Modern Biosocial Perspectives of Criminal Behavior

This section will discuss the more modern biological studies of the 20th century. We will begin with studies from the early 1900s—particularly those that sought to emphasize the influence of biological factors on criminality. Virtually all of these studies have shown a significant biological effect in the development of criminal propensities. Then we will examine the influence of a variety of physiological factors, including chromosomal mutations, hormones, neurotransmitters, brain trauma, and other dispositional aspects of individuals’ nervous systems. A special emphasis will be placed on showing the consistent evidence that has been found for the interaction between physiological and environmental factors (i.e., biosocial factors).

This section will examine a variety of perspectives that deal with interactions between physiological and environmental factors, which is currently the dominant model explaining criminal behavior. First, we will discuss the early studies that attempted to emphasize the biological aspects of offending: family, twin, and adoption studies. All of these studies show that biological influences are more important than social and environmental factors, and most also conclude that when both negative biological and disadvantaged environmental variables are combined, these individuals are by far the most likely to offend in the future, which fully supports the interaction between nature and nurture factors.

Later in this section, we will examine other physiological factors, such as hormones and neurotransmitters. We will see that chronic, violent offenders tend to have significantly different levels of hormones and other chemicals in their bodies than do other individuals. Furthermore, we will examine brain trauma and activity among violent offenders, and we will see that habitual violent criminals tend to have slower brain wave patterns and lower anxiety levels than other persons. Ultimately, we will see that numerous physiological distinctions can be made between chronic violent offenders and others but that these differences are most evident when physical factors are combined with being raised in poor, disadvantaged environments.

Nature versus Nurture: Studies Examining the Influence of Genetics and Environment

At the same time that Freud was developing his perspective of psychological deviance, other researchers were busy testing the influence of heredity versus environment to see which of these two components had the strongest effect on predicting criminality. This type of testing produced four waves of research: (1) family studies; (2) twin studies;
Family Studies

The most notable family studies were done in the early 1900s by Richard Dugdale in his study of the Jukes family and the previously discussed researcher Henry Goddard, who studied the Kallikak family. These studies were supposed to test the proposition that criminality is more likely to be found in certain families, which would indicate that crime is inherited. Due to the similarity of the results, we will focus here on Goddard’s work on the Kallikak family.

This study showed that a much higher proportion of children from the Kallikak family became criminal. Furthermore, Goddard thought that many of the individuals (often children) from the Kallikak family actually looked like criminals, which fit Cesare Lombroso’s theory of stigmata. In fact, Lombroso had photographs made of many members of this family to back up these claims. However, follow-up investigations of Goddard’s research have shown that many of these photographs were actually altered to make the subjects appear more sinister or evil (fitting Lombroso’s stigmata) by altering their facial features—most notably their eyes.

Despite the despicable methodological problems with Goddard’s data and subsequent findings, two important conclusions can be made from the family studies that were done in the early 1900s. The first is that criminality is indeed more common in some families; in fact, no study has ever shown otherwise. However, this tendency cannot be shown to be a product of heredity or genetics. After all, individuals from the same family are also products of a similar environment—often a bad one—so this conclusion from the family studies does little to advance knowledge regarding the relative influence of nature versus nurture in terms of predicting criminality.

The second conclusion of family studies was more insightful and interesting. Specifically, they showed that criminality by the mother (or head female caretaker) had a much stronger influence on the future criminality of the children than did the father’s criminality. This is likely due to two factors. The first is that the father is often absent most of the time while the children are being raised. Perhaps more important is that it takes much more for a woman to transgress social norms and become a convicted offender, which indicates that the mother is highly antisocial; this gives some (albeit limited) credence to the argument that criminality is somewhat inherited. Despite this conclusion, it should be apparent from the weaknesses in the methodology of family studies that this finding did not hold much weight in the nature versus nurture debate. Thus, a new wave of research soon emerged that did a better job of measuring the influence of genetics versus environment, which was twin studies.

Twin Studies

After family studies, the next wave of tests done to determine the relative influence on criminality between nature and nurture involved twin studies, the examination of identical twin pairs versus fraternal twin pairs. Identical twins are also known as monozygotic (MZ) twins because they come from a single (hence mono) egg (zygote). Such twins share 100% of their genotype, meaning they are identical in terms of genetic makeup. Keep in mind that everyone shares approximately 99% of the human genetic makeup, leaving about 1% that can vary over the entire species. On the other hand, fraternal twins are typically referred to as dizygotic (DZ) twins because they come from two (hence di) separate eggs. Such DZ twins share 50% of genes that can vary, which is the same amount that any siblings from the same two parents share. DZ twins can be of different genders and may look and behave quite differently, as many readers have probably observed.

