

Adolescence-Limited and Life-Course-Persistent Antisocial Behavior: A Developmental Taxonomy

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A dual taxonomy is presented to reconcile 2 incongruous facts about antisocial behavior: (a) It shows impressive continuity over age, but (b) its prevalence changes dramatically over age, increasing almost 10-fold temporarily during adolescence. This article suggests that delinquency conceals 2 distinct categories of individuals, each with a unique natural history and etiology: A small group engages in antisocial behavior of 1 sort or another at every life stage, whereas a larger group is antisocial only during adolescence. According to the theory of *life-course-persistent* antisocial behavior, children's neuropsychological problems interact cumulatively with their criminogenic environments across development, culminating in a pathological personality. According to the theory of *adolescence-limited* antisocial behavior, a contemporary maturity gap encourages teens to mimic antisocial behavior in ways that are normative and adjustable.

There are marked individual differences in the stability of antisocial behavior. Many people behave antisocially, but their antisocial behavior is temporary and situational. In contrast, the antisocial behavior of some people is very stable and persistent. Temporary, situational antisocial behavior is quite common in the population, especially among adolescents. Persistent, stable antisocial behavior is found among a relatively small number of males whose behavior problems are also quite extreme. The central tenet of this article is that temporary versus persistent antisocial persons constitute two qualitatively distinct types of persons. In particular, I suggest that juvenile delinquency conceals two qualitatively distinct categories of individuals, each in need of its own distinct theoretical explanation.

Of course, systems for classifying types of antisocial persons have been introduced before (e.g., American Psychiatric Association, 1987; Chaiken & Chaiken, 1984; Hare, Hart, & Harpur, 1991; Jesness & Haapanen, 1982; Lahey et al., 1990; Megargee, 1976; Moffitt, 1990a; Quay, 1966; Warren, 1969). However, none of these classifications has acquired the ascendancy necessary to guide mainstream criminology and psycho-

pathology research. Indeed, "general" theories of crime (e.g., Gottfredson & Hirschi, 1990), comparisons of delinquent versus nondelinquent groups (e.g., Feehan, Stanton, McGee, Silva, & Moffitt, 1990), and arraying samples of subjects along antisocial dimensions (e.g., Fergusson, Horwood, & Lloyd, 1991) remain the status quo.

Previous antisocial classification schemes may have failed to capture the imaginations of social scientists because, although they provided more or less accurate behavioral descriptions of antisocial subtypes, they offered relatively little in the way of etiological or predictive validity (Morey, 1991). A classification becomes a taxonomy if it engenders assertions about origins and outcomes by weaving a nomological net of relationships between the taxa and their correlates (Meehl & Golden, 1982). A taxon carries a network of meaning over and above a behavioral description; it includes implications for etiology, course, prognosis, treatment, and relations with other taxa. Previous classifications of antisocial behavior have not been extended into theories, and "it is theory that provides the glue that holds a classification together and gives it both its scientific and its clinical relevance" (Millon, 1991, p. 257; Quine, 1977). In this article, I elaborate on the distinction between temporary and persistent antisocial behavior and offer a pair of new developmental theories of criminal behavior that are based on this distinction. The theories are accompanied by refutable predictions.

If correct, this simple typology can serve a powerful organizing function, with important implications for theory and research on the causes of crime. For delinquents whose criminal activity is confined to the adolescent years, the causal factors may be proximal, specific to the period of adolescent development, and theory must account for the *discontinuity* in their lives. In contrast, for persons whose adolescent delinquency is merely one inflection in a continuous lifelong antisocial course, a theory of antisocial behavior must locate its causal factors early in their childhoods and must explain the continuity in their troubled lives.

The dual taxonomy (and its two theories) that I propose in

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this article is best introduced with reference to the mysterious relationship between age and antisocial behavior. This relationship is at once the most robust and least understood empirical observation in the field of criminology.

Age and Antisocial Behavior

When official rates of crime are plotted against age, the rates for both prevalence and incidence of offending appear highest during adolescence; they peak sharply at about age 17 and drop precipitously in young adulthood. The majority of criminal offenders are teenagers; by the early 20s, the number of active offenders decreases by over 50%, and by age 28, almost 85% of former delinquents desist from offending (Blumstein & Cohen, 1987; Farrington, 1986). With slight variations, this general relationship between age and crime obtains among males and females, for most types of crimes, during recent historical periods and in numerous Western nations (Hirschi & Gottfredson, 1983). A prototype of the empirical curve of criminal offenses over age is shown in Figure 1.

Until recently, research on age and crime has relied on official data, primarily arrest and conviction records. As a result, the left-hand side of the age-crime curve has been censored. Indeed, in many empirical comparisons between early-onset and late-onset antisocial behavior, *early* has been artifactually defined as mid-adolescence on the basis of first police arrest or court conviction (cf. Farrington, Loeber, Elliott, et al., 1990; Tolan, 1987). However, research on childhood conduct disorder has now documented that antisocial behavior begins long before

the age when it is first encoded in police data banks. Indeed, it is now known that the steep decline in antisocial behavior between ages 17 and 30 is mirrored by a steep incline in antisocial behavior between ages 7 and 17 (Loeber, Stouthamer-Loeber, Van Kammen, & Farrington, 1989; Wolfgang, Figlio, & Sellin, 1972). This extension to the age-crime curve is plotted in Figure 2. Furthermore, we may venture across disciplinary boundaries to add developmental psychologists' reports of childhood aggression (Pepler & Rubin, 1991) and mental health researchers' reports of conduct disorder (Kazdin, 1987) to criminologists' studies of self-reported delinquency and official crime. So doing, it becomes obvious that manifestations of antisocial behavior emerge very early in the life course and remain present thereafter.

With the advent of alternate measurement strategies, most notably self-reports of deviant behavior, researchers have learned that arrest statistics merely reflect the tip of the deviance iceberg (Hood & Sparks, 1970; Klein, 1989). Actual rates of illegal behavior soar so high during adolescence that participation in delinquency appears to be a normal part of teen life (Elliott, Ageton, Huizinga, Knowles, & Canter, 1983). With the liberty of some artistic license, the curved line plotted in Figure 3 may be taken to represent what is currently known about the prevalence of antisocial behaviors over the life course.

Although there is widespread agreement about the curve of crime over age, there are few convincing explanations for the shape of the curve. Until recently, scholars still disagreed about whether the adolescent peak represented a change in prevalence or a change in incidence: Does adolescence bring an increment



Figure 1. Age-specific arrest rates for United States Federal Bureau of Investigation's (FBI) index offenses in 1980. (Index offenses include homicide, forcible rape, robbery, aggravated assault, burglary, larceny, and auto theft. From "Criminal Career Research: Its Value for Criminology" by A. Blumstein, J. Cohen, and D. P. Farrington, 1988, *Criminology*, 26, p. 11. Copyright 1988 by the American Society of Criminology. Adapted by permission.)

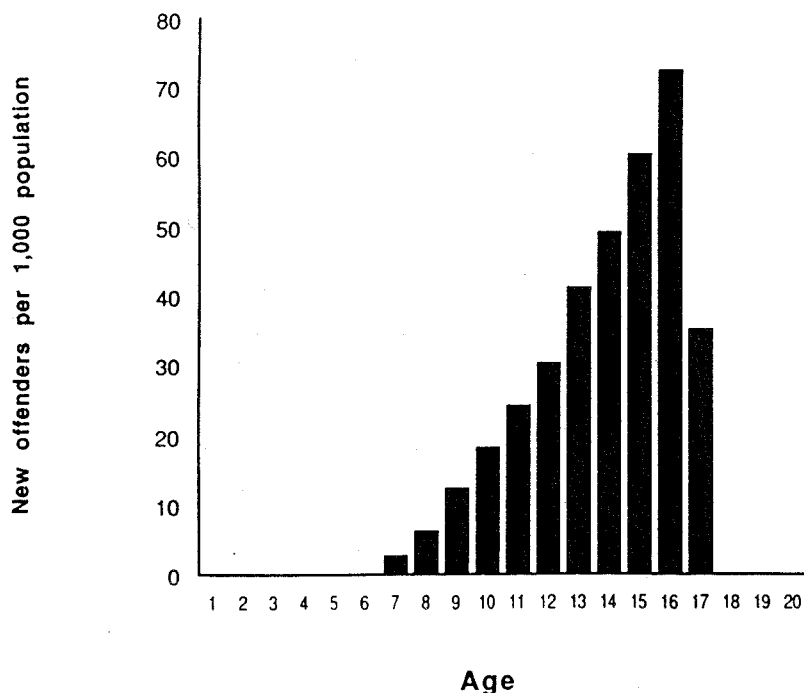


Figure 2. The rate of new male offenders at each age per 1,000 male population. (Onset of offending was defined as the age at which a child was first taken into custody and designated delinquent by the police. Rates are based on a cohort of 9,945 boys born in 1945 in Philadelphia, Pennsylvania. From *Delinquency In a Birth Cohort* (p. 132) by M. E. Wolfgang, R. M. Figlio, and T. Sellin, 1972, Chicago: The University of Chicago Press. Copyright 1972 by The University of Chicago. Adapted by permission.)

in the number of people who are willing to offend or does the small and constant number of offenders simply generate more criminal acts while they are adolescent? Empirical evaluations now suggest that the former explanation is correct. In his English study of offense rates over age, Farrington (1983) showed that the adolescent peak reflects a temporary increase in the number of people involved in antisocial behavior, not a temporary acceleration in the offense rates of individuals. This finding has been replicated in American samples (Wolfgang, Thornberry, & Figlio, 1987). The small human figures under the curve of Figure 3 portray these changes in prevalence.

