The Neuroscience of Violence and the Moral Imperative for Treatment

A review of

The Anatomy of Violence: The Biological Roots of Crime

by Adrian Raine


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Reviewed by

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Many books describe and analyze violence using a case history approach. Although these works may thrill sensation-seeking readers, they fail miserably at improving our scientific understanding of violence and effective prevention efforts. The Anatomy of Violence: The Biological Roots of Crime is an exception. The author, Adrian Raine, is recognized as one of the premier researchers of the neuroscience of violence. The scientific rigor of his research is demonstrated by his many publications in the most respected journals in criminology, neuroscience, psychology, and psychiatry.

This book is far more than an exceptional review of the literature. Raine issues an impassioned call to action through a public health approach to violence prevention based on the growing scientific understanding of the brain. The book contains 11 chapters, starting with a theoretical chapter on the biological evolutionary theory of violence and antisocial
behavior. This is followed by eight chapters summarizing the most important research on the biological basis of violence. Finally, the last two chapters discuss the implications of our growing knowledge of the biology of violence for the courts and for treatment.

A smorgasbord of evidence-based violence prevention approaches is presented that have proven effectiveness and should be implemented immediately. Biofeedback in the form of a computerized Pac-Man game is one example. A case of a juvenile is presented who exhibited conduct disorder and was failing in school. After 30 biofeedback sessions, the chronic cortical brain-wave underarousal in this juvenile was changed to faster alpha and beta brain wave activity, with a corresponding improvement in school grades and responsible behavior.

A nurse practitioner home visitation program for troubled families is another recommended intervention. In a 15-year follow-up of a nurse home visitation program, there was a substantial reduction in arrests, convictions, alcohol use, and destruction of property in children of families exposed to this program, compared with controls. This positive outcome was especially prominent in impoverished families and those with single mothers (Olds et al., 1998).

Raine summarizes his own research of a program of environmental enhancement in preschools in which the focus of intervention was on nutrition, cognitive stimulation, and physical exercise (Raine, Mellingen, Liu, Venables, & Mednick, 2003). The children in the enriched environments showed a 61-percent increase in their cognitive ability to focus at the age of 11 when compared with controls. The increased ability to focus was related to faster cortical brain-wave activity. At age 17, the children in the enriched environments showed a 52.6-percent reduction of conduct disorder behavior compared with controls. Part of the efficacy of the enrichment was related to the increased consumption of fish by the children, which replicates other research on high omega-3 diets and reduction of violent crime in children and adult felons (Iribarren et al., 2004).

The recommendations of this book are based on the biology of violence; therefore, most of the interventions discussed by Raine are at the individual level. There is little or no discussion regarding gun control, for example.

Sometimes Raine’s recommended treatment approaches are controversial. The relationship between high testosterone levels and propensity for violence is the basis for his argument for physical castration as an effective treatment approach for persistent sexual offenders. One meta-analysis reviewed showed that the effects of castration on recidivism of sex offenders were stronger than those of other treatment approaches (Lösel & Schmucker, 2005).

Other treatment recommendations in reducing violence include the use of the newer generation of antipsychotics, stimulants, mood stabilizers, and antidepressants. Mindfulness training for violence-prone individuals in prisons is also recommended. In all of these interventions, research is reviewed that links the treatment to actual physical changes in the brain, which in turn lead to reduction of violence and antisocial behavior.
Raine becomes most provocative in arguing for combining a public health approach with what we know already about the brain and violence. He describes the need for “radical steps” (p. 329). Among these radical steps is a screening program to identify high violence-prone individuals that uses brain measurement techniques already available and others that will be developed. The interventions with these screened individuals range from counseling, medications, and actual removal from homes and placement in highly structured settings on the basis of brain scans of every man and possibly every woman 18 years of age and older.

Raine describes another futuristic program (to begin in 2040) in which all children 10 years old and older will be provided a comprehensive medical, psychological, social, and behavioral evaluation. Besides identifying dyslexia and learning disabilities and physical and mental health problems commonly associated with antisocial behavior, the screening would also focus on emotion regulation and violence potential. The program would have available intense residential treatment programs that would have the goal of reduction of violence by half.

