity was one of the most consistent factors in predicting adolescent antisocial behavior. Other researchers have also found strong associations between impulsivity and antisocial behavior (Neumann, Koot, Barker, & Maughan, 2010; Beauchaine & Neuhaus, 2008; Carrasco, Rothhammer, Moraga, Henriquez, Chakraborty, Aboitiz, & Rothhammer, 2006). Maurico, Little, Chassin, Knight, Piquero, Losoya, and Vargas-Chanes (2009) found that while many factors played a role in initial drug use in a sample of 1095 serious male juvenile offenders, only impulsivity and maturity played a role in substance abuse over a period of time. Laboratory studies have found impulsivity to be among few psychological variables to be directly related to violent crime (Bailey & Taylor, 1991; Pihl, Smith, & Farrell, 1984; Zhang, Wiczorek, & Welte, 1997). Zhang et al. (1997) found that impulsivity was strongly correlated with both consuming more alcohol

on average as well as using alcohol before committing an aggravated assault in a sample of 625 males from the first wave of the Buffalo Longitudinal Survey of Young Men. In the same study impulsivity was also found to be a strong predictor of aggravated assault (Zhang et al., 1997). Many studies focus on impulsivity in either childhood or early adulthood, which relies on impulsivity to remain a relatively stable trait throughout the life-course. Moffitt (1993) argued that personality traits may remain stable; however there may be differences for different types of offenders. To clarify some individuals may have high levels of impulsivity, which remains stable across adolescence, while others may have a stable yet low level of impulsivity.

Dual Developmental Taxonomy

Moffitt's (1993) developmental taxonomy of offending includes two types of offenders: life-course persistent offenders and adolescence-limited offenders. Life-course persistent offenders are a small group of individuals who begin offending when they are only toddlers by biting and hitting as young as age four and will continue to offend through shoplifting, truancy, stealing cars, and later violent behaviors persistently throughout their life, no matter their age. The adolescence limited offenders are a much larger group who will follow closely to the original idea of the age-crime curve. This means these offenders are showing an incline in offending throughout their adolescence, peaking in their teenage-early adult years and then quickly declining thereafter, Moffitt (1993) argues offending for these individuals is merely temporary.

Individuals that comprise the life-course persistent group are more likely to be effected by early parenting and personality issues. Peer interaction does not play a large role for these individuals. Moffitt (1993) also points out those individuals who are life-course persistent were also more likely to suffer from poor prenatal care, possible drug use by their mothers, as well as complicated births. Two longitudinal studies in New Zealand and Pittsburgh found that individuals who suffered from early childhood neuropsychological dysfunctions will have poor test scores, high levels of impulsivity, suffer from ADHD and are linked to aggressive behaviors in the early adolescence (White, Moffitt, Caspi, Jøglum, Needles, & Stouthamer-Loeber, 1994). Children who have low levels of self-control or high levels of impulsivity, as well as hostile behavior are very often rejected by their peers (Coie, Belding, & Underwood, 1988; Dodge, Coie, Brakke, 1982; Vitaro, Gagnon, & Tremblay, 1990), which does not allow these children to socialize as others. Moffitt (1993) believes all of these are symptoms of life-course persistent offenders.

Adolescent-limited individuals are more susceptible to social influences, in particular peer influence. Moffitt (1993) argues that the majority of crime is committed within this group context and is the result of the lack of maturity combined with the onset of puberty. These individuals normally begin offending, by "social mimicry," through peer influence and rewards (i.e. power and privilege) earned from their mimicry adolescents are reinforced to continue their antisocial behavior. Adolescent-limited offenders are not clear cut offenders. They will engage in offending when the reward is large enough. However if it is more profitable to the adolescent to discontinue their antisocial behavior, they will cease offending. Adolescent crime is mostly a group effort, a normal social behavior, when crime in this taxonomy is highest. When these individuals shift to adulthood offending becomes more individual and adolescence-limited offenders no longer have a need to offend. Goldstein (1990) also found that besides group motivation, individuals were self motivated to offend to prove maturity and autonomy. Unlike the life-course persistent,

adolescent-limited individuals do not commit violent crimes. A study by Piquero and Brezina (2001) found that in a sample of 2,000 males those who belonged to the adolescent-limited group committed primarily rebellious acts of offending rather than physically violent offenses and almost all rebellious acts were related to maturational timing or personal autonomy.

Recently, Moffitt (2003) modified her dual taxonomy. The modification included the addition of a third group: low level-chronics. According to Moffitt (2003), low level-chronics are described as having uncontrollable temperaments early in life that results in maladjustment as adults. To clarify, this group of individuals is likely to be depressed and anxious adults. In the context of offending, Moffitt (2003) proffered that low-level chronics follow a pattern of intermittency. Intermittency occurs when some offenders are not under criminal justice control for some period, but then reappear in the criminal justice system.

