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Understanding delinquent development from childhood into early adulthood in early onset offenders

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1.1 BACKGROUND

It has long been recognized that offending behavior over time is characterized by both a striking degree of continuity, as well as a considerable amount of change (Paternoster, Dean, Piquero, Mazerolle, & Brame, 1997). A first generation of nowadays classic longitudinal studies showed that a small group of people exhibits frequent offending behavior over a long period of time (West & Farrington, 1977; Wolfgang, Figlio, & Sellin, 1972). In spite of significant evidence for stability of offending, many offenders display decreasing offense rates with age and desist from active delinquent involvement in early adulthood (Hirschi & Gottfredson, 1983; Sampson & Laub, 2003).

Even though a fairly consistent collection of risk factors of offending has been identified in prior work (for an overview see Farrington, 2003; Thornberry & Krohn, 2003), explaining variation in offending behavior over an extended period of time remains difficult (Day et al., 2012; Jolliffe, Farrington, Piquero, Loeber, & Hill, 2017; Laub, Nagin, & Sampson, 1998; Sampson & Laub, 2003). While chronic high-rate offenders are generally exposed to highest levels of risk, offenders showing other developmental types of offending are – to some extent – exposed to the same types of risk (e.g., Assink et al., 2015; Baglivio, Wolff, Piquero, & Epps, 2015; Jennings et al., 2019; Jolliffe et al., 2017). As a result, there is a lack of scientific knowledge on which types of offenders are likely to display either stable high or decreasing offending rates with age.

This knowledge-gap is problematic, as the advantages of differentiating between offenders who are about to stop offending and those who are likely to display a long criminal career have been widely acknowledged by criminological theorists and policymakers. It is of theoretical importance to study variation in long-term offending behavior and its correlates in order to confirm or challenge theoretical assumptions on these issues, which constitute an important cornerstone of criminological theory (Moffitt, 1993, 2006). From a policy perspective, knowledge on correlates of distinct long-term offense patterns may strengthen our ability to identify persistent offenders at an early stage of their criminal career, as well as help develop appropriate approaches to intervene to prevent further continuity of offending behavior.

In order to improve our understanding of variation in long-term offending behavior, theory (Moffitt, 1993, 2006; Patterson, DeBaryshe, & Ramsey, 1989), and prior studies (Assink et al., 2015; Jolliffe et al., 2017; Mulvey et al., 2010)

emphasize the importance of adopting an integrated approach to risk exposure by examining the collective impact of (the absence of) risk in several life domains (i.e., individual, familial, the peer group, school, and neighborhood). Theoretical approaches and empirical findings from many (inter)national studies suggest that offending behavior is explained by risk factors of offending originating from all life domains, and that they tend to cluster and have mutually reinforcing effects (Blokland & Nieuwbeerta, 2010; Farrington, 2003; Loeber, Stouthamer-Loeber, Slot, van der Laan, & Hoeve, 2008; Moffitt, 1993, 2006; Monroe & Simons, 1991; Zuckerman, 1999). As a result, there has been an increasing acceptance of the notion that individual factors and social/environmental context both contribute to variation in offending behavior (Ousey & Wilcox, 2007). While (biologically based) individual factors may be related to the initial onset of offending behavior, social and environmental factors related to the family, peer group, school, and neighborhood may bring about offending behavior in some individuals, while they contribute to the escalation or stabilization of offending in others (Moffitt, 1993). It is therefore important to account for the complex interplay between risk factors of offending to understand processes of change and continuity in offending behavior (Morizot, 2019).

