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## Developmental Changes in Adolescence and Risks for Delinquency

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Adolescence is a critical developmental period considering the quantity and intensity of related changes (e.g., biological and psychosocial), which may represent, in themselves, risks for present and future delinquency. It is indeed well established that the age–crime curve peaks during adolescence (e.g., Landsheer and van Dijkum 2005) and that the rate and severity of offences occurring during this period are strong predictors of later offences (e.g., Overbeek et al. 2001). Furthermore, the number of juvenile offences is extremely high in the USA, with 2.11 million juveniles arrested in 2008, a rate of about 2.4% of 10- to 17-year olds. Among these, 96,000 juveniles were arrested for violent crimes, including 1,280 murders (Sickmund 2010; Puzzanchera et al. 2010). Despite the frequency of juvenile delinquency, young offenders are rarely taken into consideration in the literature on normative adolescent development, and it would be consequently incorrect to assume that delinquency precludes youth from experiencing processes that are typical during this developmental period (e.g., Knight et al. 2009). Accordingly, the ways in which the justice system responds to juvenile

offending should be informed by the lessons of developmental science (Steinberg 2009).

The concept of “storm and stress” has been suggested (Rousseau 1762/1962), operationalized (Hall 1904), and revised (e.g., Arnett 1999) to describe the tumultuous change inherent in normative adolescence, and also to suggest pathways to delinquency. In this chapter, we build upon this concept by analyzing the developmental changes of adolescence as a fundamental context for the emergence of a range of behavior and outcomes that may include delinquency. Such contextualization could help to understand how “normative” experiences of rule breaking may persist into a delinquent identity. Complementing Steinberg’s (2009) review on adolescent development and its implications for the treatment of juveniles in the justice system, we examine neurobiological and psychosocial changes of adolescence as vulnerable contexts for the emergence of delinquency. First, we introduce the key characteristics of adolescent development in terms of neurobiological and psychosocial changes. Second, we describe how this natural developmental process can lead to maladaptive adjustment and behavior, ranging from “typical” manifestations of adolescent behavior to more troubling outcomes such as delinquency and psychopathology. Third, we examine more deeply the neurobiological factors that may be involved in the emergence of such outcomes. Finally, we review the major aspects of emerging identity that may result in internal conflicts, maladaptive

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behaviors, and delinquency. We conclude by underlining the advantages of contextualizing delinquency in neurobiological and identity changes, and by hypothesizing that developmental asynchronies may explain individual differences in experiencing storm and stress. Understanding these developmental changes individually thus provides insight into the emergence of juvenile delinquency in adolescence. Taken together, they offer new perspectives for delinquency theory and research with implications for tailored interventions, grounded in adolescent development.

### Developmental Storm in Adolescence

Several volumes on adolescent development would be necessary to describe the quantity, the intensity, and the complex interaction of the changes occurring during this period of life, and how these changes may represent specific vulnerabilities for developing adolescents. In modern societies, adolescence is indeed often characterized as a period of “storm and stress” (e.g., Hall 1904) or “developmental storm” (e.g., Cloutier 2005), as the intensity and rapidity of the changes experienced by youth are significant and widely observed. Across all these changes, the task of adolescence is above all the formation of an identity, which is triggered by environmental, social, pubertal, and neurobiological changes. These neurobiological changes, specifically, lead to increased cognitive capacity, which allows the new meta-reflexive questions of identity formation. The multitude of adolescent changes also results in behavioral manifestations such as risk taking,<sup>1</sup> impulsivity, and emotional disturbance. In this section, we introduce the key psychosocial and neurobiological transformations of adolescence in order to better understand the emergence and peak of delinquency during this period of life, as further explored in the next section.

<sup>1</sup> The tendency to engage in behaviors that have the potential to be harmful or dangerous, yet at the same time provide the opportunity for some kind of outcome that one perceives as positive (e.g., the thrill of driving at unsafe speeds, or the feelings of euphoria from taking a new drug).

### Adolescent Neurobiological Development

Puberty represents the onset of adolescence, and the mechanistic and outward physical changes involved have been widely studied and reported in the literature. However, the human brain undergoes substantial development during adolescence, and until recently the specific developmental changes occurring in the brain were opaque. While there is still much to learn, researchers have identified two neurobiological systems that are particularly important in regulating behavior during adolescent development: the socioemotional system and the cognitive control system (Casey et al. 2010; Steinberg 2008).

The socioemotional system processes social and emotional information and compels individuals to act in ways that maximizes pleasure and minimize displeasure. Due to the system’s role in reinforcing pleasurable behaviors, one of its major components is commonly referred to as the reward pathway or reward center, and it is particularly important when considering the risk versus reward considerations that are a key feature of risky decision making (Steinberg 2008). The other system, the cognitive control system, is generally responsible for executive functioning, including response inhibition, affective control, planning, weighing risks and rewards and simultaneous consideration of multiple sources of information—and these are critical features for identity formation, as reviewed below. These two systems, the socioemotional system and the cognitive control system have been observed to mature substantially during adolescence, but they do not develop at exactly the same time. As a whole, the socioemotional system develops rapidly during early adolescence likely triggered by puberty, and is undistinguishable from adults by middle adolescence (age 15–16). While the cognitive control system also shows gains in early adolescence, its development is more gradual than the socioemotional system, and only reaches the final stages of maturation as late as early adulthood (age 18–24) (Casey et al. 2010; Steinberg 2009).

This developmental lag of the cognitive control system, described as a temporal gap (e.g., Steinberg

2009), is the typical neurobiological context of adolescent behavior. The lack of inhibition from the developing cognitive control system results in a brain that is highly susceptible to social and pleasurable influences, has decreased capacity to plan ahead, and weigh the consequences of risky behavior. This temporal gap is analogous to how a growing adolescent's body can develop disproportionately, resulting in an awkward teenage look; similarly, the asynchronous development of neurobiological systems predisposes adolescents to characteristic behaviors, such as risk taking and impulsivity. Adolescents' greater susceptibility to peer influence and decreased capacity to plan for the future are additional factors that influence risk taking and impulsivity and can be explained by this temporal gap of developing brain systems.

The specific cellular changes that occur in the developing brain and ultimately lead to the formation of an adult brain are complex and there is still much to be discovered; however, underlying cellular changes can be inferred from observations made at the anatomical level. Brain development in late childhood and adolescence involves a gradual decrease in total gray matter and an increase in total white matter (Giedd 2004). The gray matter is distributed along the outer portion of brain structures and it primarily contains neuron cell bodies that project onto other cells both within the gray matter and also to other regions of the brain. The decrease in gray matter corresponds to maturation because neurons of the gray matter are thought to undergo synaptic pruning, which results in improved coordination and specialization of neurons for specific cognitive tasks (Gogtay et al. 2004). The white matter differs from gray matter in that it does not contain cell bodies, and is primarily made up of the myelinated (i.e., long and fast) connections between brain regions. The volume of white matter continues to increase linearly before stabilizing in adulthood, suggesting that connections between cortical and deep brain regions continue to increase until early adulthood when the brain has established the network of communicating neurons between its regions (Paus 2005). Such studies demonstrate that it is not until early adulthood (age 18–22) that the human brain is anatomically

stable over time (i.e., fully developed). The increasing specialization of neurons and improving interconnectivity of brain regions, occur in both neurobiological systems, the socioemotional system, and the cognitive control system. The emerging interconnectivity between these developing brain systems is a possible mechanism to explain individual behavioral tendencies, including risk-taking and impulsivity (Casey et al. 2010). The brain maturation that occurs during adolescence is also responsible for cognitive changes that allow new meta-reflexive questions involved in the process of identity formation.