But whence the increase in the prevalence of offenders? One possibility is that some phenomenon unique to adolescent development causes throngs of new adolescent offenders to temporarily join the few stable antisocial individuals in their delinquent ways. Figure 3 depicts the typological thesis to be argued here. A small group of persons is shown engaging in antisocial behavior of one sort or another at every stage of life. I have labeled these persons *life-course-persistent* to reflect the continuous course of their antisocial behavior. A larger group of persons fills out the age-crime curve with crime careers of shorter duration. I have labeled these persons *adolescence-limited* to reflect their more temporary involvement in antisocial behavior. Thus, timing and duration of the course of antisocial involvement are the defining features in the natural histories of the two proposed types of offenders.

Two oft-cited rules of thumb asserted by Robins (1978) seem to simultaneously assert and deny the life-course stability of antisocial behavior: "Adult antisocial behaviour virtually *requires* childhood antisocial behaviour [yet] most antisocial youths do *not* become antisocial adults" (p. 611). In fact, research has shown that antisocial behavior is remarkably stable across time and circumstance for some persons but decidedly unstable for most other people.

The stability of antisocial behavior is closely linked to its extremity. The extreme frequency of crime committed by a very few males is impressive; it has been repeatedly shown that the most persistent 5% or 6% of offenders are responsible for about 50% of known crimes (see Farrington, Ohlin, & Wilson, 1986, for a review). In their study of 10,000 men, Wolfgang et al. (1972) found that 6% of offenders accounted for more than half of the crimes committed by the sample; relative to other offenders, these high-rate offenders began their criminal careers earlier and continued them for more years. The relationship between stability and extremity is found in samples of children as well. In his analysis of a sample of third-grade boys, Patterson (1982) found that the most aggressive 5% of the boys constituted the most persistent group as well; 39% of them ranked above the 95th percentile on aggression 10 years later, and 100% of them were still above the median. Similarly, Loeber (1982) has reviewed research showing that stability of youngsters' antisocial behavior across time is linked with stability across situations

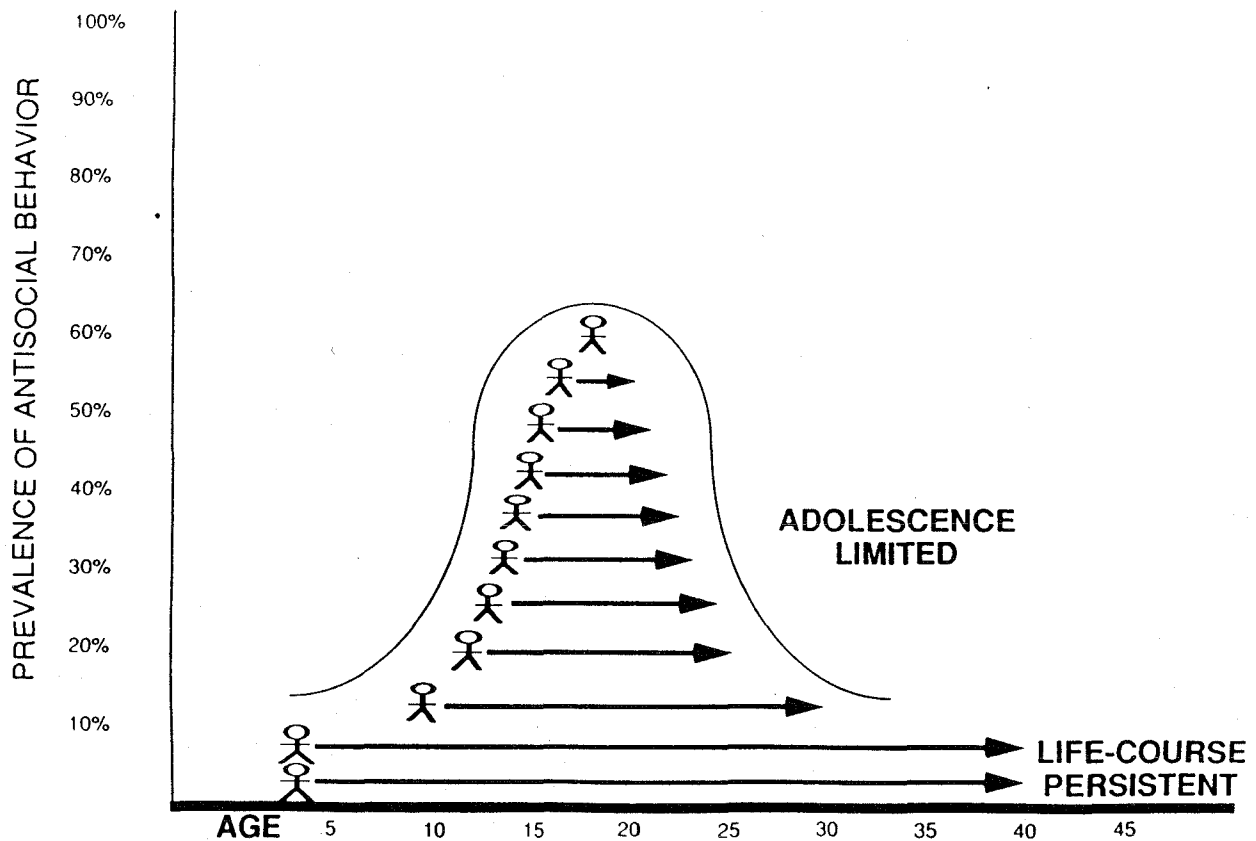


Figure 3. Hypothetical illustration of the changing prevalence of participation in antisocial behavior across the life course. (The solid line represents the known curve of crime over age. The arrows represent the duration of participation in antisocial behavior by individuals.)

and that both forms of stability are characteristic of a relatively small group of persons with extremely antisocial behavior.

Thus, in defiance of regression to the mean, a group of extremely antisocial persons remain extreme on measures taken at later ages and in different situations. Among other persons, however, temporary and situational manifestations of antisocial behavior (even to severe levels) may be quite common.

This point is vividly illustrated in a longitudinal investigation of a representative cohort of 1,037 New Zealand children born in 1972–1973. In this sample, I compared the base rates of persistent and temporary antisocial behavior problems (Moffitt, 1991). I identified a group of boys whose antisocial behavior was rated above average at each of seven biennial assessments (ages 3, 5, 7, 9, 11, 13, and 15). The boys were also rated as very antisocial by three different reporting agents (parents, teachers, and self). Five percent of the boys in the sample met these selection criteria. As a group, their mean antisocial ratings were more than a standard deviation above the norm for boys at every age. In contrast, fully two thirds of the remaining boys were rated above average on antisocial checklists as well but at only one or two ages or by only one reporter, illustrating that stability cannot be inferred from cross-sectional measures of extremity (Henry, Moffitt, Robins, Earls, & Silva, 1993). A disproportion-

ate amount of the measured stability in the New Zealand sample could be attributed to the 5% of boys whose antisocial behavior was both extreme and consistent. For example, when these few boys were excluded from calculations, the 8-year stability coefficient for teacher ratings was reduced from .28 ($R^2 = .078$) to .16 ($R^2 = .025$), indicating that 5% of the sample accounted for 68% of the sample's stability. (If antisocial behavior had been a stable characteristic throughout the sample, with most boys retaining their relative standing in the group across time, then excluding the top 5% of the sample should not have affected the stability coefficient.) In summary, there appear to be noteworthy individual differences in the stability of antisocial behavior.

I have already alluded to the small number of persons in the general population whose antisocial behavior is life-course-persistent. In fact, epidemiological research has shown that there is remarkable uniformity in the prevalence rates of different manifestations of severe antisocial behavior: Regardless of their age, under 10% of males warrant an "official" antisocial designation. For example, about 5% of preschool boys are considered by their parents or caretakers to be "very difficult to manage" (McGee, Partridge, Williams, & Silva, 1991). The prevalence of conduct disorder among elementary-school-aged boys has been

found to be between 4% and 9% in several countries (Costello, 1989; Rutter, Tizard, & Whitmore, 1970). About 6% of boys are first arrested by police as preteens (Moffitt & Silva, 1988c; Wolfgang et al., 1972); such early arrest is important because it is the best predictor of long-term recidivistic offending. The rate of conviction for a violent offense in young adult males is between 3% and 6% (Moffitt, Mednick, & Gabrielli, 1989), and about 4% of male adolescents self-report sustained careers of serious violence (three or more violent offenses per year for 5 years; Elliott, Huizinga, & Morse, 1986). Finally, the prevalence of men with antisocial personality disorder is estimated at about 4% to 5% (Davison & Neale, 1990; Robins, 1985).

It is possible, of course, that the persons who constitute these epidemiological statistics at different ages are all different individuals. However, the longitudinal data suggest otherwise: It is more likely that the remarkable constancy of prevalence rates reflects the reoccurrence of the same life-course-persistent individuals in different antisocial categories at different ages. Robins (1966, 1978) has shown that there are virtually no subjects with adult antisocial personality disorder who did not also have conduct disorder as children. White, Moffitt, Earls, Robins, and Silva (1990) found notable continuity from disobedient and aggressive behavior at age 3 to later childhood conduct disorder and thence to arrest by police in the early teen years. Loeber (1982) reviewed research that pinpoints a first arrest between ages 7 and 11 as particularly important for predicting long-term adult offending. Hare and McPherson (1984) have reported that a conviction for violence in the early 20s is characteristic of almost all men who become diagnosed with antisocial (psychopathic) personality disorder.

There are still gaps in the epidemiological database; each of the earlier cited studies connected only two or three points in the life course. Nonetheless, the consistency is impressive: A substantial body of longitudinal research consistently points to a very small group of males who display high rates of antisocial behavior across time and in diverse situations. The professional nomenclature may change, but the faces remain the same as they drift through successive systems aimed at curbing their deviance: schools, juvenile-justice programs, psychiatric treatment centers, and prisons. The topography of their behavior may change with changing opportunities, but the underlying disposition persists throughout the life course.