The goal of the twin studies was to examine the concordance rates between MZ twin pairs and DZ twin pairs regarding delinquency. Concordance is a count based on whether two people (or a twin pair) share a certain trait (or lack of the trait); for our purposes, the trait is criminal offending. Regarding a count of concordance, if one twin is an offender, then we look to see if the other is also an offender. If that person is, then we say there is concordance given the fact that the first twin was a criminal offender. Also, if neither of the twins is an offender, that also is concordance because both lack the trait. However, if one twin is a criminal offender and the other twin of the pair is not an offender, then this would be discordant in the sense that one has a trait that the other does not.

Thus, the twin studies focused on comparing the concordance rates of MZ twin pairs versus those of DZ twin pairs with the assumption that any significant difference in concordance could be attributed to the similarity of the genetic makeup of the MZ twins (which is 100%) versus the DZ twins (which is significantly less—that is, 50%). If genetics plays a major role in determining the criminality of individuals, then it would be expected that MZ twins would have a significantly higher concordance rate for being criminal offenders than would DZ twins. In these studies, it was assumed that each twin in each MZ or DZ twin pair had been raised in more or less the same environment as the other twin since each pair had been brought up in the same family at the same time.

A number of studies were performed in the early and mid-1900s that examined the concordance rates between MZ and DZ twin pairs. These studies clearly showed that identical twins had far higher concordance rates than fraternal twins; most studies showed twice as much concordance or more for MZ twins—even for serious criminality.

However, the studies regarding the comparisons between the twins were strongly criticized for reasons that many readers readily see. Specifically, identical twins, who look almost exactly alike, are typically dressed the same by their parents and treated the same by the public. In addition, they are generally expected to behave the same way. However, this is not true for fraternal twins, who often look very different and quite often are of different genders.

Thus, the foundation for criticism of the twin studies was the very valid argument that the higher rate of concordance among MZ twins could have been due to the extremely similar way they were treated or expected to behave.

Footnotes:
2. Ibid., 198–204, for an excellent discussion of the alteration of Goddard’s photographs.

References:
by society. Another criticism of the early twin studies had to do with the questionable accuracy of determinations of whether twins were fraternal or identical, which was often done by sight in the early tests. Although these criticisms were seemingly valid, the most recent meta-analysis, which examined virtually all of the twin studies done up to the 1990s, concluded that the twin studies showed evidence of a significant hereditary basis for criminality. Still, the criticisms of such studies were quite valid; therefore, in the early to mid-1980s, researchers involved in the nature versus nurture debate attempted to address these valid criticisms by moving on to another methodological approach to examining this debate: adoption studies.

Adoption Studies

Due to the valid criticisms leveled at twin studies in determining the relative influence of nature (biological) or nurture (environmental), researchers in this area moved on to adoption studies, which examined the predictive influence of the biological parents versus that of the adoptive parents who raised the children from infancy to adulthood. It is important to realize that, in such studies, the adoptees were typically given up for adoption prior to the middle of the month of age, meaning that the biological parents had relatively no interaction with their natural children; rather, they were almost completely raised from infancy by the adoptive parents.

Perhaps the most notable of the adoption studies was done by Sarnoff Mednick and his colleagues in which they examined male children born in Copenhagen between 1927 and 1941 who had been adopted early in life. In this study and virtually all others that have examined adoptees in this light, by far the highest predictability for future criminality was found for adopted youths who had both a biological parent and an adoptive parent who were convicted criminals. However, the Mednick study also showed that the criminality of biological parent(s) had a far greater predictive effect on future criminality of offspring than did the criminality of adoptive parents. Still, the adopted children who were least likely to become criminal had no parent with a criminal background. In light of this last conclusion, these findings support the major contentions of this book's authors in the sense that they fully back up the nature versus nurture argument as opposed to the nature versus nurture argument. They support the idea that both biological and environmental factors contribute to the future criminality of youths.

Unfortunately, the researchers who performed these studies focused on the other two groups of children—those who had either only criminal biological parents or only criminal adoptive parents. Thus, these adoption studies found that the adoptees who had only biological parents who were criminal had a much higher likelihood of becoming criminal compared to the youths who had only adoptive parents who were criminal. Obviously, this finding supports the idea that genetic influence predisposes people toward criminality. However, this methodology was subject to criticism.