### **Adolescent' Psychosocial Development and the Quest for Identity**

Adolescence is a fragile period of "crisis," which is a crucial time for identity development. Erikson (1968) used the term "crisis" to refer to a time of fragmentation and conflict, and to describe how adolescent development happens through contradictions and uncertainties about the self. Indeed, the adolescent's quest for identity refers to the new question "Who am I?" allowed by the new development of the brain (see previous section), major environmental changes, and the new dynamic of the need for affiliation/socialization and individuation. The formation of identity in adolescence is the pursuit of a feeling of self-sameness and existential continuity across contexts and situations (Erikson 1968). This is reached through a complex dynamic between two aspects of identity: the personal and the social. The personal aspect of identity refers to the need for individuation, or need to be unique, independent, while the social aspect involves the search for the feeling of belonging to a social group (cf. Tajfel 1982) and being accepted by a group of peers. This dynamic makes the balance between "self" and "others" a developmental challenge (e.g., Kroger 2003). This quest for identity is also compelled by an essential adaptation to a "new" body (i.e., puberty and other biological changes), and changes in cognitive functioning (i.e., access to abstract reasoning) allowing new abilities in self-representation

(e.g., Harter 2003), as well as for interpreting and interacting with the social world. At the same time, identity development occurs during a period of the first significant decisions of life, which are often required due to environmental and societal demands imposed on youth (e.g., such as the choice of a school curriculum that will determine one's future career opportunities). These commitments and commitments in general strongly contribute to the adolescent's self-image, since they define social categories that serve as a source of self-esteem (cf. Bosma 1994, Tajfel and Turner 1986).

Among different theoretical approaches, the identity status paradigm (Marcia 1966) has been used for decades to empirically describe identity formation in adolescence (e.g., Berzonsky and Adams 1999; Kroger et al. 2010; Zimmermann et al. 2010). In his early work based on the Eriksonian perspective of identity, Marcia (1966) focused on the outcome of the identity crisis in adolescence. He realized that adolescents' ability to formulate their commitments—an essential aspect for defining the self—depended on whether or not they experienced a period of “crisis,” or exploration of many possible commitments, which may lead to doubts and uncertainties about the self. For Bosma (1994), the amount of exploration involved in achieving the commitments reflects on the stability and flexibility of the sense of identity. Indeed, commitments have a social significance and provide a definition of the adolescent to him/herself (e.g., Bourne 1978; Kroger 2003). Therefore, the intensity of the commitments reveals the strength of the adolescent's sense of identity (Bosma 1994). Accordingly, Marcia (1966) constructed a model of four “identity statuses” based on an adolescent's level of exploration and commitment in significant ideological and interpersonal domains of life (e.g., future profession, leisure activities, politics, religion) (see Table 2.1). As described later, each identity status is related to various levels of psychosocial maturity,<sup>2</sup> and can explain adolescent decision making and delinquency.

**Table 2.1** The identity statuses paradigm (adapted from Marcia 1980)

		Exploration <sup>a</sup>	
		Low	High
Commitment <sup>a</sup>	Low	Diffusion	Moratorium
	High	Foreclosure	Achievement

<sup>a</sup>Level (low or high) of exploration of commitment and corresponding identity statuses

*Identity achievement status* has been described as the goal (or ideal) of a developmental trajectory because it characterized adolescents who have explored different areas of life and then committed themselves through personal choices in these domains. Therefore, this status is often described as the most mature developmental configuration in Western societies (e.g., Waterman 1999). Since commitments are grounded in their experience, identity achievers (i.e., adolescents in identity achievement status) are able to articulate the reasons for their choices. They are also described as intrinsically motivated (Waterman 2004) and open to new experience (Clancy and Dolliger 1993). Conversely, *Identity-diffusion status* is an identity structure resulting from a lack of exploration associated with a lack of commitment in significant domains. In other words, diffuse adolescents do not attempt to commit, which reflects a low level of psychosocial development and often a less mature identity (e.g., Waterman 1999). Identity-diffusion is associated with negative outcomes such as low intrinsic motivation (Waterman 2004), lack of self confidence (Dunkel 2000), higher conformism (Adams et al. 1985), and more risk for alcohol and drug abuse (Jones and Hartmann 1984). The *Moratorium status* describes adolescents in a period of wide exploration, a quest for identity with intense questioning about possible commitments. The Moratorium identity is per se, the period of identity “crisis” discussed above. In their narrative, adolescents in Moratorium describe a lot of dilemmas, internal conflicts, and often anxiety about themselves and their future (e.g., Yoder 2000). Cognitively, Moratorium's intense exploration is consistently associated with greater divergent thinking (Barbot 2008). While adolescents in this status show more

<sup>2</sup>Psychosocial maturity has been defined as the capacity of the individual to function adequately on one's own, to make decisions without excessive reliance on others, to contribute to social cohesion, and to interact adequately with others (e.g. Greenberger and Sorensen 1974).

emotional disturbance and higher anxiety than other statuses, they also show higher openness to experience (Clancy and Dolliger 1993). Conversely, the *Foreclosure-status* is characterized by very strong commitments that do not result from a period of exploration, but rather a deep internalization of parental and social values. These strong commitments leave little opportunity for exploration and reconsideration. Foreclosed adolescents are generally extrinsically motivated and dependant on relevant external forces for guidance and decision making (e.g., Archer and Waterman 1990; Marcia 1980). They attach great importance to preserve their identity through rigidly held beliefs and inflexible values (e.g., Berzonsky and Sullivan 1992; Dollinger 1995). On the other hand, they may be less inclined to take risks (Jones and Hartmann 1988) and to be open to experience (Clancy and Dolliger 1993). By protecting their commitment and their identity, these adolescents may have higher self-esteem than Moratorium and Diffuse adolescents (e.g., Cramer 1995), possibly for defensive reasons (Marcia 1980).

Confirming that the Diffusion status is a less mature configuration, whereas Achievement is more mature, evidence from numerous longitudinal studies indicates a prevalence of identity Diffusion in the beginning of adolescence, and the highest rate of Achievement in late adolescence (e.g., Kroger et al. 2010; Meeus et al. 1999). As an illustration, a recent meta-analysis of 124 longitudinal studies using Marcia's paradigm (Kroger et al. 2010) indicated that about two-thirds of the identity development trajectories started at age 14 with either a Diffusion (36%) or Foreclosure (28%) status, whereas Achievement (15%) and Moratorium (22%) statuses were less frequent. The reverse pattern was found in late adolescence, but the highest rate of Achievement is in fact more prevalent beyond adolescence (47% among 30- to 36-year olds), also suggesting that identity development does not necessarily end in adolescence (Kroger et al. 2010).

While these differences in identity status distribution suggest a direction of change from Diffusion to Achievement (e.g., Marcia 1980, 1993; Waterman 1999), the developmental

sequence in forming identity during adolescence is, however, multi-phasic (e.g., Matteson 1975) and not hierarchical, with a variable number of periods of stability, "regressions," and "progressions." Thus, throughout adolescence, identity does not develop linearly between the Diffusion status and the Achievement status. Conversely, it may be constantly explored and reconsidered (e.g., Crocetti et al. 2008), in particular when adolescents face new events of life or have to make new commitments.

The concept of *Identity confusion* proposed by Erikson (e.g., Erikson 1970) is useful to understand how this developmental task of identity formation is a difficult process which may lead to internalizing or externalizing problems. Identity confusion reflects the state in which the individual fails to resolve identity crisis and does not have a strong feeling of identity. According to Erikson (1970), a state of identity confusion, often seems to be accompanied by all the neurotic or near-psychotic symptoms to which a young person is prone on the basis of constitution, early fate, and malignant circumstance. Correspondingly, Marcia (1980; see also Archer 1989) advanced that each identity status is associated with both protective and risks factors for psychopathology (e.g., phobia, depression, anxiety) and other psychosocial problems (e.g., drug abuse, delinquency), except perhaps in the case of identity achievement, which would more likely be associated with only protective factors. According to Marcia's (1980) review, the protective factors associated with Identity Achievement include autonomy, reflection, self-esteem, post-conventional moral reasoning, mature intimacy, cultural sophistication, and an internal locus of control. Conversely, risk-factors mostly associated with Diffusion and Foreclosure include authoritarianism, pre-conventional and conventional moral reasoning, an external locus of control, less self-directedness, stereotyped interpersonal relationships, a preference for cognitive simplicity or disorganized cognitive complexity, and impulsivity. In a later section, we review what makes the process of identity formation a particularly vulnerable process for the development of delinquency.



