SECTION 2

Delinquency Theories

In Section 2, we discuss theories of delinquency that have guided scholarship and policy development during the twentieth and twenty-first centuries. Some of the theories are specific to juveniles; others apply to both children and adults. To help guide your reading, the major idea of each group of theories and its juvenile justice policy applications are summarized in the table at the end of this introductory section.

In Chapters 3 and 4, we review individual theories of delinquency. These theories reject the idea that the environment is entirely responsible for behavior and instead blame delinquency on free will—that is, people making choices—or on individual traits—for example, personality, temperament, genetics, brain chemistry, personality, and so on. Chapter 3 examines choice and biological theories. Choice theories are based on the classical school of criminology and emphasize an individual's ability to make choices; by contrast, biological theories attribute delinquency and other types of antisocial behavior to biological traits and processes, such as brain dysfunction. Chapter 4 focuses on psychological theories, which also point to causes of delinquency within the individual, such as intelligence, temperament, and personality.

Chapter 5 examines sociological theories, including cultural deviance, strain, and social control. Rather than blaming behavior on individual characteristics, these theories look at how the child's environment influences his or her behavior. Cultural deviance theories examine a child's interactions with social, cultural, and ecological factors that lead to delinquency; strain theories evaluate the role of a variety of stressors, including blocked opportunities that may push children into delinquency;

and social control theories study how closely bonded or connected children are to family, peers, and the school.

Chapter 6 focuses on critical theories. Two perspectives are presented in this chapter: labeling theories and conflict theories. Labeling theories view delinquency as a product of the interactions between individuals and other persons or groups of people. The unequal distribution of the power to define behaviors as delinquent, the inability of some youths to resist the application of stigmatizing labels, and the process by which juveniles move from unwitting or spontaneous acts to behavior associated with more organized social roles and delinquent identities are among the concerns explored by these theories. By comparison, conflict theories assess the relationships among economic, social, and political factors, including how they interact to produce delinquency.

Chapter 7 examines developmental or life-course theories of delinquency. These theories draw on earlier schools of criminological thought by integrating the strongest elements of those theories, such as social control and social learning. Additionally, developmental theories focus on protective factors and risk factors associated with changes in behavior as people mature, conceptualizing delinquency as a pattern of behavior, rather than as a discrete event.

Theories of delinquency are discussed in Chapter 8. A significant criminological reality is that nearly all theories of delinquency have been built around patterns of male delinquency; thus they may not necessarily apply well when the goal is to explain why girls commit crime. After a brief examination of the development of female gender roles and identities, Chapter 8 discusses delinquency theories in terms of their relevance and applicability to female delinquency.

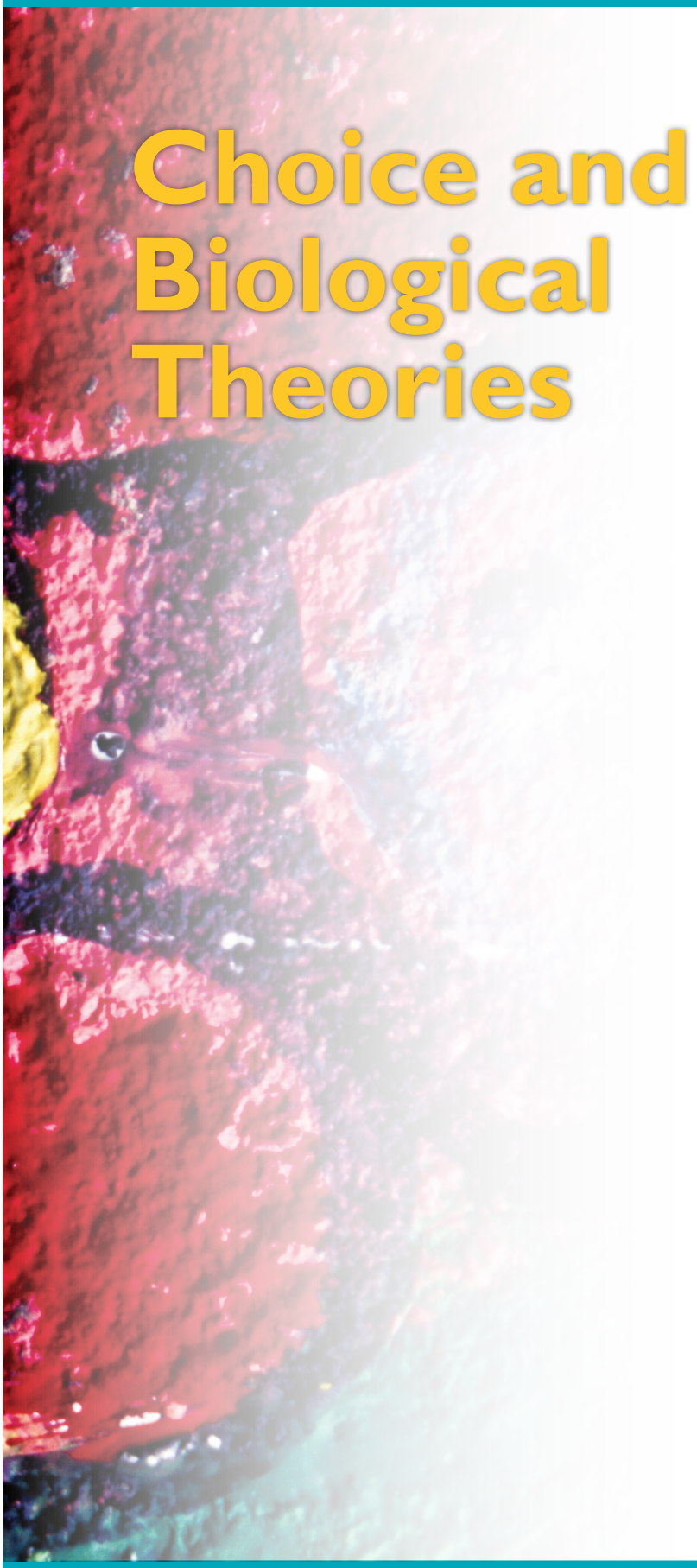
Overview of Criminology Theories and Their Policy Applications

Theory (Chapter)	*Major Premise*	*Policy Application*
Choice theory (3)	Children commit crimes because they anticipate more benefits from violating the law than from conformity.	Fixed-time sentences; shock probation; boot camps
Biological theory (3)	Crime is caused by a biological deficiency *inside* the offender.	Segregation; sterilization
Psychodynamic theory (4)	Crime is caused by an overdeveloped/ underdeveloped superego.	Psychotherapy or aversion therapy
Behavioral theory (4)	Criminal behavior is learned.	Token economies
Cultural deviance theory (5)	Crime is caused by disorganized neighborhoods.	Chicago Area Project
Strain theory (5)	Crime is caused by society telling children what to seek without providing them with the means to do so.	Project Head Start
Social control theory (5)	Juveniles who are not *bonded* to society become delinquent.	Police Athletic League

Theory (Chapter)	*Major Premise*	*Policy Application*
Labeling theory (6)	Crime is caused by societal reactions to behavior.	Diversion programs; decriminalization of offenses
Conflict theory (6)	Crime is caused by imbalances in power.	Programs that equalize power, such as Project Head Start
Developmental theory (7)	Crime is caused by many cumulative factors that vary from childhood to early adulthood.	Age-appropriate interventions that interrupt the cycle of crime
Female delinquency theory (8)	Gender socialization creates different roles for males and females.	Interventions target gender-specific pathways

OBJECTIVES

- Understand the different types of "choice" theories of delinquency that have evolved, from classical to neoclassical to rational choice theory.
- Explore early biological approaches to explaining delinquency, including atavism and body type theories, and understand the dark policies that stemmed from these early approaches.
- Examine the ways that behavioral disorders, such as Attention-deficit/hyperactivity disorder (ADHD) stem from neurological functioning.
- Identify the ways that "nature" and "nurture" forces interact to produce delinquency, including the role of intelligence, hormones, and genetics.
- Understand how environmental pathogens, such as maternal cigarette smoking, chemical poisoning, and nutrition, affect adolescent behavior.



CHAPTER

3

Choice and Biological Theories

FEATURES

- DELINQUENCY **AROUND THE GLOBE**
- **THEORY** IN A NUTSHELL
- **A WINDOW** ON DELINQUENCY
- DELINQUENCY **CONTROVERSY**

PROFILES IN DELINQUENCY

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At the end of my graduate training in clinical psychology, I could have followed several very different career paths: private practice as a clinical psychotherapist, hospital work in clinical neuropsychology, or academic research and teaching at a university.

The academic career won out as the result of a series of turning-point events in 1984. I had broken my leg very badly while parachute jumping, and was confined to a wheelchair in my office while writing my dissertation. As a result, I was unable to escape spending many days with a visitor to our department, who had directed a longitudinal study of a birth cohort of 1000 children growing up in New Zealand. I realized his study would allow me to bring together three scientific interests that had until then remained frustratingly mutually exclusive: the longitudinal cohort method of studying lives as they develop, the neuropsychological study of brain function, and the question of why people engage in crime.

I wrote a proposal to the National Institute of Mental Health (NIMH) for a study of whether neuropsychological deficits in executive self-control and verbal abilities as tested in preadolescents could prospectively predict which young people would later become involved in delinquency and violence during adolescence. Previous studies had linked neuropsychological deficits to crime; because most of these studies had looked at older offenders or prison inmates, however, it was not clear whether preexisting childhood deficits increased the risk for delinquency, or whether a lifestyle of antisocial behavior, with its consequent head injuries and substance abuse, had generated the neuropsychological deficits.

To my delight, I got the grant. Before I knew it, I was off to live in New Zealand for two years to carry out neuropsychological assessments of 1000 13-year-olds, including interviewing them about their self-reported delinquency.

In 1987, I returned from New Zealand to an assistant professorship in psychology at the University of Wisconsin, Madison. There I was able to report from my new data set the cross-sectional finding that 13-year-olds who had neuropsychological deficits were, indeed, already more involved in minor delinquency by age 13 than their peers. But the acid test would depend on longer-term prediction: Would age-13 neuropsychological deficits be able to predict which cohort members offended as the cohort grew older, especially to late adolescence, when crimes tend to become more serious?

We followed up the New Zealand cohort at ages 15 and 18, and I confidently assumed the correlation between neuropsychological test scores and crime would become stronger, after more cohort members took up delinquent offending. To my horror, as more and more adolescents in the cohort joined the ranks of offending at age 15 and 18, the correlations between risk factors and delinquency became weaker and weaker, until finally I had no findings at all to publish.

Sometimes we learn the most when the data do not cooperate with a cherished hypothesis. This was one of those times. The taxonomy of life-course persistent versus adolescence-limited antisocial behavior grew out of my struggles to understand why the data betrayed me. Why did risk factors characterize kids whose delinquency began before adolescence, but not kids whose delinquency began in mid-adolescence?

The study of juvenile delinquency spans more than 200 years. As a result of their myriad studies, criminologists have constructed a variety of **theories**—that is, integrated sets of ideas—to explain and predict *when* and *why* children will commit crime. Many theories are discussed in this chapter and the following five chapters because *ideas have consequences*. As you read about the theories, you will notice that *different* theories lead to *different* policy recommendations. In addition, theories can originate from different academic disciplines—biology, psychology, sociology, human development, and many others—and as such often make different assumptions about human behavior. How a theory explains delinquency determines which social policies will be suggested for preventing crime. Criminologists who think delinquency is rooted in faulty brain chemistry, for example, may suggest medication which specifically targets the brain region responsible for the behavior in question. Conversely, criminologists who believe delinquency is caused by economic deprivation may call for prevention policies aimed at providing equal access to legitimate opportunities.

What Theories Are

Theories are the ideas that criminologists use to explain facts. They represent the views of experts who live in a particular place during a particular period in history. Because theories are tied to real-life experiences, as societies change, so do the experiences of its members. New experiences generate new ideas, which in turn lead to new theories. While there are many theories to choose from, some theories clearly seem better than others.

Theories are evaluated on the basis of three criteria:

- Simplicity
- Testability
- Empirical validity

Each criterion forms its own continuum. As a consequence, a theory may be very strong on one or more of the criteria and weak on the remaining one(s).

For instance, theories may be quite simple or highly complex. A good theory effectively summarizes many separate observations into an easily understood statement. Simplicity is a virtue because the purpose of theory is to reduce a large body of information into a few simple laws.

A good theory is also testable, because other criminologists must be able to refute or verify it. A good theory makes clear and concise predictions that (1) confirm or modify the theory, (2) expand the parameters of the theory, and (3) have practical application. Some theories are not testable because their main concepts are unclear, not measurable, or both. For example, in Edwin Sutherland's *theory of differential association* (discussed in Chapter 5), the concept of "differential association" cannot be completely verified because no one can monitor all of the interactions of a juvenile over an extended period of time.

If a theory is simple and testable, then a third feature to look for is whether it is supported by scientific evidence. Do research findings support the theory and its predictions? Some theories give rise to many predictions, and research tests could be carried out in many different settings and with many different samples and research methods.

We will discuss a number of theories in this book. Because there is *no* perfect theory, our goal is to provide you with a thoughtful, carefully crafted, and objective analysis of the most current literature, free of discipline jargon, so you may make informed decisions about the theories that make the most sense to you. Our discussion begins with what are understood as **choice theories**.

Choice Theory

What does delinquency suggest about the rationality of people who commit crime? Do rational people commit crime? Do they exercise free will? Are they intelligent? Do they seek to maximize pleasure and minimize pain?

If you answered yes to these questions, you likely will agree with the causes of crime expressed in choice theories from the **classical school** of criminology. These theories state that juveniles are rational, intelligent people who have **free will**—that is, the ability to make choices. According to these theories, young people calculate the costs and benefits of their behavior *before* they act. Crime is the result of them imagining that greater gains will come from breaking the law than from obeying it. In the same way, children who skip school typically weigh the likelihood of getting caught against the potential fun they will have. Juveniles who commit serious crime weigh the pleasure they imagine they will receive against the possibility of being arrested, prosecuted, convicted, and sent to a correctional facility. According to choice theories, because behavior is a conscious decision children make, they may be held responsible for their choices and their consequences.

Cesare Beccaria

A leading figure of the classical school was Cesare Beccaria, who formulated his ideas about crime control during the eighteenth century. At that time, the criminal justice systems throughout Europe were cruel and ruthless and demonstrated a callous indifference to human rights. People were punished for crimes against religion, such as

Most delinquent acts are minor offenses. When young people commit these crimes, do they weigh the costs and benefits of their action *before* they act? Could crimes such as shoplifting be prevented by increasing punishment?