Whereas a few males evidence antisocial behavior that emerges in toddlerhood and is persistent thereafter, the majority of boys who become antisocial first do so during adolescence (Elliott, Knowles, & Canter, 1981). This tidal wave of adolescent onset has been studied in the aforementioned representative sample of New Zealand boys (Moffitt, 1991). Between ages 11 and 15, about one third of the sample joined the delinquent lifestyles of the 5% of boys who had shown stable and pervasive antisocial behavior since preschool. As a group, these adolescent newcomers to antisocial ways had not formerly exceeded the normative levels of antisocial behavior for boys at ages 3, 5, 7, 9, or 11. Despite their lack of prior experience, by age 15, the newcomers equaled their preschool-onset antisocial peers in the variety of laws they had broken, the frequency with which they broke them, and the number of times they appeared in juvenile court (Moffitt, 1991). On the basis of such commonly used in-

dices of adolescent delinquency, the two delinquent groups were indistinguishable. Thus, if the sample was viewed only as an adolescent cross section, researchers would lose sight of the two delinquent groups' very different developmental histories, seeing only delinquents and nondelinquents.

Indeed, researchers and practitioners cannot yet effectively assign individual delinquent adolescents to meaningful subtypes on the basis of cross-sectional "snapshots" of their antisocial behavior during adolescence (Loeber & LeBlanc, 1990; Moffitt, 1990a). Again, the New Zealand sample provides an example: At age 15, both the childhood-persistent and adolescent-onset groups had members who scored more than 5 standard deviations above the mean on self-report delinquency, and by age 19 both groups had some members with more than 50 convictions for crimes in the New Zealand courts. Elliott and Huizinga (1984) reported similarly poor classification in a representative sample of American teens. They attempted to discriminate, at the time of first arrest, individual future career offenders from adolescence-limited offenders. Discrimination could not be improved beyond chance by entering the kinds of information typically available to officials: type of current offense, age, sex, race, class, involvement with delinquent peers, and attitudes toward deviance. Addition of measures of the extremity of self-reported delinquency and emotional problems improved prediction only 7% beyond chance. Earlier, I noted that the stability of antisocial behavior implies its extremity but that extremity does not imply stability; measures of the frequency or seriousness of adolescent offending will not discriminate very well between life-course-persistent and adolescence-limited delinquents. On the basis of their study and others, Elliott and Huizinga concluded that there is "no effective means for discriminating between the serious career offenders and nonserious offenders" (p. 98). A notable feature of the taxonomy introduced in this article is that knowledge of a subject's preadolescent behavior is *required* for making the differential diagnosis between the life-course-persistent and adolescence-limited types of antisocial teenager. Longitudinal designs are needed to collect the lifetime repeated measures that are needed to distinguish individual differences in the developmental course of antisocial behavior.¹

I have argued in this section that juvenile delinquency conceals two categories of people. A very large group participates in antisocial behavior during adolescence. A much smaller group

¹ It may be countered that research has distinguished delinquent subtypes that are based on cross-sectional information. For example, the delinquent behaviors of the life-course-persistent type may be distinguished by relatively more overt aggression, whereas the adolescence-limited type may show relatively more covert offending under peer influence. I agree. Factor-analytic studies have revealed an aggressive "undersocialized" factor and a "socialized" peer-oriented factor (Quay, 1964a, 1964b, 1966), and meta-analytic studies have revealed "overt" and "covert" offense patterns (Loeber & Schmalzing, 1985). However, such scale pairs are highly and positively correlated in adolescent samples, in which the evidence for offense versatility outweighs evidence for offense specialization (Klein, 1984; Robins, 1978). Cross-sectional classification has not proven effective at the level of the individual. My assertion that developmental history is needed for confident classification is buttressed by the repeated finding that age of onset of antisocial

who continues serious antisocial behavior throughout adulthood, is the same group whose antisocial behavior was stable across the years from early childhood. The categories remain hypothetical types, because no longitudinal study has yet repeatedly measured antisocial behavior in a representative sample of the same individuals from preschool to midlife. I describe in the next sections the two hypothetical types of antisocial youth: life-course-persistent and adolescence-limited. I argue that the two groups differ in etiology, developmental course, prognosis, and, importantly, classification of their behavior as either pathological or normative. The goal of this article is to proffer a description of the two types in the form of a set of testable predictions.

Life-Course-Persistent Antisocial Behavior

My account of the life-course-persistent antisocial type follows this plan: In the first section, *Continuity of Antisocial Behavior Defined*, I provide a definition and description of persistent antisocial behavior. In the second section, *Beginnings: Neuropsychological Risk for Difficult Temperament and Behavioral Problems*, I present the hypothesis that persistent antisocial behavior has its origins in an interaction between children's neuropsychological vulnerabilities and criminogenic environments. In the third section, *Maintenance and Elaboration Over the Life Course: Cumulative Continuity, Contemporary Continuity, and Narrowing Options for Change*, I introduce the cumulative and contemporary processes that maintain antisocial behavior across time and that expand antisocial behavior into a pervasive adult life-style. In the fourth section, I summarize the theory's perspective on continuity, and in the fifth section, I make a case that life-course-persistent antisocial behavior is a form of psychopathology.

Continuity of Antisocial Behavior Defined

As implied by the label, continuity is the hallmark of the small group of life-course-persistent antisocial persons. Across the life course, these individuals exhibit changing manifestations of antisocial behavior: biting and hitting at age 4, shoplifting and truancy at age 10, selling drugs and stealing cars at age 16, robbery and rape at age 22, and fraud and child abuse at age 30; the underlying disposition remains the same, but its expression changes form as new social opportunities arise at different points in development. This pattern of continuity across age is matched also by cross-situational consistency: Life-course-persistent antisocial persons lie at home, steal from shops, cheat at school, fight in bars, and embezzle at work (Farrington, 1991; Loeber, 1982; Loeber & Baicker-McKee, 1989; Robins, 1966, 1978; White et al., 1990).

The concept of behavioral coherence, or *heterotypic continuity*, is invoked here to extend observations of continuity beyond the mere persistence of a single behavior to encompass a variety of antisocial expressions that emerge as development affords

new opportunities. Heterotypic continuity refers to continuity of an inferred trait or attribute that is presumed to underlie diverse phenotypic behaviors (Kagan, 1969). As Kagan and Moss (1962) suggested, a specific behavior in childhood might not be predictive of phenotypically similar behavior later in adulthood, but it may still be associated with behaviors that are *conceptually* consistent with the earlier behavior.

Examples of heterotypic continuities have been reported by Ryder (1967), who found that childhood aggression, physical adventurousness, and nonconformity were related to adult sexual behavior. Another example of coherence is provided in a 22-year follow-up study of men and women who had been rated as aggressive by their peers in late childhood (Huesmann, Eron, Lefkowitz, & Walder, 1984). As adults, the men were likely to commit serious criminal acts, abuse their spouses, and drive while intoxicated, whereas the women were likely to punish their offspring severely. Another example of personality coherence is the finding that the developmental antecedents of erratic work histories may be found in phenotypically dissimilar attributes of difficult temperament in childhood (Caspi, Elder, & Bem, 1987). In addition, in their hallmark study, West and Farrington (1977) observed that stealing, alcohol abuse, sexual promiscuity, reckless driving, and violence were linked across the life course. The prognosis for the life-course-persistent person is bleak: Drug and alcohol addiction; unsatisfactory employment; unpaid debts; homelessness; drunk driving; violent assault; multiple and unstable relationships; spouse battery; abandoned, neglected, or abused children; and psychiatric illness have all been reported at very high rates for offenders who persist past the age of 25 (Farrington & West, 1990; Robins, 1966; Sampson & Laub, 1990). Thus, this theory of life-course-persistent antisocial behavior predicts continuity across the entire life course but allows that the underlying disposition will change its manifestation when age and social circumstances alter opportunities.

Although reports of the continuity of antisocial styles from childhood to young adulthood abound, the outcomes of antisocial individuals during midlife have seldom been examined. The pattern of official crime over age (Figure 1) implies that criminal offending all but disappears by midlife,² but there is no reason to expect that life-course-persistents miraculously assume prosocial tendencies after an antisocial tenure of several decades. Indeed, criminal psychopaths decrease their number of arrestable offenses at about age 40, but the constellation of antisocial personality traits described by Cleckley (1976) per-

² The conclusion that crime ceases in midlife may be premature; it is based on cross-sectional age comparisons of arrest and conviction rates. There are at least four reasons to doubt the conclusions that have been based on this method. First, official records underestimate the amount of true crime. Second, there may be justice-system biases toward under-arrest and prosecution of older persons. Third, death and imprisonment may selectively remove persistent offenders from official crime statistics. Fourth, cross-cohort comparisons may mistake generational effects for age effects (Rowe & Tittle, 1977). Thus, until longitudinal researchers collect self-reports of crime in the same individuals from adolescence to old age, the midlife disappearance of crime will remain an empirical question.

behavior problems is the single best predictor of adult criminal outcomes (Farrington, Loeber, Elliott, et al., 1990).

sists in male samples at least until age 69 (Harpur & Hare, 1991). As I argue in the third section of this article (*Maintenance*), an analysis of the cumulative developmental forces underlying the continuity of aggression from childhood to adulthood will predict continuity on into midlife as well. Beyond young adulthood, the antisocial disposition of life-course-persistents may be expressed in a form that is simply not yet well measured by epidemiological surveys of official crime: One such possibility is neglect and abuse of family members. Consistent with this hypothesis, Farrington and West (1990) found that half of the persistent offenders in the Cambridge longitudinal study self-reported having hit their spouses when they were interviewed at age 32. Fagan and Wexler (1987) reviewed studies showing that spouse battery is often preceded by a history of violence against strangers. Also, crime statistics show that, whereas property crimes peak in the teen years and drop thereafter, family violence offenses show a steady increase with age (Gottfredson & Hirschi, 1986). Research is needed that follows offenders into late adulthood while measuring multiple indicators of an antisocial life-style.