Perhaps the most notable criticism of adoption studies was that adoption agencies typically incorporated a policy of selective placement in which adoptees were placed with adoptive families similar in terms of demographics and background to their biological parents. Such selective placement could bias the results of adoption studies. However, recent analyses have examined the impact of such bias, concluding that, even after accounting for the influence of selective placement, the ultimate findings of the adoption studies are still somewhat valid. Children's biological parents likely have more influence on their future criminality than the adoptive parents who raise them from infancy to adulthood. Still, the criticism of selective placement was strong enough to encourage a fourth wave of research in the nature versus nurture debate, which became studies on identical twins separated at birth.

Twins Separated at Birth

Until recently, studies of identical twins separated at birth were virtually impossible because it was too difficult to get a high number of identical twins who had indeed been separated early. But since the early 1990s, twins-separated-at-birth studies have been possible. Readers should keep in mind that, in many of the identical twin pairs studied for these investigations, the individuals did not even know that they had a twin. Furthermore, the environments in which they were reared were often extremely different; one twin might be reared by a very poor family in an urban environment while the other twin was reared by a middle- to upper-class family in a rural environment.

These studies—the most notable having been done at the University of Minnesota—found that the twin pairs often showed extremely similar tendencies for criminality, sometimes more similar than those seen in concordance rates for identical twins raised together.7 This finding, in fact, supports the profound influence of genetics and heredity, which is not surprising to most well-read scientists, who now acknowledge the extreme importance of inheritance of physiological and psychological aspects to human behavior. Perhaps more surprising was why separated identical twins, who had never known that they had a twin and were often reared in extremely different circumstances, had just as high or even higher concordance rates than identical twins who were raised together.

The leading theory for this phenomenon is that identical twins who are raised together actually go out of their way to deviate from their natural tendencies to form an identity separate from their identical twin with whom they have spent their entire lives. As for criticisms of this methodology, none have been presented in the scientific literature. Thus, it is somewhat undisputed at this point that the identical twins-separated-at-birth studies have shown that genetics has a significant impact on human behavior, especially regarding the identical twin pairs.

Ultimately, taking all of the nature versus nurture methodology approaches and subsequent findings together, the best conclusion that can be made is that genetics and heredity both have significant impacts on criminality. Environment simply cannot account for all of the consistent results seen in the comparisons between identical twins and fraternal twins, those of identical twins separated at birth, and those of adoptees with criminal biological parents versus those who did not have such parents. Despite the taboo nature and controversial response to the findings of such studies, it is quite clear that when nature and nurture are compared, biological rather than environmental factors tend to have the most influence on the criminality of individuals. Still, the authors of this book hope that readers will emphasize the importance of the interaction between nature and nurture (better stated as nature via nurture). Ultimately, we hope that we have shown quite convincingly through scientific study that it is the interplay between biology and the environment that is most important in determining human behavior.

Perhaps in response to this nature versus nurture debate, a new theoretical perspective was offered in the mid-1990s that merged biological and psychological factors in explaining criminality. Although it leaned more toward the nature side of the debate, critics would use this same perspective to promote the nurture side, so this framework was useful in promoting the interaction between biology and sociological factors.

Cytogenetic Studies: The XYY Factor

Beyond the body type theories, another model was proposed in the early 1990s regarding biological conditions that predispose individuals toward crime: cytogenetic studies. Cytogenetic studies of crime focus on the

genetic makeup of individuals, with a specific focus on abnormalities in chromosomal makeup, and specifically chromosomal abnormalities that occur randomly in the population. Many of the chromosomal mutations that have been studied (such as XYY) typically result not from heredity but from random mutations in chromosomal formation.

The normal chromosomal makeup for women is XX, which represents an X from the mother and an X from the father. The normal chromosomal makeup for men is XY, which represents an X from the mother and a Y from the father. However, as in many species of animals, there are often genetic mutations, which we see in human beings. Consistent with evolutionary theory, virtually all possible variations of chromosomes that are possible have been found in the human population, such as XXX, XXY, and many others. We will focus our discussion on the chromosomal mutations that have been most strongly linked to criminality.