Moffitt et al. (2001) found that life-course persistent offending was more likely in males, rather than females and that one of the strongest predictors of such was low constraint/ negative emotionality and the incapacity to postpone gratification and limit impulses and anger. Moffitt, Caspi, Dickson, Silva, and Stanton (1996) measured personality characteristics of Dunedin men at ages 18 and again at 26, the first wave being self reports and the second wave both self reports and reports from informants. This study found that at age 18 life-course-persistent path was differentially associated with weak family bonds and with impulsivity. Adolescence-limited individual's path was differentially associated with an inclination to sanction unconventional values as well as "social potency." The results of the second wave showed that life-course persistent offenders were more aggressive, stress reactive, alienated and less agreeable than their adolescence-limited counterparts. The second wave also found life-course persistents to be very low on the impulse scale while adolescence-limited men were still slightly high. Ge, Donnellan, and Wenk (2003) found that in a sample of 4,000 California Youth Authority inmates life-course-persistent offenders were disagreeable and high on negative emotionality, consistent with the findings of Moffitt et al. (1996).

Chapple and Johnson (2007) used the National Longitudinal Survey of Youth (NLSY79) to look at gender differences in impulsivity. Impulsivity levels were higher for boys, which is consistent with Moffitt et al. (2001). Among boys and girls in the nationally representative sample, only two predictors of impulsivity differed among genders: maternal attachment and positive discipline. The authors note that it is not greater control on girls responsible for the differences in impulsivity and delinquency, but rather the lax control on boys.

White et. al. (1994) conducted a multimethod, multisource research project to examine impulsivity, how to measure it, as well as its relationship to delinquency. Their study used a sample of 484 students who were also members of the Pittsburgh Youth Study. When looking at 11 different measures of impulsivity they found that two factors of impulsivity, cognitive and behavioral. Cognitive impulsivity was strongly associated to IQ, and behavioral impulsivity was a strongly associated to delinquency from ages 10-13. White et. al. (1994) found that impulsivity showed one of the largest differences of personality characteristics between life course persistent offenders and adolescence-limited offenders. This finding was consistent with other studies, which found impulsivity to be closely related to long term stable offending (Buikhuisen, 1988; Farrington, Loeber, Elliot,

Hawkins, Kandel, Klein, McCord, Rowe, & Tremblay, 1990; Gorenstein & Newman, 1980; Moffitt, 1993; Wilson & Herrnstein, 1985).

Importantly, the research on Moffitt's (1993, 2003) taxonomy seems to avoid the problems of viewing impulsivity as being stable or the use of classification schemes. Researchers testing Moffitt's (1993, 2003), when addressing this issue, used a statistical process to examine the taxonomy. For instance, Cote et al. (2002) used data from Quebec, Canada to explore the trajectories of impulsivity and offending using a semi-parametric group-based (SPGM) mixture modeling approach (Jones, Nagin, & Roeder, 2001; Nagin, 2005). SPGM allows researchers to identify the mixture of groups over multiple points of time. They used a measure of impulsivity that did not include hyperactivity, and they found that boys and girls have four groups of impulsivity. These groups indicated unstable levels of impulsivity for both boys and girls. While they did not address offending specifically, Cote et al.'s (2002) results are instructive for Moffitt's (1993, 2003) taxonomy--boys and girls are likely to have unstable levels of impulsivity.

Recently Jennings and Reingle (2012) conducted a meta review of delinquency trajectories to find further support for Moffitt's (2003) taxonomy. Their review consisted of 105 studies that examined life-course delinquency as well as aggressive personality traits. They found that among the studies the number of trajectory groups ranged from 2-7 groups, however, most consisted of 3-4 trajectory groups. Most of the studies (although they did not all use the exact terminology), found both an adolescent limited and a life course persistent offender. Along with these findings Jennings & Reingle (2012) also note the importance of correlates of crime, such as low self-control, or in this case, impulsivity. Their research also finds that these traits are "manifesting a similar developmental process that can largely be explained by a shared similarity in risk and protective factors" (p.486). This increases the need for studies that examine the trajectories of risk and protective traits, alongside delinquency.

The Present Study

The purpose of the present study is to address to advance our understanding of the link between impulsivity and offending. We go beyond the Cote et al. (2002) study of impulsivity and address the following questions using a national probability sample of Americans. First, are there distinct trajectories of impulsivity in these data? Second, are there distinct trajectories of offending in these data?, and Third, do those that follow higher impulsivity trajectories have a higher probability of following offending trajectories? We seek to address these questions using measures of impulsivity and offending on respondents from ages 6 to 21. The results from this study will uniquely contribute to both the impulsivity and the developmental trajectory literatures. This provides one of the few explorations of trajectories of impulsivity when the respondents are children. Further, we add to the developmental literature by exploring how these trajectories intersect with offending in young adulthood.

Methods

The methods for the present study include the sampling and analytic procedures. In addition, the measures that were used are presented, as well as their psychometric properties.

