**Chapter 6**

**Modern Biosocial Perspectives on Criminal Behavior**

**Learning Objectives**

* Evaluate the role of nature and nurture in exploring risk factors for offending
* Describe the various types of cytogenetic disorders, and which type(s) puts a person at highest risk for criminality
* Identify the hormones that play a key role in individuals who tend to engage in chronic offending. Make sure to consider females and the gender gap in offending as you read this chapter
* Explain how neurotransmitters differ from hormones, and note which of the former are the most often implicated in criminality at either high or low levels
* Identify the regions of the brain that criminological studies implicate for both structural trauma and functioning disorders
* Compare and contrast the central nervous system and the autonomic nervous system, and the ways both systems play an important part in individuals’ decisions to engage in criminal activity

**Summary**

This chapter examines the modern perspectives on the biological aspect of criminality by exploring modern factors and theories of biosocial positivism in the current criminological literature. First, we will go back in time and explore some of the early waves of studies that specifically examined the influence of biology versus environment (i.e., nature vs. nurture), which include studies of identical twins such as the pair in the story above, as well as family and adoption studies. We shall see that virtually all these studies support a more integrative approach of genetics/physiology via environment (i.e., nature via nurture). Then we will examine randomly occurring chromosomal mutations, as well as discussing which mutations seem most likely to predict criminality among individuals.

Next, we will discuss the influence of various hormones, such as testosterone, and level and activity of neurotransmitters (e.g., dopamine, serotonin) in how we behave in terms of criminality. Then we will discuss various parts of the brain that are most likely to show high correlation to criminality when traumatized or otherwise hindered in performance. In relation to brain trauma, we will then explore the extreme importance of the functioning of the central nervous system, in which the brain plays a vital part. We will also review the findings from various studies regarding the autonomic nervous system, which is vital in many aspects of our everyday lives—especially in making decisions related to illegal behavior.

Finally, we will discuss in this chapter the integration of both physiology and environment in what is called interaction effects, which modern studies show have the greatest impact on our behavior, whether in illegal activities or more conventional activities. But before we dive into the actual theories, let us discuss a case study that applies some of the theoretical concepts, propositions, and criticisms presented in this chapter.

**Chapter Outline**

* **Nature Versus Nature: Studies Examining the Influence of Genetics and Environment**
  + Waves of Research
    - Family Studies
    - Twin Studies
    - Adoption Studies
    - Studies of Identical Twins Separated at Birth
  + **Family Studies**
    - The most notable family studies were done in the early 1900s.
    - Dugdale
      * The Jukes Family
    - Goddard
      * The Kallikak Family
        + A much higher proportion of children from that family became criminal.
        + Furthermore, Goddard claimed that many of the individuals (often children) from the Kallikak family actually looked like criminals (fit Lombroso’s theory of stigmata).
        + Many of the family members were photographed to back up these claims.

Follow-up study shows that many of these photographs were actually altered in order to make the subjects appear more sinister or evil.

* + - These studies were done to examine if criminality was more likely to be found in a given family, which was supposed to test the proposition that criminality is more likely to be found in certain families, which would indicate that crime is inherited.
    - Despite the despicable methodological problems, there are two important conclusions that can be made from the family studies that were done in the early 1900s.
      * Criminality is indeed more common in some families; in fact, no study has ever shown otherwise.
        + This tendency cannot be shown to be a product of heredity or genetics.
      * The family studies 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 effect of the father’s criminality.
        + This is likely due to two factors.

The father is often absent or not around most of the time while the children are being raised.

It takes much more for a woman to transgress social norms and become a convicted offender, which indicates that the mother is highly antisocial, which gives some (albeit limited) credence to the argument that criminality is somewhat inherited.