Beginnings: Neuropsychological Risk for Difficult Temperament and Behavioral Problems

If some individuals' antisocial behavior is stable from preschool to adulthood as the data imply, then investigators are compelled to look for its roots early in life, in factors that are present before or soon after birth. It is possible that the etiological chain begins with some factor capable of producing individual differences in the neuropsychological functions of the infant nervous system. Factors that influence infant neural development are myriad, and many of them have been empirically linked to antisocial outcomes.

One possible source of neuropsychological variation that is linked to problem behavior is disruption in the ontogenesis of the fetal brain. Minor physical anomalies, which are thought to be observable markers for hidden anomalies in neural development, have been found at elevated rates among violent offenders and subjects with antisocial personality traits (Fogel, Mednick, & Michelson, 1985; E. Kandel, Brennan, & Mednick, 1989; Paulhus & Martin, 1986). Neural development may be disrupted by maternal drug abuse, poor prenatal nutrition, or pre- or postnatal exposure to toxic agents (Needleman & Beringer, 1981; Rodning, Beckwith, & Howard, 1989; Stewart, 1983). Even brain insult suffered because of complications during delivery has been empirically linked to later violence and antisocial behavior in carefully designed longitudinal studies (E. Kandel & Mednick, 1991; Szatmari, Reitsma-Street, & Offord, 1986). In addition, some individual differences in neuropsychological health are heritable in origin (Borecki & Ashton, 1984; Martin, Jardine, & Eaves, 1984; Plomin, Nitz, & Rowe, 1990; Tambs, Sundet, & Magnus, 1984; Vandenberg, 1969). Just as parents and children share facial resemblances, they share some structural and functional similarities within their nervous systems. After birth, neural development may be disrupted by neonatal deprivation of nutrition, stimulation, and even affection (Cravioto & Arrieta, 1983; Kraemer, 1988; Meany, Aitken, van Berkel, Bhatnagar, & Sapolsky, 1988). Some studies have

pointed to child abuse and neglect as possible sources of brain injury in the histories of delinquents with neuropsychological impairment (Lewis, Shanok, Pincus, & Glaser, 1979; Milner & McCanne, 1991; Tarter, Hegedus, Winsten, & Alterman, 1984).

There is good evidence that children who ultimately become persistently antisocial do suffer from deficits in neuropsychological abilities. I have elsewhere reviewed the available empirical and theoretical literatures; the link between neuropsychological impairment and antisocial outcomes is one of the most robust effects in the study of antisocial behavior (Moffitt, 1990b; Moffitt & Henry, 1991; see also Hirschi & Hindelang, 1977). Two sorts of neuropsychological deficits are empirically associated with antisocial behavior: verbal and "executive" functions. The verbal deficits of antisocial children are pervasive, affecting receptive listening and reading, problem solving, expressive speech and writing, and memory. In addition, executive deficits produce what is sometimes referred to as a comorbital learning disability (Price, Daffner, Stowe, & Mesulam, 1990), including symptoms such as inattention and impulsivity. These cognitive deficits and antisocial behavior share variance that is independent of social class, race, test motivation, and academic attainment (Moffitt, 1990b; Lynam, Moffitt, & Stouthamer-Loeber, 1993). In addition, the relation is not an artifact of slow-witted delinquents' greater susceptibility to detection by police; undetected delinquents have weak cognitive skills too (Moffitt & Silva, 1988a).

The evidence is strong that neuropsychological deficits are linked to the kind of antisocial behavior that begins in childhood and is sustained for lengthy periods. In a series of articles (Moffitt, 1990a; Moffitt & Henry, 1989; Moffitt & Silva, 1988b), I have shown that poor verbal and executive functions are associated with antisocial behavior, if it is extreme and persistent. In these studies, adolescent New Zealand boys who exhibited symptoms of both conduct disorder and attention-deficit disorder with hyperactivity (ADDH) scored very poorly on neuropsychological tests of verbal and executive functions and had histories of extreme antisocial behavior that persisted from age 3 to age 15. Apparently, their neuropsychological deficits were as long standing as their antisocial behavior: at ages 3 and 5 these boys had scored more than a standard deviation below the age norm for boys on the Bayley and McCarthy tests of motor coordination and on the Stanford-Binet test of cognitive performance. Contrast groups of boys with single diagnoses of either conduct disorder or ADDH did not have neuropsychological deficits or cognitive-motor delays, but neither were their behavior problems stable over time.

In a study designed to improve on measurement of executive functions (White, Moffitt, Caspi, Jøglum, Needles, & Stouthamer-Loeber, in press), we gathered data on self-control and impulsivity for 430 Pittsburgh youths. Twelve measures were taken from multiple sources (mother, teacher, self, and observer) by using multiple methods (rating scales, performance tests, computer games, Q sorts, and videotaped observations). A linear composite of the impulsivity measures was strongly related to the 3-year longevity of antisocial behavior, even after controlling for IQ, race, and social class. Boys who were very delinquent from ages 10 to 13 scored significantly higher on impulsivity than both their nondelinquent and temporarily delin-

quent age-mates. Taken together, the New Zealand and Pittsburgh longitudinal studies suggest that neuropsychological dysfunctions that manifest themselves as poor scores on tests of language and self-control—and as the inattentive, overactive, and impulsive symptoms of ADHD—are linked with the early childhood emergence of aggressive antisocial behavior and with its subsequent persistence.

Neuropsychological variation and the "difficult" infant. Before describing how neuropsychological variation might constitute risk for antisocial behavior, it is useful to define what is meant here by neuropsychological. By combining *neuro* with *psychological*, I refer broadly to the extent to which anatomical structures and physiological processes within the nervous system influence psychological characteristics such as temperament, behavioral development, cognitive abilities, or all three. For example, individual variation in brain function may engender differences between children in activity level, emotional reactivity, or self-regulation (temperament); speech, motor coordination, or impulse control (behavioral development); and attention, language, learning, memory, or reasoning (cognitive abilities).

Children with neurological difficulties severe enough to constitute autism, severe physical handicap, or profound mental retardation are usually identified and specially treated by parents and professionals. However, other infants have subclinical levels of problems that affect the difficulty of rearing them, variously referred to as difficult temperament, language or motor delays, or mild cognitive deficits. Compromised neuropsychological functions are associated with a variety of consequences for infants' cognitive and motor development as well as for their personality development (Rothbart & Derryberry, 1981). Toddlers with subtle neuropsychological deficits may be clumsy and awkward, overactive, inattentive, irritable, impulsive, hard to keep on schedule, delayed in reaching developmental milestones, poor at verbal comprehension, deficient at expressing themselves, or slow at learning new things (Rutter, 1977, 1983; Thomas & Chess, 1977; Wender, 1971).

Hertzog (1983) has described an empirical test of the proposed relationship between neurological damage and difficult behavior in infancy. She studied a sample of 66 low-birth-weight infants from intact middle-class families. Symptoms of brain dysfunction detected during neurological examinations were significantly related to an index of difficult temperament taken at ages 1, 2, and 3 (Thomas & Chess, 1977; the index comprised rhythmicity, adaptability, approach-withdrawal, intensity, and mood). The parents of the children with neurological impairment and difficult temperament more often sought help from child psychiatrists as their children grew up, and the most frequent presenting complaints were immaturity, overactivity, temper tantrums, poor attention, and poor school performance. Each of these childhood problems has been linked by research to later antisocial outcomes (cf. Moffitt, 1990a, 1990b). Importantly, the impairments of the children with neural damage were not massive; their mean IQ score was 96 (only 4 points below the population mean). Hertzog's study showed that even subtle neurological deficits can influence an infant's temperament and behavior, the difficulty of rearing the infant, and behavioral problems in later childhood.

Child-environment covariation in nature: A source of interactional continuity. Up to this point, I have emphasized in this article the characteristics of the developing child as if environments were held constant. Unfortunately, children with cognitive and temperamental disadvantages are not generally born into supportive environments, nor do they even get a fair chance of being randomly assigned to good or bad environments. Unlike the aforementioned infants in Hertzog's (1983) study of temperament and neurological symptoms, most low-birth-weight infants are not born into intact, middle-class families. Vulnerable infants are disproportionately found in environments that will not be ameliorative because many sources of neural maldevelopment co-occur with family disadvantage or deviance.

Indeed, because some characteristics of parents and children tend to be correlated, parents of children who are at risk for antisocial behavior often inadvertently provide their children with criminogenic environments (Sameroff & Chandler, 1975). The intergenerational transmission of severe antisocial behavior has been carefully documented in a study of three generations (Huesmann et al., 1984). In that study of 600 subjects, the stability of individuals' aggressive behavior from age 8 to age 30 was exceeded by the stability of aggression across the generations: from grandparent to parent to child. Thus, with regard to risk for antisocial behavior, nature does not follow a 2×2 design with equal cell sizes.

Parents and children resemble each other on temperament and personality. Thus, parents of children who are difficult to manage often lack the necessary psychological and physical resources to cope constructively with a difficult child (Scarr & McCartney, 1983; Snyder & Patterson, 1987). For example, temperamental traits such as activity level and irritability are known to be partly heritable (Plomin, Chipuer, & Loehlin, 1990). This suggests that children whose hyperactivity and angry outbursts might be curbed by firm discipline will tend to have parents who are inconsistent disciplinarians; the parents tend to be impatient and irritable too. The converse is also true: Empirical evidence has been found for a relationship between variations in parents' warmth and infants' easiness (Plomin, Chipuer, & Loehlin, 1990).