Sampling and Procedures

The data for the present study come from the National Longitudinal Survey of Youth (NLSY). The NLSY79 survey is sponsored and directed by the Bureau of Labor Statistics and conducted by the Center for Human Resource Research at The Ohio State University. Interviews are conducted by the National Opinion Research Center at the University of Chicago. The researchers annually interviewed the respondents in 1979 from various economic, social, and personal experiences. In 1986, the respondents addressed questions about the development of children. In 1994, children that were 15 years and older were no longer assessed by their mothers and completed individual personal interviews that focused on their young adult attitudes and behaviors. The data are extensive enough to capture criminal behaviors and nonsocial reinforcement tendencies from ages 15 to 16 in 1994, 17 to 18 in 1996; and 19 to 20 in 1998. Using these ages, for these years, the total sample size is 413 individuals.⁵

Measures

Impulsivity: The measure of impulsivity is a single item that comes from the Behavioral Problems Index (Center for Human Resource Research, 1993). The item asked the child's mother to rate whether they were impulsive. The mothers rated their child on a 3-point scale: 1 = often true, 2 = somewhat true, and 3 = not true at all. We recoded this item so that higher scores would reflect more impulsivity (1 = not true at all, 2 = somewhat true, and 3 = often true).

Offending: Following Hindelang, Hirschi, and Weis (1981), we used fourteen items to capture crime. The respondents addressed the following items: damaged property of others, got into a fight at school or work, stole from a store, stole something under 50 dollar, stole something over 50 dollars, used force to get money or things, hit or threatened to hit, attack to seriously hurt, stole a vehicle, broke into a building, sold or held stolen goods, helped with gambling operations, hurt someone bad enough to need a doctor, and lied about something important. At each age, the respondents indicated their participation in these activities by 0 equal no participation and 1 for participation. Summing the items resulted in participation index that ranged from 0 to 14 with higher scores indicating more variety of offending. The measures had solid internal consistency for each year: .74 (1994), .81 (1996), and .86 (1998).

Data Analysis

The analyses for the present study take place in three steps to address our research questions. The first step is a presentation of the descriptive statistics and the bivariate correlations. The descriptive statistics provide some insight into the general trends for the entire sample. The bivariate correlations serve two purposes. First, they allow for an inspection of the test-retest reliability of the measures. Second, the bivariate correlations provide an opportunity to explore the association between impulsivity and offending over time.

The second step is an exploration of the developmental trajectories of impulsivity and offending. These trajectories are estimated using semi-parametric group-based mixture modeling (SPGM) (Nagin, 2005). This method allows for three possibilities that are

⁵ These methods resulted in 430 cases but 17 cases had missing data. These 17 cases were eliminated. The 413 cases that remain are complete cases for nonsocial reinforcement and crime.

central to our research questions. First, SPGM makes it possible to identify distinct trajectory groups among the sample (Nagin, 2005). Second, SPGM estimates the proportion of individuals that are following each trajectory (Nagin & Tremblay, 2001). Third, SPGM places individuals into distinct trajectories that they are likely to follow (i.e., classification) (Jones, Nagin, & Roeder, 2001).

To estimate SPGM, a SAS based macro, PROC TRAJ, was used. The data come from psychometric scales; thus, the censored normal distribution (CNORM) was used. According to Nagin (2005), CNORM censors the data at the minimum and the maximum ends of the scales.

A key issue with SPGM is the determination of the proper number of groups. Two pieces of information are used to determine the proper number of groups--Bayesian Information Criterion (BIC) and posterior probabilities. The calculation of the BIC, $(-2\text{LOG}(L) + \text{Log}(n) \times k)$ [L is the model's maximized likelihood, n is the sample size, and k is the number of parameters in the model]), tends to reward smaller more parsimonious models; thus, smaller models (i.e., number of trajectory groups) are found with SPGM (see Nagin & Odgers, 2010; Piquero, 2008 for a review of this literature). Further, the BIC helps to determine the shapes of the trajectories. When the BIC is maximized, the proper number of groups has been found.

Nagin (2005) argued that the posterior probabilities are important because they provide information about the classification of individuals into specific groups. Posterior probabilities are bound between 0 and 1, and the more precisely individuals are classified into trajectory groups the higher the probabilities. Nagin (2005) suggested that posterior probabilities that are above 0.70 indicated proper classification.

The third step is an exploration of the joint trajectory analysis. The models that were found in step 2 were used in this analysis. Nagin (2005) that joint trajectory models may be used to provide more information than a cross-tabulation of joint trajectory groups. Jones et al. (2001) showed that joint trajectory analysis may be able to provide three different types of probabilities that are useful (e.g., joint probability of hyperactivity and offending, offending conditional on hyperactivity, and hyperactivity conditional on offending). The joint probability of hyperactivity and offending provides probabilities as though these two things are occurring simultaneously. The offending conditional on hyperactivity provides probabilities that offending is likely given the trajectory group of hyperactivity. Finally, the hyperactivity conditional on offending group provides probabilities as though offending is influencing hyperactivity. Logic dictates that offending conditional on hyperactivity is the set of probabilities that make the most sense to interpret. The hyperactivity data were collected before the offending data; thus, the opportunity for a offending to influence hyperactivity is not probable in these data and the data do not make much sense for hyperactivity and offending occurring simultaneously.