One of the first chromosomal mutations recognized as a predictor of criminal activity was XYY. In 1965, the first major study showed that this mutation was far more common in a Scottish male population of mental patients than in the general population. Specifically, in the general population, XYY occurs in about 1 in every 1,000 males. The first major study that examined the incidence of XYY sampled about 200 men in the mental hospital; one occurrence would have been predicted, assuming what was known about the general population. The study, however, found 13 individuals who were XYY, which suggested that individuals who have mental disorders are more likely to have XYY than those who do not. Males who have XYY have at least 13 times the likelihood (or a 1,300% chance) of having behavioral disorders compared with those who do not have this chromosomal abnormality. Subsequent studies have not been able to dismiss the effect of XYY on criminality, but they have concluded that this mutation is more often linked with property crime than with violent crime.29

Would knowing this relationship help in policies regarding crime? Probably not, considering the fact that 90% of the male mental patients were not XYY. Still, this study showed the importance of looking at chromosomal mutations as a predictor of criminal behavior.

Such mutations include numerous chromosomal abnormalities, such as XYY, which is a male who is given an extra Y chromosome, making him more "male-like." These individuals are often very tall but slow in terms of social and intelligence skills. Another type of mutation is XXX, which is otherwise known as Klinefelter's syndrome; it results in more feminine males (homosexuality has been linked to this mutation). Many other types of mutations have been observed, but it is the XYY mutation that has been the primary focus of studies, which is largely due to the higher levels of testosterone produced by this chromosomal mutation (see Figure 5.1).

On the relative criminality and deviance of a group of individuals in each of these groups of chromosomal mutations (see Figure 5.1).30 This study found that the higher the level of male hormones produced by the chromosomal mutation, the greater the likelihood that people with the mutation would commit criminal and deviant acts. On the other hand, the higher the level of feminine hormones produced by the chromosomal mutation, the lower the likelihood that individuals would commit criminal activity. Ultimately, all of these variations in chromosomes show that there is a continuum of femaleness and maleness and that the more maleness the individual is in terms of chromosomes, the more likely he is to commit criminal behavior.

Ultimately, the cyogenetic studies showed that somewhat random abnormalities in an individual's genetic makeup can have a profound influence on her or his level of criminality. Whether or not this can or should be used in policy related to crime is another matter, but the point is that genetics does indeed contribute to a disposition to commit criminal acts. The extent to which male hormones or androgens are increased by the mutation is an important predictor of criminal traits.

**Hormones and Neurotransmitters: Chemicals That Determine Criminal Behavior**

Various chemicals in the brain and the rest of the body determine how we think, perceive, and react to various stimuli. Hormones, such as testosterone and estrogen, carry chemical signals to the body as they are released from the certain glands and structures. Some studies have shown that a relatively excessive amount of testosterone in the body is consistently linked to criminal or aggressive behavior; most studies show a moderate relationship.31 This

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relationship is seen even in the early years of life. On the other side of the coin, studies have also shown that hormonal changes in females can cause criminal behavior. Specifically, studies have shown that a high proportion of the women in prison for violent crimes committed their crimes during their premenstrual cycle at which time women experience a high level of hormones that make them more malelike due to relatively low levels of estrogen compared to progesterone.

Anyone who doubts the impact of hormones on behavior should examine the scientific literature regarding performance on intelligence tests at different times of day. Virtually everyone performs better on spatial and mathmatical tests early in the day, when people have relatively higher levels of testosterone and other male hormones in their bodies; on the other hand, virtually everyone performs better on verbal tasks in the afternoon or evening, when people have relatively higher levels of estrogen or other female hormones in their systems. Furthermore, studies have shown that individuals who are given shots of androgens (male hormones) before math tests tend to do significantly better on spatial and mathematics tests than they would do otherwise. Scientific studies show that the same is true for people who are given shots of female hormones prior to verbal or reading tests.

It is important to realize that this process of differential levels of hormones begins at a very early age, specifically at about the fifth week after conception. At that time, the Y chromosome of the male tells the developing fetus that it is a male and stimulates production of higher levels of testosterone. So, even during the first few months of gestation, the genes on the Y chromosome significantly alter the course of genital and thus hormonal development.

This level of testosterone alters the genitals of the fetus during gestation as well as prompting later changes in the genital area and produces profound increases in testosterone in the teenage and early adult years. This produces not only physical differences but also huge personality and behavioral alterations. High levels of testosterone and other androgens tend to "masculinize" the brain toward risk-taking behavior, whereas the lower levels typically found in females tend to result in the default feminine model. High levels of testosterone have numerous consequences, such as lowered sensitivity to pain, enhanced seeking of sensory stimulation, and a right hemisphere shift in brain dominance, which has been linked to higher levels of spatial aptitude but lower levels of verbal reasoning and empathy. These consequences have profound implications for criminal activity and are more likely to occur in males than females.