Parents and children also resemble each other on cognitive ability. The known heritability of measured intelligence (Plomin, 1990; Loehlin, 1989) implies that children who are most in need of remedial cognitive stimulation will have parents who may be least able to provide it. Moreover, parents' cognitive abilities set limits on their own educational and occupational attainment (Barrett & Depinet, 1991). As one consequence, families whose members have below-average cognitive capacities will often be least able financially to obtain professional interventions or optimal remedial schooling for their at-risk children.

Even the social and structural aspects of the environment may be stacked against children who enter the world at risk. Plomin and Bergeman (1990) have shown that there are genetic components to measures that are commonly used by developmental psychologists to assess socialization environments. For example, the Home Observation for Measurement of the Environment scale, the Moos Family Environment scales, and the

Holmes and Rahe scales of stressful life events all revealed the influence of heritable factors when they were examined with behavior genetic research designs (Plomin & Bergeman, 1990). Vulnerable children are often subject to adverse homes and neighborhoods because their parents are vulnerable to problems too (cf. Lahey et al., 1990).

Importantly, although examples from behavior genetics research have been cited in the previous three paragraphs, the perverse compounding of children's vulnerabilities with their families' imperfections does not require that the child's neuropsychological risk arise from any genetic disposition. In fact, for my purposes, it is immaterial whether parent-child similarities arise from shared genes or shared homes. A home environment wherein prenatal care is haphazard, drugs are used during pregnancy, and infants' nutritional needs are neglected is a setting where sources of children's neuropsychological dysfunction that are clearly environmental coexist with a criminogenic social environment.

Problem child-problem parent interactions and the emergence of antisocial behaviors. I believe that the juxtaposition of a vulnerable and difficult infant with an adverse rearing context initiates risk for the life-course-persistent pattern of antisocial behavior. The ensuing process is a transactional one in which the challenge of coping with a difficult child evokes a chain of failed parent-child encounters (Sameroff & Chandler, 1975). The assertion that children exert important effects on their social environments is useful in understanding this hypothetical process (Bell & Chapman, 1986). It is now widely acknowledged that personality and behavior are shaped in large measure by interactions between the person and the environment (cf. Buss, 1987; Plomin, DeFries, & Loehlin, 1977; Scarr & McCartney, 1983). One form of interaction may play a particularly important role both in promoting an antisocial style and in maintaining its continuity across the life course: *Evocative* interaction occurs when a child's behavior evokes distinctive responses from others (Caspi et al., 1987).

Children with neuropsychological problems evoke a challenge to even the most resourceful, loving, and patient families. For example, Tinsley and Parke (1983) have reviewed literature showing that low-birth-weight, premature infants negatively influence the behavior of their caretakers; they arrive before parents are prepared, their crying patterns are rated as more disturbing and irritating, and parents report that they are less satisfying to feed, less pleasant to hold, and more demanding to care for than healthy babies. Many parents of preterm infants hold unrealistic expectations about their children's attainment of developmental milestones, and these may contribute to later dysfunctional parent-child relationships (Tinsley & Parke, 1983). More disturbing, an infant's neurological health status has been shown to be related to risk for maltreatment and neglect (Friedrich & Boriskin, 1976; Frodi et al., 1978; Hunter, Kilstrom, Kraybill, & Loda, 1978; Milowe & Lowrie, 1964; Sandgrund, Gaines, & Green, 1974).

Numerous studies have shown that a toddler's problem behaviors may affect the parents' disciplinary strategies as well as subsequent interactions with adults and peers (Bell & Chapman, 1986; Chess & Thomas, 1987). For example, children characterized by a difficult temperament in infancy are more

likely to resist their mothers' efforts to control them in early childhood (Lee & Bates, 1985). Similarly, mothers of difficult boys experience more problems in their efforts to socialize their children. Maccoby and Jacklin (1983) showed that over time these mothers reduce their efforts to actively guide and direct their children's behavior and become increasingly less involved in the teaching process. In a study of unrelated mothers and children, K. E. Anderson, Lytton, and Romney (1986) observed conduct-disordered and nonproblem boys interacting with mothers of conduct-disordered and nonproblem sons in unrelated pairs. The conduct-disordered boys evoked more negative reactions from both types of mothers than did normal boys, but the two types of mothers did not differ from each other in their negative reactions. It may well be that early behavioral difficulties contribute to the development of persistent antisocial behavior by evoking responses from the interpersonal social environment, responses that exacerbate the child's tendencies (Goldsmith, Bradshaw, & Rieser-Danner, 1986; Lytton, 1990). "The child acts; the environment reacts; and the child reacts back in mutually interlocking evocative interaction" (Caspi et al., 1987, p. 308).

Such a sequence of interactions would be most likely to produce lasting antisocial behavior problems if caretaker reactions were more likely to exacerbate than to ameliorate children's problem behavior. To my knowledge, studies of child effects have not yet tested for interactions between child behavior and parental deviance or poor parenting, perhaps because very disadvantaged families are seldom studied with such designs. Nonetheless, some data suggest that children's predispositions toward antisocial behavior may be exacerbated under deviant rearing conditions. In the New Zealand longitudinal study, there was a significant interaction effect between children's neuropsychological deficit and family adversity on one type of delinquent act: aggressive confrontation with a victim or adversary. Among the 536 boys in the sample, the 75 boys who had both low neuropsychological test scores and adverse home environments earned a mean aggression score more than four times greater than that of boys with either neuropsychological problems or adverse homes (Moffitt, 1990b). The index of family adversity included parental characteristics such as poor mental health and low intelligence as well as socioeconomic status. Behavior-genetic adoption studies of antisocial behavior often report a similar pattern of findings, wherein the highest rates of criminal outcomes are found for adoptees whose foster parents, as well as their biological parents, were deviant (e.g., Mednick, Gabrielli, & Hutchings, 1984). Thus, children's predispositions may evoke exacerbating responses from the environment and may also render them more vulnerable to criminogenic environments.

If the child who "steps off on the wrong foot" remains on an ill-starred path, subsequent stepping-stone experiences may culminate in life-course-persistent antisocial behavior. For life-course-persistent antisocial individuals, deviant behavior patterns later in life may thus reflect early individual differences that are perpetuated or exacerbated by interactions with the social environment: first at home, and later at school. Quay (1987) summarized this as "this youth is likely to be at odds with everyone in the environment, and most particularly with those

who must interact with him on a daily basis to raise, educate, or otherwise control him. . . . This pattern is the most troublesome to society, seems least amenable to change, and has the most pessimistic prognosis for adult adjustment" (p. 121).

However, inauspicious beginnings do not complete the story. In the New Zealand study, for example, a combination of preschool measures of antisocial behavior and cognitive ability was able to predict 70% of the cases of conduct disorder at age 11 but at the cost of a high false-positive rate (White et al., 1990). The next section explores the specific interactional processes that nourish and augment the life-course-persistent antisocial style beyond childhood.

Maintenance and Elaboration Over the Life Course: Cumulative Continuity, Contemporary Continuity, and Narrowing Options for Change

In the previous section, the concept of evocative person-environment interaction was called on to describe how children's difficult behaviors might affect encounters with their parents. Two additional types of interaction may help to explain how the life-course-persistent individual's problem behavior, once initiated, might promote its own continuity and pervasiveness. *Reactive* interaction occurs when different youngsters exposed to the same environment experience it, interpret it, and react to it in accordance with their particular style. For example, in interpersonal situations where cues are ambiguous, aggressive children are likely to mistakenly attribute harmful intent to others and then act accordingly (Dodge & Frame, 1982). *Proactive* interaction occurs when people select or create environments that support their styles. For example, antisocial individuals appear to be likely to affiliate selectively with antisocial others, even when selecting a mate. Some evidence points to nonrandom mating along personality traits related to antisocial behavior (Buss, 1984), and there are significant spouse correlations on conviction for crimes (e.g., Baker, Mack, Moffitt, & Mednick, 1989).

The three types of person-environment interactions can produce two kinds of consequences in the life course: *cumulative consequences* and *contemporary consequences* (Caspi & Bem, 1990). Early individual differences may set in motion a downhill snowball of cumulative continuities. In addition, individual differences may themselves persist from infancy to adulthood, continuing to influence adolescent and adult behavior in a proximal contemporary fashion. Contemporary continuity arises if the life-course-persistent person continues to carry into adulthood the same underlying constellation of traits that got him into trouble as a child, such as high activity level, irritability, poor self-control, and low cognitive ability.

The roles of cumulative and contemporary continuities in antisocial behavior have been explored by Caspi, Bem, and Elder (1989; Caspi et al., 1987), using data from the longitudinal Berkeley Guidance Study. They identified men who had a history of temper tantrums during late childhood (when tantrums are not developmentally normative). Then they traced the continuities and consequences of this personality style across the subsequent 30 years of the subjects' lives and into multiple diverse life domains: education, employment, and marriage. A

major finding was that hot-tempered boys who came from middle-class homes suffered a progressive deterioration of socioeconomic status as they moved through the life course. By age 40, their occupational status was indistinguishable from that of men born into the working class. A majority of them held jobs of lower occupational status than those held by their fathers at a comparable age. Did these men fail occupationally because their earlier ill-temperedness started them down a particular path (cumulative consequences) or because their current ill-temperedness handicapped them in the world of work (contemporary consequences)?

Cumulative consequences were implied by the effect of childhood temper on occupational status at midlife: Tantrums predicted lower educational attainment, and educational attainment, in turn, predicted lower occupational status. Contemporary consequences were implied by the strong direct link between ill-temperedness and occupational stability. Men with childhood tantrums continued to be hot-tempered in adulthood, where it got them into trouble in the world of work. They had more erratic work lives, changing jobs more frequently and experiencing more unemployment between ages 18 and 40. Ill-temperedness also had a contemporary effect on marital stability. Almost half (46%) of the men with histories of childhood tantrums had divorced by age 40 compared with only 22% of other men.