Studying delinquent development and its correlates in early onset offenders may represent an important opportunity to increase our understanding of variation in long-term offending behavior. Especially a police contact/arrest at an early age (i.e., below age 12, see Loeber & Farrington, 2001; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996) has emerged as an important indicator for persistence in offending (DeLisi, Neppl, Lohman, Vaughn, & Shook, 2013). Not only are offenders with an early onset at higher risk of displaying persistent offending behavior than those who start after age 12 during adolescence (Farrington et al., 1990; Glueck & Glueck, 1950; Moffitt, 1993; Tolan, 1987), they are also likely to commit more serious and violent offenses (Snyder, 2001). On the other hand, most delinquent children do not display persistent offending behavior (Robins, 1966, 1978), and even the most troubled children may desist from crime (Wilson, 1991). Early onset offenders thus constitute an important offender population displaying both stability and change in their long-term offense patterns. Studying (heterogeneity in) their delinquent development provides the opportunity to follow a high-risk offender population during an extended period of the life-course, during which changes occur in several life domains (Berndt, 1982; Larson & Richards, 1991), and possibly identify early origins and contributing social/environmental factors of chronic and violent offending (Loeber & Farrington, 2001). To date, insight into long-term delinquent development and its correlates in early onset offenders with a police contact/arrest (i.e., childhood arrestees) is however largely lacking, because of a lack of suitable longitudinal data on offenders in contact with the law below the age of criminal responsibility in many Western countries

(e.g., 12 years in the Netherlands) (Farrington, Loeber, Yin, & Anderson, 2002; Hemphill, Heerde, Herrenkohl, & Farrington, 2015; Jolliffe et al., 2019).

The current thesis therefore intends to provide insight into variation in offending behavior over an extended period of time by addressing the following two general aims. First, this thesis aims to provide empirical insight into (variation in) long-term development of offending behavior in early onset offenders known to the police, and its associated singular identified risk factors. Second, the current thesis aims to improve our understanding of variation in long-term offense patterns by accounting for risk exposure across life domains (i.e., individual, familial, the peer group, school, and neighborhood). In order to do so, this thesis adopts an interdisciplinary approach to risk exposure by accounting for interaction effects between and possible clustering of risk factors previously identified in the fields of sociological, biosocial, and developmental criminology.

In order to address its aims, the current thesis uses unique data from the *Dutch Childhood Arrestees Study*, containing information on offenders who were first registered by the police between 2000 and 2006 for showing offending behavior below age 12. Longitudinal data on offending, and incarceration on over 700 childhood arrestees were retrieved from official registers in the Netherlands, and merged with rich survey data on theoretically important risk factors from individual, familial, peer, school, and neighborhood domains. In this thesis, using advanced statistical techniques, several ways are adopted to take interaction effects between and possible clustering of risk factors of offending into account.

Before turning to the empirical chapters of the current thesis, the remainder of this introduction is organized as follows. The general theoretical background of this thesis is discussed in Section 1.2. Section 1.3 provides an overview of earlier empirical studies on delinquent development and its correlates. Contributions of the current thesis are specified in Section 1.4. And lastly, the outline of the current thesis is described in Section 1.5.

1.2 THEORETICAL FRAMEWORK

While criminological theory overall states that offenders with an onset in childhood are likely to display persistent offending behavior across the life course (i.e., Gottfredson & Hirshi, 1990; Moffitt, 1993), it offers divergent explanations for the overall expected continuity in offending. Theory aimed at explaining the likelihood and development of offending behavior can be anchored by three broad explanatory paradigms.

First, psychological criminology suggests that individuals develop a static antisocial propensity – from both biological and social origins – in early childhood, which determines the risk of offending during the entire life course (Gottfredson & Hirshi, 1990; Wilson & Herrnstein, 1985). According to this

line of reasoning, stable antisocial propensity is reflected by personality characteristics – such as impulsiveness, hyperactivity, and low self-control – which are expected to determine whether individuals are highly involved in offending behavior or display little delinquent involvement. In the case of an early onset of offending, the relatively high criminal propensity that caused the early onset is thought to also result in continuous delinquent involvement across the lifespan.