DELINQUENCY AROUND THE GLOBE

Is Free Will a Myth?

Different theories make different assumptions about human nature and the most basic aspects of our behavior. For example, classical theorists assume that people exercise free will, which is the power to make decisions. But what if free will itself is a myth?

Neuroscientists at the Max Planck Society for the Advancement of Science in Germany performed magnetic resonance imaging (MRI) scans on 14 people, after instructing the study participants to decide spontaneously whether to press a button on their left or their right. MRI scans indicated a flurry of activity in the unconscious brain long before the subject made his or her "spontaneous" decision. This finding suggests that the outcome of a decision is shaped very strongly by brain activity much earlier than the point in time when a person feels that he is she is actually making a decision. Thus whether free will is, indeed, entirely free is an open scientific question.

atheism and witchcraft, and for crimes against the state, such as criticizing political leaders. Worse yet, "offenders" were rarely told why they were punished. No one was exempt; any person could be hauled off to jail any time for any reason. Wealthy persons were generally spared the most torturous and degrading punishments, which were reserved for ordinary citizens who sometimes were burned alive, whipped, mutilated, or branded.[1]

These conditions inspired Beccaria to write an essay titled *On Crimes and Punishments*, in which he laid out the framework for a new system of justice that emphasized humanity, consistency, and rationality. According to Beccaria:

1. Social action should be based on the utilitarian principle of the *greatest happiness for the greatest number*.
2. Crime is an injury to society, and the only rational measure of crime is the extent of the injury.
3. Crime prevention is more important than punishment. Laws must be published so that the citizenry can understand and support them.

THEORY IN A NUTSHELL

Cesare Beccaria

Beccaria believed that people are rational and intelligent beings who exercise free will. They commit crime because they imagine they will receive greater gains from crime than from conformity. According to Beccaria, social action should be based on the utilitarian principle of the *greatest happiness for the greatest number*; because crime is an injury to society, the only rational measure of crime is the extent of the injury. Crime prevention is more important than punishment. Laws must be published so that the citizenry can understand and support them. For punishment to be effective, it must be certain, severe, and administered swiftly.

4. In a criminal procedure, secret accusations and torture must be abolished. *There should be speedy trials, and accused persons should have every right to present evidence in their defense*.
5. The purpose of punishment is to prevent crime. Punishment must be *swift*, *certain*, and *severe*. Penalties must be based on the social damage caused by the crime. *There should be no capital punishment*; life imprisonment is a better deterrent. Capital punishment is irreparable and makes no provision for mistakes.
6. Imprisonment should be widely used, but prison conditions should be improved through better physical quarters and by separating and classifying inmates as to age, sex, and criminal histories.[2]

On Crimes and Punishments has become one of the most influential papers ever written. It was the basis for the 1791 criminal code of France and for some of the salient ideas found in the United States Constitution:

- People are innocent until proven guilty.
- People cannot be forced to testify against themselves.
- People have the right to counsel and to confront their accusers.
- People have the right to a speedy trial by a jury of their peers (see the "Theory in a Nutshell" feature).

Jeremy Bentham

Among the people aroused by Beccaria's essay was the English economist Jeremy Bentham.[3] Like Beccaria, Bentham was concerned with achieving "the greatest happiness of the greatest number." Bentham's work is grounded in **utilitarian principles**, a set of ideas that assume behavior is calculated and that people gather and make sense of information before they act. People determine whether the behavior they are contemplating will bring them more pleasure than pain; they are "human calculators." Behavior is, therefore, a consequence of a thoughtful plan.

Offenders must be punished because of the harm they have caused others. Punishment serves four purposes:

1. It prevents crime.
2. It reduces the seriousness of any crime committed.
3. It ensures that an offender will use only the minimum amount of force necessary to commit a crime, and no more.
4. It keeps the cost of crime to the lowest possible level.

The cruelty exercised by the criminal justice system during the eighteenth century prompted Bentham to suggest guidelines to regulate the relationship between crime and punishment:

1. The punishment must outweigh the profit derived from committing a crime.
2. The punishment must be increased in proportion to the degree that it falls short of certainty.
3. Repeat offenders (recidivists) must be punished more severely.
4. More serious offenses must receive harsher punishments.
5. When a person is considering committing one of two offenses, the punishment for the more serious offense must be sufficient to induce him or her to commit the less serious offense.
6. The punishment must fit the crime.

7. The punishment must not exceed what is necessary to prevent crime.
8. People who commit similar offenses should receive similar punishments.

Bentham's work had an immediate effect on English criminal law. Indeed, his ideas radically transformed the nineteenth-century English penal code, which was called "The Bloody Code" because people were executed for harmless and minor offenses such as stealing turnips, associating with gypsies, and damaging fish ponds. Between 1820 and 1861, the number of capital crimes in the Code was reduced from 222 to just 3—murder, treason, and piracy—largely because of Bentham's work.[4] More importantly, however, the work of Bentham and his contemporary, Beccaria, fostered a new understanding about the relationship of people to society—one that affirmed the principle that all people should be treated equally under the law (see the "Theory in a Nutshell" feature).

The Neoclassical School

Despite its good intentions, the classical school ultimately failed because of its own rigidity. Its major weakness was not taking into account *why* people committed crime, only that they did. The theories advocated by this school held *all* people equally responsible for their behavior. Those who committed similar crimes received comparable punishments, regardless of why the crime was committed. In other words, the classical school focused on the criminal *act* and not the criminal *actor*. Yet, in reality, people are different. Children, the insane, and the incompetent are not as responsible for their behavior as adults, the sane, and the competent. The idea that there are real differences among people led to the emergence of the neoclassical school.

Social reformers of the **neoclassical school** were sympathetic to what the classical school wanted to achieve. They agreed that people were rational, intelligent beings who exercised free will, but they also thought some crimes were caused by factors beyond the offender's control. According to members of the neoclassical school, **mitigating circumstances**, or factors such as age or mental illness, sometimes influence the choices people make and affect a person's ability to form criminal intent or *mens rea* (guilty mind). This is why today most states establish minimum ages (typically age 7) for holding a child *legally* responsible for a criminal act (see Chapter 13).

The introduction of mitigating circumstances at criminal trials gave rise to the principle of **individual justice**, the idea that criminal law *should* reflect differences

THEORY IN A NUTSHELL

Jeremy Bentham

Bentham, a leader in the utilitarian movement, was mostly concerned with the irrationality of existing laws and punishments and their failure to deter criminality. He promoted Beccaria's idea of the "greatest happiness principle," which holds that the purpose of criminal law is to provide for the "greatest happiness for the greatest number" of people. Crime must be prevented because it harms the "collective happiness." Bentham also believed that people exercise free will and are rational beings who choose to act on the basis of a pursuit of their own happiness. Perhaps his most significant contribution was a series of guidelines intended to regulate the relationship between crime and punishment. His ideas profoundly affected criminal justice policy in England. Before Bentham's work, English law called for the death penalty for 222 crimes. After the publication of his theory, the death penalty was reserved for only 3 crimes—murder, treason, and piracy.

Until a person reaches age 7, the law does not recognize a child's ability to form criminal intent. Age is often used as a mitigating circumstance in sentencing, particularly when defendants are either very old or very young.

among people and their circumstances. Individual justice produced a series of important developments in criminal justice, including the insanity defense and inclusion of expert witnesses. Perhaps most important, it served as the cornerstone for a new explanation of crime that blamed delinquency on individual traits or characteristics that were in place *before* the act was committed. The foundation of this new way of thinking about crime was *scientific determinism*, which depended on the scientific method to explain crime and was the focus of the positive school of criminology.

Modern Classical School Theory

In the 1960s and early 1970s, criminologists began to question the effectiveness of rehabilitation. A flurry of evaluation studies of rehabilitation programs concluded that *some* treatment works *some* of the time for *some* offenders in *some* settings.[5] This unconvincing endorsement of the rehabilitation model led to the proposal that criminals need to be punished rather than rehabilitated. One advocate of this change was the influential criminologist James Q. Wilson, who said:

> Wicked people exist. Nothing avails except to set them apart from innocent people. And many people—neither wicked nor innocent, but watchful, dissembling, and calculating of their chances—ponder our reaction to wickedness as a clue to what they might profitably do.[6]

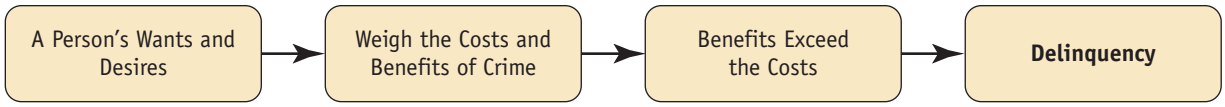


FIGURE 3–1 Mapping Delinquency Theory: Classical and Rational Choice Theories

In this view, the reason to punish crime is that if crime is not punished, people "on the fence" will think crime pays and possibly commit it.

About the same time, other criminologists were busy constructing alternative theories to the neoclassical school's position. Ronald Clarke and Derek Cornish introduced **rational choice theory**, in which they charged that delinquents are rational people who make calculated choices about what they are going to do *before* they act. According to this view, offenders collect, process, and evaluate information about the crime and make a decision whether to commit it after they have weighed the costs and benefits of doing so (**Figure 3–1**). Thus crime represents a well-thought-out decision: Offenders decide where to commit it, who or what to target, and how to execute it.[7]

Research has shown that many offenders *do* select a specific location to commit crime. For example, Bruce Jacobs has reported that crack cocaine street dealers like to operate in the middle of a long block because they can see everything in both directions from this location.[8] It also has been found that offenders pick their crime targets only *after* they study the behavior of potential victims.[9] Criminals also learn how to avoid arrest. Successful crack cocaine dealers, for instance, know where to hide drugs on their person, on the street, and at home.[10] Even robberies of drug dealers have been found

A WINDOW ON DELINQUENCY

Rational Predation?

Many acts of delinquency seem rational when they pertain to everyday types of crime. For instance, a young person might decide to steal from a store because he or she believes that stores have great resources and will not miss the stolen items. Other people might drive a car while intoxicated because they feel in control and figure that because they are only 20 minutes from home, little could go wrong. But is rational choice or classical theory relevant for extreme forms of crime?

Eric Beauregard and his colleagues studied rational choice theory based on interviews with 69 incarcerated serial sex offenders in Canada. All of the men had committed at least two prior sexual assaults or other sexually related crimes against stranger victims. The researchers found that serial sex offenders did not use a consistent method in selecting or "hunting" their victims. Instead, sexual predators studied the routine activities of potential victims to calculate the best way to carry out the crime. The offenders planned how to meet their victims, which attack strategy would be used to commit the crime, and how or if they would release the victim after the sexual assault. The offenders were keenly attuned to situational factors surrounding each attack and adjusted their approach and behavior as the situation warranted. In other words, serial sexual predators are guided by much the same principle that a child uses when stealing candy from a candy store: rationality.

Sources: Eric Beauregard, Kim Rossmo, and Jean Proulx, "A Descriptive Model of the Hunting Process of Serial Sex Offenders: A Rational Choice Perspective," *Journal of Family Violence* 22:449–463 (2007); Eric Beauregard and Benoit Leclerc, "Application of the Rational Choice Approach to the Offending Process of Sex Offenders: A Closer Look at the Decision-Making," *Sexual Abuse: A Journal of Research and Treatment* 19:115–133 (2007).

to operate on rational principles. Recently, Bruce Jacobs and Richard Wright described three general types of robberies among drug dealers:

- *Market-related* robberies occur as a result of disputes among rival drug dealing offenders.
- *Status-based* robberies occur when one drug dealer's character or reputation is damaged or threatened by another drug dealer.
- *Personalistic* robberies occur when a drug dealer's autonomy is threatened by another drug dealer.[11]

In other words, even the seemingly random violence of the drug underworld has been shown to unfold consistently with classical theory.

A similar theoretical explanation is advanced by Lawrence Cohen and Marcus Felson. Their **routine activities theory** examines the crime target or whatever it is the offender wants to take control of, whether it is a house to break into, a bottle of beer, merchandise from a department store, or illegal downloads of music off the Internet. Cohen and Felson argue that before a crime will be committed, three elements must converge:

- Motivated offenders
- Suitable targets
- An absence of people to deter the would-be offender[12]

Thus crime increases when there are motivated offenders, vulnerable targets (e.g., keys left in the ignition), and only a few people to protect those targets (e.g., police).[13] (See **Figure 3–2**.)

There are two problems with the rational choice and routine activity theories. First, they do not identify which factors motivate offenders to commit crime. Second, they overlook factors that cause the criminalization of some behavior (e.g., smoking marijuana) and not other behavior (e.g., drinking alcohol).[14] Nonetheless, both theories force criminologists to recognize that *every crime is a unique event*. Crime may have as much to do with situational factors and free will as it does with the offender's psychology.

Are Offenders Rational?

Are offenders rational? Do rational people murder their friends? Do they stab to death a 10-year-old child walking home from school? Do they drop a playmate from a fourteenth-floor window because he would not steal candy?[15] In fact, juveniles committed each of these crimes.

Research on whether offenders are rational has produced mixed results. Some studies have shown that street criminals, prostitutes, thieves, drug dealers and users, burglars, robbers, serial killers, and rapists do calculate the risks of getting caught. Gang leaders have been reported to be rational decision makers when they determine who their enemies are, which business deals to make, what the likelihood of being caught

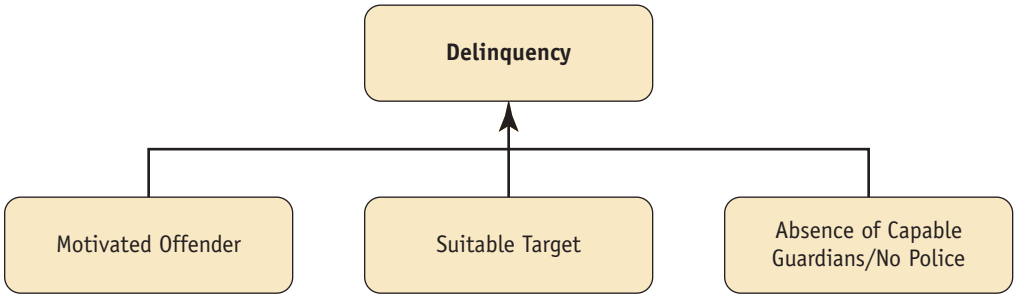


FIGURE 3–2 Mapping Delinquency Theory: Routine Activities Theory

is, and how to recruit new members. However, others who commit the same offenses have been found to exercise less rationality than might been expected.[16] Kenneth Tunnell studied the motivations of chronic property offenders and concluded:

1. They do not consider the legal consequences of their behavior.
2. They focus on rewards and not risks, believing they will not get caught.
3. They do not consider the law, arrest, or imprisonment."[17]

Ronald Akers suggests that the concept of rationality is itself problematic. If being rational means having full and accurate access to *all* potential outcomes of behavior, then classical theories are unrealistic because such predictable situations do not exist. If being rational means making a decision based on the available information, then offenders have "limited rationality." With limited rationality, the emphasis on free will and autonomy, which is the cornerstone of the classical argument, is lost.[18] The information that is available may be faulty or the individual's assessment of the situation may be incorrect. As a consequence, people may not be as free to choose between alternative courses of action as these theories suggest.

