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THE IMPLICATIONS OF NEUROSCIENCE AND POSITIVISTIC SCHOOL IN CRIMINAL JUSTICE

- **Fizza Assad[1] and Komal Gupta[2]**

ABSTRACT

This paper attempts to study how new discoveries in neuroscience fit with the basic principles of positivistic criminology to better explain crime patterns. Cesare Lombroso founded biological positivism which changed the way we study offenders by examining their biological traits alongside psychological behaviour and social factors. Neuroscience research with EEG and fMRI has helped scientists better understand brain connections to criminal behaviours along with brain injuries and genetic patterns. Behavioural changes in offenders result from combined use of neuroplasticity and neuroscience-based treatment programs for reduced repeat crimes. Our research combines methods from multiple disciplines to help us understand crime better and improve justice systems.

THE IMPLICATIONS OF NEUROSCIENCE AND POSITIVISTIC SCHOOL IN CRIMINAL JUSTICE

The area of criminology has attempted to undermine the complexities of the criminal behaviour, and tried to understand the origin and factors which are responsible for the crime in the society. Among the other theories of criminology, the interaction between the positivist school of criminology and neuroscience gives the essential backgrounds in conjecturing the biological and psychological aspects of the criminality. This school transpired in response to the pre-classical and classical school of criminology, as well as the idea of spiritual omnipotence and free will, as hypothetical and irrational. This school mounted a defining moment in the course of the development of the criminology as it moved from the offence to the offender, and the factors responsible for the criminal behaviour. Cesare Lombroso who is often regarded as father of modern criminology, in late 19th century, introduced the idea that criminal behaviour could be explained by biological factors, thus paving way laying for biological positivism. His research, based on observations in asylums and penitentiary, contested the classical theory of criminal responsibility attributing crime origin to choice and self-determination. His thoughts, even though

[1] Final Year Student at School of Legal Studies, Central University of Kashmir, Tullmulla Jammu &Kashmir.
[2] Final Year Student at School of Legal Studies, Central University of Kashmir, Tullmulla Jammu &Kashmir.

quite radical, became significant to change the perspective of analysing crime in relation to the development of the criminological theories that pointed out the fact that the essence of criminal behaviour is rooted in the anthropological coordination of the criminal and structure and performance of the brain, therefore linking criminality to biological, psychological and sociological factors.

In the recent decades, the development of neuroscientific inventions has changed the way in which criminal behaviour is conceptualized. A range of modern instruments including EEG, PET, fMRI and MEG have developed the possibility to observe the functioning of the brain, to identify structural and biochemical shifts relating to behaviour and mental state. These innovations have given new understanding of the facts of the neural activities affecting human behaviour; in other words, these theoretical innovations are scientifically grounded to support the notion of biological explanation of criminal behaviour. These recent advances of research have been called as the neuroscientific revolution as it poses significant threat to free will and consciousness and tries to realign them with the brain.

Following such advances at the same level of theoretical development, the question regarding whether criminality is an innate characteristic or affected by the surrounding environment is still open, however, an increasing number of criminologists are adopting the biosocial model. This perspective acknowledges that there are several avenues that a crime and criminal behaviour hence involving endowment factors, genetic, environmental and social factors. The biosocial perspective of criminology, grounded in biological positivism, posits that biology and sociology both plays effective role in inclination to criminality in an individual. Hence, in spite of substantial empirical evidence on the validity of this integrated model, conventional criminological theories have embraced these outcomes rather reluctantly.

This research seeks to analyse the impact of neuroscience as well as the positivistic school of criminology in analysing criminal conduct. It also explores the history of biological positivism, the relationship between genetics, neuroscience and criminology, as well as the realistic approach from this multiple discipline point of view, and its implications to crime control and criminal justice policy. Consequently, it is the aim of this paper to integrate perspectives of the above identified fields in order to provide a broader perspective when tackling the Continental issue of criminality within modern society.

HISTORICAL OVERVIEW OF BIOLOGICAL POSITIVISM

Biological positivism, which is also as the biological version of the predestined actor model of crime, has been started with criminologists including Lombroso, Ferri, and Garofalo, with a focus on scientific based research to explain criminality (Burke, 2014). Novel theories were based on physical appearances and genetic characteristics of criminals. Gradually, the approach developed including psychological and sociological positivism, focusing on mental conditions and social environments influencing the criminality of the offenders.