Second, sociological theories of offending have traditionally focused on neighborhood and environmental characteristics (Merton, 1938; Shaw & McKay, 1969), and social relationships with family, peers, and school (Akers, 1973; Akers & Jennings, 2016; Hirschi, 1969; Hoebe, Meldrum, Walker, & Young, 2016; Sutherland, 1947). Regarding neighborhood characteristics, it has been suggested that individuals residing in deprived neighborhoods are more likely to display offending behavior, because they lack the legitimate means to achieve their desired financial or economic goals (Merton, 1938), and community relationships and local institutions fail to exert informal social control (Shaw & McKay, 1969). Sociological theories focused on social relationships continue to argue that informal social control resulting from close relationships with conventional others restrains individuals engaging in offending behavior (Hirschi, 1969), while continued social interaction with delinquent others – especially delinquent peers – increase the likelihood of offending behavior (Akers, 1973; Sutherland, 1947). To the extent that neighborhood characteristics and social relationships lead to an early onset of offending, these social influences are also thought to result in the continuation of the offending behavior.¹

A third framework combines ideas from psychological and sociological criminology to explain the likelihood (Monroe & Simons, 1991; Zuckerman, 1999) and development (Moffitt, 1993, 2006) of offending behavior. Both biosocial (Monroe & Simons, 1991; Zuckerman, 1999) and developmental (Moffitt, 1993, 2006) theorists suggest that stable antisocial propensities and (changes in) social influences may interact, and together explain within- and between-individual change in offending over time. Specifically, Moffitt (1993, 2006) suggests that early onset offenders – as opposed to adolescent onset offenders – develop relatively high levels of antisocial propensity, based on inherited or acquired (through mechanisms such as maternal drugs use or pregnancy complications) biological vulnerability. Children suffering from high levels of antisocial propensity are also thought to particularly experience, as well as be more susceptible to, adverse social interactions in several life

1 Chapter 6 offers a more elaborate theoretical discussion of the way social influences are theorized to influence the likelihood of offending behavior.

domains (i.e., family, peers, school, and neighborhood).² The combination of biological vulnerability and social/environmental disadvantage is assumed to exponentially increase the likelihood of persistent, versatile, and increasingly violent offending behavior in a large share of early onset offenders (i.e., high level chronics). When early onset offenders additionally suffer from social isolation (i.e., heightened depression and anxiety), or reside in more adaptive social environments, the escalation of offending may be prevented, resulting in persistent yet low offending rates across adolescence (i.e., low level chronics) (Moffitt, 2006).³

In sum, criminological theory assumes that offenders with an onset in childhood will typically display persistent offending behavior throughout the life-course. It follows from biosocial and developmental criminological theory that continuity in offending results from a process of reciprocal interactions between individual, familial, school, peer, and neighborhood characteristics. To increase our understanding of the development of offending in offenders with an onset in childhood, it is thus of theoretical importance to study risk exposure in multiple life domains, and account for their mutually reinforcing effects. In the current thesis, different approaches are therefore used to account for the combined effects of (the absence of) risk exposure across life domains.

1.3 PRIOR RESEARCH

The following section provides an overview of research on the development of offending with age and associated singular identified risk factors, as well as of (ways to conduct) research on associated risk exposure across life domains. Subsequently, limitations of prior work and underexplored research areas are stipulated.

1.3.1 Delinquent development and associated singular identified risk factors

With the aim of providing extensive insight into longitudinal patterns of offending, and based on criminological theory assuming that many individual

2 If the biological vulnerability were inherited, this implies that at least one parent also suffers from neuropsychological, temperamental, or cognitive deficits. These inherent deficits in the parents then have a direct negative impact on the child's social environment. Alternatively, a deficient social environment might actually cause prenatal problems (e.g., such as prenatal substance – alcohol, drugs, cigarette – use) that, in turn, result in biological vulnerability in the child.

3 A more extensive overview of dual taxonomic theory on delinquent development is provided in Chapters 3 and 4. Additionally, Chapter 2 discusses biosocial theory useful for understanding why individuals exposed to a combination of biological and social risk factors are at increased risk of displaying offending behavior.

offense patterns will be similar (Moffitt, 1993), a rapidly accumulating number of empirical studies has focused on grouping individuals with homogeneous offending patterns (Nagin, 2005; Nagin & Land, 1993). An important advantage of identifying subgroups displaying distinct developmental trajectories of offending behavior is that it allows researchers to explore varying levels of continuity and change in offending behavior in a given sample.