Boot camps employ grueling mental and physical regimines in an effort to instill discipline and self-worth in young offenders. Do boot camps work? In what ways does the effectiveness of boot camps matter to the general public? What is the allure of get-tough responses to delinquency?

Under some circumstances, predatory crimes such as robbery are rational. But what about bizarre crimes such as personal crimes of violence? Are these crimes rational? It is tempting to blame them on biological impulses and psychological delusions. Violence, however, may be rational in circumstances where offenders believe it will produce the desired rewards. When rival gangs fight, for example, the perceived reward is reputation. Boyfriends assault girlfriends to win arguments. Children murder classmates to stop being bullied. In other words, *some* juveniles *some* of the time in *some* situations may see violence as an effective means to get what they want.[19]

Another reason why some juveniles make some bad choices is their lack of morality. James Q. Wilson thinks juveniles who behave badly do so because they have not had a sense of morality instilled into them:

> The moral relativism of the modern age has probably contributed to the increase in crime rates. . . . It has done so by replacing the belief in personal responsibility with the notion of social causation and by supplying to those marginal persons at risk for crime a justification for doing what they might have done anyway.[20]

Psychologist Hans Eysenck, who blames juvenile violence on parental and societal permissiveness, agrees. According to Eysenck, how young people are reared today has produced a serious problem: They have not developed a conscience because they have not been taught to connect their misbehavior with a negative outcome. Delinquency is the price we pay for society and parents who are not doing their job.[21]

Choice Theory and Delinquency Prevention

Choice theories aim to prevent delinquency in one of two ways: through the *justice model* or through the *utilitarian punishment model*. Both models hold children responsible for their behavior; that is, both assume children are sufficiently rational, intelligent beings who exercise free will. According to these models, children calculate whether to commit crime based on the rewards and punishments they imagine they will receive *before* they act. The models differ on the reasons cited for doling out punishment, however: The *justice model* punishes offenders because of the social harm they have caused, whereas the *utilitarian punishment model* punishes offenders to protect society.

Does punishment deter crime? Retribution, the idea that delinquents should be punished for the harm they cause the society, is one of the oldest and most publicly favored responses, to juvenile delinquency and crime.

The Justice Model

In *We Are the Living Proof*, David Fogel introduced the **justice model**, which promotes the notion of fixed-time sentences, seeks to abolish parole, and would use prisons to punish offenders.[22] Fogel argues that **indeterminate sentences**—that is, sentences of varying time lengths, such as 5 to 10 years—should be abolished and replaced with **determinate sentences**—that is, sentences of a fixed amount of time—because the courts cannot discriminate between offenders who can be reformed from those who cannot. A fairer system would be one in which people who committed similar crimes received equivalent punishments.

Fogel's thinking is grounded in the idea of **retribution**, which states that criminals must be punished because of the social harm they have caused. According to this view, *punishment is criminals' just desserts*. Underlying retributive philosophy is the notion that punishment should reflect the seriousness of the crime and the culpability of the offender. In addition, when sentencing offenders, it is wrong to consider their needs. Instead, sentences should reflect only the penalties criminals deserve for breaking the law.[23]

Critics complain that Fogel's remedies pander to a correctional policy of despair rather than one of hope. There also is not much empirical evidence to support the idea that the justice model leads to a more humane and impartial criminal justice system. To the contrary, some state legislatures have established determinant or fixed-time sentences as a way to create more punitive sentences.[24]

The Utilitarian Punishment Model

At the core of the **utilitarian punishment model** is the idea that offenders must be punished to protect society. According to Ernest van den Haag:

> If a given offender's offenses are rational in the situation in which he lives—if what he can gain exceeds the likely cost to him by more than the gain from legitimate activities he does—there is little that can be "corrected" in the offender. Reform will fail. It often fails for this reason. What has to be changed is not the personality of the offender, but the cost–benefit ratio which makes his offense rational. The ratio can be changed by improving and multiplying his opportunities for legitimate activity and the benefits they yield, or by decreasing this opportunity for illegitimate activities, or by increasing their cost to him, including punishment.[25]

In Van den Haag's opinion, punishment *deters crime*. If he is right, then it should be possible to prevent crime by punishing offenders more severely. This idea has steadily increased in popularity, based on research findings published by criminologists who calculated the risk of *actual* time served for each Crime Index offense. The likelihood of a person who commits a serious crime serving prison time is very, very low. As time served has increased, however, the crime rate has dropped.

Several delinquency prevention programs are based on the utilitarian punishment model. In *shock probation*, offenders experience fear through a short period of incarceration preceding probation. In *boot camps*, offenders are drilled and tormented for 60 to 90 days. In *Scared Straight*, juveniles attend presentations at adult prisons where hardened convicts and inmates serving life sentences yell and scream threats of assault and rape at them, letting them know what will happen if they come to prison.

Research evaluating the effectiveness of these programs has generally been critical of their ability to deter juvenile offenders.[26] In fact, instead of controlling crime, such programs tend to increase it. When Anthony Petrosino and his colleagues conducted

a systematic review of Scared Straight programs, they found that youths who went through the program had higher rates of offending than youths who did not. According to these researchers, "on average these programs result in an increase in criminality in the experimental group when compared to a no-treatment control group. According to these experiments, doing nothing would have been better than exposing juveniles to the program."[27]

Public Adoption of Choice Theory

The general public also protects itself from criminal victimization by following the principles of choice theory. For instance, Matthew Giblin examined the ways that Americans protect themselves from criminal harm using a sample selected from 12 large cities. Giblin found that people take a variety of rational steps to increase their personal security, including avoiding areas characterized by disorder and crime, altering their lifestyles to avoid risky situations, and becoming aware of the services that community police officers provide in terms of crime safety.[28] In this sense, choice theory has an important application to the everyday lives of citizens. Indeed, recent research has revealed that simple, everyday situational prevention strategies are the best way to guard against becoming a victim of crime.[29]

Biological Theories

The idea that criminals are biologically abnormal is very old. It can be traced to the positive school of criminology, which marked a shift in our thinking about crime from the *act* to the *actor*. Charles Darwin was largely responsible for this change. In *On the Origin of Species*, he argued that God had not created *all* the species of animals, but rather that people had evolved from lower forms of life over the course of millions of years. Then, in *Descent of Man*, Darwin proposed that God had not made people in his own image and suggested that there are actually very few differences between people and animals. Darwin's ideas captured the attention of a group of nineteenth-century criminologists, who called themselves *Positivists* because they believed using the scientific method was the best way to study crime. These scholars, who formed the **positive school** of criminology, attributed crime to factors that were in place *before* the crime was committed.

In *On the Origin of Species*, Charles Darwin suggested that God had not created all the species of animals and that human beings had evolved from lower forms of life over millions of years. In a second book, *The Decent of Man*, Darwin challenged the belief that God had created people in his image. He argued that there were few differences between humans and animals, and therefore the behavior of both was regulated by the same set of laws.

Atavism

The Italian criminologist Cesare Lombroso constructed the first biological theory of crime when he argued that you could tell how highly evolved someone was from his or her physical appearance. Applying Darwin's teachings, Lombroso theorized that criminals were **atavistic beings**—that is, throwbacks to an earlier, more primitive stage of human development. According to Lombroso, these individuals more closely resembled their ape-like ancestors in terms of their traits, abilities, and dispositions. Because criminals were not so highly evolved as their noncriminal counterparts, they possessed **stigmata**—distinctive physical features, such as an asymmetrical face, an enormous jaw, large or protruding ears, and a receding chin—that distinguished them from ordinary people. Through no fault of their own, criminals were incapable of obeying the complex rules and regulations of modern society; for this reason, Lombroso stated, they should be placed in restrictive institutions, such as prisons.[30]

Years later, the English economist Charles Goring challenged the validity of Lombroso's findings. Goring compared the physical measurements of 3000 English convicts

on 43 traits with similar measurements from a sample of university students. He found *no* evidence of a physical type of criminal.[31] Goring's conclusion remained unchallenged until 1939, when Harvard anthropologist Earnest Hooton discovered that Goring had ignored his own data that refuted his argument (and supported Lombroso). Upon reexamining Goring's data, Hooton found relative differences between criminals and non-offenders.[32] What is interesting is that more than 125 years after Lombroso made his claims, Zeynep Benderlioglu and his colleagues from Ohio State University found that men and women with asymmetrical extremities—ears, fingers, or feet of different sizes or shapes—were more likely to react aggressively when annoyed or provoked. The researchers argued that factors such as smoking or drinking during a pregnancy might stress a fetus in various ways, causing slight physical imperfections and also poorer impulse control.[33]

Today, the notion that delinquents are atavistic, evolutionary throwbacks is no longer believed; however, this does not mean that evolutionary processes are unrelated to delinquent behavior. For example, the field of **evolutionary psychology** examines how evolutionary forces shape patterns of human cognition and behavior. Specific antisocial forms of behavior may be refined, enhanced, or curtailed over evolutionary time as people adapt to their environment for survival. In some cases, antisocial behaviors can be helpful for survival, such as the use of violence to resolve conflicts. Over time, however, antisocial behaviors are modified so that human groups can evolve into functional societies.[34] The overarching thesis of evolutionary psychology is that humans and their environment interact to produce human behavior.

Body Type

In 1949, William Sheldon theorized there was a relationship between body type and delinquency, an idea known as **somatotype** theory. Sheldon identified three ideal body types (see **Figure 3–3**):

- *Ectomorphs*, who are introverted and overly sensitive, and who love privacy
- *Mesomorphs*, who are active and assertive, and who lust for power
- *Endomorphs*, who are relaxed, comfortable, extroverted "softies"

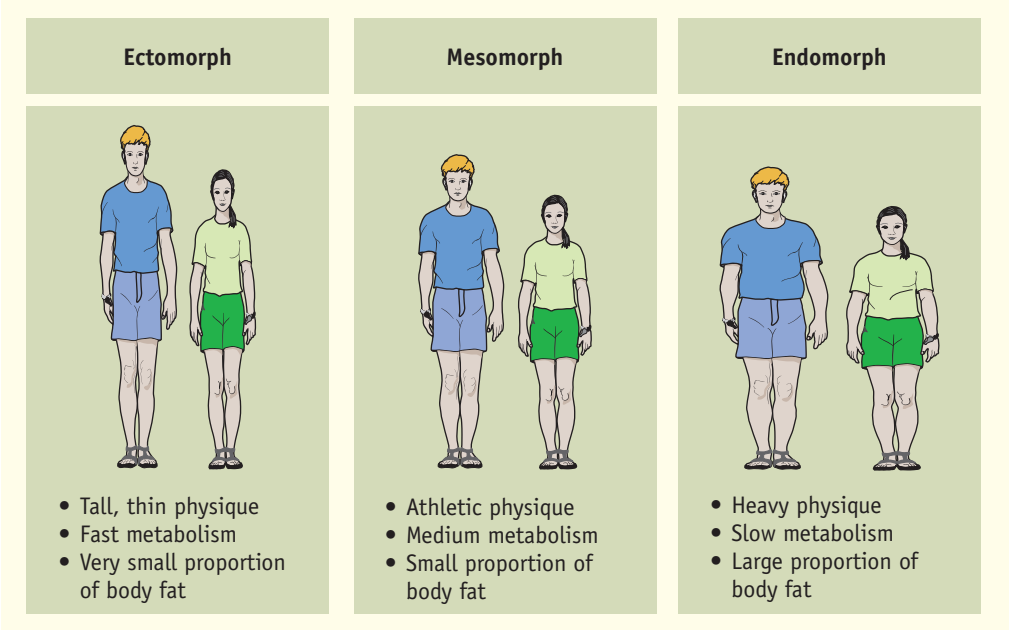


FIGURE 3–3 Sheldon's Types of Human Physique

Sheldon tested his thesis by "typing" the bodies of 200 incarcerated juvenile offenders and 4000 male college students. He found that delinquents were more likely to be mesomorphs and much less likely to be ectomorphs. He detected no significant differences between the groups on endomorphy.[35]

Sheldon's research has since been replicated as other criminologists continue to search for a link between mesomorphy and delinquency. For instance, when Sheldon Glueck and Eleanor Glueck compared the body types of 500 delinquents and 500 nondelinquents, they also found that delinquents were more likely to be mesomorphs.[36] Juan Cortes and Florence Gatti typed 100 delinquents and 100 high school students and reported similar findings—that 57 percent of the delinquents and only 20 percent of the nondelinquents were mesomorphs.[37]

More contemporary research has provided further support for Sheldon's hypothesis that mesomorphic people are more antisocial. Based on data from a sample of prisoners in the Arkansas Department of Corrections, Sean Maddan and his colleagues assessed the body type–delinquency relationship using the *body mass index* (BMI), which is calculated as a person's weight divided by his or her height squared. People who have a BMI over 26 are considered overweight (endomorphs). Those with a BMI between 19 and 25 are considered athletically fit and consistent with the mesomorphic body type. People who are frail and underweight have a BMI below 19, which is consistent with the ectomorphic body type. Maddan and his colleagues found that offenders with a mesomorph body type were significantly more likely than either ectomorphs or endomorphs to be incarcerated for a violent offense. Thus body type appears to have a minor, yet statistically significant effect on violent forms of delinquency.[38]

If there is a relationship between body type and delinquency, it could be linked to temperament. For instance, Adrian Raine, David Farrington, and their colleagues studied the effects of body size on delinquency in a sample of 1130 children. They found that large body size at age 3 was predictive of increased aggression at age 11. Large children tended to be more fearless and stimulation seeking, but the effects of body size on delinquency remained even after controlling for temperament.[39]

Of course, there may be other explanations for this relationship. Perhaps mesomorphs are more effective at acting out their frustrations and desires than more delicately built children. Perhaps being muscular enables mesomorphs to be more readily admitted into delinquent gangs. Because masculinity allows someone to more easily dominate others, it might also encourage the use of violence and threats. Muscularity might also be perceived as a sign of masculinity and physical toughness, so that boys with muscles feel they need to play the role of "tough guy." In fact, recent ethnographic research suggests that male street offenders view criminal offending and substance abuse as ways to show their "manhood" and view others' inability to commit crime as a sign of weakness.[40] Finally, perhaps the relationship researchers have found between mesomorphy and delinquency results from juvenile justice officials—particularly law enforcement officers—regarding mesomorphy as a sign of danger and then reacting differently toward mesomorphs than they do toward juveniles with other body types.