CRIMINAL ATAVISM

Lombroso's causation of crime was a product of hierarchical evolution post vivid influences from Darwinism claiming that criminals were less evolved than others and were atavistic organisms who possessed duties akin to the early generations of humanity and inferior animals (Lombroso, 1876, as cited in Taylor, Walton, & Young, 1973). There he said that he reached to this conclusion after studying the skull of an Italian brigand named Villella (Rafter, 2008). Lombroso observed that about 30% of criminals were "born criminals," evolutionary throwbacks who were predisposed to crime due to inherent biological traits. He proposed that moral insanity and epilepsy often tend to be present when this kind of criminality was involved. He categorized criminals into distinct types: The criminals of passion, who acted as a result of considerable provocation or, political motives and aims, such as political revolutionaries or individuals acting out of jealousy or betrayal (e.g., husbands killing unfaithful wives) (Gibson & Rafter, 2006); occasional criminals, who lacked inherent criminal traits but accumulate criminal tendencies as a consequence of social and situational causes; insane criminals, who were driven by low mental capacity, alcoholism, or excitable and hysterical nature; and criminaloids, physically possessing the traits which are associated with criminality and committed crimes to compensate for their inferiority or to meet survival needs. Thus, in his anthropological and biological researches, Lombroso aimed at the explanation of the interaction of criminals with the element of Darwin's biological determinism.

FERRI'S THEORY OF CRIMINALITY

Enrico Ferri expanded on Lombroso's biological theory by adding social, emotional and environmental elements to explain how criminals behave. In his *Law of Criminal Saturation*, Ferri proposed that crime is the result of three factors: physical (geographical), anthropological and psychological patterns affect criminal activities. He believed that quick social changes results in

social disintegration which then makes crime more likely to occur. Ferri classified criminals into five categories: born criminals, occasional, passionate, insane, and habitual criminals, and emphasised on addressing the root causes that are responsible for criminality. He used Lombroso's results as a base to study how natural traits connect with mindsets and personality features which impact criminal rates under many societal conditions including living density and family structures (Ferri 1896).

RAFFAELE GAROFALO: CRIME, MORALITY, AND PUNISHMENT

The field of early biological positivism received valuable input from Raffaele Garofalo although his perspective differed from Cesare Lombroso's by emphasizing less biological content. As he applied social Darwinism principles, Garofalo defined natural crimes through analogies between social systems and organic life while treating criminal acts as diseases. He supported isolating criminals as a way to stop the spread of their "disease" and suggested lifetime imprisonment or execution for those beyond treatment (Bohm & Vogel, 2011; Lilly et al., 2011). Garofalo emphasized that crime violated two moral sentiments: probity (related to property rights) and pity (related to suffering of other persons) where crimes against people arise from absent pity and crimes against property emerge from absent probity (Taylor et al., 1973). Garofalo discarded the idea of free will in crime and instead examined the effect of social surroundings on offenders while advocating extensive study of offender backgrounds. He classified criminals into four categories: Murderers at the core represent endemic criminals while the violent type follows religious or political rules. Other criminals choose property crimes and sex offenders fall into the lascivious category (Patuelli, 2010). The jurist Garofalo wanted death sentences or long terms in prison alongside forced exile for repeat offenders because they failed to integrate into society (Garofalo, 1914).

NEUROSCIENCE AND CRIMINOLOGY

Neuroscience is a term that refers to the study of the nervous system and includes varied fields that involve chemistry, computer science, medicine, mathematics, psychology, philosophy, and sociology. These fields have recently experienced rapid and astonishing advances, propelled by the rising number of scientists studying the nervous system with more advanced techniques. New brain imaging techniques EEG, MEG, PET, SPECT, and MRI/fMRI enables us to observe physical and chemical brain activity during mental processes and human behaviour. New brain

research advancements help us better understand how the brain controls most difficult actions. Through, these modern tools we can explore both how brain structures transform and how brain chemicals change when under stress. New brain research significantly changes how we think about human behaviours and human nature including our understanding of consciousness and personal freedom. Studies of neuroscience bring valuable brain information to science but trigger debates on ethical and philosophical and social matters (Edelman, 2004).

POSITIVISTIC APPROACH OF NEUROSCIENCE IN CRIMINAL RESPONSIBILITY

Understanding the crime and offender, primarily developed around the concept of accountability for the punishment and prevention of crime from the society, whose senses and purposes change as per the different underlying principles. The positivistic approach in criminology emphasizes that criminal behaviour is determined by factors beyond the individual's control, such as biological, psychological, and social influences. When integrated with neuroscience, this approach delves deeper into how brain structure, function, and anomalies impact criminal responsibility. The interplay between neuroscience and criminology has provided new sphere of understanding criminal behaviour, which often regarded as *neurolaw* seeks to understand the scientific insights about the brain in relation to the legal framework to address issue of free will, culpability, and prevention of crime.