## From Developmental Storm to the Perfect Storm: Risks Inherent to Adolescent Development

At the inception of adolescent development as an area of scientific study, the term “storm and stress” was used to characterize the chaos, passion, energy, and tumult that was more often observed in adolescence than in other age groups (e.g., Hall 1904). The “storm and stress” issue has been explicitly considered in relation to adolescent normative development to describe adolescents’ typical tendency (a) to question and contradict their parents (adolescence is a time when conflict with parents is especially high, which is associated with a tendency to be rebellious and to resist adult authority), (b) in their mood disruptions (adolescents tend to be more volatile emotionally and to experience more extremes and swings of mood, including more frequent episodes of depressed mood), and (c) in their propensity for reckless and antisocial behavior (they have higher rates of reckless, norm-breaking, and antisocial behavior) (Arnett 1999). Indeed, adolescence has long been associated with heightened rates of antisocial, norm-breaking, and criminal behavior, particularly for boys. Hall (1904) included this as part of his view of adolescent storm and stress, suggesting that “a period of semi-criminality is normal for all healthy [adolescent] boys” (Vol. 1, p. 404). While this idea is still accepted, as suggested by international guidelines on adolescent delinquency (United Nations 1990), adolescents do vary a great deal in the extent to which they participate in reckless and antisocial behavior (Arnett 1999).

If adolescence is expected to be a time of storm and stress for all, there may be adolescents whose serious problems go unrecognized and untreated, while adolescents who are experiencing normal difficulties may be seen as pathological and in need of treatment (Arnett 1999). Similarly, startling statistics on psychiatric symptoms, mortality, crime, and drug abuse, should not be misconstrued to suggest that all adolescents are criminals, or even that all adolescents are greatly affected by storm and stress. However,

epidemiological data identify adolescence as the most common time of life for psychiatric illness to emerge (Kessler et al. 2005), and adolescents have been observed to have higher rates of depressed mood than either children or adults (Petersen et al. 1993), which is consistent with common observations of adolescent storm and stress. US mortality statistics also reinforce the notion that adolescence is a time of storm and stress as accidents, homicide, and suicide are the three leading causes of death for 15- to 19-year-olds (Heron 2007), which is also the case worldwide. Indeed, the leading causes of death for all countries combined in ages 15–19 are road traffic accidents (11.6%), self-inflicted injuries (7.3%) and violence (6.2%). Furthermore, in the 20–24 age group, deaths from HIV/AIDS become the second leading cause of mortality (8.3%) (Patton et al. 2009), in large part a consequence of the increased risky sexual behavior that occurs in adolescence.

Just as disquieting are studies suggesting that “extreme forms” of storm and stress (such as delinquency) are associated with mental disorders (e.g., Fazel et al. 2008). A number of US studies report that nearly 70% of incarcerated youths and 50% of youths on probation screen positive for at least one mental disorder, and in those that screened positive, rates of comorbidity were as high as 80% (Teplin et al. 2002; Wasserman et al. 2002, 2005). Setting out to further estimate the disease burden of mental health in incarcerated youths, a recent meta-analysis on the international prevalence of mental disorders among juveniles in correctional facilities included data from 25 studies from eight countries for a total of 13,778 boys and 2,972 girls (mean age 15.6 years, range 10–19 years) (Fazel et al. 2008). Results are summarized in Table 2.2. The investigators state that they limited their analysis to psychotic disorders, major depression, and ADHD due to their treatability, and to conduct disorder because of its prognostic value. Substance abuse prevalence was also excluded due to the substantial influence of reporting and ascertainment bias. While these data offer a limited view of disease burden, they have external validity that far exceeds individual studies in a field with limited

**Table 2.2** Aggregated prevalence of juvenile psychopathology in correctional facilities compared with community estimates

	Correctional facilities		Community estimates <sup>a</sup> (%)
	Boys (%)	Girls (%)	
Psychotic disorder	3.3 <sup>b</sup>	2.7 <sup>b</sup>	0.3
Major depression	10.6 <sup>b</sup>	29.2 <sup>b</sup>	5
ADHD	11.7 <sup>b</sup>	18.5 <sup>b</sup>	3
Conduct disorder	52.8 <sup>b</sup>	52.8 <sup>b</sup>	4
PTSD	10.9 <sup>c</sup>	14.7 <sup>c</sup>	1

<sup>a</sup>US data (Costello et al. 2005)<sup>b</sup>Fazel et al. (2008)<sup>c</sup>US data (Abram et al. 2004)

epidemiological data. Nonetheless, to offer a more complete picture, the table also includes findings in Post-Traumatic-Stress-Disorders (PTSD) prevalence from a recent large US study of 532 males and 366 females from a single urban area (Abram et al. 2004). For comparison, the median US-wide community prevalence of the same disorders are also listed (as reported by Costello et al. 2005), but similar to reports on disease prevalence in incarcerated youth, the reviewers caution that remarkably few rigorous epidemiological surveys reporting the general prevalence of mental disorders in adolescents have been carried out, hence the lack of precision in the numbers reported.

Table 2.1 clearly shows that the burden of mental illness in delinquent adolescents is high (with rates of psychotic disorder, ADHD, conduct disorders and PTSD above ten times greater than for the community estimates; and two to six times higher rates for major depression). In other words, incarcerated adolescents tend to present much higher risks for psychopathology (Teplin et al. 2002). However, it should be noted that incarcerated youths represented only approximately 35% of all delinquency cases in 2007 (Puzzanchera et al. 2010). Therefore, these epidemiological data may disregard possible other prevalent diseases of adolescents who are not detained as well as those who evade the juvenile justice system and/or the mental health care system. Thus, it appears that storm and stress in adolescence is sometimes much more severe than the three keys aspects usually mentioned in the literature and reviewed above: conflict with parents, emotional disturbance, and antisocial behaviors.

Although contemporary views of adolescence's storm and stress have attempted to revise, or reconsider it (e.g., Arnett 1999), the concept still presents a limited view of the risk involved in adolescence. Nor does it take into account the important consideration of complex interaction of risk and resilience factors that go far in accounting for which adolescents are most likely to have difficulty (for review see Loeber 2008). Of course, many adolescents proceed through and emerge from this developmental stage without any great conflict or negative outcomes.

Thus, typical adolescent changes are expressed as a broad range of outcomes. Most adolescents experience the typical storm and stress as described above. Others experience storm and stress to a more "extreme" degree: at one extreme, albeit rare, is total absence of storm and stress; at the other extreme is severe storm and stress, including delinquency and psychopathology that may be comorbid. Given that storm and stress is exclusively an adolescent phenomenon, it is reasonable to situate it in the unique developmental specificities of this period of life. Accordingly, the degree of storm and stress expressed may be rooted in how one experiences the most salient changes of adolescence: neurobiological changes and identity formation.

As identity formation is the key developmental task of adolescence, this difficult process may indeed be particularly associated with various degrees of storm and stress expressions, including delinquency in the extreme. In a later section, we will describe different approaches in psychology suggesting that delinquency in adolescence can be understood as a consequence of identity formation issues that adolescents face—especially dealing with emerging personal, social, gender, and ethnic identity—and delinquency is in most cases, a way of coping maladaptively with such identity issues. Typical manifestations of storm and stress can also be understood in this light. For instance, conflicts emerging from the contradictions between the need for affiliation (being part of a social group) and the need for individuation (need for autonomy) represent a developmental process that is easy to relate to the typical manifestations of storm and stress

described above: conflicts with parents and “emotional disturbance.” While conflict with—or detachment from—parents reflects the developmental need for individuation and autonomy (e.g., Steinberg 1990), it is only one aspect of larger changes in the adolescent’s social environment. Interpersonal development also includes a necessary investment in the sphere of peers, which is a key influence in identity development and psychosocial development in general. In other words, the fundamental elements of storm and stress—conflicts with parents, emotional disturbance, and antisocial behavior—can be understood in terms of the psychosocial changes related to identity formation in adolescence. By extension, delinquency, as an extreme expression of storm and stress, can also be understood in these terms.