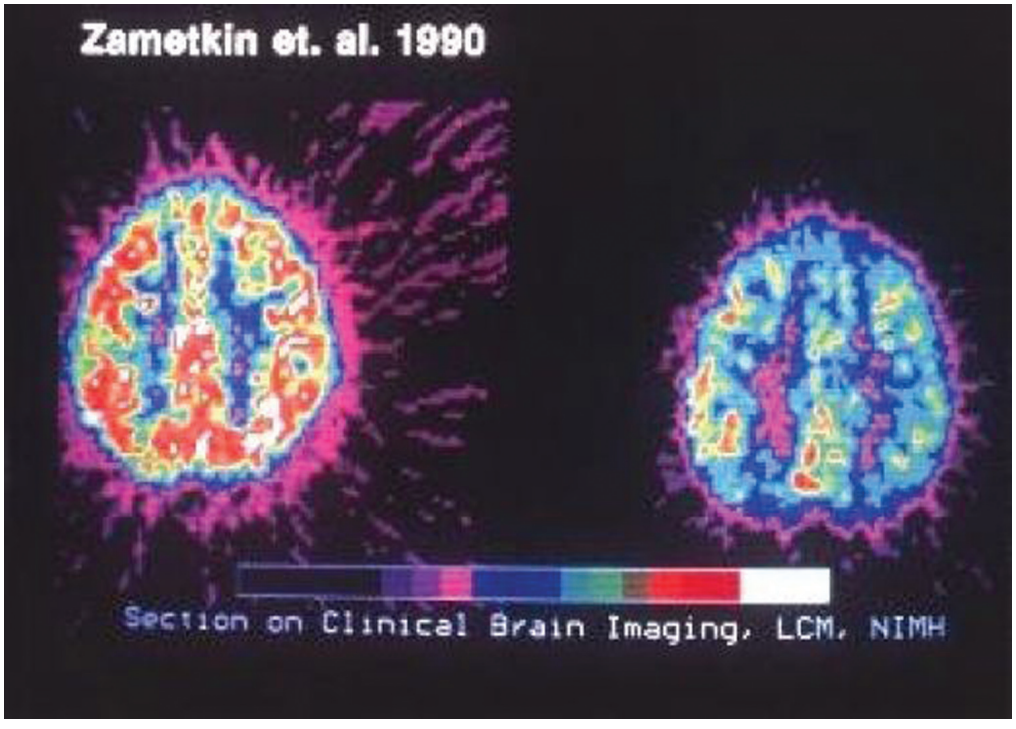
Autonomic Hypoactivity and ADHD

In hindsight, early trait theories of delinquency seem almost laughable in their crudeness. However, scholarly investigations of the biological or physiological differences between serious delinquents and nondelinquents continued. Today, this line of research examines internal factors, such as heart rate, brain activity, and brain structure, rather than external differences, such as physical appearance.

The most consistently documented biological correlate of delinquency is *autonomic hypoactivity*—that is, an under-aroused system marked by a low resting heart rate. Low resting heart rate is more commonly found among males than females, among chronic

offenders than normative delinquents, among violent offenders than nonviolent offenders, and among prisoners than those in the community. The relationship between low resting heart rate and problem behavior has been replicated in samples from Canada, England, Germany, Mauritius, New Zealand, and the United States.[41] When David Farrington examined the predictors of violence using 48 sociological, psychological, and biological independent variables, he found that low resting heart rate was *the* strongest and most consistent predictor of crime.[42]

Several explanations have been proposed for why resting heart rate is so strongly predictive of criminal behavior. For a variety of reasons—some known and others waiting to be discovered—there are important differences among people in terms of how their brains are structured and how their brains process information. A growing body of literature confirms that criminality is tied to differences in brain structure, which affects people's ability to exercise self-control (frontal lobe) and respond to environmental changes (temporal lobe). For some people, their brains produce either more or fewer chemicals than they need. For example, those with brains that produce too little *serotonin* may have a behavioral condition that has been coupled with impulsivity, aggression, and violent offending.[43] Recent evidence from brain scanning research suggests that persons with behavioral inhibition dysfunction have reduced activation or brain activity in the left dorsolateral prefrontal cortex, posterior cingulated gyrus, and bilateral temporal–parietal regions compared to children who are able to adequately modulate their behavior.[44] Another major area of research in neuropsychiatry focuses on scanning the brains of persons who appear to have physiological predispositions for behavioral problems.



Brain scan images produced by positron emission tomography (PET) show differences in the brains of an adult with ADHD (right) and an adult without ADHD (left). Has sociological criminology been completely misguided by ignoring the role of biology in behavior? Whatever the effects of all theories of delinquency, are they all subservient to a simpler explanation: the human brain?

Reproduced from A.J. Zametkin, et al., *N Engl J Med* 323:1361–1366 (1990). Courtesy of Alan Zametkin/National Institute of Mental Health.

A possible consequence for children who have brains that produce too little *serotonin*, which is one of the neurotransmitters that sends communications between synapses in the brain, is **Attention-Deficit/Hyperactivity Disorder** (ADHD). The most common neurobehavioral disorder of childhood, it affects between 4 and 12 percent of children ages 6 to 15. A physician in Providence, Rhode Island, while studying the causes of delinquency, discovered ADHD in the 1930s when he stumbled across a way to calm rowdy boys by giving them stimulants. Because low arousal is an unpleasant physiological state, youths seek stimulation to increase their arousal levels to normal levels. The stimulant helps persons with ADHD to achieve normal arousal levels. The discovery led to the creation of the first generation of drugs to treat ADHD.[45]

ADHD is generally recognizable by its symptoms, which include inattention and hyperactivity that cause difficulty in school, poor relationships with family and peers, and low self-esteem. Children with ADHD demonstrate the following behaviors:

- Are more than just fidgety—their "motor" is running all of the time
- Run, jump, and climb everywhere
- Constantly lose and misplace things
- Have difficulty following simple instructions
- Have trouble finishing work
- Need constant reminders to remain on task
- Do things without thinking about the consequences
- Are driven by the pursuit of immediate gratification

ADHD symptoms usually appear before age four. Often, children are not diagnosed with the disorder until they enter school, where they talk excessively, interrupt teachers, and commit physically dangerous acts. It is not easy, however, to determine whether a child has ADHD or some other disorder. In one study, more than half of the children who received medication for ADHD did not have this condition.[46]

Estimates of the prevalence of ADHD vary. As noted earlier, it has been estimated that between 4 and 12 percent of the school-age population (children ages 6 to 12) are diagnosed with ADHD, and the disorder is approximately five times more common in boys than in girls.[47] The adult prevalence of ADHD in the United States has been estimated at 4 percent based on the National Comorbidity Survey Replication.[48] Because ADHD is a relatively stable disorder, the adult prevalence should be consistent with the ADHD prevalence in children and adolescents. ADHD in girls, however, may be as common as it is among boys and might be under-diagnosed because girls with ADHD have developed more passive and acceptable coping strategies than boys.[49] Rather than being rebellious, ADHD girls often are inattentive and misdiagnosed as being lazy or spacey when they are not.[50] For instance, Teresa Nadder and her colleagues found that the symptoms of ADHD are similar for boys and girls.[51] Compared to girls who do not have ADHD, girls with the disorder are more likely to have conduct disorder, depression, anxiety, alcoholism, substance abuse problems, anorexia, and bulimia; they are also more likely to smoke.[52]

The cause of ADHD is not entirely known. In reports by the mainstream media, this condition has been tied to heredity, prenatal stress, neurological damage, food allergies, family turmoil, and more. In fact, ADHD is almost entirely caused by genetic factors. Soo Rhee and his colleagues assessed the genetic and environmental influences of ADHD using data from 2391 twin and sibling pairs from Australia. They found that between *85 and 90 percent* of ADHD symptoms were directly attributable to genes.[53] For instance, studies by behavioral geneticists found that persons with the 7-repeat allele of the dopamine D4 receptor gene (DRD4) develop ADHD.[54] Stephen Faraone and his

As researchers learn ever more about brain functioning and dysfunction, it is likely that additional drugs will be developed to treat behavioral disorders. The benefits of overcoming ADHD are many, but what are the costs?

colleagues recently confirmed that abnormalities in DRD4 are likely the genetic cause of ADHD.[55]

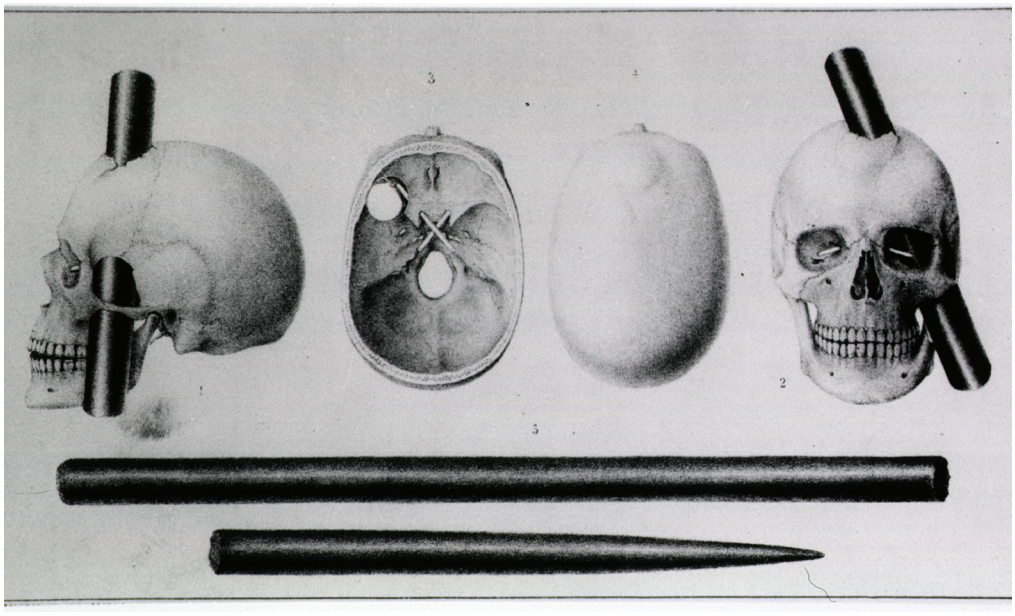
What does this molecular genetics language mean? Basically, crucial parts of the brains of children with ADHD develop more slowly than other children's brains. These slower-developing regions are related to the parts of the brain that control the ability to focus attention, suppress inappropriate actions and thoughts, use short-term memory, work for reward, and control movement. When children have inefficient forms of genes—variants of genes are called *polymorphisms*—their brains do not perform at an optimal level.[56]

There are many negative consequences of having ADHD. For instance, children with ADHD are more likely to be depressed, have speech and language impediments, and have learning disabilities. They also engage in more problematic behaviors throughout their lives. In turn, they are arrested, adjudicated delinquent, and become adult criminals much more often than non-ADHD children.[57] Nondelinquents with ADHD have been found to have better cognitive functioning and verbal skills than ADHD delinquents, who in turn have more cognitive defects than non-ADHD delinquents. When James Satterfield and his colleagues compared 110 children with ADHD and 88 normal children, he found that the children with ADHD were more likely to be arrested for a serious crime and were 21 times more likely to be institutionalized for antisocial behavior.[58] Recently, Travis Pratt and his associates conducted a meta-analysis of 20 studies that examined the effects of ADHD and delinquency. They found a consistent relationship between the disorder and crime, making ADHD an important risk factor for antisocial conduct.[59]

In the United States, many medical centers treat ADHD. The most common treatment is drug therapy—specifically, methylphenidate (Ritalin) or an amphetamine (Adderall or Dexedrine). Between 2000 and 2006, the use of ADHD-treatment drugs increased nearly 60 percent.[60] Sales of these drugs now exceed $1 billion annually. With children as young as age 5 being prescribed methylphenidate or an amphetamine, some experts worry about the long-term side effects these drugs may have, such as psychosis, mania, loss of appetite, depression, sleep problems, moodiness, and stunting of growth.[61] Matthew Hutson reports that as many as 5 percent of children who are prescribed Ritalin complain of psychotic, delusional episodes where they believe that bugs are infesting their bodies.[62] Research indicates that children metabolize medications differently than adults; the brain also develops much more rapidly in children than in adults. Some studies have demonstrated that the maturing neurotransmitter system in children's brains is so sensitive to drugs that the drugs may cause permanent changes in the child's adult life.[63] This concern is the source of the current controversy over use of stimulants such as Ritalin in young children.

Frontal Lobes and Executive Functioning

On September 13, 1848, a freakish accident affecting railroad worker Phineas Gage occurred that would lead to an important scientific discovery about the human brain and its control over various aspects of behavior. While workers were setting railroad track, an explosives accident sent a tamping iron, 3 feet long and weighing about 13 pounds, through Gage's cheekbone and out the anterior frontal cortex of his head. Amazingly, not only did Gage survive the accident, but he appeared to be generally okay, suffering only minimal blood loss. His personality was another story. Before the accident, Gage was a responsible, hard-working, disciplined, congenial man who got along well with others. After the accident, he was highly impulsive, egocentric, irresponsible,



The radical change in the personality of Phineas Gage highlighted its biological origins. The frontal lobes are the anatomical location of the executive functions and have important implications for delinquent behavior.

and irreverent, and did not get along well with others. He seemed entirely different in personality and temperament.[64]

The Gage accident is commonly cited to illustrate the role of the human brain, and various sections of the brain, in controlling different aspects of our behavior. With the advancement of neuroimaging techniques, such as magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), and positron emission tomography (PET), neuroscientists have learned a great deal about the workings of the brain, including how different parts of the brain are responsible for different tasks. One of the more significant discoveries—and one that has direct application to delinquency—relates to the functions and operations of the prefrontal cortex.[65]

The human brain consists of two main areas: the subcortex and the cerebral cortex. The subcortex is located beneath the cerebral cortex and contains the brain stem, the midbrain, and the forebrain. It performs many duties, but is primarily responsible for many of the lower-order functions of humans, such as the regulation of breathing and the activation of reflexes.