Neuroscience researches have demonstrated that criminal behaviour may be linked to abnormalities in brain structure or function (Glenn et al., 2009, Yang and Raine, 2009), influenced by hormones and neurotransmitter levels (Glenn et al., 2009, Yang and Raine, 2009) environmental events or genetic influence (Carrier & Walby, 2014). This perspective offers a modern analysis for understanding criminal responsibility, while also sharing similarities to Cesare Lombroso's positivistic approach on physical abnormalities as indicators of criminality (Carrier & Walby, 2014). From positivistic approach, a valid explanation for criminality can be presented by neurological factors. The study of the brain has evolved from focusing solely on pathological aspects to understanding normal cognitive and behavioural processes, facilitated by advancements in neuroscience. The human brain is highly complex organ with four lobes performing distinct functions, frontal lobe determines the cognitive facility and controls emotions. Underneath the brain surface the limbic system runs memories emotions aggression and fear through amygdala and hippocampus.

Advance researches in neuroscience have established that injuries in the brain, mental disorders or morphological anomalies in the brain influences the criminality. Damage to the brain significantly changes how we think, feel emotions and interact with others. Injury to the pre-frontal cortex and orbito-frontal cortex brain areas results in judgment and impulse problems plus social interaction difficulties respectively. Through specific examples researchers study how Donta Page (PFC disruption led to aggression)[3], Charles Whitman (limbic injury produced violence)[4] and Phineas Gage (whose frontal loss transformed his personality)[5]. When people get help for brain tumours or damage their behaviour returns to normal.

Early pioneers like Angelo Mosso, who observed the relationship between brain activity and blood flow, and Paul Broca, who identified functional localization in the brain, laid the foundation for modern neuroscience (Sartori & Gnoato, 2010). This *neuroscientific revolution* has significant implications for criminology, particularly in assessing criminal responsibility, prevention, and sanctions. Neuroimaging techniques now offer objective data on pathological brain processes, surpassing traditional psychiatric evaluations **(**Sammicheli & Sartori, 2009). In Italy, courts have already used forensic neuroscience to assess mental capacity, such as recognizing genetic predispositions to impulsive behaviour in cases of violent crimes. Beyond forensic applications, neurolaw explores the neural basis of moral reasoning and applies neuroscientific research to predict and prevent criminal behaviour (Sammicheli & Sartori, 2009). In 2009 the Assize Court of

[3] The criminal court sentenced Donta Page to prison in 1999 because he murdered Peyton Tuthill in Denver USA. Brain scans taken afterward confirmed lower activity levels in his ventral prefrontal cortex. A combination of childhood adversity factors identified as inadequate nutrition and parental caretaker negligence and bodily trauma with sexual violence together with psychiatric heredity and maltreatment were presented as causes of impaired behavioural control. Page was granted life imprisonment rather than execution because doctors discovered corroboration for his brain disorder through medical tests.

[4] During 1966 the engineering student Charles Whitman from the University of Texas murdered sixteen people alongside his wife and mother. Tests performed after his death showed a growth located near his right amygdala that several scientists linked to brain dysfunctions affecting emotional and behavioural regulation.

[5] Throughout 1848 Phineas Gage survived an accident in which an iron rod perforated his skull and struck his left frontal lobe. After the trauma caused him frontal lobe brain damage which transformed his conduct to include inappropriate sexual acts toward his children and violent behaviour and inappropriate behaviours. Neuroscience and psychology researchers use his case to understand how damage to the brain transforms human conduct.

Appeal in Trieste accepted that partial mental impairment from genetic predisposition affected an Algerian murderer. In 2011 a court sentenced a woman who killed her sister and tried to kill her parents to 20 years in prison. A Como courthouse found its defendant had specific mental problems related to their brain's effect on controlling anger plus a genetic predisposition toward impulsive violence.

In People v. The Weinstein,[6] admitted he killed his wife yet faced a charge of second-degree murder. He used brain imaging tests to prove that his brain disorder prevented him from taking responsibility for his actions. Weinstein received permission to plead guilty to the charge of manslaughter while avoiding a second-degree murder conviction.