The licensing of people to have children is another controversial idea. Such a program could be structured around an intensive classroom program provided in all schools that covers topics such as reproduction and prenatal nutrition, stress reduction, early needs of a developing baby, providing structure for a growing child, negotiation skills for teenagers, and the psychological problems of teens. For example, the students would be taught that shaking a baby can lead to the disconnection of white fibers in the brain connecting the prefrontal cortex with the limbic system. Passing these classes would be a condition of getting a license to have a child. If a woman has a child without passing this class and without a license, then sanctions would be applied, such as having the child removed and placed in a foster home until the woman passes a crash course. A DNA bank would be set up to track all fathers who have children but are not licensed.

Raine makes a fervent plea that we should use neurobiological markers of violence to aid in making important decisions such as who is released from prison, who should parent children, and who should be forced into treatment for violence potential. He states, “We must act . . . perilous though the ethics may be” (pp. 363–364). He contrasts and compares treatment and prevention of recidivistic violence to intervention and prevention of cancer. He argues that both are clinical conditions that call for active treatment.

Raine anticipates that many will reject these interventions because of an innate tendency to want to punish those who commit violent acts. He contends that this innate desire for retribution has an origin in biological evolution. It has been engrained in people to want to punish those who cheat and gain resources unlawfully and commit violent actions against others. Many people and the courts would argue that people freely choose to commit harm.

However, Raine cites Francis Crick (1994), the Nobel Prize winner for the discovery of the structure of DNA, who argued that free will is due to the large number of neural connections in the brain and that it would be possible to build a machine that would believe
that it has free will. Raine states that “free will is sadly an illusion” (p. 316). Belief in free will is described as a religious view of violence as evil versus his biosocial understanding of violence as a “clinical disorder” (p. 337).

Even though the author argues for aggressive intervention because of the suffering of others caused by violent individuals, many would object, including myself, that the infringement of individual rights by some of his futuristic recommendations would lead to even greater harm. The science is promising for better prediction, but the prediction accuracy is unlikely to ever be perfect, and the protection of individual rights, even when there is danger to others, has always been a valued principle in America.

Like all good scientists, Raine places his review in a theoretical context, and that context is biological evolution. He takes the perspective of Richard Dawkins (1976) and argues that people use violence and rape to ensure that their genes will be reproduced. “Many violent crimes may sound mindless, but they are informed by a primitive evolutionary logic” (p. 14). The purpose of violence is to gain status and resources toward the goal of reproduction. He uses anthropology and descriptions of cultures in Brazil and Africa to illustrate evolutionary development of psychopaths, whom he describes as individuals who cheat social norms to gain advantage in sexual reproduction.

However, most of the material in The Anatomy of Violence lays a foundation for Raine’s pleas for intervention based on the biology of violence. Genetic studies on violence and antisocial personality are reviewed, including his research. One remarkable study of the author’s was a genetic study of 1,210 sets of twins from Southern California. Astonishingly, 96 percent of antisocial behavior in children was found to be due to inheritance when multiple reliable measures of antisocial behavior were combined (Baker, Raine, Liu, & Jacobson, 2008).

Low resting heart rate is another biological marker of antisocial behavior (Raine, Venables, & Mednick, 1997). Boys with low resting heart rates are more antisocial than boys with high heart rates, and girls with low heart rates are more antisocial than girls with high resting heart rates. The sex differences in resting heart rate are presented by the author as a clue as to why men commit more crimes than do women. High levels of dopamine and low resting levels of serotonin are other biological predisposing factors.

The author’s references for support of his reviews are outstanding. His presentation of the importance of low resting heart rate is based on several long-term follow-up studies that take into consideration the possible interaction effects with the environment plus meta-analytic reviews. His genetic studies use comparisons of twins separated at birth in order to control for environmental effects. Nevertheless, human behavior is complex, and prediction is not perfect, and sometimes the author does not articulate the limitations of the science.