Most research examining the neurological basis of antisocial behaviors has focused on the cerebral cortex.[66] The human brain has two hemispheres (i.e., the left hemisphere and the right hemisphere), and the cerebral cortex is found on the outer edges of both. Each hemisphere can be artificially divided into four lobes: the frontal lobe, the temporal lobe, the parietal lobe, and the occipital lobe. Although each lobe performs specialized functions for the human brain, the lobes most likely to be related to antisocial behaviors and traits are the two frontal lobes (one corresponding to each hemisphere).

The coordinated activities of the frontal lobes are referred to as *executive functions*; this cluster of higher-order cognitive processes, involving initiation, planning, cognitive flexibility, abstraction, and decision making, collectively allows the execution of contextually appropriate behavior.[67] Terrie Moffitt describes the day-to-day operations of the frontal lobes in this way:

> [T]he normal functions of the frontal lobes of the brain include sustaining attention and concentration, abstract reasoning and concept formation, goal formulation, anticipation and planning, programming and initiation of purposive sequences of motor behavior, effective self-monitoring of behavior and self-awareness, and inhibi-

tion of unsuccessful, inappropriate, or impulsive behaviors, with adaptive shifting to alternative behaviors. These functions are commonly referred to as "executive functions," and they hold consequent implications for social judgment, self-control, responsiveness to punishment, and ethical behavior.[68]

Executive functioning has clear implications for involvement in delinquency because it deals with regulating impulsive tendencies, controlling emotions, sustaining attention, appreciating behavioral consequences, and inhibiting inappropriate conduct (**Figure 3–4**). Research has clearly linked frontal lobe damage and impairments in executive functioning to delinquency, especially among the most severe types of offenders, such as life-course persistent offenders[69] and psychopaths.[70]

In addition to injuries like those sustained by Phineas Gage, brain damage that results from many other causes may affect human behavior. For instance, researchers have shown that genetic risks relating to one polymorphism, known as monoamine oxidase A (MAOA), predispose persons to impulsive behavior and affect the frontal lobes.[71]

Kathleen Heide and Eldra Solomon have documented how prolonged abuse and neglect of children can lead to biological changes in the ways their brains process and respond to social stimuli. These environmentally induced changes in brain chemistry place individuals at greater risk for delinquency, especially the most serious forms of violence.[72] Heide and Solomon's work points to the essence of biologically based theories of delinquency—namely, the interconnections between genes, biological functioning, and the social environment. The interplay between nature and nurture is complex and reciprocal, and the following sections highlight how these forces combine to produce delinquency.

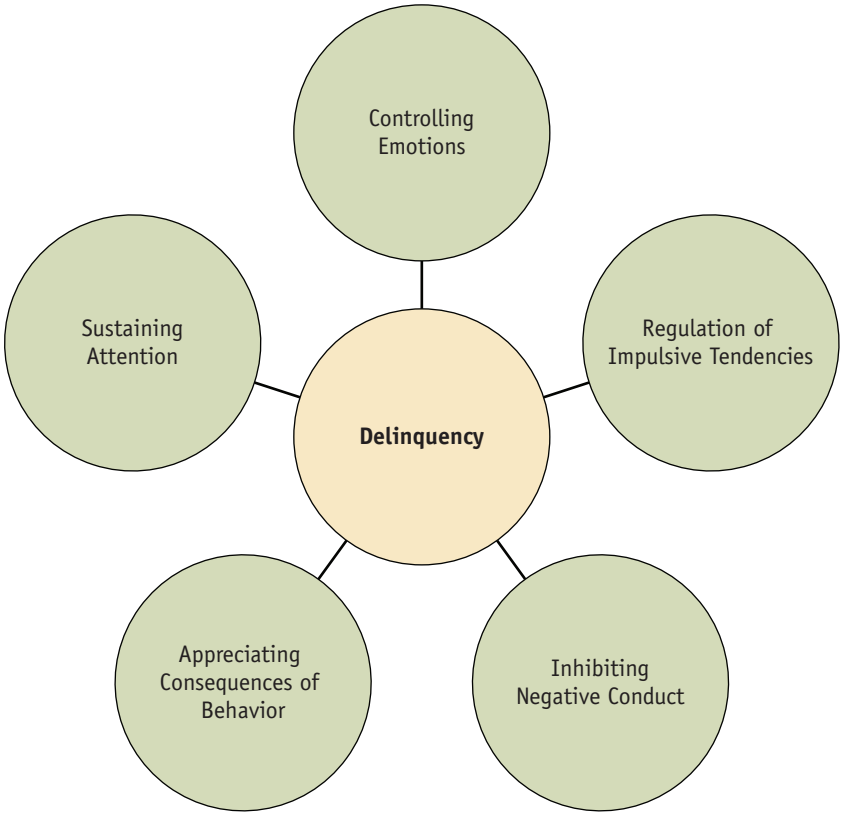
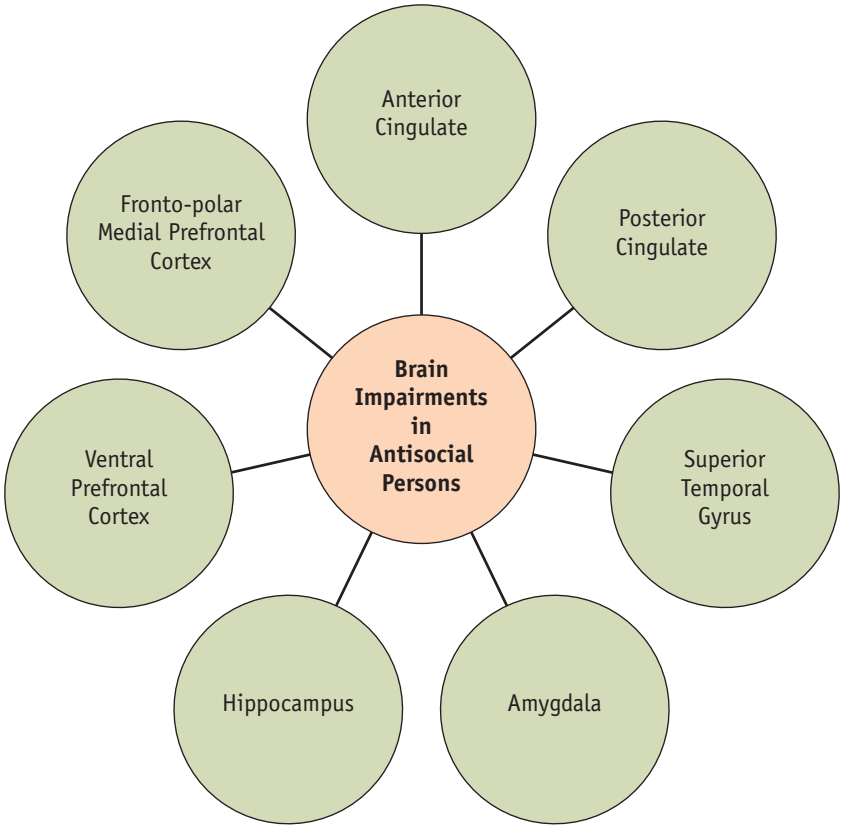


FIGURE 3–4 The Executive Functions in the Frontal Lobes of the Brain

A WINDOW ON DELINQUENCY

The Criminology of the Brain

This diagram is a partial listing of the areas of the brain that show impairments in antisocial people in their ability to use moral decision making. Increasingly, brain functioning is seen as a major reason why delinquency peaks during adolescence—the young brain is simply not as mature as it is in adults. In fact, in 2005, the U.S. Supreme Court utilized information about adolescent brain development to inform their decision to prohibit capital punishment for juveniles in the landmark case *Roper v. Simmons* (see Chapter 13).



Source: Adapted from Adrian Raine and Yaling Yang, "Neural Foundations to Moral Reasoning and Antisocial Behavior," *Social Cognitive and Affective Neuroscience* 1:203–213 (2006).

The brain of the unborn child develops rapidly. Fifty-thousand neurons per second are generated during the gestation of a fetus; 200 billion nerve cells throughout the body begin firing signals to an infant's brain with its first breath; three billion learning connections per second are made in a child's brain.

How Does Biology Work? The Nature–Nurture Interplay

Early biological theories of crime pointed to features on the human body as evidence of criminality. Today, it is understood that biology affects behavior both through its heritability (for instance, through characteristics people inherit from their biological parents) and through its direct effects on human behavior (such as brain functioning). This section highlights how biological factors translate into social behavior, including delinquency.

An individual's genetic composition, or **genotype**, is largely responsible for shaping, structuring, and selecting those environments that allow for optimal gene expression.[73] The ways that genes connect with environmental conditions is referred to as a gene × environment correlation. Gene × environment correlations (rGE) are important explanations for why researchers often find a correlation between an individual's personality or temperament and the environment in which the person finds himself or herself.

Most personalities and temperaments are partially heritable. People with certain personality traits, such as a penchant for thrill seeking, are apt to find themselves in dangerous or risky situations, such as bungee-jumping or skydiving classes. In contrast, an individual with a cautious or docile disposition would probably pass up the opportunity to jump out of an airplane in favor of a less hazardous and more mundane activity. In this case, the genes responsible for the creation of personality characteristics are also the genes responsible for the creation of the environment. Three main types of rGEs are distinguished—passive, evocative, and active—each of which accounts for a unique process by which genetic factors influence or otherwise mold the environment.[74]

Passive rGEs build on the fact that parents pass along two different elements to their children: genes and an environment. Because children receive half of their genes from each parent and are born into environments that are largely created from, or reflect, their parents' genetic makeup, it is not surprising that children's genetic propensities are correlated with the environment into which they are born. This type of rGE is referred to as a passive rGE because the child does not have an active voice in choosing his or her genotype or familial environment; instead, these elements are passively passed on from parent to offspring.

Evocative rGEs, the second type of rGEs, reflect the fact that people elicit certain responses from the environment based, in part, on their genes. A person with one genotype may evoke one type of response from the environment, whereas another person, owing to his or her own unique genotype, may evoke a completely different response. For example, family researchers have long recognized that parents treat their children very differently depending on how their children behave. A difficult and taxing child will likely be reprimanded, punished, and disciplined regularly by their parents. A sibling who has an easygoing personality and who is relatively obedient, in contrast, will be much more enjoyable for their parents to raise, so punishment will be less frequent. In this case, children, depending on their unique genotypes, evoke differential responses from their parents.[75] These different familial environments are correlated with the child's genetically influenced temperaments. Evocative rGEs can be best summarized by stating that certain genetic polymorphisms elicit particular responses from the environment, and these responses are correlated with the person's genotype.

Active rGEs have the most relevance for criminologists because they help explain why some adolescents associate with delinquent peers.[76] Youths actively seek out and select environments or niches that are compatible with their personalities and other

DELINQUENCY CONTROVERSY

Do Parents Matter?

Judith Rich Harris answers the question, "Do parents have any important long-term effects on the development of their child's personality?" with a resounding "No!" According to Harris, the peer relationships that children form with other children are primarily responsible for inculcating culture and modifying innate personality features. It is within these friendship groups that the psychological traits that a child is born with become permanently modified by the environment.

According to Harris, two processes—not our parents—make us who we are: assimilation and differentiation. *Assimilation* transmits cultural norms, smoothes off rough edges of the personality, and makes children more like their peers. In contrast, *differentiation* exaggerates individual differences and increases variability. Whether assimilation or differentiation occurs at a given point depends on the context of the interaction (e.g., participating in a sporting event, sitting in the classroom, playing at recess). In behavioral genetic parlance, this means that the effects of the nonshared environment are significantly more powerful than the effects of the shared environment.

Harris's work has had great public impact and is highly controversial mainly because *it contradicts the notion that parents are most responsible for people's personalities and behaviors because of the ways that they socialize their children*. Instead, according to Harris, parents are important simply because they pass on their genetic information to their children. Otherwise, personality and behaviors are molded by peer relationships occurring outside the home.

Behavioral genetics research shows that genes and environmental influences are crucial to our development, but not all environmental influences have equal weight. Approximately 40 to 50 percent of the variance in delinquency is attributable to nonshared environment factors, whereas 0 to 10 percent is the result of shared (family) environment. According to Robert Plomin and Denise Daniels, "behavioral genetic studies consistently point to nonshared environment as the most important source of environmental variance for personality, psychology, and IQ after childhood. . . . children in the same family experience practically no shared environmental influence that makes them similar for behavior traits."

Sources: Judith Rich Harris, "Where Is the Child's Environment? A Group Socialization Theory of Development," *Psychological Review* 102:458–489 (1995); Judith Rich Harris, *The Nurture Assumption: Why Children Turn Out the Way They Do* (New York: Free Press, 1998); Judith Rich Harris, *No Two Alike: Human Nature and Human Individuality* (New York: W. W. Norton, 2007); David Rowe, *The Limits of Family Influence: Genes, Experience, and Behavior* (New York: Guilford Press, 1994); Robert Plomin and Denise Daniels, "Why Are Children in the Same Family So Different from One Another?" *Behavioral and Brain Sciences* 10:1–60 (1987).

genetic predispositions. For some adolescents, especially those with a genetic proclivity to engage in mischief, antisocial friendship groups may be alluring and seductive. Other youths—particularly those who are not genetically predisposed to become involved in delinquency—may veer away from deviant peers and select more prosocial youths to befriend.[77] According to the logic of active rGEs, the individual person plays an important role in identifying and selecting environments that reinforce his or her genetic makeup.[78]

Intelligence

The relationship between intelligence and delinquency has had a long and colorful history. In 1575, the Spanish physician Juan Huarte formally defined **intelligence** as the ability to learn, exercise judgment, and be imaginative. Since the sixteenth century, scientists have designed different ways to measure intelligence. In 1905, Alfred Binet and Theophile Simon developed the first standardized IQ test. In 1912, the German psychologist William Stern introduced the idea of an "intelligence quotient" (IQ), contending that every person has a mental age that can be represented by an **IQ score**,

defined as the ratio of the person's mental age multiplied by 100 and divided by the person's chronological age. The "average" ability for any age is 100, which is the point at which mental age and chronological age are equal.

Most of the early researchers who studied intelligence said very little about the heritability of intelligence. The idea that intelligence might be inherited was popularized in 1916 by Stanford University professor Lewis Terman, who revised the Binet-Simon test and renamed it the Stanford-Binet Intelligence Test; the revised test remains widely used today. Criminologists at the beginning of the twentieth century who were trained in medicine or in psychology made some inflated and inflammatory claims about the relationship between intelligence and crime. Specifically, they suggested that people of low intelligence were easily led into law-breaking activities by more clever people and did not realize that committing an offense in a certain way often led to getting caught and being punished.