Elsewhere, I describe in detail some of the patterns of interaction between persons and their social environments that may promote antisocial continuity across time and across life domains (Caspi & Moffitt, in press-b). Two sources of continuity deserve emphasis here because they narrow the options for change. These processes are (a) failing to learn conventional prosocial alternatives to antisocial behavior and (b) becoming ensnared in a deviant life-style by crime's consequences. These concepts have special implications for the questions of why life-course-persistent individuals fail to desist from delinquency as young adults and why they are so impervious to intervention.

A restricted behavioral repertoire. This theory of life-course-persistent antisocial behavior asserts that the causal sequence begins very early and the formative years are dominated by chains of cumulative and contemporary continuity. As a consequence, little opportunity is afforded for the life-course-persistent antisocial individual to learn a behavioral repertoire of prosocial alternatives. Thus, one overlooked and pernicious source of continuity in antisocial behavior is simply a lack of recourse to any other options. In keeping with this prediction Vitaro, Gagnon, and Tremblay (1990) have shown that aggressive children whose behavioral repertoires consist almost solely of antisocial behaviors are less likely to change over years than are aggressive children whose repertoires comprise some prosocial behaviors as well.

Life-course-persistent persons miss out on opportunities to acquire and practice prosocial alternatives at each stage of development. Children with poor self-control and aggressive behavior are often rejected by peers and adults (Coie, Belding, & Underwood, 1988; Dodge, Coie, & Brakke, 1982; Vitaro et al., 1990). In turn, children who have learned to expect rejection are likely in later settings to withdraw or strike out preemptively, precluding opportunities to affiliate with prosocial peers

(Dodge & Newman, 1981; Dodge & Frame, 1982; LaFrenier & Sroufe, 1985; Nasby, Hayden, & DePaulo, 1980). Such children are robbed of chances to practice conventional social skills. Alternatively, consider this sequence of narrowing options: Behavior problems at school and failure to attain basic math and reading skills place a limit on the variety of job skills that can be acquired and thereby cut off options to pursue legitimate employment as an alternative to the underground economy (Farrington, Gallagher, Morley, Ledger, & West, 1986; Maughan, Gray, & Rutter, 1985; Moffitt, 1990a). Simply put, if social and academic skills are not mastered in childhood, it is very difficult to later recover lost opportunities.

Becoming ensnared by consequences of antisocial behavior. Personal characteristics such as poor self-control, impulsivity, and inability to delay gratification increase the risk that antisocial youngsters will make irrevocable decisions that close the doors of opportunity. Teenaged parenthood, addiction to drugs or alcohol, school dropout, disabling or disfiguring injuries, patchy work histories, and time spent incarcerated are snares that diminish the probabilities of later success by eliminating opportunities for breaking the chain of cumulative continuity (Cairns & Cairns, 1991; J. Q. Wilson & Herrnstein, 1985). Similarly, labels accrued early in life can foreclose later opportunities; an early arrest record or a "bad" reputation may rule out lucrative jobs, higher education, or an advantageous marriage (Farrington, 1977; Klein, 1986; West, 1982). In short, the behavior of life-course-persistent antisocial persons is increasingly maintained and supported by narrowing options for conventional behavior.

Interventions with life-course-persistent persons have met with dismal results (Lipton, Martinson, & Wilks, 1975; Palmer, 1984; Sechrest, White, & Brown, 1979). This is not surprising, considering that most interventions are begun relatively late in the chain of cumulative continuity. The forces of continuity are formidable foes (Caspi & Moffitt, in press-a). After a protracted deficient learning history, and after options for change have been eliminated, efforts to suppress antisocial behavior will not automatically bring prosocial behavior to the surface in its place. Now-classic research on learning shows conclusively that efforts to extinguish undesirable behavior will fail unless alternative behaviors are available that will attract reinforcement (Azrin & Holz, 1966). My analysis of increasingly restricted behavioral options suggests the hypothesis that opportunities for change will often be actively transformed by life-course-persistents into opportunities for continuity: Residential treatment programs provide a chance to learn from criminal peers, a new job furnishes the chance to steal, and new romance provides a partner for abuse. This analysis of life-course-persistent antisocial behavior anticipates disappointing outcomes when such antisocial persons are thrust into new situations that purportedly offer the chance "to turn over a new leaf."

The Reason for Persistence: Traits, Environments, and Developmental Processes

According to some accounts of behavioral continuity, an ever-present underlying trait generates antisocial outcomes at every point in the life span (e.g., Gottfredson & Hirschi, 1990). By

other accounts, antisocial behavior is sustained by environmental barriers to change (e.g., Bandura, 1979, pp. 217-224). In this theory of life-course-persistent antisocial behavior, neither traits nor environments account for continuity.

True, the theory begins with a trait: variation between individuals in neuropsychological health. The trait is truly underlying in that it seldom comes to anyone's attention unless an infant is challenged by formal examinations; it is manifested behaviorally as variability in infant temperament, developmental milestones, and cognitive abilities.

Next, the theory brings environments into play. Parents and other people respond to children's difficult temperaments and developmental deficits. In nurturing environments, toddlers' problems are often corrected. However, in disadvantaged homes, schools, and neighborhoods, the responses are more likely to exacerbate than amend. Under such detrimental circumstances, difficult behavior is gradually elaborated into conduct problems and a dearth of prosocial skills. Thus, over the years, an antisocial personality is slowly and insidiously constructed. Likewise, deficits in language and reasoning are incrementally elaborated into academic failure and a dearth of job skills. Over time, accumulating consequences of the youngster's personality problems and academic problems prune away the options for change.

This theory of life-course-persistent antisocial behavior emphasizes the constant process of reciprocal interaction between personal traits and environmental reactions to them. The original attribute is thus elaborated on during development, to become a syndrome that remains conceptually consistent, but that gains new behavioral components (Caspi & Bem, 1990). Through that process, relatively subtle childhood variations in neuropsychological health can be transformed into an antisocial style that pervades all domains of adolescent and adult behavior. It is this infiltration of the antisocial disposition into the multiple domains of a life that diminishes the likelihood of change.

When in the life course does the potential for change dwindle to nil? How many person-environment interactions must accumulate before the life-course-persistent pattern becomes set? I have argued that a person-environment interaction process is needed to predict emerging antisocial behavior, but after some age will the "person" main effect predict adult outcomes alone? An answer to these questions is critical for prevention efforts. The well-documented resistance of antisocial personality disorder to treatments of all kinds seems to suggest that the life-course-persistent style is fixed sometime before age 18 (Suedfeld & Landon, 1978). Studies of crime careers reveal that it is very unusual for males to first initiate crime after adolescence, suggesting that if an adult is going to be antisocial, the pattern must be established by late adolescence (Elliott, Huizinga, & Menard, 1989).³ At the same time, efforts to predict antisocial outcomes

³ Between 9% and 22% of males not arrested as juveniles are arrested as adults, suggesting that adult-onset offenders constitute between 5% and 15% of all males (for a review see Farrington, Ohlin, & Wilson, 1986). However, estimates that are based on such official data are too high because most offenders engage in crime for some time before they are first arrested. Longitudinal studies of self-report delinquency show that only 1% to 4% of males commit their first criminal offense after age

from childhood conduct problems yield many errors (e.g., White et al., 1990). These errors seem to suggest that antisocial styles become set sometime after childhood.

Unfortunately, the extant longitudinal database does not provide a sound basis for conclusions. Typically, childhood behavior problems are assessed at only one time point from a single source, thereby lumping the many children who are temporarily or situationally aggressive with the few children who are on a persistent and pervasive trajectory. Outcomes are also typically assessed at a single point, often during late adolescence when temporary delinquents and future persisters are lumped together. According to my theory, such predictive designs should yield large numbers of false positives and false negatives. Analyses should ask, when between preschool and late adolescence can *stable-pervasive* antisocial behavior problems best predict antisocial outcomes among adults?

Life-Course-Persistent Antisocial Behavior as Psychopathology

The life-course-persistent antisocial syndrome, as described here, has many characteristics that, taken together, suggest psychopathology. For example, the syndrome is statistically unusual; much research converges to suggest that it is characteristic of about 5% of males (Robins, 1985). Its rarity is thus consistent with a simple statistical definition of abnormality.

The theoretical syndrome is also characterized by tenacious stability across time and in diverse circumstances. This high-probability response style is relied on even in situations where it is clearly inappropriate or disadvantageous (Caspi & Moffitt, in press-b), especially if there is a very limited repertoire of alternative conventional behaviors (Tremblay, 1991). Life-course-persistent antisocial behavior is thus maladaptive in the sense that it fails to change in response to changing circumstances.

The syndrome of life-course-persistent antisocial behavior described here has a biological basis in subtle dysfunctions of the nervous system (Moffitt, 1990b). (I reiterate my assertion that biological origins are in no way deterministic. Rather, individual variations in nervous system health provide raw material for subsequent person-environment interactions.)

The syndrome is associated with other mental disorders. There is good evidence that such "comorbidity" is associated with long-term continuity. An impressive body of research documents an overlap between persistent forms of antisocial behavior and other conditions of childhood such as learning disabilities and hyperactivity (cf. Moffitt, 1990a). Three studies (Elliott, Huizinga, & Menard, 1989; Farrington, Loeber, & Van Kammen, 1990; Moffitt, 1990a) have now shown that the presence of multiple behavioral disorders predicts persistence of illegal behavior over the course of years. This proliferation of mental disorders is common among life-course-persistent antisocial

persons. For example, in the Epidemiological Catchment Area (ECA) study of mental disorders among 19,000 adults, over 90% of the cases with antisocial personality disorder had at least one additional psychiatric diagnosis. (Evidence of onset before adulthood is required for the diagnosis of antisocial personality disorder, confirming persistence in the ECA cases.) The comorbid conditions that disproportionately affected antisocial adults were mania, schizophrenia, drug and alcohol abuse, depression, and anxiety disorders (Robins & Regier, 1991).

