Journal of Law and Legal Reform
Vol. 7 Issue 4 (2026) 2135–2172
DOI: https://doi.org/10.15294/jllr.v7i4.19949
Online since: October 28, 2026

Journal of Law & Legal Reform
https://journal.unnes.ac.id/journals/jllr

Penal Neuroabolitionism: Advancing Legal Reform for a Fair Criminal System with Neuroscience

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Abstract

Penal Neuroabolitionism represents a radical approach that challenges traditional criminal law by emphasizing the significant influence of biological and environmental factors on human behavior. Rooted in neuroscience, this perspective argues that legal systems must be reformed to consider conditions such as brain disorders impacting individuals' decision-making processes. Penal Neuroabolitionism aspires to establish a more just and scientifically informed legal system by fostering collaboration between neuroscience and law. The primary objective of this study is to explore the potential of Penal Neuroabolitionism to reform criminal law by integrating insights from neuroscience. It aims to identify the challenges and opportunities associated

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with applying neurological evidence in courts, while proposing pathways for developing a legal framework that accurately reflects the complexities of human behavior. Using a normative legal method, this research employs conceptual, comparative, and futuristic approaches, supported by content analysis of legal texts, neuroscience studies, and relevant case studies. The study's descriptive and prescriptive analysis highlights practical challenges, such as the correct interpretation of neurological evidence in court, the need for robust neuroscience infrastructure, and the transformative opportunities it presents for legal reform. Findings indicate that while Penal Neuroabolitionism offers immense potential to reshape criminal law by incorporating neuroscience insights, its implementation requires multidisciplinary collaboration between legal and neuroscience professionals. This collaboration is essential to ensure that the integration of neuroscience into criminal law advances scientific understanding and promotes justice and fairness within the legal system.

Keywords

Penal Neuroabolitionism, Legal System, Neurosciences, Indonesia.

HOW TO CITE:

Chicago Manual of Style Footnote:

[1] Setiawan Noerdajasakti, Kiki Kristanto, Zico Junius Fernando, Panca Sarjana Putra, and Nabilaa Mohamed, "Penal Neuroabolitionism: Advancing Legal Reform for a Fair Criminal System with Neuroscience," *Journal of Law and Legal Reform* 7, no 4 (2026): 2135–2172, https://doi.org/10.15294/jllr.v7i4.19949.

Chicago Manual of Style for Reference:

Noerdajasakti, Setiawan, Kiki Kristanto, Zico Junius Fernando, Panca Sarjana Putra, and Nabilaa Mohamed. "Penal Neuroabolitionism: Advancing Legal Reform for a Fair Criminal System with Neuroscience." *Journal of Law and Legal Reform* 7, no 4 (2026): 2135–2172. https://doi.org/10.15294/jllr.v7i4.19949.

Introduction

Criminal justice has been a significant public and academic discussion topic for centuries. Over time, our understanding of law and punishment has evolved and changed significantly. In recent decades, humanity has seen a scientific and technological revolution that has affected almost all aspects of human life, including how to approach the criminal justice system. One that is developing is the field of neuroscience.[1] Neuroscience has advanced greatly in the last few decades, providing increasingly deep insights into how the human brain works and how it influences behavior.[2]

Within the legal context, these developments have opened up opportunities for a new approach known as penal neuroabolitionism. Penal neuroabolitionism is an approach that seeks to integrate human understanding of neuroscience into the criminal justice system. This approach assumes that criminal behavior can be better understood by paying attention to neurological and biological factors, not just looking at the individual's social and environmental context. This concept views various neurological conditions or brain disorders as influencing criminal behavior. For example, conditions such as attention-deficit hyperactivity disorder (ADHD), schizophrenia, or traumatic brain damage can affect a person's impulse control and moral judgments, increasing the risk of criminal behavior. According to penal neuroabolitionism, this understanding should impact how humans judge and punish individuals in the criminal justice system. Instead of punishing individuals for their actions, the legal system should consider any neurological or biological conditions that may influence their behavior.