One psychologist, Henry Goddard, who coined the term "moron," administered intelligence tests to prison and jail inmates and reported that 70 percent were "feeble-minded." This very high percentage of low-intelligence inmates led the public, social reformers, and state legislators to conclude that low intelligence predisposed people to commit crime. Goddard's conclusion stood unchallenged for more than a decade.[79] In 1926, however, in a study comparing more than 1500 delinquent males with a group of male nondelinquents, John Slawson found no relationship between IQ and criminality.[80] Later replications and extensions of Slawson's pioneering work seemed to confirm his findings. In 1928, Barbara Burks who studied the intelligence of children of mentally deficient parents reported that when the children were placed in foster homes with a nurturing environment, their IQ scores reached normal levels.[81] In 1931, Edwin Sutherland evaluated IQ studies of delinquents and believed that he refuted the idea that any significant relationship might exist between IQ and delinquency.[82]

Intelligence and Delinquency

The early research on the relationship between IQ and delinquency relied on relatively simple methodologies and statistical techniques. In contrast, contemporary research, which is more methodologically sophisticated, consistently reports a connection between IQ and delinquency. In a landmark study, Travis Hirschi and Michael Hindelang found that *IQ is a better predictor of involvement in delinquency than either race or social class* and that the IQ of the average delinquent is about eight points lower than the IQ of the average nondelinquent.[83] Other researchers have confirmed these conclusions. For example, Donald Lynam and his colleagues reported that IQ predicted delinquency even when controlling for important correlates of delinquency, such as social class, race, and academic motivation.[84] Leslie Leve and Patricia Chamberlain reported that girls with low intelligence were significantly more likely to have an early onset of antisocial behavior, which often sets the stage for a sustained delinquent career.[85]

Intelligence also has been linked to the most serious forms of criminal behavior. For instance, Jean-Pierre Guay and his colleagues evaluated the intelligence–crime link among 261 sex offenders and 150 nonsexual violent offenders in Canada. They found that sex offenders have significantly impaired cognitive abilities compared to other criminals in areas such as vocabulary, comprehension, arithmetic, mental math computations, object assembly, letter–number sequencing, and perception.[86]

Exactly how intelligence affects delinquency remains a mystery. There are at least five possibilities.

First, intelligence might have no effect. Perhaps both intelligence and delinquency are affected by some third variable (a spurious relationship), such as social class. This hypothesis is commonly held, but it has no empirical support. Within the same social class, students with lower IQs have been reported as having higher rates of delinquency.

Second, Adrian Raine and his colleagues found that criminal offenders are more likely to suffer from brain dysfunction as a result of birth complications, environmental toxins, and head injuries, which lead to problem behaviors and having a low IQ. According to this theory, early brain damage causes cognitive deficiencies that produce an array of endless problems for children, such as school failure and low self-esteem, which in turn lead to delinquency. [87]

Third, the relationship between intelligence and delinquency may be confounded by moral reasoning and *cognitive empathy* (defined as the ability to understand and share in another person's emotional state or context). Darrick Jolliffe and David Farrington analyzed 35 studies of cognitive empathy, intelligence, and delinquency. They found that persons who have weak cognitive empathy are more likely than others to be criminal offenders, an effect that was particularly pronounced among violent offenders. Interestingly, the linkages between cognitive empathy and crime disappeared once intelligence was considered. From this perspective, both delinquency and ability to empathize with others are controlled by intelligence.[88]

Fourth, some criminologists contend that intelligence influences delinquency *indirectly*—that is, the effect is transmitted through school-experience variables. One purpose of IQ tests is to predict how well a person will do in school. Although they are not perfect, IQ tests do have a reasonably good prediction record in this regard: Students who perform well on IQ tests tend to get good grades. School performance (grades) affects various aspects of a student's life, but especially the student's attitude toward school. Students who receive good grades find school more enjoyable than students who receive poor grades, and they seem to be more accepting of a school's authority. Students who tolerate the school's authority are not as likely to break the rules and are less likely to become delinquent. Looking at the issue from this perspective, we can say that low IQ leads to lower grades in school, lower grades lead to disliking school, disliking school leads to rejecting its authority, and this rejection of authority leads some students into delinquency.[89] Jean McGloin and her colleagues found that intelligence did not directly predict delinquency, but did predict poor school performance, association with deviant peers, and low self-control. In turn, all of these variables were directly related to delinquency.[90] Similarly, Chris Gibson and his colleagues have reported that the independent effect of low intelligence *interacts* with family adversity to explain delinquency.[91]

Fifth, Thomas Bouchard and his colleagues suggest that the abilities measured by IQ tests are partly genetic. For example, verbal abilities may be as inheritable as nonverbal abilities. Their theory is based on data from the Minnesota Twin Study, a 10-year longitudinal study of identical twins (also known as monozygotic [MZ] twins) and fraternal twins (also known as dizygotic [DZ] twins) twins who were reared apart. This study found evidence of a strong genetic component in many psychological traits, including IQ. With respect to intelligence, the researchers concluded that 70 percent of the influence on IQ scores is genetic and 30 percent comes from the environment. According to Bouchard and his colleagues, "Although parents may be able to affect their children's rate of cognitive skill acquisition, they may have relatively little influence on the ultimate level attained."[92]

Hormones and Puberty

It is easy to recognize the effects of "raging hormones" and puberty on behavior during adolescence. For many parents, the years when their children are teenagers are the most challenging. Over the years, many criminologists have explored the effects of hormones and puberty on delinquency. In particular, they have focused on the potential effects of testosterone, which is a hormone largely responsible for the maintenance of secondary sex characteristics in males.[93] Testosterone is also a correlate of aggression.

For instance, James Dabbs and Robin Morris assessed the relationship between testosterone, social class, and antisocial behavior using a sample of 4462 American military veterans. The majority of the sample, 4000 veterans, had normal testosterone levels. By comparison, 446 veterans had high testosterone levels. The latter group was characterized by significantly higher levels of childhood and adult delinquency; narcotic, marijuana, and alcohol use; sexual promiscuity; and military AWOL (absent without leave) behavior. Further, socioeconomic status (SES) moderated the independent effects of testosterone, as risk ratios were twice as high in the low-SES group compared to the high-SES group.[94] Alan Booth and Wayne Osgood similarly found a significant relationship between testosterone and deviance, and noted that this relationship was mediated by the influence of testosterone on social integration and prior delinquency.[95] Both the Dabbs/Morris and Booth/Osgood studies demonstrate that hormonal factors interact with social and environmental conditions to produce various behavioral effects.

Hormonal effects on delinquency also have been found among correctional samples and among persons who demonstrate more extreme forms of antisocial conduct. James Dabbs and his colleagues reported a relationship between testosterone level and criminal violence among a sample of 89 male prisoners. Among the 11 offenders with the lowest testosterone levels, 9 had committed nonviolent offenses. Among the 11 offenders with the highest testosterone levels, 9 had committed violent crimes.[96]

It also has been reported that inmates who have been convicted of murder, rape, and child molestation have significantly higher testosterone levels than offenders convicted of other felonies. Moreover, testosterone level significantly predicts inmate infractions: Inmates with high hormonal levels tend to commit the most serious types of misconduct, such as assaulting inmates and committing other acts of overt confrontation.[97] Higher testosterone levels also have been reported among homicide offenders who were convicted of premeditated, more "ruthless" types of murder.[98]

The relationship between puberty and delinquency is multifaceted and important for both teenage boys and girls. For example, Richard Felson and Dana Haynie have found that adolescent boys who are more physically developed than their peers are more likely to engage in violent and property crimes, drug use, and sexual activity. Interestingly, these effects of puberty on delinquency were direct and not explained by other individual factors. In fact, Felson and Haynie concluded that the effects of puberty on delinquency are stronger than the effects of social class, race, and family structure.[99]

Among adolescent girls, early pubertal development leads to more strained relationships with parents and "party"-related deviance, such as excessive drinking and drug use.[100] Dana Haynie and Alex Piquero have reported that adolescents who go through puberty early are also more likely to be the victims of crime—an effect that is notably stronger among physically developed girls who are dating.[101] When Kevin Beaver and John Wright assessed how puberty related to adolescent development and delinquency among a national sample of 6504 youths, they found that among both boys and girls, early puberty contributed to greater association with delinquent peers and, in turn, to greater delinquency. These effects of puberty on delinquency were more pronounced among males than females, however. During puberty, the early-developing boys tended to have poorer impulse control, have more negative interaction styles with parents and peers, and associate more frequently with other delinquent boys.[102]

Family, Twin, and Adoption Studies

Criminologists have commonly utilized family studies to examine the heritability of antisocial behavior. In family studies, index subjects, known as *probands*, who present the trait or behavior under investigation, such as criminality, are compared to a control group of persons who do not present the trait or behavior. From these study groups, the prevalence of the trait is examined among first-degree relatives (children, siblings,

or parents) of the proband and control subjects. Genetic effects are inferred or estimated when the trait or behavior is more prevalent among relatives of the probands than among relatives of the control group.

Sheldon Glueck and Eleanor Glueck used family study designs to examine the heritability of crime among their classic samples of delinquent youth. In their sample of male delinquents, the Gluecks found that the prevalence of family member arrest was nearly 200 percent greater among probands than among controls.[103] For females, the prevalence of family member arrest was about 160 percent higher among probands than among controls. In short, the Gluecks provided speculative, but empirically compelling evidence that crime "runs in the family."[104]

MZ twins have similar levels of criminality. Why do criminologists trained as sociologists often ignore or dismiss this fact?

Robert Cloninger and Samuel Guze produced even stronger evidence for the heritability of crime in their studies of the transmission of sociopathy among families. In a study of 519 first-degree relatives of sociopathic males, the prevalence of sociopathy among proband subjects was more than 330 percent higher than among controls.[105] The researchers found even stronger effects among female index subjects using arrests and sociopathy diagnosis as outcomes: The prevalence of arrest and sociopathy diagnoses were nearly 700 percent greater among probands than among control subjects.[106] Their work provides compelling evidence that the most serious forms of delinquency are largely inherited.[107]

David Rowe and David Farrington examined the familial transmission of criminal convictions using data from 344 families with two or more children selected from a British sample. These researchers assessed whether the effect of parent convictions on children convictions was direct or was mediated through the quality of the family environment, as evidenced parental supervision, child rearing, and family size. Rowe and Farrington found a direct effect without mediation from family environment and concluded that "unmeasured genetic or environment influences may determine convictions to a greater degree than measured aspects of the family environment."[108] It also has been reported that paternal criminality is the strongest familial predictor of delinquency in children.[109] To illustrate this point, children of murderers are a staggering *2400 percent* more likely to commit violent crimes than children whose parents were not murderers.[110]

Another way to evaluate the impact of heredity on behavior is to study twins. **Monozygotic twins (MZ)**, also known as identical twins, have identical DNA and come from one fertilized egg; **dizygotic twins (DZ)**, also known as fraternal twins, come from two separate eggs fertilized at the same time. Fraternal twins are no more alike genetically than non-twin siblings. If a genetic factor truly plays a role in determining delinquency, MZ twins should be more alike than DZ twins. This similarity, which is called *concordance*, occurs when both twins share a characteristic. For example, if one twin is delinquent and the other twin is also delinquent, there exists concordance with respect to delinquency. Conversely, if one twin is delinquent and the other is not, the discrepancy is called *discordance*.

In 1929, Johannes Lange published the first study of twins and criminality. He examined 37 twin pairs including 13 MZ twins, 17 DZ twins, and 7 pairs who could not be classified. In each pair, at least one twin had been in prison. In 10 of the 13 MZ pairs, the other twin had also been in prison, while in only 2 of the 17 DZ pairs had both twins served prison sentences.[111]

Karl Christiansen completed the earliest comprehensive twin study in Denmark. He identified 3586 twin pairs born between 1870 and 1920 who were listed in the Danish Twin Register. Christiansen then reviewed police records and court documents for each

twin set. A total of 926 twins belonging to 799 of the pairs had committed at least one criminal offense. When Christiansen computed the criminal concordance rates for the sample, he found much greater concordance among crime and criminal careers for MZ twins than for DZ twins.[112]

David Rowe and Wayne Osgood examined the genetic and environmental causes of antisocial behavior using a sample of 168 MZ twin pairs and 97 same-sex DZ twin pairs. They explored the frequency with which the youth committed assorted interpersonal (violent), property, and nuisance offenses during the prior year. These researchers found that more than 60 percent of the variation in antisocial acts and delinquent peer associations was accounted for by genetic factors. Among male twins, genes explained 61 percent of the variation and environmental factors explained 39 percent of the variation. Among female twins, genes accounted for 64 percent of the variation, with environmental factors explaining the remaining 36 percent.[113]

In a subsequent study, Rowe examined environmental and hereditary components of antisocial behavior. In his investigation, common-family environment—which includes social class, child-rearing styles, parental attitudes, parental religion, and other factors—*did not* influence antisocial behavior, but heredity did. The primary genetic antecedents of antisocial behavior were deceitfulness and temperamental traits, such as lack of empathy, anger, and impulsivity.[114]

It also has been reported that the concordance rates for self-reported delinquency are much higher among MZ twins than among DZ twins. Likewise, MZ twins have been found to have more delinquent friends than DZ twins do. Thus genes may predispose some children to select friends who are delinquent.[115]

Another way to evaluate the relationship between heredity and behavior is by studying adoptees. Adopted children usually have little or no contact with their biological parents. Therefore, to the extent that their behavior resembles the behavior of their biological parents, an argument can be made that genes influence behavior. Barry Hutchings and Sarnoff Mednick compared the criminal records of 662 adopted sons with the criminal records of their biological and adoptive fathers. When both the biological and adoptive fathers had a criminal record, 36 percent of the sons were criminal; when only the biological father had a criminal record, 22 percent of the sons were criminal; when only the adoptive father was criminal, 12 percent of the sons were criminal; and when neither of the fathers were criminal, only 10 percent of the sons had a record.[116]

In another study, Mednick and his associates matched the court convictions of 14,427 male and female adoptees with the court convictions of their biological mothers and fathers and their adoptive mothers and fathers. They found that the criminality of the child was more closely related to the criminality of the biological parents.