Just as significant is the neurobiological development that underlies the typical behavioral changes observed in adolescence. Recent research efforts in this domain offer a new perspective to understand typical manifestations of storm and stress as well as more serious forms of antisocial behavior and delinquency. For instance, risk taking and impulsivity are features of adolescence that are easy to relate to the underlying developmental trajectory of the adolescent brain: the rapid development of the socioemotional system means that adolescents have a highly active reward pathway (strongly connected to risk-taking) for which the cognitive control system has not yet developed the adult levels of inhibitory strength to prevent impulsivity. This neurobiological context predisposes an adolescent to risky and impulsive behaviors as well as affective dysregulation, all of which contribute to typical expressions of storm and stress, and may lead to rule breaking and delinquency. In the same vein, the temporal gap between these two neurobiological systems leaves adolescents more susceptible to external influence including anti-social peer influence. Furthermore, this gap may account for a relative disregard for future consequences, which along with peer influence, is implicated in adolescents’ serious risk-taking. More broadly, these neurobiological changes underlie the development of new cognitive capacities that enable the adolescent’s new interpretations and interactions with the world, engaged in the considerations of identity formation.

To sum up, delinquency can be situated as an extreme expression of storm and stress, grounded in inevitable neurobiological development and identity formation inherent to adolescence. Neurobiological and identity changes are indeed among the most salient in adolescent development, and are two complementary components in the process of becoming an adult. While neurobiology and identity perspectives are quite separate in the literature, they are not mutually exclusive and both provide insights to understand the range of adolescents’ behaviors. Neurobiological changes help, for example, to understand the propensity for risky behaviors, impulsivity, and emotional lability that emerge in adolescence. At the same time, the identity formation process provides further insights in that it guides the expression of these behaviors (e.g., break the law in the need for exploration, or to integrate into a peer group), and such maladaptive behaviors may crystallize into a persistent delinquent identity. Taken together, identity formation and neurobiological development provide a complementary view to elucidate “normative” storm and stress as well as more serious delinquent behaviors. Indeed, recent and successful interdisciplinary approaches such as social neuroscience (Cacioppo et al. 2007) devoted to understanding how biological systems implement social processes and behavior, have proved to be promising to elucidate, inform, and refine theories of social behavior (Cacioppo et al. 2007). Extending this approach to the study of delinquency, by situating how neurobiological changes and identity formation processes results in delinquency, could offer a new light to understand the phenomena. In the following sections, we explore this developmental contextualization in depth by considering separately these two key aspects of development.

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## Neurobiological Development and Risks for Delinquency

Until recent decades our understanding of adolescent brain development was largely informed by the limited information gathered from post-mortem and behavioral studies, but advances in



research and especially neuroimaging have accelerated our understanding. Such advances have in turn shed new light on behavioral studies, offering analyses that go beyond observations of behavioral tendencies by proposing etiological neurobiological foundations of adolescent behavior. As introduced earlier, the model of adolescent brain development we describe here involves the coordinated development of two neurobiological systems, the socioemotional system, and the cognitive control system. We begin by describing each system in some detail and then consider how the differential timing of development of the two systems predisposes adolescents to risk taking (or reward seeking) and impulsivity, both of which are important features of adolescent behavior that may lead to delinquency. We also relate peer influence and adolescents' future planning to the neurobiological model of adolescent development, as these two psychosocial factors are particularly relevant to delinquent youth (Steinberg 2008).

### **The Socioemotional System: Reward Susceptibility and Risk-Taking**

The increased emotionality of adolescents is rooted in the rapid neurobiological development of the socioemotional system (Steinberg 2008). Anatomically, this system is contained within deep brain structures and as such it is often characterized as subcortical, but certain cortical areas have also been implicated. Specific locations include the amygdala, ventral striatum, orbitofrontal cortex, medial prefrontal cortex, insula, and superior temporal sulcus. In addition to accounting for the neural basis of social attachment and emotional impulses, the system also contains the developmentally important reward pathway, which has a central role in adolescent risk taking. Understanding adolescent patterns of risk taking provides some explanation for the entire range of risky behaviors exhibited in adolescence, including potentially delinquent behaviors.

The generally increased risk-taking behavior among adolescents is popularly attributed to a teen's sense of invincibility or a decreased perception of potential risks. This idea, however, is inconsistent with a body of research that

describes the opposite: contrary to the popular belief that increased risk taking in adolescence results from adolescents' sense of invincibility or a decreased awareness of potential risk, studies show that perception of risk is actually observed to be at its highest in early adolescence and is still typically higher in middle/late adolescence than in adulthood (Millstein and Halpern-Felsher 2002). In fact, the notion of auto-invincibility is actually more frequent in adulthood than any younger age. It is therefore somewhat surprising that while adolescents are generally more aware of potential risks than adults, they nonetheless engage in more risky behavior. The explanation for this is based on a risk-reward paradigm of decision making, supported by research into reward sensitivity and reward seeking. As we discuss below, increased risk taking appears to have more to do with adolescents' heightened sensitivity to intense rewards than to their perception of risk (Galvan et al. 2007; Steinberg 2008).

The neurobiological basis of the relationship between reward seeking and risk taking rests within an important component of the socioemotional system, the reward pathway. Activation of this pathway is associated with pleasurable feelings about one's self, and dopamine is the chief neurotransmitter involved. Animal models have suggested that a rapid decline in dopamine receptors occurs at the onset of puberty (Sisk and Foster 2004; Sisk and Zehr 2005; Teicher et al. 1995). With fewer receptors to transmit signal, greater stimulation is required to activate the neurons, thus compelling adolescents to seek more intense behavioral and emotional rewards, which are theorized to cause release of high levels of dopamine that, in turn, activate the brain reward system, even with its reduced number of receptors. This phenomenon has implications for adolescent risk taking, as such high-intensity rewards are often also associated with great risk (e.g., driving 90 mph on the highway at night, engaging in sexual activity with an unknown partner, stealing something that is really wanted). Thus, much of the risk taking observed in adolescents, including rule breaking involved in delinquent behaviors, may actually be explained by a neurobiological compulsion to seek rewards intense enough to activate the brain's attenuated reward system.

Numerous fMRI studies examining the activity of socioemotional brain structures further the hypothesis of how altered function of the reward pathway in adolescence results in greater risk taking. In agreement with the theorized process of stimulation from intense rewards, these studies describe increased brain activity during reward processing, the time immediately after rewards are received, but they also note a heightened activity during reward anticipation, the time immediately before reward, when reward is uncertain. Both of these observations were noted to be stronger in early and middle adolescence and became indistinguishable from adults by late adolescence (Casey et al. 2008; Ernst et al. 2005, 2006; Galvan et al. 2006), suggesting that for at least the reward pathway, adult levels of development are achieved after age 16. More recent studies have as well concluded that early and middle adolescents have greater anticipation for and response to high-intensity rewards (Forbes et al. 2010; Van Leijenhorst et al. 2010). While this neurobiological tendency to highly anticipate and respond to rewards is typical of most adolescents, the individual manifestations of these general neurobiological changes differ across individuals. These individual differences account for the varied behaviors of some adolescents who engage in very little reward seeking and risk taking, whereas others engage in more risk taking and are likely to become delinquent.