While prior work aimed at identifying distinct offending trajectories has not yet reached consensus about the number or shape of distinct offending trajectories, it is well supported that substantial variation in the development of offending with age exist (for narrative reviews, see Jennings & Reingle, 2012; Piquero, 2008; van Dulmen, Goncy, Vest, & Flannery, 2009). Most prior studies identified between two and seven trajectory subgroups, with three or four being the most common. Several studies identifying four groups report a similar model: stable-low, stable-high, increasing, and decreasing trajectories (Lynne-Landsman, Graber, Nichols, & Botvin, 2011; Miller, Malone, Dodge, & Conduct Problems Prevention Research Group, 2010; Odgers et al., 2008; White, Bates, & Buyske, 2001). In the Netherlands, strong support for distinct offending trajectories was found in the Criminal Career and Life Course Study based on a Dutch conviction cohort (Blokland, Nagin, & Nieuwbeerta, 2005). Four trajectory subgroups were identified, of which the high-rate persisters continued offending even after age 50. The few prior studies that were able to explore which trajectories were populated by early onset offenders confirmed taxonomic assumptions, by showing that early onset offenders generally populate the most chronic trajectory subgroup, and commit the highest amount and most diverse types of offenses (Allard, Chrzanowski, & Stewart, 2017; Broidy et al., 2015; Day et al., 2012).

Various studies have shown that singular identified risk factors can be used to distinguish between high-rate chronic offenders and non- or sporadic offenders, with high-rate chronic offenders being exposed to overall heightened levels of risk in several life domains. For example, risk factors characterizing high-level trajectories include increased levels of impulsivity (Baglivio et al., 2015), low parental supervision/neglectful parenting (Hoeve et al., 2008; Monahan & Piquero, 2009; Wiesner & Capaldi, 2003), and deviant peers (Baglivio et al., 2015; Chung, Hill, Hawkins, Gilchrist, & Nagin, 2002; Monahan & Piquero, 2009; van der Geest, Blokland, & Bijleveld, 2009). Unfortunately however, singular risk factors are less helpful in differentiating between distinct offending trajectories (Day et al., 2012; Laub et al., 1998; Mulvey et al., 2010; Sampson & Laub, 2003; Wiesner, Kim, & Capaldi, 2005).

1.3.2 Delinquent development and associated risk exposure across life domains

As previously mentioned, scholars have highlighted that accounting for exposure to combinations of risk factors across life domains, as well as their mutually reinforcing effects (Loeber, Stouthamer-Loeber, et al., 2008; Moffitt, 1993, 2006), might help improve our understanding of variation in (long-term) delinquent development (Morizot, 2019). Three ways of taking the interaction effects and clustering of risk factors of offending into account are described below.

Biosocial interaction

One way of accounting for possible mutually reinforcing effects of risk factors of offending is by studying their interaction. As previously discussed, biosocial and developmental criminological theory emphasize the importance of combining biological and social/environmental explanatory factors into a multidisciplinary (i.e., biosocial) perspective on adverse behavioral outcomes. In response, researchers have addressed how social (the family and peers), and environmental (the neighborhood) correlates of offending may exert diverse effects on individuals with different biological wiring. As the body of literature on biosocial interactions and delinquency is rapidly growing, it is important to synthesize this research in order to offer new interpretations that transcend findings from individual studies.

Risk profiles

Building on studies highlighting the importance of risk exposure in distinct life domains, some prior work has aimed to identify subgroups of individuals exposed to similar levels or combinations of risk factors in multiple life domains (i.e., risk profiles). This approach allows researchers to simultaneously examine numerous risk factors of offending, while accounting for interaction effects between and possible confounding of singular risk factors. Findings from the limited number of studies identifying risk profiles within offender populations support the assumption that there are subgroups of individuals exposed to distinct patterns of risk (i.e., Dembo, Wareham, Poythress, Meyers, & Schmeidler, 2008; Lopez-Romero et al., 2019; Schwalbe, Macy, Day, & Fraser, 2008). Importantly, prior work highlights the utility of risk profile identification as they revealed associations between specific combinations of risk and variation in delinquent involvement (Onifade et al., 2008).