Results

Step 1

The first step is a presentation of the descriptive statistics and bivariate correlations. The descriptive statistics show that impulsivity is stable until 10 to 12 when it drops, but it rises again from 12 to 14. Offending seems to be decreasing with time. The bivariate correlations provide evidence that test-retest reliability is present for the impulsivity measures. The bivariate correlations show that test-retest reliability for the offending

measures. Finally, the bivariate correlations show that the link between impulsivity and offending over time is sporadic and weak suggesting more inquiry.

Table 1. Descriptive and Pearson's Product-Moment Correlations among Impulsivity and Delinquency at Ages 12 to 16

Measure	1.	2.	3.	4.	5.	6.	7.	
1. Impulsivity (6-8)	1.00							
2. Impulsivity (8-10)		0.38**	1.00					
3. Impulsivity (10-12)		0.25**	0.43**	1.00				
4. Impulsivity (12-14)		0.27**	0.43**	0.44**	1.00			
5. Crime (15-17)		0.00	0.06	0.10*	0.07	1.00		
6. Crime (17-19)		0.05	0.20**	0.14**	0.16**	0.40**	1.00	
7. Crime (19-21)		0.13*	0.19**	0.10	0.16**	0.27**	0.52**	1.00
Mean	1.67	1.67	1.63	1.66	1.91	1.65	1.38	
SD	0.59	0.62	0.63	0.67	2.44	2.45	2.47	

Note ***p<.001; **p<.01; *p<.05

Step 2

The second step is an exploration of the distinct trajectories of impulsivity and offending. Table 2 shows that a 3-group model fits the data best with a BIC of -1364.94. The BIC scores for the 2-and 4-group models were -1378.99 and 1365.90. The posterior probabilities for the 3-group model were all above 0.70 suggesting that the individuals had been properly classified. Table 2 also shows that a 3-group model (BIC = -1991.34) is the best fitting offending model. The BIC scores for the 2-and 4-group models were -2004.74 and -1995.92. The posterior probabilities for the 3-group model were all above 0.70. These results indicate that distinct trajectories of impulsivity and offending are possible.

Figure 1 shows the 3-group model for impulsivity and offending. The impulsivity trajectory groups were as follows: G1 (44.07%), G2 (47.77%), and G3 (8.16%). G1 followed a trajectory reflecting a slight linear decline in impulsivity at ages 6-8 to low and stable impulsivity by ages 12-14. G2 followed a trajectory reflecting stability in impulsivity from ages 6-8 to 12-14. G3 had a linear trajectory, indicating that there was a slight increase in impulsivity as they aged.

Table 2. BIC and Posterior Probabilities for Impulsivity and Offending

Number of Groups	BIC	Posterior Probability
Impulsivity		
1		0.88
2	-1378.99	0.88
3	-1364.94	0.84
4	-1365.90	
Offending		
1		0.83
2	-2004.74	0.85
3	-1991.34	0.88
4	-1995.92	

Figure 1. Impulsivity from Age 6 through 14 and Offending Trajectories from Age 15 to 21 years