The offender in R v Lea-Caton[7] received a lighter 22-year sentence because his brain damage decreased his mental capacity during the kidnapping and murder of his co-perpetrators. The offender suffered brain injuries after a traffic accident that revealed his poor pressure handling and decision-making abilities during prosecution tests and scans alongside his sister's behavioural report. His mental health issues lessened his capacity to handle ongoing events hence decreasing the actual grave nature of this crime. This case demonstrates how neuroscience research supports psychological analysis and behavioural facts to shape sentencing outcomes.

The California Court of Appeal required a new suitability hearing for Andrew Dave Shelton in a case dated January 2020. This decision came after the 64-year-old began serving a life term in 1991 for murder. Shelton demonstrated in his appeal that the Board of Parole Hearings overlooked his mental conditions which included both brain trauma from military service and PTSD plus neurocognitive disorder. The board denied Shelton's parole in 2016 and 2018 because he offered unclear details about his crime and appeared to show limited understanding of his actions. The court mandated a fresh review because Shelton's brain damage hampers his understanding which fails to match board requirements.

Recent studies reveal that from 2005 through 2012 US courts mentioned neurological and genetic evidence in 1585 criminal case decisions across the nation (Farahany, 2016). During 2012 the US courts reviewed 250 instances where defendants pleaded neurobiological reasons behind their criminal conduct. Research during 2016 showed that neuroscientific and genetic evidence appeared

[6] People v. The Weinstein (1992)

[7] R v Lea-Caton [2007] NSWSC 1294

in 5% of all murder trials and 25% of all death penalty trials in 2012 (Farahany, 2016). Our review included 1585 judicial opinions and 15% featured detailed examination of neuroscientific evidence. The majority of criminal cases never reach trial because most defendants reach settlements or plead guilty. Fewer than half of prosecuted cases progress to appellate court and result in official opinions. These court opinions represent a limited group of actual cases and trials.

Neuroscientific evidence serves both as a defence to lower sentences and as evidence to strengthen them depending on which aspect is used in court (Jones, 2013; Shen, 2016). Neuroscience research typically helps defendants receive lighter penalties since it primarily demonstrates reduced culpability per Denno (2015). A review of 231 legal cases with neurological evidence showed that genetic information influenced sentencing in just 15 cases (Weisberg, Taylor, & Hopkins, 2015). Researchers face obstacles when trying to determine how well someone will behave in the future due to limited understanding within neuro-prediction science (Aharoni et al., 2013; Delfin et al., 2019). Lawyers can use neuroscientific proof with confidence to help clients earn lower sentences since judges are cautious about raising terms of imprisonment (Denno, 2015).

NEUROPLASTICITY AND REHABILITATION

Neural plasticity means the brain reshapes itself through experiences with learning and treatment methods. Within the positivist criminological framework rehabilitation takes precedence over punishment because it shows criminals can change their ways. Through scientific approaches such as therapy and neurofeedback plus medicine neuroscience shows how targeted activities use brain plasticity to teach better brain function. Brain training methods assist people in gaining improved self-control while managing aggression and treating specific mental processes linked to crime. Through neural plasticity research neuroscience demonstrates how science-based approaches help reform criminals and lower repeat offenses according to positive psychology. Neuroscience helps in determination of development of rehabilitation programs targeting cognitive functions.

CONCLUSION

Bringing neuroscience into positivistic criminology creates a new way to understand and treat criminal behaviour. Through this approach researchers study how biological systems interact with psychological pathways and environmental experiences to create criminal behaviour. Early positivist scientists like Lombroso, Ferri, and Garofalo built modern criminology which grows stronger through current brain scans and genetic studies.

Modern technology in neuroscience has transformed how criminal behaviour is understood while letting courts use neuroscientific test results to decide criminal responsibilities, appropriate penalties, and restoration plans. New discoveries about neuroplasticity show that science-based treatment methods can fix criminal behaviour better than punishment.

Despite ongoing ethical concerns and misuse risks this joint effort helps improve criminal justice operations. Policymakers and service providers who use scientific findings from biology and neuroscience create better ways to change criminal conduct in today's world.

REFERENCE

Allen, C. H., Vold, K., Felsen, G., Blumenthal-Barby, J. S., & Aharoni, E. (2019). Reconciling the opposing effects of neurobiological evidence on criminal sentencing judgments. *PLoS One, 14*(1), e0210584.