Further evidence of heightened reward sensitivity in adolescence relative to other age groups has been widely observed in laboratory comparisons of adolescents and adults. Overall, children and early adolescents are more sensitive to rewards than to losses, but by late adolescence individuals behave similarly to adults and are more sensitive to losses (Cauffman et al. 2010; Crone et al. 2005; Hooper et al. 2004). More precisely, adults appear more conservative in a gambling task<sup>3</sup> because the

influence of their recent experience with loss outweighs the influence of their experience with reward; whereas in adolescents, the influence of experience with reward outweighs the influence of experience with loss. This increased sensitivity to reward has also been associated with specific pubertal changes (for review see Dahl 2004). For example, a recent study comparing reward-related brain activity in adolescents in early versus late pubertal stages, found a relationship between reward-response and testosterone levels in both boys and girls (Forbes et al. 2010). Such evidence of a relationship between adolescents' reward sensitivity and the hormonal changes that occur in puberty supports the idea of a physiological, neurobiological basis for the increased risk taking observed in adolescence. While adolescents are, for example, more likely than adults to drive recklessly, to drive while intoxicated, to use varied illicit substances, to have unprotected sex, and to engage in both minor and more serious antisocial behavior (Arnett 1999), the degree to which adolescents engage in this behavior varies widely by individual. The reasons for these individual differences could be explained not only by differences in the function of the socioemotional system (and in particular, the reward pathway), but also by the interaction of this socioemotional system with the cognitive control system.

### **Cognitive Control System: Improved Cognitive and Affective Control**

As adolescents mature beyond puberty, their reward-seeking behavior decreases as another neurobiological system, the cognitive control system itself matures and exercises greater control on behavior. This system is generally localized to cortical regions and is recognized as a top-down control system of the brain's more internal socioemotional system. Anatomically, the cognitive control system is composed of the lateral prefrontal and parietal cortices and includes connections to the anterior cingulate cortex. The development of these regions is delayed relative to the socioemotional system, and this delay is a central process of the changing adolescent brain—see the

<sup>3</sup>The Iowa Gambling task in which individuals are given four decks of cards from which they are told to choose at will with the goal of winning the most money. Unknown to participants, two of the decks have high value rewards, but also many losses, and thus result in a net loss; whereas the other two decks contain lower value rewards but result in a net gain.

next section. This normal delayed development of the cognitive control system has been confirmed by both primate studies and human postmortem studies indicating that the prefrontal cortex, a key region associated with cognitive control, is actually one of the last brain regions to mature (Bourgeois et al. 1994; Huttenlocher 1979). These late changes that continue to occur in humans after age 16 and progress well into early adulthood are the primary neurobiological basis for which others, such as Steinberg (2009), have argued that even late adolescents are developmentally immature, and their particular immaturities often play an important role in the motivation of delinquent acts and criminal decision making.

The specific changes to occur in the prefrontal cortex and cognitive control system include synaptic pruning and continued myelination (Paus 2005), which respectively increase the efficiency of neuronal communication and facilitate transmission of nerve impulses. As these developments occur and neural connections are improved, there is more coordinated activation of cortical areas (Brown et al. 2005; Durston et al. 2006). These developmental changes may manifest as improved executive functioning, including response inhibition, planning, weighing risks and rewards and simultaneous consideration of multiple sources of information. Additional developments of this system include improved connections between cortical regions and more internal structures (Steinberg 2009). In other words, these late stages of brain development improve cognitive control of the structures implicated in the socioemotional system. This interconnect-edness between systems is the neural basis for improved coordination of affect and cognition, a hallmark of brain maturity. Conversely, any delay in development of the cognitive control system would result in affective dysregulation and greater impulsivity. Most adolescents indeed demonstrate such a delay as part of typical development, whereas in others, there may be a more profound delay that could contribute to a prolonged period of risk for delinquency.

The capacity of the cognitive control system to regulate behavioral impulses can be analyzed in studies examining impulsivity in adolescence.

The trajectory of impulsivity, or the propensity to act without considering the consequences of one's actions, differs from reward-seeking in that impulsivity steadily decreases with age, and does not peak in adolescence as do risk-taking and heightened reward-seeking (Galvan et al. 2007; Steinberg et al. 2008). The age-related decline in impulsivity has been demonstrated in the laboratory with the Tower of London task<sup>4</sup> (Berg and Byrd 2002). Younger children take no more time before making their first move in complex scenarios than in simpler ones. More simply put, children were observed to not pause and think before making their first move during more complex tasks. Impulsivity measured in this way decreases steadily with age. So while adolescents are less impulsive than children, they are nonetheless still more impulsive than adults and this increased impulsivity in combination with their heightened reward sensitivity reasonably contributes to impulsive and risky behavior. Thus it is reasonable to consider that these behaviors occur within a spectrum of normal, in the context of an immature brain with a still-developing cognitive control mechanism. However, extreme impulsive and risky behaviors that are associated with delinquency can be better described in terms of the interaction between the two brain systems, particularly in the vulnerable period in adolescence where the brain's socioemotional development outpaces its cognitive control.

### **Temporal Gap of Developing Brain Systems and Immature Decision-Making**

The behavioral effects of the developmental lag of the cognitive control system relative to the socioemotional system are demonstrated in a variety of studies describing adolescent decision making and planning. Short of making direct connections to the underlying developmental

<sup>4</sup>In this task participants have to arrange objects with the goal of using a minimum number of moves and as quickly as possible. Typical measures include time to first move, total completion time and number of moves.

neuroscience, these studies nonetheless provide vivid examples of adolescents' social, emotional, and cognitive vulnerabilities that peak in middle adolescence and then decrease in late adolescence and into early adulthood, a pattern that is consistent with the underlying neurobiological developmental changes. These vulnerabilities include increased reward sensitivity and impulsivity, and the relevance of these particular adolescent features to delinquency has already been emphasized. As Steinberg (2009) noted, two additional psychosocial features of adolescence, a heightened response to peer influence and immature future-orientation are of particular concern in delinquent adolescents. Studies focusing on each of these features arrive at conclusions consistent with principals of neurobiological development, suggesting that as adolescents mature, improved cognitive control not only effects to attenuate reward seeking and impulsivity, but more importantly, to dampen social influences and promote goal-directed future planning.

For the large portion of adolescents who commit crimes but do not persist in adulthood (i.e., adolescence-limited antisocial behavior), it has long been hypothesized that the imitation of higher-status peers is a major motivation for delinquent acts (Moffitt 1993). In support of this assertion is the observation that adolescents are far more likely than adults to commit crimes in groups (e.g., Zimring 1998). This observation can be widely related to identity formation (see next section). While peer influence can be pro- or antisocial as well as neutral, antisocial peer influence is of particular interest in considering the underlying causes of juvenile delinquency. All forms considered, the impact of peer influence on behavior decreases over time for boys and girls after reaching peak levels around age 15 (Steinberg and Monahan 2007). In a remarkable laboratory demonstration (Gardner and Steinberg 2005), participants were randomly assigned to perform a simulated driving exercise designed to measure risk taking, either alone or in a group with two other similar-age peers. Individually, risk taking declined slightly with age, but within all three age groups risk taking was greater when the exercise was performed in groups.

Furthermore, this group effect on risk taking was by far the greatest for adolescents, while young adults (i.e., college age) demonstrated intermediate levels of risk taking in groups compared with the adult group (Gardner and Steinberg 2005). While research into the neural foundations for the decreasing peer influence that is thus observed in late adolescence and early adulthood is limited, such studies can nonetheless be described by the neurobiological model: it is the limited development of interconnections between the socioemotional system and the cognitive control system that leave adolescents more susceptible to peer influence (Grosbras et al. 2007; Paus et al. 2008).