Of course, no one or two of these parameters is enough to warrant the classification of life-course-persistent antisocial behavior as psychopathology. Nonetheless, when taken together they form a more persuasive argument that persons whose antisocial behavior is stable and pervasive over the life course may constitute a category that is distinct from persons whose antisocial behavior is short term and situational.

Adolescence-Limited Antisocial Behavior

My account of the adolescence-limited antisocial type will follow this plan: In the first section, *Discontinuity: The Most Common Course of Antisocial Behavior*, I provide a definition and description of this ubiquitous form of antisocial behavior. In the second section, *Beginnings: Motivation, Mimicry, and Reinforcement*, I present three etiological hypotheses. Adolescence-limited antisocial behavior is motivated by the gap between biological maturity and social maturity, it is learned from antisocial models who are easily mimicked, and it is sustained according to the reinforcement principles of learning theory. In the third section, I answer the question, *Why doesn't every teenager become delinquent?* In the fourth section, *Desistance From Crime: Adolescence-Limiteds Are Responsive to Shifting Reinforcement Contingencies*, I explain how temporary delinquents come to be exempted from the processes of continuity. In the fifth section, *Adolescence-Limited Delinquency and Secular Change*, I locate adolescence-limited delinquency in its recent historical context. In the sixth section, I make a case that the antisocial behavior of adolescence-limited delinquents is best regarded as adaptive social behavior.

Discontinuity: The Most Common Course of Antisocial Behavior

As implied by the proffered label, discontinuity is the hallmark of teenaged delinquents who have no notable history of antisocial behavior in childhood and little future for such behavior in adulthood. However, the brief tenure of their delinquency should not obscure their prevalence in the population or the gravity of their crimes. In contrast with the rare life-course-persistent type, adolescence-limited delinquency is ubiquitous. Several studies have shown that about one third of males are arrested during their lifetime for a serious criminal offense, whereas fully four fifths of males have police contact for some minor infringement (Farrington, Ohlin, & Wilson, 1986). Most of these police contacts are made during the adolescent years. Indeed, numerous rigorous self-report studies have now documented that it is statistically aberrant to refrain from crime dur-

17 (Elliott, Huizinga, & Menard, 1989). Adult-onset crime is not only very unusual, but it tends to be low rate, nonviolent (Blumstein & Cohen, 1987), and generally not accompanied by the many complications that attend a persistent and pervasive antisocial life-style (Farrington, Loeber, Elliott, et al., 1990).

ing adolescence (Elliott et al., 1983; Hirschi, 1969; Moffitt & Silva, 1988c).

Compared with the life-course-persistent type, adolescence-limited delinquents show relatively little continuity in their antisocial behavior. Across age, change in delinquent involvement is often abrupt, especially during the periods of onset and desistence. For example, in my aforementioned longitudinal study of a representative sample of boys, 12% of the youngsters were classified as new delinquents at age 13; they had no prior history of antisocial behavior from age 5 to age 11. Between age 11 and age 13, they changed from below the sample average to 1.5 standard deviations above average on self-reported delinquency (Moffitt, 1990a). By age 15, another 20% of this sample of boys had joined the newcomers to delinquency despite having no prior history of antisocial behavior (Moffitt, 1991). Barely into mid-adolescence, the prevalence rate of markedly antisocial boys had swollen from 5% at age 11 to 32% at age 15. When interviewed at age 18, only 7% of the boys denied all delinquent activities. By their mid-20s, at least three fourths of these new offenders are expected to cease all offending (Farrington, 1986).

Adolescence-limited delinquents may also have sporadic, crime-free periods in the midst of their brief crime "careers." Also, in contrast with the life-course-persistent type, they lack consistency in their antisocial behavior across situations. For example, they may shoplift in stores and use drugs with friends but continue to obey the rules at school. Because of the chimeric nature of their delinquency, different reporters (such as self, parent, and teacher) are less likely to agree about their behavior problems when asked to complete rating scales or clinical interviews (Loeber, Green, Lahey, & Stouthamer-Loeber, 1990; Loeber & Schmalings, 1985).

These observations about temporal *instability* and cross-situational *inconsistency* are more than merely descriptive. They have implications for a theory of the etiology of adolescence-limited delinquency. Indeed, the flexibility of most delinquents' behavior suggests that their engagement in deviant life-styles may be under the control of reinforcement and punishment contingencies.

Unlike their life-course-persistent peers, whose behavior was described as inflexible and refractory to changing circumstances, adolescence-limited delinquents are likely to engage in antisocial behavior in situations where such responses seem profitable to them, but they are also able to abandon antisocial behavior when prosocial styles are more rewarding. They maintain control over their antisocial responses and use antisocial behavior only in situations where it may serve an instrumental function. Thus, principles of learning theory will be important for this theory of the cause of adolescence-limited delinquency.

A theory of adolescence-limited delinquency must account for several empirical observations: modal onset in early adolescence, recovery by young adulthood, widespread prevalence, and lack of continuity. Why do youngsters with no history of behavior problems in childhood suddenly become antisocial in adolescence? Why do they develop antisocial problems rather than other difficulties? Why is delinquency so common among teens? How are they able to spontaneously recover from an antisocial life-style within a few short years?

Just as the childhood onset of life-course-persistent persons

compelled me to look for causal factors early in their lives, the coincidence of puberty with the rise in the prevalence of delinquent behavior compels me to look for clues in adolescent development. Critical features of this developmental period are variability in biological age, the increasing importance of peer relationships, and the budding of teenagers' self-conscious values, attitudes, and aspirations. These developmental tasks form the building blocks for a theory of adolescence-limited delinquency.

Beginnings: Motivation, Mimicry, and Reinforcement

Why do adolescence-limited delinquents begin delinquency? The answer advanced here is that their delinquency is "social mimicry" of the antisocial style of life-course-persistent youths. The concept of social mimicry is borrowed from ethology. Social mimicry occurs when two animal species share a single niche and one of the species has cornered the market on a resource that is needed to promote fitness (Moynihan, 1968). In such circumstances, the "mimic" species adopts the social behavior of the more successful species to obtain access to the valuable resource. For example, cowbird chicks, who are left by their mothers to be reared in the nests of unsuspecting parent birds, learn to behave like the parent birds' own true chicks and thus stimulate the parents to drop food their way. Social mimicry may also allow some species to safely pass among a more successful group and thus share access to desired resources. For example, some monkey species have learned to mimic bird calls. One such species of monkeys, rufous-naped tamarins, is able to share the delights of ripe fruit after a tree has been located by tyrant flycatchers, whose superior avian capacities in flight and distance vision better equip them to discover bearing trees. Similarly, zebras are sensitive to the social signals of impalas and gazelles and thus benefit from the latter species' superior sensitivity to approaching predators (E. O. Wilson, 1975).

If social mimicry is to explain why adolescence-limited delinquents begin to mimic the antisocial behavior of their life-course-persistent peers, then, logically, delinquency must be a social behavior that allows access to some desirable resource. I suggest that the resource is mature status, with its consequent power and privilege.

Before modernization, biological maturity came at a later age, social adult status arrived at an earlier age, and rites of passage more clearly delineated the point at which youths assumed new roles and responsibilities. In the past century, improved nutrition and health care have decreased the age of biological maturity at the rate of three tenths of a year per decade (Tanner, 1978; Wyshak & Frisch, 1982). Simultaneously, modernization of work has delayed the age of labor-force participation to ever later points in development (Empey, 1978; Horan & Hargis, 1991; Panel on Youth of the President's Science Advisory Committee, 1974). Thus, secular changes in health and work have lengthened the duration of adolescence. The ensuing gap leaves modern teenagers in a 5- to 10-year role vacuum (Erikson, 1960). They are biologically capable and compelled to be sexual beings, yet they are asked to delay most of the positive aspects of adult life (see Buchanan, Eccles, & Becker, 1992, for a review of studies of the compelling influence of pubertal hormones on

teens' behavior and personality). In most American states, teens are not allowed to work or get a driver's license before age 16, marry or vote before age 18, or buy alcohol before age 21, and they are admonished to delay having children and establishing their own private dwellings until their education is completed at age 22, sometimes more than 10 years after they attain sexual maturity. They remain financially and socially dependent on their families of origin and are allowed few decisions of any real import. Yet they want desperately to establish intimate bonds with the opposite sex, to accrue material belongings, to make their own decisions, and to be regarded as consequential by adults (Csikszentmihalyi & Larson, 1984). Contemporary adolescents are thus trapped in a *maturity gap*, chronological hostages of a time warp between biological age and social age.

This emergent phenomenology begins to color the world for most teens in the first years of adolescence. Steinberg has shown that, between ages 10 and 15, a dramatic shift in youngsters' self-perceptions of autonomy and self-reliance takes place. Moreover, the timing of the shift for individuals is connected with their pubertal maturation (Steinberg, 1987; Steinberg & Silverberg, 1986; Udry, 1988). At the time of biological maturity, salient pubertal changes make the remoteness of ascribed social maturity painfully apparent to teens. This new awareness coincides with their promotion into a high school society that is numerically dominated by older youth. Thus, just as teens begin to feel the discomfort of the maturity gap, they enter a social reference group that has endured the gap for 3 to 4 years and has already perfected some delinquent ways of coping with it. Indeed, several researchers have noted that this life-course transition into high school society may place teens at risk for antisocial behavior. In particular, exposure to peer models, when coupled with puberty, is an important determinant of adolescence-onset cases of delinquency (Caspi, Lynam, Moffitt, & Silva, 1993; Magnusson, 1988; Simmons & Blyth, 1987).