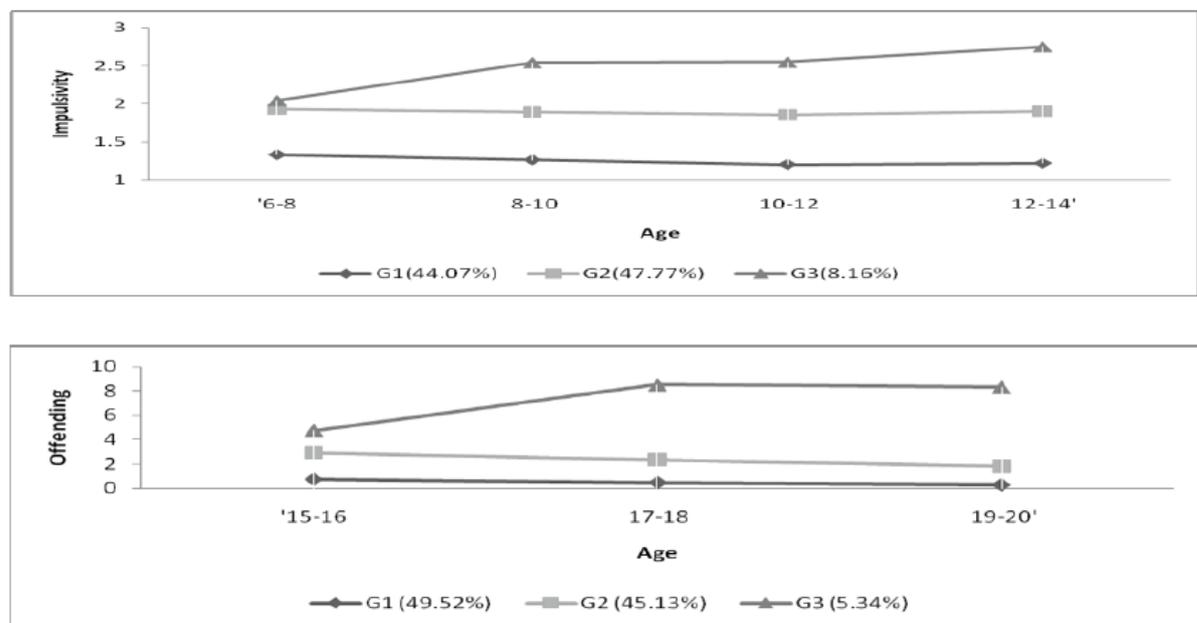


Figure 1 shows the offending trajectory groups were as follows: G1 (49.52%), G2 (45.13%), and G3 (5.34%). G1 followed a trajectory reflecting a slight linear decline in offending from ages 15-16 to ages 19-20. G2 followed a trajectory similar to G1 (i.e., linear decline), but it began at a higher rate. G3 followed a quadratic trajectory that increased as they aged.

Step 3

The third step in this analysis is an exploration of the dual trajectory analysis for impulsivity and offending. Table 3 presents the dual trajectory analysis presents the

probabilities of offending conditional on impulsivity. The results show that following the impulsivity G1 trajectory group had a 0.55 probability of following the offending G1 trajectory group. Following the impulsivity G3 trajectory group had a 0.57 probability of following the offending G3 trajectory group. These results address our third research question that following a higher distinct trajectory of impulsivity does result in following a higher offending trajectory. Our results should be tempered because the probability is slightly above chance.

Table 3. Probability of Offending Conditional on Impulsivity⁶

Trajectory of Offending	Trajectory of Impulsivity		
	G1	G2	G3
G1	0.55	0.49	0.22
G2	0.34	0.38	0.21
G3	0.10	0.14	0.57

Discussion and Conclusion

The purpose of the present study was to contribute to the literature by providing an understanding of the longitudinal links between impulsivity and offending. To make this contribution, we formulated three research questions. The research questions were: 1) are their distinct trajectories of impulsivity in these data? 2) Are there distinct trajectories of offending in these data? 3) Do those that follow higher impulsivity trajectories have a higher probability of following offending trajectories?

Concerning the first research question, we showed that three distinct trajectories of impulsivity are present in these data. The first trajectory contained low levels of impulsivity; the second trajectory followed higher levels of impulsivity; and the third trajectory was the highest level of impulsivity. The first two trajectory groups accounted for nearly 91 percent of the individuals in the sample. Further, the three trajectories show that levels of impulsivity are relatively stable in childhood in these data. The stability of impulsivity is consistent with the assumptions from Caspi (1998) that personality traits remain relatively stable. This result is at odds with Cote et al. (2002) that showed that impulsivity was unstable for boys and girls. We believe that Cote et al. (2002) used a broader measure that contained multiple measures of impulsivity that may contribute to the instability.

To address the second research question, we show that three trajectory groups of offending best represent these data. The first trajectory group follows a low or no offending trajectory. The second trajectory group seems to be declining in their offending. These two groups account for over 94 percent of the individuals. Accounting for 5.34 percent of the individuals, the third group seems to accelerate their offending and then remain relatively stable. These trajectory groups are consistent with the Piquero's

⁶ We do not present the joint hyperactivity and offending, or hyperactivity conditional on offending because the data are situated in a manner that does not allow for them to occur. The data only allow for offending to be conditional on hyperactivity.

(2008) finding that researchers that use SPGM uncover approximately 3 to 5 offending groups. Further, these results seem to fit Moffitt's (1993, 2003) versions of the developmental taxonomy and the inclusion of the low level chronic.

We address the third research question by using a dual trajectory analysis. We show that those that are following a high trajectory of impulsivity are likely to be following a high trajectory of offending. This is consistent with the view that impulsive individuals are less likely to see the consequences of their actions. In addition, this may be attributed to the inclinations toward immediately gratifying actions. That is, the impulsive person is willing to perform these actions because they are likely to be rewarded for their behavior. This is consistent with Caspi's (1998) view that impulsive individuals are likely to commit crime. We believe that this is also evidence that impulsivity, a biologically oriented concept, is likely to resonant more with the life course persistent individual; thus, the life course offender is likely to be more impulsive. This is instructive because the impulsivity measurement occurs in childhood and the offending occurs in adolescence and young adulthood. This means that early impulsivity has consequences in later offending that we consider as evidence that Moffitt (1993, 2003) may be correct.

We only argue that Moffitt (1993, 2003) may be correct, because our study has limits. The first limit is the measure of impulsivity relies on a single item measure. That is, a broader measure may provide more information that our single item indicator does not. Second, our measure of impulsivity does not take into account biological functions, and this may provide a clearer picture toward addressing Moffitt's (1993, 2003) assumptions. Third, this study does not consider the origins of impulsivity. That is, this study does not go beyond assuming how impulsivity was developed biologically and does not consider how impulsivity came about sociologically. We believe that these areas are ripe for further development and study.

Despite the limits of the present study, this study has attempted to provide information that tests Moffitt's (1993, 2003) assumptions from her developmental taxonomy. Whiel this study has limits, the results of the present study are important. The results indicate that impulsivity remains relatively stable throughout childhood and operates at different levels for groups of individuals. Further, the results indicate that offending takes place in multiple groups that seem to follow Moffitt's (1993, 2003) assumptions. In addition, those that follow high levels of impulsivity are likely to following high levels of offending consistent with Moffitt's (1993, 2003) assumptions.