Within-individual change in risk exposure

Finally, scholars have accounted for risk exposure across life domains by studying the association between developmental changes in risk exposure and variability in individual offending behavior over time (Thornberry, 1996). By focusing on associations between within-individual change in risk exposure

and behavioral outcomes, pre-existing differences between individuals are held constant and are therefore accounted for (Allison, 2009). The few studies that used the within-individual methodology to explain variation in offending across adolescence have generated mixed findings. While some work showed that change in social influences in familial, peer, and school domains had the expected effect on changes in individual offending behavior (see for example Beardslee et al., 2018; Craig, 2016; Rokven, de Boer, Tolsma, & Ruiter, 2017), other studies failed to find associations between changes in time-varying social influences and individual's own delinquent behavior (Farrington et al., 2002; Unnever & Chouhy, 2019).

1.3.3 Shortcomings of previous research

While recognizing the clear value of prior work on delinquent development and its correlates, there are three main limitations that should be mentioned, justifying the need for further research. First and foremost, on the basis of reviewing previous studies it can be concluded that, despite the apparent theoretical and practical importance of studying delinquent development in the population of offenders in contact with the law below age 12, this has rarely been done (but see van Domburgh, Vermeiren, Blokland, & Doreleijers, 2009). International and national longitudinal studies on the development of offending over time are typically based on general population and general offender samples. Unfortunately, it is not sufficient to simply generalize previous findings to the specific offender population of early onset offenders, as early onset offenders without an arrest during adolescence are not included in general population or general offender samples. Furthermore, variation in offending among children that do re-offend might be overshadowed by offending behavior of the more common adolescent onset offender. Because of a lack of available longitudinal studies focused on early onset offenders known to the police, it is currently unknown how many children in contact with the law are continuously registered by the police for offending behavior into early adulthood, and what long-term re-offense patterns in childhood arrestees might look like.

Second, most prior studies aimed at providing insight into the etiology of variation in offending pathways used singular identified risk factors, which were largely incapable of distinguishing between offenders populating distinct offending trajectories (e.g., Assink et al., 2015; Day et al., 2012; Ferrante, 2013; Jolliffe et al., 2017; Ward et al., 2010). While accounting for risk exposure across life domains seems like a promising avenue to further our understanding of variation in delinquent behavior, the limited number of studies that adopted a holistic view on risk exposure (see, among others, Craig, 2016; Lopez-Romero et al., 2019; Na, 2017; Schwalbe et al., 2008) unfortunately measured delinquent outcomes across a short period of the lifespan. As a result, our understanding

of variation in longitudinal offense patterns remains limited, and theoretically-relevant issues regarding the etiology of distinct long-term developmental patterns of offending remain understudied.

And finally, although prior work has progressed our understanding of within-individual change in offending behavior over time, empirical studies have yet to address the biosocial and developmental theoretical assumption that the effects of time-varying social influences on offending depend on individual's antisocial propensity. Consequently, we do not know whether variability in individual offending behavior over time can be explained by interaction effects between antisocial disposition and changes in social influences, like developmental taxonomic theory suggests.

1.4 THE CURRENT THESIS

The current thesis aims to address above-mentioned matters, by studying the extent to which risk factors across life domains can help explain variation in both between- and within-individual offending behavior over time in early onset offenders. As mentioned earlier, its two central aims are to (1) provide insight into (variation in) the long-term development of offending behavior in early onset offenders with a police contact/arrest, and associated singular identified risk factors, and (2) improve our understanding of variation in long-term offense patterns by combining theoretical insights stemming from different scholarly traditions (i.e., sociological, biosocial, and developmental criminology) on risk exposure in multiple life domains (i.e., individual, familial, peers, school, and neighborhood).