In addition to peer influence, adolescents also differ from adults in their future orientation, defined as their ability to plan for the future as well as their perception of how their current position (in society, employment, etc.) relates to their plans for the future. Future orientation figures prominently in adolescents' engagement in anti-social behavior, because it impacts the value one assigns to the risk that may occur when making a decision. Earlier it was noted that adolescents may in fact be more perceptive than adults of the risk inherent in certain situations. However, adults generally exceed adolescents in their ability to coordinate their cognitive and emotional awareness of potential future negative consequences. Studies have shown that the development of future orientation continues through adolescence and into early adulthood. Specifically, consideration of future consequences, concern for the future and ability to plan ahead, all increase with age (Greene 1986; Nurmi 1991). These observations have furthermore been correlated to neurobiological studies that have reported associations between future orientation and age-related differences in the cognitive control system (Cauffman et al. 2005).

Additional insight into differences in adult and adolescent future orientation is also provided by a consideration of adolescents' relatively limited life experience. Not only do adolescents have fewer memories to rely upon when considering future consequences, but they also perceive future time differently in that they are less able to

perceive the proximity of the future, and are therefore less likely to heavily weigh future consequences. Five years of time, for example, represents a full third of a 15-year-old's life but only represents a fifth of a 25-year-old's, and given the relative paucity of episodic or autobiographical memory before school age (Nurmi 1991), such relative differences in perception of time are even more significant. Thus, 5 years into the future reasonably seems much farther away to a 15-year-old than a 25-year-old, and so long-term consequences of present-day decisions are likely to seem more immediate with increasing age. Additionally, while it may be true that adolescents are highly aware of potential risks, is it likely that their relative inexperience with negative outcomes means that they lack the emotional aversion to negative consequences that is elicited by negative memories. It is important to consider adolescents' life experience as well as their developmental status in order to understand how they perceive the future, more importantly, the extent to which they understand the future consequences of their present actions.

The ability to plan for the future and realistically consider future consequences is a highly complex cognitive task that requires a high level of integration of the cognitive control system and the socioemotional system. For most adolescents, future orientation proves challenging as their brains are still developing the connections between regions responsible for executive functioning and episodic memory. Furthermore, by middle adolescence, the socioemotional system is largely developed, and so while adolescents may experience social and emotional impulses similarly to adults, their still-developing cognitive control system means they are less able to coordinate these impulses when planning and making decisions (Steinberg 2009). Future orientation only becomes more difficult to achieve when adolescents are influenced by any number of social influences that aggravate normative deficits most adolescents already face. Exposure to violence, for example, can contribute to notions of uncertainty about the future, and unstable relationships can increase emotionality, making coordination of socioemotional impulses and

executive functioning all more difficult (Nurmi 1991). Such disturbances of the complex cognitive processes in future orientation provide some insight into how social and environmental risk factors for delinquency interact with the normative neurobiological "deficits" of the adolescent brain (cf. Robbins and Bryan 2004). Indeed, delinquency and other extreme expressions of storm and stress can be better understood when the trajectories of brain development are viewed in complement with the psychosocial developmental process of adolescence.

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### **Identity Development as a Risk Factor for the Emergence of Delinquency and a Delinquent Identity**

Little is known about identity development among juvenile delinquents; however, an increased understanding of this important developmental milestone has implications, notably for rehabilitation efforts (Grier 2000). For decades, identity theorists have described failure in identity crisis resolution as a possible cause for maladaptive adjustment and identity-confusion (e.g., Erikson 1968). Such maladaptive development can lead to the emergence of a "delinquent identity," which is in fact a superposition of several aspects of identity (United Nations 2003). For instance, and as we will review closer more extensively throughout this section, research on ego-identity has shown that diffusion status (Berzonsky 1989; Marcia 1966) is associated with delinquency (Grier 1997, 2000), as well as alcohol abuse (Jones and Hartmann 1988) and substance abuse (Jones et al. 1989). Issues with emerging ethnic-identity may lead minority youth to be more aware of racial discrimination (Lee et al. 2010). Incidentally, perceived racial discrimination has also been associated with delinquency (e.g., Anderson 1999), and this perception may mediate the link between ethnic-identity and delinquency. Gender identity, fully developing and expressed during adolescence, may also be associated with "gendered" roles predisposing more or less to



delinquency (Walklate 2003). Indeed, due to gendered stereotypes, males are more inclined to break the rules and be involved in delinquent behaviors. Largely, authors focusing on social identity have also emphasized that several young people may need to pursue their “delinquent reputations” as a means to assert their identity (cf. Emler and Reicher 1995). Complementary, psychodynamic models of adolescent development have explained violent behaviors and delinquency in adolescence as an attempt to restore a menaced identity (e.g., Jeammet 2009). Finally, protective and risk factors for delinquency identified in the literature (e.g., Shader 2003) have also been recognized as strong mediators of identity development (e.g., Yoder 2000), substantiating the relationship between delinquency and identity development. These factors include gender, parental involvement and monitoring, peer support, economic status, or attitude toward school. In this section, we review four aspects of identity (personal, social, ethnic, and gender) which may be related to the emergence of delinquency and its possible crystallization into a delinquent identity.

### Personal Identity and Delinquency

Few researches using Marcia’s Identity-status paradigm have linked the diffusion status with delinquency and other behavioral problems (e.g., Grier 1997, 2000; White and Jones 1996; Jones et al. 2003). Grier examined identity status among a group of African American male juvenile delinquents. She found a high prevalence (i.e., 74%) of the sample to be of diffused identity status; a far greater rate than any previous developmental study among adolescents across age groups (cf. Kroger et al. 2010). Likewise, White and Jones (1996) indicated that detainees with a diffuse identity are younger at the time of their first arrest, and show greater number of total arrests than individuals having other identity status. These findings suggest that diffused adolescents are at higher risk for recidivism. Consistently, Grier (2000) concluded that a diffused identity pattern may put individuals at risk for further criminal activity. Conversely, Jones et al. (2003)

indicated that Foreclosed adolescents were unlikely to recidivate, use drugs, and they reported fewer previous offenses. More recently, Crocetti et al. (2008) examined the process of “reconsideration of commitment,” an identity process referring to the comparison between current commitments and other possible alternatives, which can lead to diffusion or in most cases in changes in identity structure. They found this process to be related to psychosocial problems, both internalizing (e.g., depressive and anxiety symptoms) and externalizing (e.g., involvement in delinquent behaviors).

As identity status reflects the level of psychosocial maturity, it can also be stated that identity status is related to criminal decision making, because psychosocial immaturity is often connected to criminal decision making (e.g., Fried and Reppucci 2001; Steinberg and Cauffman 1996). According to Greenberger and Sorensen (1974), psychosocial maturity is indeed strongly related to the “success” of identity. Individuals who know who they are, what they believe, what they want, and who have a sense of their worth as persons, will be better able to function adequately on their own than individuals without a clear and stable identity. Viewed in light of Marcia’s paradigm, Greenberger’s idea suggests that identity Achievement would be a protective configuration for immature decision making, whereas an unclear identity (i.e., diffusion and moratorium) represents risk for immature decision making and possibly even criminal decision making.

Thus, certain issues related to the process of building one’s identity as a person (personal identity) could represent risk for delinquency and psychosocial problems. Conversely, certain identity states could be associated with protective factors for such difficulties. This has implication for intervention and rehabilitation efforts (cf. Archer 1994). Reaching such protective identity, however, is not only a personal process but also has much to do with the social and environmental context in which the adolescent develops. Yoder (2000) identified cultural variables that constitute “barriers” in the developmental process of exploration and commitment. These barriers, including geographic isolation, physical limitations, political restrictions,

ethnicity, gender, age, and religion, can affect optimal identity formation. The “social barriers” take the form of encouragement or prohibition of certain practices, beliefs, or values within the social group, which have a strong impact on personal identity development. Ethnicity and gender will also affect personal identity depending on whether the individual belongs to the “dominant” class or not. Therefore, the social side of identity has to be taken into account when considering an adolescent’s personal identity, psychosocial maturity, and criminal decision making.