References

- Bailey, D. S., & Taylor, S. P. (1991). Effects of alcohol and aggressive disposition on human physical aggression. *Journal of Research in Personality, 25*, 334-342.
- Barratt, E. S. (1965). Factor analysis of some psychometric measures of impulsivity and anxiety. *Psychology Reports, 16*, 547-554.
- Beauchaine, T. P., & Neuhaus, E. (2008). Behavioral disinhibition and vulnerability to psychopathology. In T. P. Beauchaine & S. P. Hinshaw (Eds.), *Child psychopathology: Genetic, neurobiological, and environmental substrates* (pp. 129-156). Hoboken, NJ: Wiley.
- Blanco, C., Potenza, M. N., Kim, S. W., Ibanez, A., Zaninelli, R., Saiz-Ruiz, J., & Grant, J. E. (2009). A pilot study of impulsivity and compulsivity in pathological gambling. *Psychiatry Research, 167*, 161-168.

- Bruce, K. R., Steiger, H., Ng Ying Kin, N. M. K., & Israel, M. (2006). Reduced platelet [³H-] paroxetine binding in anorexia nervosa: relationship to eating symptoms and personality pathology. *Psychiatry Research*, *142*, 225–32.
- Buikuisen, W. (1988). Chronic juvenile delinquency: A theory. In W. Buikuisen & S. A. Mednik (Eds.), *Explaining Criminal Behavior: Interdisciplinary Approaches* (pp. 27–50). Leiden; New York: E.J. Brill.
- Carrasco, X., Rothhammer, P., Moraga, M., Henriquez, H., Chakraborty, R., Aboitiz, F., & Rothhammer, F. (2006). Genotypic interaction between DRD4 and DAT1 loci is a high risk factor for attention-deficit/hyperactivity disorder in Chilean families. *American Journal of Medical Genetics*, *141*, B1, 51–54.
- Caspi, A. (1998). Personality development across the life course: In Eisenburg, N., Daom W. (eds.), *Handbook of Child Psychology* (pp. 311–388). New York, NY: Wiley Press.
- Caspi, A. (2000). The child is the father of the man: Personality continuities from childhood to adulthood. *Journal of Personality and Social Psychology*, *78*, 158–172.
- Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E., & Silva, P. A. (1995). Temperamental origins of child and adolescent behavior problems: From age three to age fifteen. *Child Development*, *66*, 55–68.
- Caspi, A., Moffitt, T. E., Silva, P.A., Stouthamer-Loeber, M., Krueger, R. F., & Schmutte, P. S. (1994). Are some people crime-prone? Replications of the personality-crime relationship across nation, gender, race, and method. *Criminology*, *32*, 301–333.
- Caspi, A., & Roberts, B. W. (1999). Personality change and continuity across the life course. In L. A. Pervin & O. P. John (eds.), *Handbook of Personality Theory and Research* (pp. 300–326). Guilford Press: New York, NY.
- Chapple, C., & Johnson, K. (2007). Gender Differences in Impulsivity. *Youth Violence and Juvenile Justice*, *5*(3), 221–234.
- Coie, J. D., Belding, M., & Underwood, M. (1988). Aggression and peer rejection in childhood. In B. B. Lahey & A. E. Kazdin (eds.), *Advances in Clinical Child Psychology* (pp. 125–158) Vol. 11. New York: Plenum Press.
- Cote, S., Tremblay, R. E., Nagin, D., Zoccolillo, M., & Vitaro, F. (2002). The development of impulsivity, fearfulness, and helpfulness during childhood: Patterns of consistency and change in the trajectories of boys and girls. *Journal of Child Psychology and Psychiatry*, *43*, 609–618.
- Dalley, W., Theobald, E., Pereira, C., Li, C., Robbins, W. (2002). Specific abnormalities in serotonin release in the prefrontal cortex of isolation-reared rats measured during behavioural performance of a task assessing visuospatial attention and impulsivity. *Psychopharmacology*, *164*, 3, 329–341.
- Dodge, K. A., Coie, J. D., & Brakke, N. P. (1982). Behavior patterns of socially rejected and neglected preadolescents: The roles of social approach and aggression. *Journal of Abnormal Child Psychology*, *18*, 389–409.
- Evenden, J. L. (1999). Varieties of impulsivity. *Psychopharmacology*, *146*, 348–361.
- Eysenck, H. J. (1977). *Crime and Personality*. London: Routledge & Kegan.
- Farrington, D. P., Loeber, R., Elliot, D. S., Hawkins, J. D., Kandel, D. B., Klein, M.W., McCord, J., Rowe, D. C., & Tremblay, R. E. (1990). Advancing knowledge about the onset of delinquency and crime. In B. B. Lahey & A. E. Kazdin (Eds.) *Advances in Clinical Child Psychology* (pp. 283–342) vol. 13. New York: Plenum Press.