Life-course-persistent youngsters are the vanguard of this transition. Healthy adolescents are capable of noticing that the few life-course-persistent youths in their midst do not seem to suffer much from the maturity gap. (At a prevalence rate of about 5%, one or two such experienced delinquents in every classroom might be expected.) Already adept at deviance, life-course-persistent youths are able to obtain possessions by theft or vice that are otherwise inaccessible to teens who have no independent incomes (e.g., cars, clothes, drugs, or entry into adults-only leisure settings). Life-course-persistent boys are more sexually experienced and have already initiated relationships with the opposite sex.⁴ Life-course-persistent boys appear relatively free of their families of origin; they seem to go their own way, making their own rules. As evidence that they make their own decisions, they take risks and do dangerous things that parents could not possibly endorse. As evidence that they have social consequence in the adult world, they have personal attorneys, social workers, and probation officers; they operate small businesses in the underground economy; and they have fathered children (Weiher, Huizinga, Lizotte, & Van Kammen, 1991). Viewed from within contemporary adolescent culture, the antisocial precocity of life-course-persistent youths becomes a coveted social asset (cf. Finnegan, 1990a, 1990b; Jessor & Jessor, 1977; Silbereisen & Noack, 1988). Like the aforementioned

bird calls that were mimicked by hungry tamarin monkeys, antisocial behavior becomes a valuable technique that is demonstrated by life-course-persistents and imitated carefully by adolescence-limiteds. The effect of peer delinquency on the onset of delinquency is among the most robust facts in criminology research (Elliott & Menard, in press; Jessor & Jessor, 1977; Reiss, 1986; Sarnecki, 1986). However, is there evidence consistent with a social mimicry interpretation? I describe the evidence in the next section.

Social mimicry and the relationships between life-course-persistent and adolescence-limited delinquents. One hypothesized by-product of the maturity gap is a shift during early adolescence by persistent antisocial youth from peripheral to more influential positions in the peer social structure. This shift should occur as aspects of the antisocial style become more interesting to other teens. In terms of its epidemiology, delinquent participation shifts from being primarily an individual psychopathology in childhood to a normative group social behavior during adolescence and then back to psychopathology in adulthood. Consider that the behavior problems of the few pioneering antisocial children in an age cohort must develop on an individual basis; such early childhood pioneers lack the influence of delinquent peers (excepting family members). However, near adolescence, a few boys join the life-course-persistent ones, then a few more, until a critical mass is reached when almost all adolescents are involved in some delinquency with age peers. Elliott and Menard (in press) have analyzed change in peer group membership from age 11 to age 24 in a national probability sample. Their data show a gradual population drift from membership in nondelinquent peer groups to membership in delinquent peer groups up to age 17; the trend reverses thereafter. For example, 78% of 11-year-olds reported no or minimal delinquency among their friends. In contrast, 66% of 17-year-olds reported substantial delinquency on the part of the friends in their group.

The word *friends* in the previous sentence seems to imply a personal relationship between life-course-persistents and adolescence-limiteds that is implausible. Much evidence suggests that, before adolescence, life-course-persistent antisocial children are ignored and rejected by other children because of their unpredictable, aggressive behavior (Coie et al., 1988; Dodge et al., 1982). After adolescence has passed, life-course-persistent adults are often described as lacking the capacity for loyalty or friendship (Cleckley, 1976; Robins, 1985). At first, these observations may seem contrary to my assertion that life-course-persistents assume social influence over youths who admire and emulate their style during adolescence. However, it is important to recall that social mimicry required no exchange of affection between the successful birds and their monkey mimics. In this theory, adolescents who wish to prove their maturity need only

⁴ Several longitudinal studies have shown that a history of antisocial behavior predicts early sexual experience for males relative to their age peers (Elliott & Morse, 1987; Jessor, Costa, Jessor, & Donovan, 1983; Weiher, Huizinga, Lizotte, & Van Kammen, 1991). Specifically, almost all of the sexual experience of an early adolescent cohort is concentrated among the most seriously delinquent 5% of its boys (Elliott & Morse, 1987).

notice that the style of life-course-persistents resembles adulthood more than it resembles childhood. Then they need only observe antisocial behavior closely enough and long enough to imitate it successfully. What is contended is that adolescence-limited youths should regard life-course-persistent youths as models, and life-course-persistent teens should regard themselves as magnets for other teens. Neither perception need involve reciprocal liking between individuals.

A modeling role would imply that measures of exposure to delinquent peers (e.g., knowledge of their delinquent behavior or time spent in proximity to them) should be better predictors of self-delinquency than measures of relationship quality (e.g., shared attitudes or attachment to delinquent peers). Few studies have parsed peer-delinquency effects into separate components, but two findings consistent with this prediction have been reported from the National Youth Survey, a representative sample of more than 1,500 teens. Agnew (1991) examined relationship characteristics in interaction with levels of peer delinquency. He argued that attachment to peers should encourage deviance if peers are delinquent but discourage it if they are not. Agnew's results showed that such interaction terms were good predictors. However, the results also showed that time spent with delinquent peers was a stronger unique predictor of self-delinquency than the interaction between peer attachment and peer crime. Warr and Stafford (1991) found that the knowledge of friends' delinquent behavior was 2.5 to 5 times more important for self-delinquency than friends' attitudes about delinquency. (This pattern has been replicated in another sample by Nagin & Paternoster, 1991.) Moreover, the effect of peer delinquency was direct; it was not mediated by influencing the respondents' attitudes to be more like those of deviant peers. These findings are not consistent with the notion that teens take up delinquency after pro-delinquency attitudes are transferred in the context of intimate social relations. Rather, Warr and Stafford concluded that the data on peer effects are best interpreted in terms of imitation or vicarious reinforcement.

A magnet role would imply that children who were rejected and ignored by others should experience newfound "popularity" as teens, relative to their former rejected status. That is, life-course-persistent youth should encounter more contacts with peers during adolescence when other adolescents draw near so as to imitate their life-style. Some research is consistent with this interpretation. For example, in a study of 450 students in middle school, aggressive youths who were rejected by their peers reported that they did not feel lonely, whereas submissive rejected youths did feel lonely (Parkhurst & Asher, 1992). Similarly, aggressive seventh-graders in the Carolina Longitudinal Study were rated as popular as often as nonaggressive youths by both teachers and themselves and were as likely as other youths to be nuclear members of peer groups (Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988). In their review of peer-relationship studies, Coie, Dodge, and Kupersmidt (1990) noted that the relationship between overt aggression and peer rejection is weaker or absent in adolescent samples compared with child samples. Findings such as these suggest that aggressive teens experience regular contacts with peers, however short-lived. Similarly, in the Oregon Youth Study, rejection by peers at age 10 was prognostic of greater involvement with delinquent peers 2

years later (Dishion, Patterson, Stoolmiller, & Skinner, 1991). Although the Oregon researchers interpreted their results as suggesting that aggressive children seek delinquent friends, their data are equally consistent with my interpretation that aggressive youths begin to serve as a magnet for novice delinquents during early adolescence. Definitive sociometric research must follow up aggressive-rejected children to test whether they develop networks in adolescence that include late-onset delinquents of the adolescence-limited type.

Researchers from the Carolina Longitudinal Study have carefully documented that boys with an aggressive history do participate in peer networks in adolescence but that the networks are not very stable (Cairns et al., 1988). Consistent with a social mimicry hypothesis, delinquent groups have frequent membership turnover. In addition, the interchanges between network members are characterized by much reciprocal antisocial behavior (Cairns et al., 1988). Reiss and Farrington (1991) have shown that the most experienced high-rate young offenders tend to recruit different co-offenders for each offense.

Life-course-persistents serve as core members of revolving networks, by virtue of being role models or trainers for new recruits (Reiss, 1986). They exploit peers as drug customers, as fences, as lookouts, or as sexual partners. Such interactions among life-course-persistent and adolescence-limited delinquents may represent a symbiosis of mutual exploitation. Alternatively, life-course-persistent offenders need not even be aware of all of the adolescence-limited youngsters who imitate their style. Unlike adolescence-limited offenders, who appear to need peer support for crime, life-course-persistent offenders are willing to offend alone (Knight & West, 1975). The point is that the phenomena of "delinquent peer networks" and "co-offending" during the adolescent period do not necessarily connote supportive friendships that are based on intimacy, trust, and loyalty, as is sometimes assumed. Social mimicry of delinquency can take place if experienced offenders actively educate new recruits. However, it can also take place if motivated learners merely observe antisocial models from afar.

Reinforcement of delinquency by its "negative" consequences. For teens who become adolescence-limited delinquents, antisocial behavior is an effective means of knifing-off childhood apron strings and of proving that they can act independently to conquer new challenges (Erikson, 1960). Hypothetical reinforcers for delinquency include damaging the quality of intimacy and communication with parents, provoking responses from adults in positions of authority, finding ways to look older (such as by smoking cigarettes, being tattooed, playing the spender with ill-gotten gains), and tempting fate (risking pregnancy, driving while intoxicated, or shoplifting under the noses of clerks). None of these putative reinforcers may seem very pleasurable to the middle-aged academic, but each of the aforementioned consequences is a precious resource to the teenager and can serve to reinforce delinquency. Bloch and Niederhoffer (1958) have offered an anthropological perspective: "It is almost as if the contemporary young person, in the absence of puberty rituals and ordeals, is moved to exclaim: If you don't care to test us, then we will test ourselves!" (p. 28).

I suggest that every curfew violated, car stolen, drug taken, and baby conceived is a statement of personal independence and