Follow-up research has produced similar findings.[117] For example, a Swedish study of nearly 900 male adoptees, it was reported that the criminal histories of children were more similar to those of their biological parents than to those of their adoptive parents.[118] In follow-up research, Raymond Crowe analyzed arrest records of 52 adoptees who had been separated from their incarcerated biological mothers. When he compared them to a group of adoptees whose biological mothers had no criminal record, he discovered that the adoptees of the "criminal mothers" were approximately 500 percent more likely than the adoptees of "noncriminal mothers" to have an arrest record.[119] In addition, adoptees with "criminal mothers" were more likely than adoptees with "noncriminal mothers" to be diagnosed with antisocial personalities.[120]

The most direct way to measure the effects of genetic factors on delinquency is to use *actual measured genes*—a feat made possible by the mapping of the human genome, which was completed in 2003. In recent years, behavioral scientists have explored the effects of genes on delinquent behavior using data from the National Longitudinal Study of Adolescent Health (Add Health), a data set in which a subsample of study par-

ticipants were genotyped for five monoamine genes: 5HTT, DAT1, DRD2, DRD4, and MAOA. These genes are known to regulate the amounts of dopamine and serotonin in the brain; both dopamine and serotonin have important effects on mood, personality, and behavior. Thus far, variants of these genes (polymorphisms) have been linked to an array of outcomes. For instance:

- A recent study investigated the linkages between self-reported serious and violent delinquency and two dopamine genes (DRD2 and DAT1). Both polymorphisms were associated with greater involvement in serious and violent crime among both adolescents and adults.[121]
- In a related study, polymorphisms in three genes (MAOA, DAT1, and DRD2) were associated with serious and violent delinquency among young males.[122]
- Guang Guo and his colleagues found that all five genes included in the Add Health project predicted frequency of alcohol use and accounted for 7 to 20 percent of the variance in alcohol consumption.[123]
- Kevin Beaver and his colleagues found that DRD2 was associated with increased delinquency victimization, even when the researchers controlled for a variety of other correlates of victimization, including demographics, neighborhood disadvantage, maternal attachment, maternal involvement, maternal disengagement, and parental permissiveness.[124]
- In a related study, Beaver and his colleagues found that the genes included in the Add Health data are associated with desistance from delinquency and that some genes interact with marital status to predict desistance from delinquency.[125]
- Evidence suggests that males who have a certain variant of the dopamine transporter gene DAT1 are more likely to associate with delinquent peers, but only when they also live in a high-risk family environment.[126]

A variety of other genes have been found to be associated with delinquency and other forms of maladaptive behaviors.

How Does Environment Work? The Nurture–Nature Interplay

Behavior is under the control of the brain. The brain is constructed of complex neural circuits that begin to form shortly after conception and grow and change throughout life as genes and cells *interact* with the environment. For instance, researchers have found that those teens who play violent video games and then perform simple tasks use different parts of their brain than children who play other, nonviolent video games. Apparently, playing violent video games makes children's brains fire differently, especially affecting their ability to concentrate and modulate emotion. This effect, in which video games influence brain physiology, could potentially make a child more aggressive.[127]

Although the brain directs people's activities in everyday life, the activities themselves shape how the brain processes information throughout life. The environment, in other words, contributes to both the brain's contents and its wiring. However, the brain of an unborn child is not a miniature of an adult's brain. Rather, it is a dynamically changing structure that is adversely affected by outside contaminants in social environments. This section reviews some of the environmental conditions that are known to cause serious biological damage to developing children, create risk factors for delinquency, and preclude healthy human development.[128]

Maternal Cigarette Smoking

The public health costs of cigarette smoking are great. More than 126 million nonsmoking Americans are exposed to secondhand smoke. More than 22 million children between the ages 3 and 11 also are exposed to secondhand smoke.[129] Each year, secondhand smoke kills 49,000 adult nonsmokers via heart disease and lung cancer.

A WINDOW ON DELINQUENCY

Genetic Underpinnings of Delinquent Conduct

There are approximately 25,000 to 30,000 genes in the human genome. Today scientists are seeking to identify genes that code for proteins that perform specific functions, with the resulting outcomes being known as phenotypes. A gene is simply a segment of DNA that codes for the amino acid sequences of a protein. The resulting protein products may take the form of enzymes, hormones, or cell-structured proteins and facilitate the ways that we experience the environment and behave. Genes that are hypothesized to be associated with antisocial behavior are known as candidate genes; in other words, because of their function, they are believed to be associated with traits or behaviors that are related to delinquency.

Two of the most important sources of candidate genes for delinquency are the serotonergic system and the dopaminergic system. Serotonin and dopamine are neurotransmitters. Serotonin is an inhibitory neurotransmitter, which means that it functions to regulate emotions and behaviors that inhibit aggression. The more serotonin in the brain, the more inhibited and controlled the behavior. Conversely, people with deficient serotonin functioning show greater aggression and impulsivity—two important drivers of delinquent behavior. Dopamine is an excitatory neurotransmitter that is involved in behavioral activation, motivated behavior, and reward processing. A higher level of dopamine in the brain results in more excitable, impulsive, and aggressive behavior.

Numerous genes within these systems have been linked to antisocial behavior. For example, the dopamine genes DRD1, DRD2, DRD3, DRD4, DRD5, and DAT1 have been associated with delinquency, impulsivity, aggression, and ADHD diagnosis. Candidate genes in the serotonergic system, including 5HTT, HTR1A, HTR1B, HTR1DA, HTR2A, TDO2, and TRH, also have been linked to these phenotypes. Most molecular genetics research has found that complex phenotypes such as delinquency are partially caused by many genes. A phenomenon that has its roots in the actions of many genes is known as a *polygenic* effect. Another important finding is that individual genes are often associated with multiple, but similar behavioral outcomes. For example, many of the genes discussed here and in the rest of this chapter are associated not only with delinquency, but also with aggression, impulsivity, depression, alcoholism, substance abuse, and other maladaptive behaviors. In such a *pleiotropic effect*, a single gene influences multiple behavioral outcomes.

Although research into the molecular bases of delinquency is still new and much remains to be learned, more study has been conducted, and greater advances made, in other behavioral disorders. For example, at least four candidate genes for ADHD have been located: ADHD1 at 16p13, ADHD2 at 17p11, ADHD3 at 6q12, and ADHD4 at 5p13. In these examples, the combination of numbers and letters gives the address (cytogenic location) of the gene. The number indicates the chromosome on which the gene is located. The letter is the arm of the chromosome, with "p" used to indicate the short arm and "q" used to indicate the long arm of the chromosome. The final number is the region or band on the arm of the chromosome where the gene is located.

In the next few years, much more will become known about the genetic underpinnings of delinquency. Perhaps in time medications and other treatments will be created to address those genetic risks that contribute to antisocial conduct.

Sources: Dongju Seo, Christopher Patrick, and Patrick Kennealy, "Role of Serotonin and Dopamine System Interactions in the Neurobiology of Impulsive Aggression and Its Comorbidity with Other Clinical Disorders," *Aggression and Violent Behavior* 13:383–395 (2008); Matt DeLisi, "Neuroscience and the Holy Grail: Genetics and Career Criminality," pages 209–224 in Anthony Walsh and Kevin Beaver (eds.), *Contemporary Biosocial Criminology: New Directions in Theory and Research* (New York: Routledge, 2009); Matthew Ogdie, Simon Fisher, May Yang, Janeen Ishii, Clyde Francks, Sandra Loo, Rita Cantor, James McCracken, James McGough, Susan Smalley, and Stanley Nelson, "ADHD: Fine Mapping Supports Linkage to 5p13, 6q12, 16p13, and 17p11," *American Journal of Human Genetics* 75:661–668 (2004); David Comings, Radhika Gade-Andavolu, Nancy Gonzalez, Shijuan Wu, Donn Muhleman, Hezekiah Blake, George Dietz, Gerard Saucier, and James MacMurray, "Comparison of the Role of Dopamine, Serotonin, and Noradrenaline Genes in ADHD, ODD, and Conduct Disorder: Multivariate Regression Analysis of 20 Genes," *Clinical Genetics* 57:31–40 (2000).

Nearly 500 newborns die from sudden infant death syndrome induced by secondhand smoke. Also each year, children experience nearly 1 million ear infections and 200,000 episodes of asthma related to smoking.[130]

In addition to secondhand smoke, nonsmokers can be exposed to *thirdhand smoke*, which is composed of the particles and gases given off by cigarettes that cling to walls, clothes, furniture, skin, and hair. Thirdhand smoke can linger for months depending on the ventilation and level of contamination.

Because crawling babies explore the world by touching and putting everything in their mouth, the environmental effects of cigarette smoke and its by-products can be extensive.[131] At a basic level, mothers who smoke while pregnant and parents who smoke around their children may be reflecting a tendency to place their personal desires ahead of a concern for the potential long-term detrimental consequences for their children.

Many criminologists have explored maternal smoking as a risk factor for delinquency and other problem behaviors. For example, Nancy Day and her colleagues have studied the effects of prenatal nicotine exposure on preschoolers' behavior. They report that children whose mothers smoked while pregnant were significantly more likely to have the following characteristics:

- Emotionally unstable
- Physically aggressive
- Socially immature
- Affected by an oppositional defiant disorder

Tobacco exposure was the strongest predictor of oppositional and defiant behavior among children at age 3. At age 10, these children had severe deficits in learning and memory.[132]

Another important consequence of prenatal tobacco exposure is extremely premature birth, defined as children born at less than 26 weeks of gestation. Children who are born very prematurely are at risk for a variety of developmental and behavioral problems:

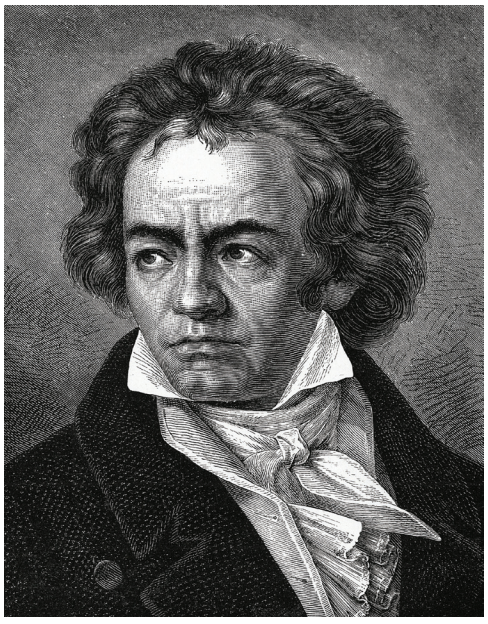
- Hyperactivity
- Conduct problems
- Cognitive problems
- Attention problems
- Problems bonding with parents

Recent research has shown that, based on parent and teacher ratings, children who were born extremely prematurely are more than four times likely to have emotional problems at age 6 independent of other important predictors of child development.[133]

Patricia Brennan and her colleagues have studied the long-term effects of maternal smoking during pregnancy among a birth cohort of males from Denmark. Controlling for a host of predictors of crime, they found that children whose mothers smoked while pregnant with them were significantly more likely to engage in persistent criminal behavior into adulthood. In fact, smoking contributed to violent and property offending even when the males had reached age 34.[134] Maternal smoking during pregnancy also caused psychiatric problems among the males well into adulthood.[135]

Chris Gibson and Stephen Tibbetts similarly found that prenatal and perinatal exposure to maternal smoking contributes to an early onset of delinquency and police contacts.[136] Recent reviews of research studies conclude that maternal smoking during pregnancy is a formidable risk factor for delinquency and related problem behaviors.[137] Moreover, this important public health threat is wholly preventable.

Maternal cigarette smoking during pregnancy is one of the most powerful environmental causes of delinquency. Given the tremendous damage that nicotine inflicts on the body, should smoking during pregnancy be a crime? Is it already sufficiently limited by informal social controls?



Composer Ludwig van Beethoven died as the result of lead poisoning in 1827. Today, lead poisoning continues to pose devastating health problems for children and is a major cause of delinquency.

Chemical Poisoning

Few people would blame delinquency on environmental toxins and chemicals. However, an abundance of evidence suggests that chemical pollutants such as mercury, a dangerous neurological toxin, are especially harmful when ingested by children. Much of this mercury is emitted into the air from coal-burning power plants. Mercury pollution from power plants is ultimately deposited into waterways and accumulates as it moves up the food chain, until it ends up on our dinner plates. In recognition of this pathway by which mercury can enter humans, Colorado posted health warnings for nearly 20,000 acres of lakes warning people to limit fish consumption.

Exposure to mercury causes damage to the brain, kidneys, and cardiovascular system. Those most vulnerable to this threat are young children, whose brains are still developing. Pregnant women, new mothers, and women who may become pregnant are especially at risk of passing this risk on to their children. In a recent study by the Centers for Disease Control and Prevention, researchers reported that one in six women of childbearing age has enough mercury in her body to put the health of her children at risk.[138]

While chemicals do not cause children to commit crime, they indirectly affect behavior by interfering with the ability of the brain to perceive and react to the environment. Neurotoxins affect many of the executive functions described earlier in this chapter. Besides mercury, another toxin that adversely affects brain functioning and may cause changes in behavior in children is *lead*. In the 1970s and 1980s, the United States phased out leaded gasoline, which had poisoned more than 65 million children over the more than 50 years it was used. Public health advocates had warned politicians for many years that using lead in gasoline was dangerous. During these decades, lead pollution caused learning disabilities, hearing loss, reduced attention spans, and lower IQs—just as it has for centuries. For instance, composer Ludwig van Beethoven died in 1827 as the result of lead poisoning.[139] Yet, more than 7 million tons of lead was burned in the United States before it was banned. The good news is that now lead is illegal, the percentage of children with elevated levels of lead in their blood has decreased dramatically in the past three decades.[140]

Lead gets into the bodies of children in several different ways. For example, lead in the body of a pregnant woman may be transferred to her unborn child. In addition, children may ingest lead by inhaling dust particles traveling in the air or by eating sweet-tasting lead-based paints peeled or chipped from walls. Lead-based paint was banned in the United States in 1978 but is still found in 24 million housing units.[141] In recent years, several cases of lead poisoning have made national headlines. For instance, an Illinois toddler was tested in 2006 and found to have blood lead levels of 136 micrograms per deciliter (μg/dL), which is an astounding 13 times the maximum safe level. The girl's mother has reported that her child can be very aggressive and attributes this behavior to lead exposure. In 2007 and 2008, it was discovered that several popular children's toys that were manufactured in China contained high levels of lead; in fact, one study found that 35 percent of toys were unsafe.[142]

Once lead enters a child's body, it makes its way into the bloodstream, then into soft body tissues (which includes the brain and kidneys), and finally into hard tissues (bones and teeth).[143] Children are more susceptible to low levels of lead poisoning than adults because their nervous systems are developing rapidly, they are exposed to more lead, and their lead absorption rate is higher. Unfortunately, a high percentage of the lead that children absorb is not eliminated from their bodies for 20 or more years.