In this context, a new approach called Penal Neuroabolitionism has emerged, which argues that a new understanding of Neuroscience

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1 Allan McCay and Jeanette Kennett, "Neuroscience and Punishment: From Theory to Practice," *Neuroethics* 14, no. 3 (December 2021): 1–14, https://doi.org/10.1007/S12152-018-09394-0/METRICS.

2 G. M. Gkotsi, V. Moulin, and J. Gasser, "Neuroscience in the Courtroom: From Responsibility to Dangerousness, Ethical Issues Raised by the New French Law," *L'Encephale* 41, no. 5 (October 2015): 385, https://doi.org/10.1016/J.ENCEP.2014.08.014.

must be used to reform the criminal justice system.[3] Penal neuroabolitionism is a school of thought that suggests that much criminal behavior can be explained through a neurological understanding. This approach looks towards a criminal law system that is more oriented towards understanding, prevention, and rehabilitation, not retribution. Proponents of penal neuroabolitionism argue that by understanding the biological and neurological sources of criminal behavior, humans can seek new ways to prevent crime and aid in rehabilitating those who engage in criminal behavior.[4]

However, although penal neuroabolitionism offers an exciting and potentially revolutionary view of the criminal justice system, many challenges and questions remain unanswered. For example, how should this neurological understanding be applied to legal practice? What is the impact on human rights and social justice? Moreover, how can humans ensure that these approaches are not abused or used to discriminate? To answer these questions, humanity needs to learn more about penal neuroabolitionism and how it can be applied in the context of criminal law. This research aims to dig deeper into the concept of penal neuroabolitionism.

Historically, criminal law has focused on retribution, the idea that those who commit crimes should be punished as a form of retribution for their actions. Although criminal law in Indonesia has slowly shifted from focusing on retributive to restorative justice, a retributive approach still exists and is applied in the criminal justice system.[5] The retributive approach has been criticized for not considering the underlying causes of criminal behavior. Penal neuroabolitionism offers an alternative to this approach. This school of thought argues that by understanding the neurological and biological causes of criminal behavior, humans can seek

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[3] Diego Borbón and Luisa Borbón, "A Critical Perspective on NeuroRights: Comments Regarding Ethics and Law," *Frontiers in Human Neuroscience* 15 (2021): 1–4, https://doi.org/10.3389/FNHUM.2021.703121/BIBTEX.

[4] Diego Borbón, "Neurosociology and Penal Neuroabolitionism: Rethinking Justice With Neuroscience," *Frontiers in Sociology* 7, no. January (2022): 1–5, https://doi.org/10.3389/fsoc.2022.814338.

[5] Brilian Capera, "Keadilan Restoratif Sebagai Paradigma Pemidanaan Di Indonesia," *Jurnal Lex Renaissance* 6, no. 2 (2021): 225–34, https://doi.org/10.20885/jlr.vol6.iss2.art1.

new ways to prevent crime and aid in rehabilitating those who have committed crimes.

The concept of penal neuroabolitionism is rooted in recent developments in neuroscience. In the last few decades, researchers have significantly advanced in understanding how the brain works and how specific neurological and biological processes can influence human behavior. Studies have shown that factors such as brain damage, mental disorders, and substance abuse can significantly impact an individual's ability to make decisions and control human behavior.[6] In this context, penal neuroabolitionism argues that criminal punishment should not focus on retaliation but on understanding and rehabilitation. However, while this neurological understanding offers a potentially revolutionary view of the criminal justice system, many challenges and questions still need to be answered.[7]

For example, how can humans apply this understanding in legal practice, especially law in Indonesia? What is the impact on human rights and social justice? Moreover, how can humans ensure that this approach is not abused or used to discriminate? Learning more about penal neuroabolitionism and how humans can apply it to the criminal justice system is necessary to answer these questions. In this research, we will dig deeper into penal neuroabolitionism and how new understandings of neuroscience can be used to reform the criminal justice system and build a more just justice system. This research is fundamental because it covers various aspects of people's lives, including law, ethics, neuroscience, and social justice.