### **Social-Identity and the Emergence of a “Delinquent Reputation”**

In the context of adolescent development, the need for social affiliation can lead to maladaptive decision making, which is mostly due to peer influence. The neurobiological foundations of this susceptibility to peer influence have been described above. Psychosocially, the increased significance of peers in adolescence likely makes approval seeking especially important at this stage of life in group situations (Steinberg 2009). That is why, in certain subcultures (Miller 2008), delinquency is sometimes viewed as “valorizing,” “desirable,” and “integrative” within a social group, helping adolescents to assert themselves, their identity, and their membership of the group (Emler and Reicher 1995; Oyserman 1993). Ultimately, adolescents can decide to pursue their “delinquent reputation” through an affiliation to juvenile gangs, which constitute a serious form of delinquency, facilitating transition into adult criminality (Chap. 36). Fortunately, this extreme form of maladaptive affiliation is not the common way of socializing in adolescence: as said earlier, antisocial behavior may indeed be a typical part of development which tends to disappear spontaneously in most individuals during the transition to adulthood (United Nations 1990). However, one would wonder why it does not disappear in some cases, and why a normative “semicriminality” (in reference to Hall 1904) could turn into deep-seated predispositions to criminality (e.g., Steinberg 2009).

Emler and Reicher (1995) interpreted delinquency by asking about the social dynamics of behavior and misbehavior. Their central thesis is that conduct is motivated by reputation: the pursuit or avoidance of delinquent behavior is a choice of social identity and moral reputation. They developed the idea of “reputation management” and examined the kind of reputation and identity that is conveyed by delinquent action and the advantages this may have for the actor. Although delinquency can developmentally be viewed as an “affiliative act” (within the social group), the problem is to explain why many young people choose to pursue their delinquent reputations (Emler and Reicher 1995). An important element of the answer is that as the significance of peers increases in early adolescence, resistance to peer influence (particularly to deviant peers) may or may not develop while transiting from middle adolescence to adulthood. This could be explained by both the “barriers” of identity formation described above (e.g., strong community pressure), as well as a certain neurobiological context in which cognitive control functions lose out to socioemotional affiliative impulses.

Recently, Monahan et al. (2009) examined how individual variation in exposure to deviant peers and resistance to peer influence affect antisocial behavior from middle adolescence into young adulthood (ages 14–22 years). Using data from a longitudinal study of 1,354 serious juvenile offenders,<sup>5</sup> they found evidence that antisocial individuals choose to affiliate with deviant peers, and that affiliating with deviant peers is associated with an individual’s own delinquency—as already noted in the research literature. However, they indicated that these complementary processes of peer selection and peer socialization operate in different developmental periods. In middle adolescence, both peer selection and socialization serve to make peers similar in antisocial behavior, but in the transition to adulthood only peer socialization appears to be important. Later (after age 20), the impact of

<sup>5</sup> Participants were adolescents who have been convicted of a felony or similarly serious non-felony offense as a misdemeanor weapons offense, or misdemeanor sexual assault.

peers on antisocial behavior disappears as individuals become increasingly resistant to peer influence, suggesting that the process of desistance from antisocial behavior may be tied to normative changes in peer relations that occur as individuals mature socially and emotionally (Monahan et al. 2009). Conversely, pursuing one's delinquent identity may suggest that the individual does not demonstrate the level of psychosocial maturity necessary to individuate and separate from peers. Furthermore, in the event of a strong affiliation with a deviant peer group, this normative and necessary task of disengagement from the peers, may be all the more difficult. The success of this task, requiring resistance to peer influence, could also vary as a function of other mediators such as gender and ethnicity (cf. Gardner and Steinberg 2005).

### **Gender Identity and the Gendered Nature of Delinquency**

It is well established that youth crime is disproportionately committed by young men (e.g., Snyder 2008), and several approaches have attempted to determine the reasons for this overrepresentation (e.g., Eadie and Morley 2003). For instance, neurophysiological research has linked testosterone levels to risk taking (e.g., Forbes et al. 2010), suggesting a higher propensity for risk taking not only in boys, but for individuals of both sexes with relatively higher testosterone levels. Alternatively, Heimer and De Coster (1999) suggested that traditional gender definitions are essential for understanding gender differences in delinquency. They perceive adolescent delinquency and violent offending as a product of gendered experiences, gender socialization, and the patriarchal system in which they emerge. This "product," which can be called "gender-identity," results in typical gender differences in delinquency. In general, girls who accept the traditional gender definition of femininity—often equated with a high capacity for nurturance, a tendency toward passivity rather than aggressiveness, and physical and emotional weakness (e.g., Burke 1989)—are less likely than other girls to

offend, as reported by multiple indices of delinquency (Heimer 1996). For the latter girls, violent delinquency would be viewed as "doubly deviant," violating the law as well as their beliefs about femininity. Boys who accept traditional gender definitions of masculinity—associated with competitiveness, independence, rationality, and strength (e.g., Burke 1989)—may be more likely to use physical force and aggression (Heimer 1996). Consistently, Horwitz and Raskin White (1987) showed that females tend to display higher rates of internalizing problems (i.e., psychological distress), whereas males tend to externalize more with problems such as delinquency and addiction problems. However for both genders, masculine identity is associated with higher rates of delinquency. Thus, the development of a masculine identity and acting out these stereotypes about masculinity may make young men more likely to engage in antisocial and criminal behavior (Walklate 2003). In light of this "gendered view" of delinquency seen through social roles and identity, the serious problem of antisocial and criminal behavior committed by adolescent females (see Chap. 35) has to be studied more extensively. Indeed, a recent, and worrying, increase in the prevalence of arrest rates among this population (Snyder 2008) introduces new social questions regarding identity formation in girls. For instance, possible profound social changes may be contributing to this increase in female delinquency: are social changes in gendered experiences, gender socialization, and the patriarchal system, resulting in new gendered differences in delinquency?

Interesting results indicate that these gendered differences in delinquency could be exacerbated when adolescents are influenced by the peer group—social environment would thus be an aggravating factor. Gardner and Steinberg (2005) measured risk preference by asking adolescents to rate the cost–benefit ratio of certain risky decisions (e.g., having sex without a condom, riding in a car with someone who has been drinking, trying a new drug that no one knows anything about, breaking into a store at night and stealing something that one really wants, and driving over 90 mph on the highway at night). They observed that males,

compared to females, assigned a greater weight to the benefits of such risky decisions than to the risks. They also observed that males assigned a greater weight to the benefits of risky decisions when in groups; younger males weighted the benefits more than older males, and there were no differences between older males and older females—which could reflect the “protective effect” of psychosocial maturity in reaching identity achievement. Taken together, these observations suggest that the perception of benefits to risk taking is greatest when young adolescent males (age 13–16) are in a group. With respect to identity formation, these results are an example of how gender and the presence of peers influence an individual’s perceptions, with the likely consequence of altering how one behaves. As we will review now, ethnicity and ethnic identity are also factors that may have similar influence on behavior.

### **Ethnic Identity and the Overrepresentation of Ethnic Minorities in Juvenile Detention Centers**

Although ethnic minorities are often overrepresented in the juvenile justice system, the particular identity issues that these minority adolescents face receives little attention in the literature, and have begun to generate empirical studies only recently (e.g., Arbona et al. 1999; Caldwell et al. 2004; French et al. 2006; Lee et al. 2010). However, a large body of research literature exists about the more general race–crime relationship, suggesting that even though there is empirical evidence indicating a higher rate of offence among minorities,<sup>6</sup> much of the minority overrepresentation in prisons can be attributed to race group differences in arrests for crimes<sup>7</sup> that are most likely to lead to imprisonment (e.g., Chambliss 1994). Whether “differential involvement,” “differential selection” or a “combined” approach (e.g., Feld 1999) is defended by researchers, ethnic-identity is often thought to be related to perceptions of

discrimination (Lee et al. 2011) and racial segregation specific to minority communities, which is often viewed as a contributor of delinquency (Anderson 1999).