- Fischer, S., Smith, G. T., & Cyders, M.A. (2010). Another look at impulsivity: A meta-analytic review of trait impulsivity and its association with bulimic symptoms. *Clinical Psychology Review*, 28, 1413-1425.
- Ge, X., Donnellan, M. B., & Wenk, E. (2003). Differences in Personality and Patterns of Recidivism between Early Starters and Other Serious Male Offenders. *Journal of the American Academy of Psychiatry and the Law*, 31, 68-77.
- Gorenstein, E. E., & Newman, J. P. (1980). Disinhibitory psychopathology: A new perspective and model for research. *Psychological Review*, 87, 301-315.
- Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.
- Grasmick, H.G., Tittle, C., Bursik, R.J., Arneklev, B. (1993). Testing the core empirical implications of Gottfredson and Hirschi's General Theory of Crime. *Journal of Research in Crime and Delinquency*, 30, 5-29.
- Gray, J. A. (1987). *The psychology of fear and stress*. Cambridge: Cambridge University Press.
- Hindelang, M. J., Hirschi, T., & Weis, J. G. (1981). *Measuring Delinquency*. Beverly Hills, CA: Sage.
- Hinslie, L., & Shatzky, J. (1940). *Psychiatric Dictionary*. Oxford University Press, New York.
- Jennings, W. G. & Reingle, J. M. (2012). On the number and shape of developmental/life-course violence, aggression, and delinquency trajectories: A state-of-the-art review. *Journal of Criminal Justice*, 40, 472-489.
- Jones, B. L., Nagin, D. S., & Roeder, K. (2001). A SAS procedure based on mixture models for estimating developmental trajectories. *Sociological Methods and Research*, 29, 374-393.
- Komarovskaya, I., Loper, A. B., & Warren, J. (2007). The role of impulsivity in antisocial and violent behavior and personality disorders among incarcerated women. *Criminal Justice and Behavior*, 34, 1499 – 1515.
- Lindstrom, M.B., Ryding, E., Bosson, P., Ahnslide, J.A., Rosen, I., & Traskman-Bendz, L. (2004). Impulsivity related to brain serotonin transporter binding capacity in suicide attempters. *European Neuropsychopharmacology*, 14, 4, 295-300.
- Loeber, R. (1990). Development and risk factors of juvenile antisocial behavior and delinquency. *Clinical Psychology Review*, 10, 1-41.
- Masse, L. C., & Tremblay, R. E. (1997). Behaviors of boys in kindergarten and the onset to substance abuse in adolescence. *Archives of General Psychiatry*, 54, 62-68.
- Mauricio, A. M., Little, M., Chassin, L., Knight, G. P., Piquero, A. R., Losoya, S. H., & Vargas-Chanes, D. (2009). Juvenile offenders' alcohol and marijuana trajectories: Risk and protective factor effects in the context of time in a supervised facility. *Journal of Youth and Adolescence*, 39, 3, 440-453.
- Miller, J. D., Campbell, W. K., Young, D. L., Lakey, C. E., Reidy, D. E., Zeichner, A., & Goodie, A. S. (2009). Examining the relations among narcissism, impulsivity, and self-defeating behaviors. *Journal of Personality*, 77, 761-794.
- Moeller, F. G., Barratt, E. S., Dougherty, D., Schmitz, J. M, & Swann, A. C. (2001) Psychiatric aspects of impulsivity. *American Journal of Psychiatry*, 158, 1783-1793.
- Moffitt, T. E. (1993). "Life-course persistent" and "adolescent-limited" anti-social behavior: A Developmental taxonomy. *Psychological Review*, 100, 674-174.