Bohm, R. M., & Vogel, B. L. (2011). *A primer on crime and delinquency theory.* Belmont, CA: Wadsworth.

Burke, R. (2014). *An introduction to criminological theory* (4th ed.). Abingdon, Oxon: Willa.

Carrier, N., & Walby, K. (2014). Ptolemizing Lombroso: The pseudo revolution of biosocial criminology. *Journal of Theoretical and Philosophical Criminology, 6*(1), 1–45.

Chakraborty, N. K., Upreti, P. N., & Mishra, A. (2011). Genetic and environmental influences on criminal behaviour. *Calcutta Law Times, 1,* 36.

C., Gibson, M., & Rafter, N. H. (2006). *Criminal man* (M. Seymour, Trans.). Duke University Press. https://doi.org/10.2307/j.ctv11vc7kd

Denno, D. W. (2015). The myth of the double-edged sword: An empirical study of neuroscience evidence in criminal cases. *Boston College Law Review, 56*(2), 493–551.

Edelman, G. M. (2004). *Wider than the sky: The phenomenal gift of consciousness.* New Haven, CT: Yale University Press.

Farahany, N. A. (2016). Neuroscience and behavioural genetics in US criminal law: An empirical analysis. *Journal of Law and the Biosciences, 2*(3), 485–509.

Ferri, E. (1896). *Criminal sociology* (W. D. Morrison, Ed.). D. Appleton & Co. https://doi.org/10.1177/000271629600800211

Garofalo, R. (1914). *Criminology.* Boston: Little, Brown and Company.

Glenn, A. L., & Raine, A. (2014). Neuro-criminology: Implications for the punishment, prediction, and prevention of criminal behaviour. *Nature Review Neuroscience, 15,* 54–63.

Jones, O. D. (2013). Seven ways neuroscience aids law. In A. M. Battro, S. Dehaene, M. S. Sorondo, & W. J. Singer (Eds.), *Neurosciences and the human person: New perspectives on human activities* (pp. 181–194).

Lilly, J. R., Cullen, F. T., & Ball, R. A. (2011). *Criminological theory: Context and consequences* (5th ed.). Thousand Oaks, CA: SAGE Publications.

Massaro, P. (2018). Neuroscience, criminology and the issue of the cause of criminal behaviour. *Criminology and Criminal Law Review, 2,* 19.

Nirmala, G. (2009). *Criminology* (p. 45). Justice and Legal System Research Institute.

Patuelli, F. (2010). Garofalo, Raffaele: Positivist School. In F. T. Cullen & P. Wilcox (Eds.), *Encyclopedia of criminological theory* (pp. 353–356). SAGE Publications, Inc. https://doi.org/10.4135/9781412959193.n97

Rafter, N. (2008). *The criminal brain: Understanding biological theories of crime.* New York University Press. https://www.nyupress.org

Rajadhyaksha, M. (2022). Condemned by birth: The implications of genetics for the theories of crime and punishment. *Volume 2, Issue 1,* 92.

Sammicheli, L., & Sartori, G. (2009). Neuroscienze giuridiche. I diversi livelli di interazione tra diritto e neuroscienze. In A. Bianchi, G. Gulotta, & G. Sartori (Eds.), *Manuale di scienze forensi.* Milano: Giuffrè.

Sartori, G., & Gnoato, F. (2010). Come quantificare il libero arbitrio. In M. De Caro, A. Lavazza, & G. Sartori (Eds.), *Siamo davvero liberi? Le neuroscienze e il mistero dellibero arbitrio.* Torino: Codice.

Shen, F. X. (2016). The overlooked history of neurolaw. *Fordham Law Review, 85*(2), 667–695.

Taylor, I. R., Walton, P., & Young, J. (1973). *The new criminology: For a social theory of deviance.* Routledge.

Walsh, C. (2011). Youth justice and neurosciences: A dual dilemma. *The British Journal of Criminology, 51*(23). https://www.jstor.org/stable/23640335

Weisberg, D. S., Taylor, J. C., & Hopkins, E. J. (2015). Deconstructing the seductive allure of neuroscience explanations. *Judgment and Decision Making, 10*(5), 429–441.

West, D. J. (1988). Psychological contributions to criminology. *The British Journal of Criminology, 28*(2), 77. https://www.jstor.org/stable/23637373

Zavatta, L. (2015). Neuroscience as revival on Lombroso's theories. *Journal of Law and Criminal Justice, 3*(1), 109. https://doi.org/10.15640/jlcj.v3n1a8