Ultimately, hormones have a profound effect on how individuals think and perceive their environments. All criminal behavior comes down to cognitive decisions in our 3-pound brains. So, it should not be surprising that hormones play a highly active role in this decision-making process. Nevertheless, hormones are probably secondary to levels of neurotransmitters, which are chemicals in the brain and body that help transmit electric signals from one neuron to another.

Neurotransmitters can be distinguished from hormones in the sense that hormones carry a signal that is not electric, whereas the signals that neurotransmitters carry are indeed electric. Neurotransmitters are chemicals that are released when a neuron, the basic unit of the nervous system, wants to send an electric message to one or more neighboring neurons. Sending such a message requires the creation of neural pathways, which means neurotransmitters must be activated in processing the signal. At any given moment, healthy levels of various neurotransmitters are needed to pass messages from one neuron to the next across gaps between them, called synapses.

Although there are many types of neurotransmitters, the most studied in relation to criminal activity are dopamine and serotonin. Dopamine is most commonly linked to feeling good. For example, dopamine is the chemical that tells us when we are experiencing good sensations, such as good food, sex, and so on. Most illicit drugs elicit a pleasurable sensation by enhancing the levels of dopamine in our systems. Cocaine and methamphetamine, for example, tell the body to produce more dopamine and inhibit the enzymes that typically mop up the dopamine in our systems after it is used.

Although a number of studies show that low levels of dopamine are linked to high rates of criminality, other studies show no association—or even a positive link—to criminal behavior. However, the relationship between dopamine and criminal behavior is probably curvilinear, such that both extremely high and extremely low levels of dopamine are associated with deviance. Unfortunately, no conclusion can be made at this point due to the lack of scientific evidence regarding this chemical.

On the other hand, a clear conclusion can be made about the other major neurotransmitter that has been implicated in criminal offending: serotonin. Studies have consistently shown that low levels of serotonin are linked with criminal offending. Serotonin is important in virtually all information processing, whether it be learning or emotional; thus, it is vital in most aspects of interacting with the environment. Those who have low levels of serotonin are likely to have problems in everyday communication and life in general. Therefore, it is not surprising that low levels of serotonin are strongly linked to criminal activity.

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2Diane Halpern, Sex Differences in Cognitive Abilities (Mahwah, NJ: Lawrence Erlbaum, 2000).
3Ibid.
5Ibid.
Brain Injuries

Another area of physiological problems associated with criminal activity is that of trauma to the brain. As mentioned before, the brain weighs only 3 pounds, but it is responsible for every criminal act that an individual commits, so any problems related to this structure have profound implications regarding behavior, especially deviance and criminal activity.

Studies have consistently shown that damage to any part of the brain increases the risk of crime by that individual in the future. However, trauma to certain portions of the brain tends to have more serious consequences than injury to other areas. Specifically, damage to the frontal or temporal lobes (particularly those on the left side) appears to have the most consistent associations with criminal offending. These findings make sense primarily because the frontal lobes (which include the prefrontal cortex) are the areas of the brain where the realm of higher-level problem solving and "executive" functioning takes place. Thus, the frontal lobes, especially on the left side, process what we are thinking and inhibit us from doing what we are emotionally charged to do. Thus, any moral reasoning relies on this executive area of the brain because it is the region that considers long-term consequences. If people suffer damage to their frontal lobes, they will be far more inclined to act on their emotional urges because they are not receiving any logical inhibitions from this specialized region.

In a similar vein, the temporal lobe region is highly related to memory and emotion. To clarify, the temporal lobes cover and communicate almost directly with certain structures of our brain's limbic systems. Certain limbic structures govern our memories (the hippocampus) and emotions (the amygdala). Any damage to the temporal lobe, which is generally located above the ear, is likely to damage these structures or the effective communication of these structures to other portions of the brain. Therefore, it is understandable why trauma to the temporal region of the brain is linked to future criminality.


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**Case Study: Charles Whitman**

Charles Whitman’s shooting spree is legendary and notorious for many reasons. He killed 15 people and injured 28 others from a landmark university tower at the University of Texas at Austin (UT Austin: the UT flagship campus). But what is almost more fascinating is his life story up until that fateful day.