In doing so, the current thesis adds to prior research in three important ways. First, given the paucity of studies focused on long-term re-offense patterns in early onset offenders, the current thesis follows children in contact with the law across a lengthier follow-up period than all of the previous studies, making use of the rare opportunity to explore meaningful variation in long-term delinquent pathways within this high-risk offender population. Importantly, early onset offenders were followed beyond adolescence (Jennings & Reingle, 2012), during which delinquent behavior is theorized to peak for all individuals regardless of age of onset (Moffitt, 1993). As such, the current thesis represents an important contribution to our understanding of distinct delinquent pathways in offenders with an onset in childhood, who cause so much harm to society. Second, this thesis incorporates a large set of correlates of offending from a variety of scholarly traditions, including sociological, biosocial, and developmental criminology. This is important, as all three research fields have found associations between singular identified risk factors and future offending behavior. Furthermore, criminological theory and prior studies suggest that risk factors of offending do not operate in isolation but tend to cluster and are mutually reinforcing (Caspi et al., 2014; Farrington &

Welsh, 2008; Loeber, Stouthamer-Loeber, et al., 2008; Moffitt, 1993, 2006; Monroe & Simons, 1991; Zuckerman, 1999). By adopting an interdisciplinary perspective on offending, the current thesis is therefore able to empirically address several theoretical assumptions on associations between risk exposure across life domains and development of offending behavior over an extended period of the lifespan. Third, state of the art methods are used to account for possible clustering of and cumulative effects between risk factors of offending.

In order to address its aims, the current thesis builds upon the work of van Domburgh (2009), Geluk (2014), and Cohn (2017), by using and extending data from the *Dutch Childhood Arrestees Study* – a prospective longitudinal research project focused on children in contact with the police for the first time because of an alleged offense under the age of 12.⁴⁵ As offending behavior displayed under the age of 12 is not recorded in national registration systems, three local police registration systems (Rotterdam-Rijnmond, Gelderland-Midden and Utrecht) were used to select children registered for displaying behavior that could be prosecuted when displayed from age 12 onward, excluding status offenses (i.e., behavior that is only prosecutable for certain (age) groups, such as truancy) as these are generally not dealt with by the Dutch police. In order to address the first aim, the delinquent development of children in contact with the law was reconstructed using official registration data, containing information on police registrations, mortality, and criminal sanctions from age 12 into early adulthood. The second aim was addressed by combining official registration data with information on a large number of individual, familial, peer, school, and neighborhood characteristics, derived from standardized instruments – interviews as well as questionnaires – administered to parents and children during three assessment occasions across adolescence.

4 This study was carried out by VU University Medical Centre, Department of Child and Adolescent Psychiatry and approved by the Dutch Ministry of Justice. The *Dutch Childhood Arrestees Study* was supported by the municipalities of Utrecht and Amersfoort, the Rotterdam metropolitan region, and the province of Utrecht; the Kinderpostzegels Nederland Foundation, and Leiden University.

5 It is important to note that, by using data from the *Dutch Childhood Arrestees Study*, the current thesis used a first police registration below age 12 as a proxy for early onset offending. While a police registration in childhood is an important risk factor for persistent delinquent behavior (DeLisi et al., 2013), our sample of early onset offenders may include children who only displayed offending behavior that one time they were registered by the police. The proxy for early onset offending used in the current thesis therefore differs from the one used in studies conducted by Moffitt and colleagues (i.e., Moffitt & Caspi, 2001; Moffitt et al., 1996; Moffitt, Caspi, Harrington, & Milne, 2002), which defined early onset offenders as stable and pervasive antisocial behavior problems across situations below age 12 (i.e., rated one standard deviation above the sample mean by parents and teachers on at least three of four assessment occasions).

1.5 OUTLINE OF THE THESIS

Empirical findings addressing the two central aims are presented in the following four chapters of this thesis (an overview of which is presented in Table 1.1).⁶

As questions surrounding the interaction between antisocial disposition and social/environmental influences on offending behavior are central to the current thesis, a review of prior literature on interactions between biological and social/environmental correlates of offending is offered in Chapter 2. The current thesis is especially focused on antisocial disposition resulting from biological vulnerability, as both theory (Moffitt, 1993) and prior research (for a review see Yang et al., 2014) have identified biological vulnerability as an important indicator of antisocial disposition interacting with social risk. As crime is a relatively rare phenomenon, Chapter 2 is based on the related, but more general phenomenon of antisocial behavior, in order to learn more about ways in which biosocial interaction is associated with adverse behavioral outcomes.