Juridically, the urgency of this research lies in the need for criminal law reform that responds to the advancement of scientific knowledge, including neuroscience, in understanding criminal behaviour.[8] While

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[6] Diego Borbón, "Humanistic Incompatibilism: A Counterproposal of Penal Neuroabolitionism," *Cuadernos Electronicos de Filosofia Del Derecho* 45, no. 45 (2021): 46–72, https://doi.org/10.7203/CEFD.45.20713.

[7] Gerben Meynen, "Neurolaw: Neuroscience, Ethics, and Law. Review Essay," *Ethical Theory and Moral Practice* 17, no. 4 (2014): 819–29, https://doi.org/10.1007/s10677-014-9501-4.

[8] Indah Sri Utari, Ridwan Arifin, and Ahmad Zaharuddin Sani Ahmad Sabri, "Why Did a Five-Year-Old Toddler Become a Victim of Murder? A Criminological and

approaches such as restorative justice and the protection of individuals with mental disorders have begun to gain recognition, neuroscience-based perspectives have not yet been explicitly accommodated within the criminal justice system. This calls for a normative exploration of how the principles of penal neuroabolitionism can be integrated into the national legal framework. Moreover, the principles of non-discriminatory treatment and the right to a fair trial, as guaranteed by Article 28D of the 1945 Constitution, emphasize the importance of a legal system that holistically considers an individual's condition, including neurological aspects. Philosophically, this approach encourages a redefinition of the foundational principles of criminal law, particularly moral responsibility and free will. Penal neuroabolitionism challenges the assumption that all offenders act with the same level of autonomy and questions the validity of purely retributive punishment. It aligns with modern legal philosophy, emphasizing human dignity, empathy, and rehabilitation as moral foundations for criminal justice policy. Sociologically, penal neuroabolitionism responds to the need for a more inclusive and adaptive legal system that reflects the complexity of social realities. Many offenders come from marginalized groups, have experienced childhood trauma, or live under adverse psychosocial conditions that affect their neurological functioning. Thus, this approach is relevant in reducing over-criminalization, lowering prison populations, and strengthening rehabilitative policies focused on social reintegration. Amid ongoing justice crises and high recidivism rates, penal neuroabolitionism offers a more humane and socially sustainable alternative.

Several previous studies have laid a solid foundation for the emergence of penal neuroabolitionism as a new paradigm in criminal justice. Diego Borbón (2021) introduced the concept of penal neuroabolitionism as a critique of traditional punitive systems, emphasizing the influence of neurobiological factors on behavior and challenging the legitimacy of retributive punishment.[9] Building on this, Borbón and Luisa Borbón (2021) explored the intersection between

Legal Perspective," *Indonesian Journal of Criminal Law Studies* 8, no. 2 (2023), https://doi.org/10.15294/ijcls.v8i2.48591.

[9] Borbón, "Neurosociology and Penal Neuroabolitionism: Rethinking Justice With Neuroscience."

neuroethics and human rights, advocating for legal reforms grounded in neuroscientific understanding to uphold dignity and justice.[10] In a more clinical context, Bellesi et al. (2019) conducted a systematic review demonstrating a strong correlation between pediatric traumatic brain injuries and antisocial behavior, strengthening the argument for biological influences on criminal tendencies.[11] Nita Farahany (2020) highlighted the importance of establishing "neuro-rights" and fostering interdisciplinary collaboration to ensure the ethical use of neuroscience in legal systems. More recently, José Manuel Díaz-Soto and Diego Borbón (2024) analyzed how structural injustice and marginality shape criminal responsibility, proposing an integrated approach between neurolaw and normative theory to advance a more equitable justice system.[12]