Whitman was, by most accounts, a great person and a good soldier. He was one of the youngest Eagle Scouts ever to earn the honor. He graduated near the top of his class in high school and then went on to become a stellar member of the U.S. Marine Corps, earning the rating of sharpshooter. He used this skill when he went on his shooting rampage on August 1, 1966. It should be noted that the day before, he killed his wife and mother and left some letters (which will come up later). Then he planned out his attack on the university for the following day.

The day after Whitman killed his wife and mother, he proceeded to the main tower at UT Austin, killed the receptionist, ascended the tower, and waited for classes to break; he then opened fire on the crowd of students. It is notable that he had taken with him a variety of materials that imply he was in it for the long haul. These items included toilet paper, spray deodorant, water canteens, gasoline, rope, andail and a variety of weapons, such as a machete, a hatchet, a .357 Magnum revolver, a 12-gauge sawed-off shotgun, two rifles (one with a telescopic sight), 700 rounds of ammunition, and other weapons.

Whitman was shooting people on the run and in places only a trained sharpshooter could hit. He shot a pregnant woman, who later gave birth to a stillborn baby. He also shot a person crossing a street 500 yards away. This is the type of shot glorified in *Full Metal Jacket*, a Stanley Kubrick film that examined the Marine boot camps of the late 1990s. There is no doubt that Whitman was an expert sharpshooter and that the Marine Corps trained him well. Unfortunately, in this case his training was used against innocent targets. Whitman continued his mass killing for a couple of hours until several police officers were able to find a way through ground tunnels and then up to the top of the tower to shoot Whitman.

But why did he do it? The best guess we have, which directly relates to this section, began with one of his last letters. He wrote, "After my death, I wish an autopsy on me to be performed to see if there is any mental disorder." An autopsy was performed, and as Whitman sort of predicted, he did not simply have a mental disorder but a large brain tumor (about the size of a golf ball). As we examine how vulnerable our brain functioning can be to trauma, imagine the likely effects of a large tumor on thinking and processing skills.

**Think About It**

1. Do you believe Whitman was insane? Give your reasons why you believe so or not.

2. Given how much planning went into his attack, how much of an effect do you believe his tumor had on him at the time of the attack?

Central and Autonomic Nervous System Activity

The brain is a key player in two different types of neurological systems that have been linked to criminal activity. The first is the central nervous system (CNS), which involves our brains and spinal columns and governs our voluntary motor activities. For example, the fact that you are reading this sentence means that your brain is in control of this brain-processing activity. Empirical studies of the influence of CNS functioning on criminality have traditionally focused on brain wave patterns with most using electroencephalograms (EEGs). Although EEGs do not do a good job of describing which areas of the brain are active or inactive, they do reveal how much the brain as an entire organ is performing at certain times.

Studies have compared brain wave patterns of known chronic offenders (e.g., psychopaths, repeat violent offenders) to those of "normal" people (i.e., those who have never been charged with a crime). These studies consistently show that the brain wave patterns of chronic offenders are abnormal compared to those of the normal population. Most studies showing slower brain wave patterns in psychopaths. For example, studies have found that, compared to normals, chronic offenders have slower brain wave patterns, suggesting a lack of neurological hyperactivity. However, these studies are limited in their ability to assess the influence of chronic criminality on brain wave patterns.

The second area of the nervous system that has been most linked to criminal behavior is the autonomic nervous system (ANS), which is primarily responsible for involuntary motor activities, such as heart rate, dilation of pupils, and electric conductivity in the skin. This is the type of physiological activity that is measured by polygraph measures or lie detector tests. Such measures capitalize on the inability of individuals to control physiological responses to anxiety, which occurs in most normal persons when they lie, especially regarding illegal behavior. However, such measures are not infallible because the individuals who are most at risk of being serious, violent offenders are the most likely to pass such tests even when they are lying. See Figure 5.2.

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25 For further discussion and explanation, see Raine, Psychopathology of Crime, 174-77.

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Figure 5.2 • Central nervous system and autonomic nervous system

Sympathetic
Parasympathetic

Consistent with the findings regarding CNS arousal levels, studies have consistently shown that individuals who have significantly low levels of ANS functioning are far more likely to commit criminal acts. For example, studies consistently show that chronic violent offenders tend to have much slower resting heart rates than normal people;
a number of studies estimate this difference to be as much as 10 beats per minute slower for the offenders. This is a highly significant gap that cannot be explained away by alternative theories—for example, the explanation that offenders are just less excited in laboratory tests.