* + **Twin Studies**
    - Specifically meant to determine the relative influence on criminality between nature and nurture.
    - Examined identical twin pairs versus fraternal twin pairs.
    - Monozygotic Twins (MZ)
      * Identical
    - Dizygotic Twins (DZ)
      * Fraternal
    - The goal of the twin studies was to examine the concordance rates between MZ twin pairs versus that of DZ twin pairs regarding delinquency.
      * Concordance is a count based on whether two people (or a twin pair) shares a certain trait (or lack of the trait), criminal offending.
    - If genetics play 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.
    - The studies which have clearly shown that MZ twins are far more similar for the trait of criminality than were the DZ twins.
    - Most studies showed twice as much concordance or more for MZ twins, even for serious criminality.
    - The studies were strongly criticized.
      * Identical twins, who look almost exactly alike, are typically dressed the same by their parents, as well as treated the same by the public.
      * This is not true for fraternal twins, who often look very different and quite often are different genders.
      * The higher concordance among MZ twins could have been due to the extremely similar way they were treated, or expected to behave, by society.
      * Another criticism of the early twin studies was regarding the accuracy in determining twins as fraternal versus identical, which was often done by sight in the early tests.
  + **Adoption Studies**
    - Examined the predictive influence of the biological parents of adopted children versus that of the adoptive parents that raised the children from infancy to adulthood.
    - Mednick and Colleagues
      * Examined male children born in Copenhagen between 1927 and 1941 who had been adopted early in life.
      * The findings can be considered a 2x2 matrix, containing four cells of youth which represent adoptees in various circumstances in terms of the criminality of their biological and/or adoptive parents.
    - The highest predictability for future criminality was found for adopted youth who had both biological and adoptive parents who were convicted criminals.
    - Adoptees who had only biological parents who were criminal had a much higher likelihood of becoming criminal as compared to the youths who only had adoptive parents who were criminal.
      * Biological parents had far more influence in the likelihood that youth would become criminal.
    - This methodology was subject to criticism.
      * Adoption agencies typically incorporated a policy of selective placement.
        + The adoptees were placed with adoptive families similar to those in terms of demographics and background as those of the biological parents.
        + Recent analyses that have examined the impact of such bias have concluded that even when accounting for the influence of selective placement, the ultimate findings of the adoption studies are still somewhat valid.
  + **Twins Separated at Birth**
    - University of Minnesota Study
      * Twin pairs often showed extremely similar tendencies for criminality, sometimes more than those seen in concordance rates for identical twins raised together.
      * These findings obviously supported the profound influence of genetics and heredity.
    - Perhaps more surprising was why separated identical twins who never knew they had a twin, and were often raised in extremely different circumstances, had just as similar or even more similar concordance rates with their pairs than did 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 in order to form their own identity separate from their identical twin whom they have spent their entire life.
  + Taking all of the “nature versus nurture” methodological approaches and subsequent findings together, the best conclusion that can be made is that genetics and heredity both have a significant impact on criminality.
* **Cytogenetic Studies: The XYY Factor**
  + Focus on the genetic makeup of individuals, with a specific focus on abnormalities in their chromosomal makeup.
    - Many of the chromosomal mutations that have been studies (such as XYY) do not typically occur due to heredity, but rather are largely due to random mutations in chromosomal formation.
  + Basics regarding chromosomal makeup.
    - XX = female, an X from the mother and an X from the father.
    - XY = male, an X from the mother and a Y from the father.
  + Virtually, all possible variations of chromosomes that are possible have been found in the human population, such as XXY, XYY, and many others.
  + Chromosomal mutations that have been strongly linked to criminality.
    - The Mutation of XYY
      * In 1965, Jacobs and her colleagues presented the first major study that showed this mutation was far more common in a Scottish male population of mental patients than in the general population.
        + In the general population, XYY occurs in approximately 1 of every 1,000 males.
      * Subsequent studies that have examined this association have not been able to dismiss the effect of XXY with criminality, but concluded that this mutation was more linked with property crime than with violent crime.
  + Chromosomal Abnormalities
    - XYY
      * Male is given an extra Y chromosome.
      * Makes them more “male-like.”
      * Often very tall, but slow in terms of social and intelligence skills.
    - XXY
      * Klinefelter’s syndrome.
      * Results in higher likelihood for homosexuality and other behaviors, but not typically linked to criminality.
    - XXX
      * Female is given an extra X chromosome.
      * Female is tall in stature.
  + One study examined the relative criminality and deviance of a group of individuals in each of these groups of chromosomal mutations.
    - This study found that the more that these chromosomal mutations produced more male hormones (androgens), the more likely they were to commit crimes and deviant acts.
  + Ultimately, the cytogenetic studies showed that somewhat random abnormalities in an individual’s genetic makeup can have profound influence on their level of criminality.
* **Hormones and Neurotransmitters: Chemicals that Determine Criminal Behavior**
  + There are various chemicals in the brain and the rest of the body that determine how we think, perceive, and react to various stimuli.
  + Some studies have shown that a relatively excessive amount of testosterone in the body is consistently linked to criminal or aggressive behavior, with most studies showing a moderate relationship.
  + 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 “male-like” during that time.
  + Although hormones are a key part of the criminal process, they probably are secondary in terms of levels of neurotransmitters.
    - **Neurotransmitters** are chemicals in the brain and body which help transmit electric signals from one neuron to another.
    - The most studied neurotransmitters in relation to criminal activity are dopamine and serotonin.
    - **Dopamine**