In fact, racial identity and the engagement in delinquent behavior, particularly violent acts, maintain complex, gender-specific relationships, in which violence and delinquency can be viewed as a response to racial discrimination (Caldwell et al. 2004). Indeed, Caldwell et al. (2004) study suggested that experiences with racial discrimination explained violent behavior in young adults over and above earlier adolescent risk factors for violence. They indicated that among young adult males for whom race was less central to their identity, experience with racial discrimination was associated with engaging in more types of violent behaviors. Conversely, experiences with racial discrimination may be less likely to be associated with violence when it is balanced with strong feelings of ethnic identity. This interaction was not found for females.

Thus, in some conditions, ethnic identity could operate as a protective factor against delinquency. More precisely, this mechanism has been described as a “buffering effect” of ethnic identity in the relation between minority discrimination and negative outcomes such as delinquency and violence (e.g., Sellers et al. 2006). Nevertheless, Cadwell and colleagues’ (2004) study was conducted among young adults—for whom identity is supposed to be stabilized—and the developmental period of adolescence with emerging ethnic identity could appear to be conversely a vulnerable context, at risk for delinquency. Indeed, during adolescence, the increasing meta-cognitive abilities that result from cognitive maturation make ethnic identity more salient and increase perception of racial discrimination: adolescents become highly aware of the evaluations of their group made by the majority culture (Lee et al. 2011; Dupree et al. 1997; Spencer and Dornbusch 1990). Thus, the personal salience of ethnicity affects the extent to which discrimination is perceived (Sellers and Shelton 2003) as indicated by research showing that adolescents who more extensively explore their ethnic

<sup>6</sup>“Differential involvement” explanation of youth crime.

<sup>7</sup>“Differential selection” explanation of youth crime.

identity—which is an additional developmental task for them—or for whom ethnicity is an important part of their identity, are more likely to perceive discrimination (Lee et al. 2011; Romero and Roberts 1998; Sellers et al. 2003). As said earlier, such discrimination is in most cases associated with higher rates of delinquency.

Beyond the social discrimination explanations, Gardner and Steinberg's (2005) study indicated that minority adolescents take more risks in the presence of their peers than white adolescents do. However, in individual situations, minority and non-minority adolescents performed similarly. The observed increased susceptibility to peer influence for minorities disappeared in adulthood, and minority adults actually observed a slightly greater resistance to peer influence than non-minority adults. This adolescence-limited susceptibility likely suggests that group affiliation and acceptance holds a greater influence on ethnic minorities, and thus the social aspects of identity formation may be more significant for minority youth. Furthermore, the fact that minority adults are less susceptible to peer influence may be a sign of a more mature identity formation that has resulted from a more extensive identity-exploration in adolescence.

Furthermore, models of ethnic-identity process such as Phinney's (1990), suggests that minority ethnic groups must resolve basic conflicts that occur as a result of their membership in a non-dominant group. They must resolve the stereotyping treatment of the dominant group, as well as negotiate a bicultural value system. For individuals from the dominant group, these issues may not be salient since ethnicity is usually unconscious, because societal norms have been constructed around their racial, ethnic, and cultural frameworks (Chávez and Guido-DeBrito 1999). This additional identity issue for youth of ethnic minorities consists of the integration of a sense of ethnic identity into their larger personal identity (Phinney 1989). This specific issue could be related to supplementary identity conflicts that may result in negative outcomes such as delinquency or substance abuse.

## Conclusion

Juvenile delinquents are a worrying population not only for their maladaptive behaviors and the consequence of their offences for society, but also because they appear to accumulate difficulties in terms of identity issues and psychiatric problems, which may lead them to persist in such antisocial behaviors beyond adolescence. Indeed, 70% of juvenile delinquents meet one or more criteria for the diagnosis of psychopathology (Teplin et al. 2002) and a high proportion of this population is of Diffusion identity status (Grier 1997), an identity configuration associated with low psychosocial maturity (e.g., Waterman 1999) and other negative outcomes such as alcohol and drug abuse (Jones and Hartmann 1988). Given the frequency of such outcomes in this population, it is likely that the identity configuration of most delinquent adolescents could be a more profound form of identity Diffusion (cf. Erikson's notion of identity confusion and extended definitions of identity Diffusion, such as Archer and Waterman 1990) than the form that most individuals experience at some point in their life. Beyond the possible aggravating effects of identity-related factors such as ethnicity, gender, and community, which can restrict the exploration and commitment that is essential to achieve an identity, the specific reasons for the emergence of delinquency in the developmental context of adolescence remain complex. The particular trajectory of the most serious cases, when maladaptive behaviors persist and crystallize into a delinquent identity, is a process that must be further investigated in order to be better prevented. Indeed, while nearly all adolescents engage in rule-breaking as part of the process of exploring limits, reflecting the adolescent's normative "semicriminality" suggested by Hall (1904), the problem is to understand why a number of adolescents exceed these adolescence-limited experiences, and ultimately commit to "deep-seated criminality" (Moffitt 1993).



In this chapter, we explored two salient aspects of adolescent development (i.e., neurobiological changes and identity formation) that are useful to contextualize normal expressions of storm and stress, as well as more serious forms of antisocial behavior that may emerge in adolescence. We proposed the idea of a continuum of storm and stress experience in adolescence, ranging from “no manifestation” of storm and stress, to “extreme expression” of storm and stress leading to both internalizing and externalizing problems such as delinquency. Individual differences in the degree of experiencing storm and stress may result from these typical changes of adolescence that are neurobiological development and identity formation. While risk taking and impulsivity are hardly new characteristics of adolescence, understanding these behaviors in the context of neurobiological development can be extremely helpful to researchers and clinicians alike, who aim to better understand the most severe cases, when risk taking and impulsivity result in antisocial or delinquent behavior. In the same way that misbehavior in toddlers must be dealt with in an age-appropriate manner, the evaluation of and response to such behavior in adolescents will be most effective if we consider the recent scientific advances that have improved our understanding of adolescent brain development. Additionally, identity formation has been described as the most important task of adolescence, and better situating the emergence of delinquency and related maladaptive behavior into this necessary and complex task, provides essential context to better understand the persistence of delinquency beyond adolescence, which has implications for delinquency theory, prevention, and intervention.

To sum up, knowledge of neurobiological changes is useful to understand adolescent susceptibility to the key aspects of storm and stress: impulsivity, risk taking, and emotional disturbance. Knowledge of identity formation provides useful insight to understand how these behavioral and psychological specificities may be expressed as outcomes of identity issues. Ultimately, identity development may sustain the experience of storm and stress into the formation of a delinquent identity. In our examination of identity formation

and neurobiological development, we have emphasized the quantity, intensity, and variety of the changes occurring during adolescence, and have underlined how these changes may represent risks for delinquency in themselves. On an individual basis, however, it is obviously impossible to predict an adolescent’s trajectory, whether he or she is on the path to delinquency, and whether the antisocial behavior will be persistent or not. An individual’s trajectory is indeed determined by a multitude of factors, including genetic endowment, life events, psychosocial and environmental conditions, and other numerous factors. Nevertheless, situating maladaptive behaviors in the context of neurobiological development and identity formation, processes unique to adolescence, is essential to understanding the emergence and persistence of delinquency. Such contextualization may also prove helpful in grounding new, tailored, developmentally informed interventional approaches that may improve the effectiveness of rehabilitation efforts. Further research is needed to integrate these key aspects of development and to better understand them as foundations for delinquency. While identity formation and neurobiological development have each been extensively studied (and more rarely linked, independently, to delinquency), there is a lack of research exploring the interactions, overlaps, antecedents, and consequences between them. Such research is needed to identify possible incongruence, or developmental asynchronies (i.e., relative to “gaps”) between neurobiological and identity development that may be associated with patterns of vulnerability for delinquency. It is likely that the particular interactions of brain and identity development, when accompanied by certain social or environmental demands, result in cumulative risks for the emergence of antisocial and delinquent behaviors.

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## Authors Note

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