Furthermore, people who have such low levels of ANS arousal tend to experience what is known in the psychological literature as stimulus hunger. Stimulus hunger means that individuals with such a low level of ANS arousal may constantly seek out experiences and stimuli that are risky and thus often illegal. Readers may recall children they have known who can never seem to get enough attention, with some even seeming to enjoy being spanked or other forms of harsh punishment. In addition, people with a low level of ANS arousal may feel no anxiety about punishment, even corporal punishment, and thus they may not adequately learn right from wrong through normal forms of discipline. This is perhaps one of the reasons why children who are diagnosed with attention deficit hyperactivity disorder (ADHD) have a higher likelihood of becoming criminals than their peers.

Because people who are accurately diagnosed with ADHD have a neurological abnormality—a significantly low functioning ANS level of arousal—doctors prescribe stimulants (e.g., Ritalin) for such youths. It may seem counterintuitive to prescribe a hyperactive person a stimulant; however, the medication boosts the individual's ANS functioning to a normal level of arousal. This makes such individuals experience a healthy level of anxiety, which they would not normally experience from wrongdoing. Assuming that the medication is properly prescribed and at the correct dosage, children who are treated tend to become more attuned to the discipline that they face if they engage in rule violation.

Children who do not fear punishment at all—in fact, some of them do not feel anxiety even when being physically punished (e.g., spankings)—are likely to have lower-than-average levels of ANS functioning. Such individuals are likely to become chronic offenders if this disorder is not addressed, because they will not respond to discipline in the long term. The consequence of their risky behavior. If people don't fear punishment or negative consequences from their behavior, they may be more likely to engage in selfish, greedy behavior. Thus, it is important to address this issue when it becomes evident. On the other hand, children will be children, and ADHD and other disorders have been overly diagnosed in recent years. A well-trained physician should investigate thoroughly to decide whether an individual has such a low level of ANS functioning that medication or therapy is required to curb deviant behavior.

Individuals who have significantly lower ANS arousal are likely to pass lie detector tests because they feel virtually no anxiety when they lie; many of them lie all the time. Thus, it is ironic, but the very people whom lie-detecting measures are meant to capture are the most likely to pass such tests, which is probably why they are typically not allowed to be used in court. Only through medication or cognitive behavioral therapy can such individuals learn to consider the long-term consequences of the decisions they make regarding their behavior.

Individuals with low levels of ANS functioning are not always destined to become chronic offenders. Some evidence has shown that people with low ANS arousal often become successful corporate executives, decorated military soldiers, world-champion athletes, and high-level politicians. Most of these occupations require people who constantly seek out exciting, risky behaviors, and others require constant and convincing forms of lying to others. So there are many legal outlets and productive ways for people with low levels of ANS functioning to use their natural tendencies. These individuals could perhaps be steered toward such occupations and opportunities when they present themselves. This is clearly a better option than committing antisocial acts against others in society.

Section V  Modern Biosocial Perspectives of Criminal Behavior

Ultimately, low levels of cortical arousal in both the CNS and ANS are clearly linked to a predisposition toward criminal activity. However, modern medical research and societal opportunities exist to help such individuals divert their tendencies toward more prosocial outlets.

Biosocial Approaches to Explaining Criminal Behavior

Perhaps the most important and most recent perspective of how criminality is formed is that of biosocial approaches to explaining crime. Specifically, if there is any conclusion that can be made regarding the previous theories and research in this section, it is that both genetics and environment influence behavior, particularly the interaction between the two. Even the most fundamental aspects of life can be explained by these two groups of factors.

For example, if we look at the height of individuals, we can predict with a great amount of accuracy how tall a person will be by looking at the individual's parents and other ancestors because much of height is determined by a person's genotype. However, even for something as physiological as height, the environment plays a large role. As many readers will observe, individuals who are raised in poor, underdeveloped areas (e.g., Mexico, Asia) are shorter than children raised in the United States. However, individuals who descend from immigrants and relatives in these underdeveloped areas but are raised in the United States tend to be just as tall (if not taller) than children born here. This is largely due to diet, which obviously is an environmental factor.