Lead damages a child's internal organs, causes brain and nerve damage, and results in intelligence and behavioral problems, particularly in children (**Figure 3–5**). Lead

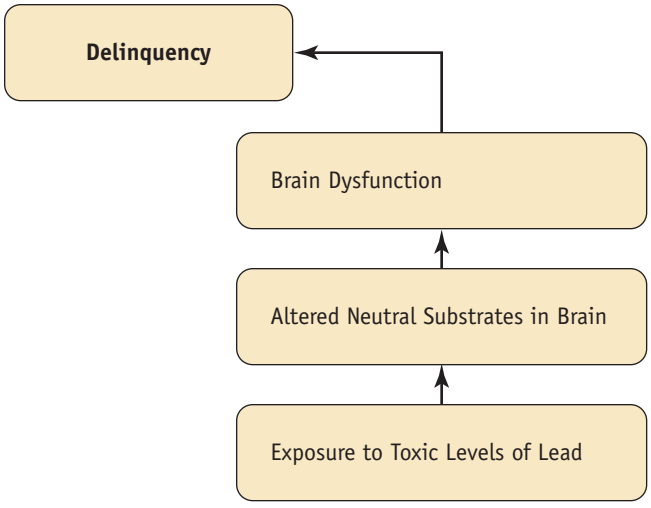


FIGURE 3–5 Mapping Delinquency Theory: Lead Poisoning and Delinquency

poisoning has also been connected to delinquency. For instance, Herbert Needleman and his colleagues published a report that showed levels of lead in bone are much higher in adjudicated delinquents than in nondelinquents. Children with high levels of bone lead were more aggressive, self-reported more delinquency, and exhibited more attention difficulties. Lead poisoning also interfered with school performance[144]

In a related study of 900 boys, Deborah Denno concluded that lead poisoning was a principal predictor of delinquency and chronic criminality in adulthood.[145] Rick Nevin has documented significant relationships between preschoolers' blood lead concentrations and aggression, juvenile delinquency, adult property and violent crime, and even murder. These relationships were found in Australia, Great Britain, Canada, France, Germany, Italy, New Zealand, and the United States.[146] In 2008, scientists produced the first prospective evidence of the long-term effects of prenatal and childhood blood lead concentrations on criminal behavior in adulthood.[147]

Lead and Delinquency

Although the negative effects of lead exposure have been well documented, most studies relied on indirect measures of exposure and did not follow participants into adulthood to assess the long-term effects of excessive lead exposure. In 2008, a landmark study revealed the effects of prenatal lead exposure by taking multiple measures of child lead concentrations among 250 persons recruited at birth between 1979 and 1984. The participants lived in Cincinnati in impoverished neighborhoods characterized by a high concentration of older, lead-contaminated buildings. Those individuals with higher levels of lead in their blood were significantly more likely to be arrested and to be arrested for violent crimes later in life. The study showed the long-term effects of prenatal and childhood lead exposure and subsequent antisocial behavior. These devastating results illustrate the profound ways that biological and environmental factors—nature *and* nurture—interact to produce delinquency.

Source: John Paul Wright, Kim Dietrich, Douglas Ris, Richard Hornung, Stephanie Wessel, Bruce Lanphear, Mona Ho, and Mary Rae, "Association of Prenatal and Childhood Blood Lead Concentrations with Criminal Arrests in Early Adulthood," *PLoS Medicine* 5:732–740 (2008).

Children vary in terms of their exposure to lead and, therefore, in terms of their propensity to develop lead poisoning. The children most susceptible to lead poisoning are poor children. Their environments, including their homes and schools, are much more likely to be heavily contaminated with lead and other toxins than are the environments where wealthier children live. In fact, children living in poverty are eight times more likely than affluent children to have high and dangerous levels of lead in their blood.

The tendency to develop lead poisoning also differs by age. Children between the ages of 2 and 4 years old are most likely to suffer from elevated blood lead levels. By comparison, children younger than 1 year of age are the least likely to have been poisoned by lead.

Nutrition

Are children what they eat? Does the food children ingest affect their behavior? Is a partial remedy for delinquency to change the diets of children? These questions have puzzled criminologists ever since 1942, when Hugh Sinclair suggested that poor diets—particularly diets deficient in vitamin B_3, vitamin B_6, and omega-3 essential fatty acids—were a cause of antisocial behavior and persuaded the British government to supplement the diet of all children with cod liver oil and orange juice.[148] Nearly 70 years later, nutrition is as important as ever as a health factor among children and adolescents.

Today, one in eight U.S. households with infants is *food insecure*, which means that the family has limited or uncertain availability of nutritionally adequate and safe foods. In poor households with infants, 30 percent of households are food insecure. In addition, mothers in food-insecure homes report greater levels of depression and experience less positive interactions with their infant children.[149]

Researchers have repeatedly confirmed the existence of a link between nutrition and behavior. Stephen Schoenthaler and his colleagues, for example, have conducted a variety of studies examining the association between diet and aggressive behavior. One of their experiments involved 80 working-class children who had been formally disciplined for violating school rules during the school year. Half of these children were administered a daily vitamin–mineral supplement for four months, while the others received placebos. Children who took the vitamin–mineral supplement exhibited a 47 percent lower average rate of antisocial behavior than the children receiving the placebos. This finding affirmed other research findings, which have consistently revealed reductions in disciplinary actions in incarcerated children who received a vitamin–mineral supplement. Moreover, the greatest decrease in rule-violating behavior typically occurs among children who previously have been identified as chronic offenders (see Chapter 2).

Schoenthaler and his colleagues also examined the relationship between diet and intelligence in more than 200 elementary school children, half of whom received vitamin–mineral supplements and half of whom received placebos. Again, significant differences between the groups emerged. After only three months, children receiving the vitamin–mineral supplement exhibited an average 16-point higher net gain in IQ scores than the matched placebo sample. Finally, in a series of three randomized controlled experiments in which half of 66 elementary school children, 62 confined teenage delinquents, and 404 confined adult felons received dietary supplements (the other half received placebos), Schoenthaler and colleagues found that for all three groups of subjects, those who received dietary supplements showed less aggressive behavior.[150]

Bernard Gesch and his colleagues have replicated and extend some of Schoenthaler's work in their study of 230 young adult prisoners. Like Schoenthaler's team, the Gesch team administered dietary supplements to half of their sample; the other half of the sample received placebos. The two inmate groups were matched on their number of disciplinary incidents as well as on their IQ scores, verbal ability, and levels of anger, anxiety, or depression. After 142 days, the subjects were compared. The researchers

found that inmates who received the dietary supplements had 26 percent fewer offenses, with the greatest reduction in offenses (37 percent) being noted for serious violent incidents.[151]

Richard Carlton and his colleagues have reported similar findings. In their study of 20 learning-disabled students, the researchers found that dietary supplements dramatically improved the participants' school performance, both academically and behaviorally, within weeks or months of beginning treatment.[152]

Poor nutrition and malnutrition have severe long-term consequences for deprived children. Jianghong Liu and his colleagues found that children who were malnourished at age 3 were more likely than other children to be aggressive and hyperactive at age 8; to exhibit aggressive, externalizing behaviors at age 11; and to exhibit conduct disorder and hyperactivity at age 17.[153]

Of course, no one suggests that nutrition is the sole cause of delinquency. Nevertheless, the evidence from the United States and Great Britain indicates that violent behavior might be reduced significantly with dietary supplementation in schools and correctional institutions. It is becoming clearer that a healthy diet improves brain function, intelligence, and performance in school—and all of these variables have been strongly linked to delinquency.

One of the most visible and destructive signs of social inequality is the concentration of lead in housing projects in the United States.

Biological Theory and Delinquency Prevention

In the past, social policy based on biological theories recommended that offenders receive drug therapy and/or be isolated from the general population. Because offenders cannot control their debilitating condition on their own, public safety concerns mandate that when the cause of the behavior is known, it must be neutralized. Practically speaking, offenders will likely submit to drug therapy to control their impulses, be institutionalized, or both.

Previous attempts to prevent delinquency in accordance with biological theory were benighted, cruel, and unsuccessful. Fortunately, contemporary biological criminology points to the critical importance of both biology and sociology/environment in producing delinquency. Many environmental risk factors, such as maternal smoking, alcohol, and environmental toxins, can be reduced through education, public policy, and enforcement. Early-life home environments are the conditions that facilitate the transition of biological dispositions into antisocial behavior. If the environment is "good," then the biological basis of delinquency is less likely to become manifest.[154]

Prevention (see Chapter 14) is another way to reduce delinquency, particularly among the youngest potential offenders who present biological risk factors for crime. In her review of the promise of prevention as it relates to neurobiological research, Diana Fishbein concluded:

> As a result of the ineffective, unidimensional approaches of the past, we are now defaulting to the mental health and criminal justice systems with troubled individuals. Rather than ignoring the warning signs in childhood and waiting until adulthood to put these systems into motion, spending billions of dollars for legal remedies that do not produce favorable outcomes, the provision of sorely needed services and interventions to high risk individuals can yield far greater benefits.[155]

These students eating lunch at Jones College Prep High School in Chicago are confronted with a bank of vending machines, which typically are filled with junk food. Must the brain be properly nourished to function efficiently? Does poor nutrition lead to aggressive behavior?

In other words, early intervention in the lives of at-risk children can help to promote factors that insulate children from delinquency, minimize or erase the risk factors that contribute to delinquency and overall try to equalize the life chances for all children and adolescents to develop into healthy, prosocial adults (see Chapter 14).

WRAP UP

THINKING ABOUT JUVENILE DELINQUENCY: CONCLUSIONS

Theories answer the questions of why and when something will happen. They are important because *ideas have consequences*. Two broad types of theories were discussed in this chapter: choice and biological theories. Choice theories assume children are rational and intelligent people who make informed decisions to commit crime based on whether they will benefit from doing so. Biological theories blame delinquency on factors over which the individual has very little, if any, control, such as body type, defective brain chemistry, hyperactivity, and low intelligence.

The classical school of criminology encompasses choice theories. Besides theorizing that people are rational, intelligent beings who exercise free will, these theories state that people commit crime because they imagine it to be in their best interests. Classical theorists also think that punishment deters crime and that the best punishment is one that is certain, swift, and severe. The classical school ultimately failed because of its rigidity. In so doing, it gave rise to the neoclassical school, which introduced the ideas of mitigating circumstances and individual justice, and laid the groundwork for the positive school of criminology.

Biological theories go hand-in-hand with the positive school of criminology. The theories discussed in this chapter represent more than 150 years of thinking about crime. Theories that emphasize the biology of the offender blame delinquency on heredity or some other trait located *inside* of children. Biological theories that take environmental factors into account suggest that delinquency may be caused by an interaction of social factors (such as the environment, poverty, or racism) with biology, chemistry, nutrition, and other environmental issues. Chapter 4 focuses on psychological factors to further explore the roots of delinquency.

Chapter Spotlight

- Classical theorists including Cesare Beccaria and Jeremy Bentham developed choice theories, which assumed that delinquency is the outcome of weighing the costs and benefits of antisocial conduct.
- Neoclassical approaches, including routine activities theory and rational choice theory, take an econometric perspective that suggests the causes and prevention of delinquency should follow rational principles.
- Early biological theories of crime were crude and framed delinquents as evolutionary throwbacks. Modern-day biological criminology is more scientifically rigorous and focuses on the brain as the driver of behavior.
- Nature and nurture interact and mutually reinforce each other to produce all forms of behavior, including juvenile delinquency.
- Several genes within the dopaminergic and serotonergic systems are associated with delinquency and other forms of antisocial behavior, including substance use.
- Early-life environmental factors, including exposure to maternal cigarette smoking, lead poisoning, and nutrition, have long-term effects on delinquency.

Critical Thinking

1. Classical theorists such as Bentham suggested that the punishment should fit the crime. Does the U.S. juvenile justice system serve this purpose for serious felonies? Should legal condemnation and punishment match the barbarity of the most severe types of delinquency?
2. Children with ADHD are often difficult to parent and educate because of their consistently disruptive behavior. Should ADHD children be medicated to control their behavior? What are the benefits and costs of medicating children?
3. Chemical toxins, such as leaded paint, are a significant health risk to children. What are the implications for the social development of children who are exposed to such paint? Do you think exposure to leaded paint and delinquency are related?
4. The evidence is clear that maternal cigarette smoking produces antisocial behaviors, including delinquency. Should maternal cigarette smoking be viewed as a crime? Could such a law be enforced? Would it be enforced?
5. Since the mapping of the human genome was completed in 2003, scientists have been better able to identify the ways that nature and nurture interact to produce delinquency. Why might some people be concerned about genetic-based research on the causes of delinquency? Is it a better form of science than delinquency research has traditionally been?

Key Terms

atavistic beings The idea that criminals are a throwback to a more primitive stage of development.

Attention-Deficit/Hyperactivity Disorder (ADHD) The most common neurobehavioral childhood disorder, which is characterized by the following symptoms: inattention and hyperactivity that cause difficulty in school, poor relationships with family and peers, and low self-esteem.

choice theories Theories that frame delinquency as the outcome of rational thought.

classical school A school of thought that blames delinquency on the choices people make.

determinate sentence A prison sentence of a fixed amount of time, such as 5 years.

dizygotic twins (DZ) Fraternal twins who develop from two eggs fertilized at the same time.

evolutionary psychology A branch of psychology that examines the ways that evolutionary forces shape patterns of human cognition and behavior.

free will The idea that people can and do choose one course of action over another.

genotype A person's genetic composition.

indeterminate sentence A prison sentence of varying time length, such as 5 to 10 years.

individual justice The idea that criminal law must reflect differences among people and their circumstances.

intelligence The ability to learn, exercise judgment, and be imaginative.

IQ score A person's intelligence quotient, defined as the ratio of one's mental age multiplied by 100 and divided by one's chronological age.

justice model A corrections philosophy that promotes flat or fixed-time sentences, abolishment of parole, and use of prison to punish offenders.

mitigating circumstances Factors that may be responsible for an individual's behavior, such as age, insanity, and incompetence.

monozygotic twins (MZ) Identical twins who develop from one fertilized egg. MZ twins have identical DNA.

neoclassical school A school of thought that considers mitigating circumstances when determining culpability for delinquency.

positive school A school of thought that blames delinquency on factors that are in place before a crime is committed.

rational choice theory Theory suggesting that delinquents are rational people who make calculated choices regarding what they are going to do before they act.

retribution A punishment philosophy based on society's moral outrage or disapproval of a crime.

routine activities theory Theory arguing that motivated offenders, suitable targets, and absence of capable guardians produce delinquency.

somatotype The idea that criminals can be identified by physical appearance.

stigmata Distinctive physical features of born criminals.

theory An integrated set of ideas that explains and predicts a phenomenon.

utilitarian principles A set of ideas that assume behavior is calculated and that people gather and make sense of information before they act.

utilitarian punishment model The idea that offenders must be punished to protect society.

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