      * The neurotransmitter that is most commonly linked to feeling good.
      * 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, it is likely that there is a curvilinear relationship between dopamine and criminal behavior, such that both extremely high and extremely low levels of dopamine are both associated with deviance.
      * Two of the most recent reviews of the literature on dopamine levels, by Wright et al. (2008) and Beaver (2008), have supported this curvilinear effect, as well as previous reviews such as Raine’s (1993) archetypal review of the biological research up to the early 1990s.
      * Unfortunately, no conclusion can be made at this point about dopamine levels, 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.
    - Specifically, studies have consistently shown that low levels of serotonin are consistently linked with criminal offending.
    - **Serotonin**
      * Is important in virtually all information processing, whether it be learning, emotional processing, etc., thus, it is vital in more aspects of interactions with the environment.
* **Brain Injuries**
  + Studies have consistently shown that damage to any part of the brain increases the risk of crime by individuals in the future.
  + Trauma to certain portions of the brain tends to have more serious consequences than others.
    - Specifically, damage to the **frontal lobes** or **temporal lobes** (particularly those on the left side) appears to have the most consistent association with criminal offending.
* **Central and Autonomic Nervous System Activity**
  + Central Nervous System (CNS)
    - Largely consists of the brain and spinal column, which is largely responsible for what we as individuals chose to do, meaning our voluntary activities.
    - Studies have emphasized comparing brain wave patterns of known chronic offenders (i.e., psychopaths, repeat violent offenders) to those of “normal” persons (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 as compared to the normal population, with most studies showing slower brain wave patterns in psychopaths as compared to normals.
    - Four Types of Brain Waves (from slowest to fastest)
      * Delta
        + Often seen when people sleep.
      * Theta
        + Typically observed in times of lower levels of being awake, such as drowsiness.
      * Alpha
        + Divided into “slow alpha” and “fast alpha.”
        + Tend to be related to more relaxed wakefulness.
      * Beta
        + Divided into “slow beta” and “fast beta.”
        + Observed with high levels of wakefulness.
    - Psychopaths tend to have more activity in the theta (or sometimes “slow alpha”) patterns, whereas normals tend to show more activity in the “fast alpha” or beta types of waves.
    - It is likely that chronic offenders typically do not have the mental functioning that would be disposed toward accurate assessments regarding the consequences of committing criminal behavior.
  + Autonomic Nervous System
    - Primarily responsible for involuntary motor activities, such as heart rate, dilation of pupils, electric conductivity in the skin, etc.
    - This is the type of physiological activity that is measure by polygraph measures.
      * 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 though they are lying.
    - Studies have consistently shown that individuals who have a significantly low level of ANS functioning are far more likely to commit criminal acts.
    - Persons who have low levels of ANS arousal tend to experience “stimulus hunger.”
      * Stimulus hunger is a phenomenon meaning that certain individuals have such a low level of ANS arousal that they constantly seek out experiences and stimuli that are risky, and thus often illegal.
* **Biosocial Approaches Toward Explaining Criminal Behavior**
  + Perhaps, the most important, and most recent, perspective of how criminality is formed is that of biosocial approaches toward explaining crime.
  + Over the last decade, 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/genetic variables or environmental factors separately.
    - Findings from a cohort study in Philadelphia showed that individuals who had low birth weight when they were born were more likely to commit crime, but primarily if they were raised in a lower-income family or a family with weak social structure.
  + Studies have clearly shown that it is the interaction between biological factors with environmental deficiencies that have the most consistent effects on predicting criminality.
  + **Behavioral Genetics Studies**
    - These studies estimate heritability estimates based on percentages derived from the variance scores among identical versus fraternal twin pairs on a variety of characteristics and behaviors, which provide an approximate percentage of the influence in a given phenotype accounted for by genetic factors, shared environmental factors (i.e., the same across both wins in the pair, such as growing up in the same family), and nonshared environmental factors (i.e., accounting for different peer groups, significant events [e.g., employment, college education, arrests, etc.], and other nonshared environmental factors).
    - The meta-analyses of all the 80-plus studies of behavioral genetic studies regarding criminality or antisocial behaviors consistently show that heritability/genetic factors explain approximately 50% or half of the variance in antisocial behavior.
    - Heritability estimates appear to fluctuate over the life course, with such heritability estimates being very high during early childhood, relatively low during adolescence (during which time peer/environmental influences, and sometimes parents, are likely to have their greatest influence), and then the heritability influence experiences a rebirth, and becomes much stronger in adulthood.
    - It should also be noted that while the heritability estimates show approximately half of the variation in antisocial/criminality, environmental factors—such as peer, familial, or community influence—also explained approximately half of such variation across these many studies.
      * This finding goes a long way toward supporting a “nature via nurture” perspective, as opposed to a “nature versus nurture” model.
  + **Diet/Nutrition**
    - 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%).
    - Other studies have reported that various food additives and dyes can also have a significant impact on criminal behavior.
  + **Toxins**
    - High levels of certain toxins, particularly lead and manganese, can have a profound effect on behavior, including criminality.
    - Recent studies have found a consistent, strong effect on high levels of lead in predicting criminal behavior.
* **Policy Implications**
  + Maternal/infant health care, at all stages including pre-natal, post-natal, and first years of life.
    - There is no doubt that providing adequate health care for expecting mothers, as well as extended care for infants in their first year(s) of life, is the absolutely most cost-effective way that any society can address reducing future criminality among these infants.
* **Conclusion**