Chapter 3 addresses the first general aim of this thesis, by empirically evaluating hypotheses on the delinquent development in early onset offenders and associated singular identified risk factors. Specifically, Chapter 3 studies whether early onset offenders have distinctive long-term re-offense patterns from age 12 to age 25 across several types of offenses. In order to address the assumption from taxonomic theory that males, minorities, and children from disadvantages neighborhoods are at increased risk of following chronic offending pathways, Chapter 3 also examines whether offenders following distinct trajectories can be characterized based on gender, ethnicity, and neighborhood socioeconomic status and urbanization levels.

Building on findings from the systematic review described in Chapter 2, Chapter 4 continues to address the second aim of the thesis by examining whether clusters of risk in childhood can help explain variation in long-term variation in offending behavior. Specifically, it investigates whether subgroups of early onset offenders are identifiable based on re-offense patterns into early adulthood (i.e., trajectory subgroups), as well as based on similarity in risk exposure across life domains (i.e., risk profiles). Subsequently, Chapter 4 compares risk profiles on placement across distinct offending trajectories up to age 20.

Chapter 5 presents a study that uses the interaction between time-stable biological characteristics with time-varying social variables that reflect elements of social bonding and social learning to explain within-individual variation in offending behavior over time. This chapter first provides insight into the extent to which change in social bonds with family, peers, and school can help

6 It should be noted that Chapters 2 to 5 were originally written as separate manuscripts, resulting in a degree of overlap between the chapters in this dissertation.

explain variability in individual offending behavior in early onset offenders. In addition, it is investigated whether the social bonds-offending relationship varies across early onset offenders who suffered from biological vulnerability as opposed to the early onset offenders who did not.

Finally, Chapter 6 provides a summary of the main findings from this thesis and recapitulates answers to its general aims. After evaluating the current thesis' strengths and weaknesses, recommendations are made for future research and intervention efforts aimed at curbing the delinquent development in early onset offenders in contact with the law.

Table 1.1 Outline of the thesis

Chapter	Research question(s)	Data	Dependent variable	Independent variable	Analytical strategy
2	–To what extent are interactions between biological and social/ environmental risk factors associated with antisocial and delinquent behavior?	–Prior empirical work	–Antisocial behavior	–Peri/prenatal problems or psycho-physiological risk –Social/ environmental risk	–Literature review
3	–To what extent can distinct offending trajectories be identified based on frequency and type of offending from childhood into adulthood in early onset offenders? –And to what extent can sex, ethnicity, and childhood neighborhood factors characterize subgroups following distinct offending trajectories?	–Registration data S1 & S2, N = 708	–Offense frequency across age and offense types	–Sex –Ethnic origin –Neighborhood SES –Neighborhood urbanization	–Multi-trajectory modeling –Multinomial regression
4	–To what extent are early onset offenders assigned to specific risk profiles identified in childhood differentially at risk of following specific offending trajectories into early adulthood?	–Registration data –Survey data S2, W1, N = 348	–Offense frequency across age	–Risk profiles, based on risk exposure in individual, familial, peer, school, and neighborhood domains	–Trajectory modeling –Latent profile analysis –Analysis of variance –Chi-squared test –Multinomial regression
5	–To what extent are changes in social bonds with parents, peers, and school associated with changes in offense frequency in early onset offenders, during the transition from childhood into early adolescence? –And to what extent do such associations depend on biological vulnerability resulting from peri/prenatal problems?	–Registration data –Survey data S2, W1-3, N = 348	–Offense frequency across time	–Changes in social bonds with family, peers, and school –Peri/prenatal problems	–Hybrid random effects models

Note. S1 = Sample 1; S2 = Sample 2; W1 = wave 1; W1-3 = wave 1 through 3, SES = socioeconomic status.