In other words, our genotype provides a certain range or window that determines the height of an individual based on ancestral factors. But the extent to which individuals grow to the maximum or minimum, or somewhere in between, is largely dependent on what occurs in the environment as they develop. This is why biologists make a distinction between genotype, which is directly due to genetics, and phenotype, which is a manifestation of genetics interacting with the environment. The same type of biosocial effect is seen for criminal behavior. Furthermore, over the past decades, a number of empirical investigations have examined the extent to which physiological variables interact with environmental variables, and the findings of these studies have shown consistent predictions regarding criminality. Such studies have been more accurate than those that rely on either physiological and genetic variables or environmental factors separately. For example, findings from a cohort study in Philadelphia showed that individuals who had low birth weights were more likely to commit crime, but that was true primarily if they were raised in a lower-income family or a family with a weak social structure. Those who were raised in a relatively high-income household or a strong family structure were unlikely to commit crime. The strength of the relationship is a physiological deficiency (i.e., low birth weight) and an environmental deficit (i.e., weak family structure or income) that had a profound effect on propensity for criminal behavior.

In addition, recent studies have shown that when incarcerated juveniles were assigned to diets with limited levels of simple carbohydrates (e.g., sugars), their reported levels of violations during incarceration declined by almost half (45%). Furthermore, other studies have reported that various food additives and dyes, such as those commonly found in processed foods, can also have a significant influence on criminal behavior. Thus, the old saying "you are what you eat" appears to have some scientific weight behind it—at least regarding criminal behavior. Additional studies have found that high levels of certain toxins, particularly lead and manganese, can have profound effects on behavior, including criminality. Recent studies have found a consistent, strong effect of high lead levels in predicting criminal behavior. Unfortunately, medical studies have also found many subtle sources of high lead levels, such as the fake jewelry that many children wear as toys. Also unfortunate is that individuals who are most vulnerable to high levels of lead (like virtually every other toxin) are children, yet they are the most likely to

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Policy Implications

The theories in this section have plenty of policy implications: a few of the primary interventions are discussed here. First, there should be universal, funded preschool for all children. This early life stage is important not only for developing academic skills but also for fostering healthy social and disciplinary skills, which children who do not attend preschool often fail to develop. In addition, there should be funded mental health and drug counseling for all young children and adolescents who exhibit symptoms of mental disorders or drug problems. There should also be universal funding for health care for all expectant mothers, especially those who have risk factors (poverty, inner-city residence, etc.).

Perhaps most important, there should be far more thorough examinations of children's physiological makeup in terms of hormones, neurotransmitters, brain formation and functioning, and genetic design so that earlier interventions can take place. It has been shown empirically that the earlier that interventions take place, the better the outcomes. A review of the extent literature, hereafter referred to as the Maryland Report (because all key authors of the report were professors at the University of Maryland), emphasized the importance of identifying and quickly treating any head and bodily trauma early in development among infants and toddlers, concluding that some of the most consistently supported early intervention programs for such physiological problems are those that involve weekly infant home visitation, typically by nurses or neonatal experts.

Conclusion

This section has examined a large range of explanations of criminal behavior that place most of the blame on biological and psychological factors, which are typically intertwined. These types of explanations were primarily popular in the early years of the development of criminology as a science, but they have also been shown in recent years to be quite valid as significant factors in individual decisions to commit crime. This section examined the influence of genetics and environment in family studies, twin studies, adoption studies, and studies of identical twins separated at birth. These studies have ultimately shown the consistent influence of inheritance and genetics in predisposing individuals toward criminal activity. This is supported by the influence of hormones (e.g., testosterone) in human behavior as well as the influence of various chromosomal mutations (e.g., XXV). Recent research has supported both of these theories in showing that people with high levels of male androgens are far more likely to commit crimes than those who do not have high levels of these hormones.

The link between brain trauma and crime was also discussed, emphasizing the consistent association between damage to the left or frontal parts of the brain. We also examined theories regarding variations in levels of CNS and ANS functioning; nearly all empirical studies have shown that low levels of functioning of these systems have links to criminality. Finally, we explored the extent to which the interaction between physiological factors and environmental variables contributes to the most consistent prediction of criminal offending. Ultimately, it is interesting that the very theories that were key in the early years of the development of criminology as a science are now showing strong support in studies for being primary influences on criminal behavior.

Ultimately, despite the neglect that biosocial models of crime receive in terms of both recognition and policy implications, there is no doubt that this area is crucial if we hope to advance our understanding and create more efficient policies regarding criminal behavior. It is time that all criminologists recognize the degree to which human behavior results from physiological disorders. We all have brains, each about 3 pounds in weight, that determine the choices we make. Criminologists must acknowledge the influence of biological or physiological factors that influence this vital organ, or the discipline will be behind the curve in terms of understanding why people commit (or do not commit) criminal offenses.

33 Wright et al., Criminals in the Making.
38 Wright et al., Criminals in the Making.
39 Ibid.