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| Theory | Key Proponents | Concepts/Factors | Key Propositions |
| Family Studies | Dugdale, Goddard, etc. | Criminality | Criminality runs in families. |
| Twin Studies | Various | Concordance for criminality | MZ twins have higher concordance than DZ twins. |
| Adoption Studies | Mednick & Colleagues and many others | Criminality among various adoptees | Adoptees with criminal biological parents more likely to be criminal, as compared to criminal adoptive parents. |
| MZ Twins Separated at Birth | Various | Concordance rates of MZ twins raised apart | Criminality among MZ twins reared apart is similar. |
| Cytogenetic Studies | Jacobs, and many others | Chromosomal mutations | XYY individuals have more criminality. |
| Hormonal Theory | Various | Testosterone, estrogen levels | Higher levels of testosterone and lower levels of estrogen predict criminality. |
| Neurotransmitters | Various | Dopamine, Serotonin, etc. | Low levels of serotonin predict more criminality, whereas findings for other neurotransmitters are mixed. |
| Brain Injury | Various | Various lobes and brain structures | Trauma to certain portions of the brain (e.g., frontal lobe) and structures (e.g., limbic structures) predict criminality. |
| Central Nervous System (CNS) Functioning | Various | Brain wave patterns | Slower brain wave patterns predict criminality. |
| Autonomic Nervous System (ANS) Functioning | Various | Heart rate, sweating, and other indicators | Lower ANS functioning predicts criminality. |
| Biosocial Interaction Theory | Various | A variety of both physiological and developmental factors | Weak physiological factors interact with weak social and environmental factors to predict criminality. |