- Moffitt, T. E., Caspi, A., Dickson, N., Silva, P. A., Stanton, W. R. (1996). Childhood-onset versus adolescent-onset antisocial conduct problems in males: Natural history from ages 3 to 18 years. *Development and Psychopathology*, 8, 399-424.
- Moffitt, T. E., Caspi, A., Rutter, M., & Silva, P. A. (2001). *Sex differences in antisocial behavior: Conduct disorder, delinquency, and violence in the Dunedin longitudinal study*. Cambridge, UK: Cambridge University Press.
- Moffitt, T. E. (2003). Life-Course-Persistent and Adolescence-Limited Antisocial Behavior: A 10-Year Research Review and a Research Agenda. In B. B. Lahey, A. Caspi, & T. E. Moffitt (Eds.), *Causes of conduct disorder and juvenile delinquency* (pp. 49-75). New York: Guilford Press.
- Nagin, D. S. (2005). *Group-based modeling of development*. Cambridge, MA: Harvard University.
- Nagin, D. S. (1999). Analyzing group-based trajectories: A semi-parametric, group-based approach. *Psychological Methods*, 4, 139-177.
- Nagin, D. S., & Odgers, C. L. (2010). Group-based trajectory modeling in clinical research. In Nolen-Hoekland, S., Cannon, T. Widger, T. (eds.), *Annual Review of Clinical Psychology*. Annual Reviews, Palo Alto, CA.
- Nagin, D. S., & Tremblay, R. E. (2001). Analyzing developmental trajectories of distinct but related behaviors: A group-based method. *Psychological Methods*, 6, 18-34.
- Neumann, A., Koot, H.M., Barker, E. D., Maughan, B. (2010). The role of contextual risk, impulsivity, and parental knowledge in the developmental of adolescent antisocial behavior. *Journal of Abnormal Psychology*, 119, 3, 534-545.
- Patton, J. H., Standford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology*, 51, 768-774.
- Pihl, R.O., Smith, M., & Farrell, B. (1984). Research note: Individual characteristics of aggressive beer and distilled beverage drinkers. *Substance Use & Misuse*, 9, 6, 689-696.
- Piquero, A. R. (2008). Taking stock of developmental trajectories of criminal activity over the life course. In A. M. Liberman (Ed.), *The long view of crime: A synthesis of longitudinal research* (pp. 23-60). New York: Springer.
- Piquero, A. R., & Brezina, T. (2001). Testing Moffitt's account of adolescence limited delinquency. *Criminology*, 39, 353-370.
- Pulkkinen, L. (1982). Self-control and continuity from childhood to late adolescence: In B. P. Baltes & O. G. Brim, Jr. (Eds.), *Life-span development and behavior* (pp. 63-105). New Jersey: Lawrence Erlbaum.
- Pulkkinen, L. (1986). The role of impulse control in the development of antisocial and prosocial behavior. In D. Olewus, J. Block, & M. Radke-Yarron (Eds.) *Development of Antisocial and Prosocial Behavior: Research, Theories, and Issues* (pp. 149-175). Waltham, Massachusetts: Academic Press (Now Elsevier).
- Roberts, B. W., & DelVecchio, W. F., (2000). The rank order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*, 126, 3-25.
- Robinson, T. R. Smith, S. W., Miller, M. D., & Brownell, M. T. (1999). Cognitive behavior modification of hyperactivity/impulsivity and aggression: A meta-analysis of school based studies. *Journal of Educational Psychology*, 91, 195-203.
- Rogers, R. D., Moeller, F. G., Swann, A. C., & Clark, L. (2010). Recent research on impulsivity in individuals with drug use and mental health disorders: Implications for alcoholism. *Alcoholism: Clinical and Experimental Research*, 34(8), 1319-1333.

- Sesia, T., Bulthuis, V., Tan, S., Lim, L. W., Vlamings, R., Blokland, A., Steinbusch, H. W. M., Sharp, T., Visser-Vandewalle, V., Temel, Y. (2010). Deep brain stimulation of the nucleus accumbens shell increases impulsive behavior and tissue levels of dopamine and serotonin. *Experimental Neurology*, 225(2), 302-309.
- Vazsonyi, A., Cleveland, H. H., & Wiebe, R. (2006). Contextual Effects on the Relationships between Risk Factors and Risk Behaviors. *Criminal Justice and Behavior*, 33, 511-541.
- Verdejo-Garcia, A., Lawrence, A. J., & Clark, L. (2008) Impulsivity as a vulnerability marker for substance-use disorders: Review of findings from high-risk research, problem gamblers, and genetic association studies. *Neuroscience Biobehavior Review*, 32, 777-810
- Vitaro, F., Gagnon, C., & Tremblay, R. E. (1990). Predicting stable peer rejection from kindergarten to grade one. *Journal of Clinical Child Psychology*, 3, 257-264.
- Walderhaug, E., Herman, A. I., Magnusson, A., Morgan, M. J., Landro, N. I. (2010). The short (S) allele of the serotonin transporter polymorphism and acute typtophan depletion both increase impulsivity in men. *Neuroscience Letters*, 473, 3, 208-211.
- White, J., Moffitt, T. E., Caspi, A., Jeglum-Bartusch, D., Needles, D., & Stouthamer-Loeber, M. (1994). Measuring impulsivity and examining its relation to delinquency. *Journal of Abnormal Psychology*, 103, 192-205.
- Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences*, 30, 669-689.
- Whiteside, S. P., Lynam, D. R., Miller, J. D., & Reynolds, S. K. (2005). Validation of the UPPS Impulsive Behaviour Scale: A four-factor model of impulsivity. *European Journal of Personality*, 19, 559-574.
- Wilson, J. Q., & Herrnstein, R. (1985). *Crime and Human Nature: The Definitive Study of the Causes of Crime*. New York: Simon and Schuster.
- Zhang, L., Wiczorek, W. F., & Welte, J. W. (1997). The nexus between alcohol and violent crime. *Alcoholism: Clinical and Experimental Research*, 21, 1264-1271.
- Zuckerman, M. (1994) *Behavioural Expressions and Biosocial Bases of Sensation-Seeking*. Cambridge: Cambridge University Press.
- Zuckerman, M., Bone, R., Neary, R., Magelsdorff, D., & Brustman, B. (1972). What is the sensation seeker? Personality trait and experience correlates of the sensation seeking scales. *Journal of Consulting and Clinical Psychology*, 39, 308-321.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.