Raine’s description of his personal thinking about the rationale behind all of his research is exciting. A couple of the author’s research studies are my favorites. One study examined the brain scans of 41 convicted murderers and matched control subjects. His results demonstrated clear prefrontal cortex difficulties as well as poor functioning in the
limbic system control of emotions. The murderers had poorer functioning in the angular gyrus and abnormalities in the posterior cingulate, the amygdala, and the hippocampus, whereas others showed abnormal functioning in the superior temporal gyrus (Raine et al., 1998). He even compared a scan of his own brain with his 41 subjects to extract lessons from this research.

One of the most ingenious studies conducted by Raine and his colleagues was of a sample of individuals from a temporary employment agency. An astonishing 42.9 percent met the adult criteria for antisocial personality disorder. With full guarantee of confidentiality, 43 percent admitted to having committed rape, 29 percent had committed robbery, and 29 percent had either attempted or committed homicide. Over 30 percent had scores on the Hare Psychopathy Checklist indicating significant antisocial personality traits.

Using this sample, Raine explored differences in resting heart rate for successful versus unsuccessful psychopaths as well as differences in skin conductance. In addition, detailed anatomical magnetic resonance imaging was used to demonstrate clear differences between nonviolent and violent individuals in cortical and subcortical brain structures (Raine, Lencz, Bihrlle, LaCasse, & Colletti, 2000).

The persistent theme throughout this work is that for most offenders something has gone wrong with their brains early in life. Both genetics and environment can lead to bad brains and violence. Raine examines the research that supports the influence of a number of very important environmental factors contributing to violence, such as maternal rejection, being raised in an unstable home, birth complications, maternal smoking during pregnancy, fetal alcohol syndrome, malnutrition, sugar consumption, heavy metal exposure, and mental illness.

*The Anatomy of Violence* contains a lot of research review material. However, the author adds a very important chapter that integrates this research and makes palatable this amount of information. He describes the cognitive, affective, and motor variables that are linked to violence and links these factors to specific brain structures and their functions, and then links these functions to specific psychological and behavioral variables that are linked with violence. For example, specific areas of the hippocampus and amygdala are linked to impaired affect in individuals and, in particular, disregard for social rules and insensitivity to punishment. Also, one can have bad decision making at the cognitive level, callousness at the emotional level, and disinhibition at the behavioral level.

An interesting possibility raised by Raine is the role of epigenetics in violence (Tremblay, 2010). For example, a dysfunctional home can be a factor leading to violence in an individual and also in his or her offspring. He argues that protein malnutrition during pregnancy not only affects the mother’s child but the grandchildren as well because changes in gene structures arise and are passed on with their ill effects. This is a powerful argument that successful prevention of violence has a multiplying effect across generations and therefore warrants great effort.
There is much in this book that will challenge important societal beliefs, such as freedom of will and personal responsibility. It is very well written, including the author’s own life journey of discovery. Many clinical cases are used to make salient his conclusions. Both professionals and nonprofessionals can read this book because it is so well written. It is a book that is a must read for criminologists, psychologists, psychiatrists, social workers, legal professionals, and others who want to make a difference by reducing violence in our world. In conclusion, a major theme of this book is that we now know enough about the neuroscience of violence that we have a moral imperative to treat and intervene, just as we would have an equal obligation to act if we knew of an effective cure for cancer.

The reader gets the impression that this is a book that summarizes a lifetime of research by a great scientist. Even though the author makes an effort to integrate all the material that he presents, there is so much material in this book that many readers will be overwhelmed. A second critical point is that the author presents many studies and focuses on good methodology, but he does not articulate the limitations of many of these studies. For example, not everyone who has a low resting heart rate will have a history of antisocial or violent behavior. Finally, from the author’s perspective, protection of the many against violent individuals is very important, but to most readers, the protection of individual rights will perhaps be more important.

References