While these studies have made important strides in linking neuroscience to the law, there remains a gap in exploring how penal neuroabolitionism can be systematically developed within the context of developing countries, particularly in Indonesia, where punitive approaches still dominate legal culture, and neuroscientific frameworks are scarcely considered in criminal proceedings.[13] This study distinguishes itself by offering a comprehensive, interdisciplinary exploration of penal neuroabolitionism that combines legal theory, neuroscientific evidence, philosophical reasoning, and sociological critique. Unlike previous works focusing primarily on Western jurisdictions or theoretical reflections, this research provides a normative and contextual framework for integrating neuroscience into Indonesian

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[10] Borbón and Borbón, "A Critical Perspective on NeuroRights: Comments Regarding Ethics and Law."

[11] Giulia Bellesi et al., "Pediatric Traumatic Brain Injury and Antisocial Behavior: Are They Linked? A Systematic Review," *Brain Injury* 33, no. 10 (2019): 1272–92, https://doi.org/10.1080/02699052.2019.1641621.

[12] José Manuel Díaz-Soto and Diego Borbón, "Structural Injustice, Marginality, and Neurolaw: A Normative Comparative and Theoretical Approach," *Frontiers in Sociology* 9 (September 2024): 1–8, https://doi.org/10.3389/FSOC.2024.1403914/BIBTEX.

[13] Pidari Sinaga et al, "Neuroscience and Islamic Law: Contemporary Perspectives," *Pakistan Journal of Criminology* 16, no. 3 (May 2024): 729–46, https://doi.org/10.62271/PJC.16.3.729.746.

criminal law reform, addressing the unique cultural, infrastructural, and legal challenges.[14]

The urgency of this study lies in its potential to contribute to a more humane, rehabilitative, and scientifically grounded criminal justice system. As the world faces increasing calls for legal systems prioritizing fairness, rehabilitation, and the protection of vulnerable individuals, penal neuroabolitionism offers a compelling path forward.[15] This research aims to critique the limitations of retributive justice and propose an alternative vision that aligns with both neuroscientific understanding and human rights principles. In doing so, it seeks to foster a paradigm shift in understanding criminal behaviour and how justice should be delivered in the modern age.

The study entitled "Penal Neuroabolitionism: Building a Fairer Criminal Law System Using Neuroscience" used normative or literary law research methods.[16] This normative legal research focuses on legal norms and principles governing human behavior, using legal materials and literature as the primary sources.[17] This research involves an in-depth study of literature or secondary data.[18] This secondary data includes primary legal materials, such as regulations and court decisions; secondary legal materials, such as academic literature and legal commentaries; and tertiary legal materials, such as legal dictionaries and encyclopedias. To find answers and solutions to existing problems,

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[14] Zico Junius Fernando et al., "Neurolaw: A Concept in Development and Enforcement of Criminal Law in Indonesia," *Jambura Law Review* 7, no. 1 (December 2025): 55–87, https://doi.org/10.33756/JLR.V7I1.24144.

[15] Indah Sri Utari et al., "Rethinking Filicide through Freudian Psychoanalysis: A Comparative Perspective on Indonesian and Spanish Criminal Cases," *Jurnal IUS Kajian Hukum Dan Keadilan* 14, no. 2 (2026): 587–620, https://doi.org/10.29303/ius.v14i2.1997.

[16] Kiki Kristanto et al., "The Convergence of Drug Trafficking and Terrorism: Uncovering the Dynamics of Narco-Terrorism," *Yustisia* 13, no. 3 (2024): 261–82, https://doi.org/10.20961/yustisia.v13i3.81599.

[17] Erdianto Effendi et al., "Trading in Influence (Indonesia): A Critical Study," *Cogent Social Sciences* 9, no. 1 (December 2023): 1–13, https://doi.org/10.1080/23311886.2023.2231621.

[18] Akhmad Akhmad, Zico Junius Fernando, and Papontee Teeraphan, "Unmasking Illicit Enrichment: A Comparative Analysis of Wealth Acquisition Under Indonesian, Thailand and Islamic Law," *Journal of Indonesian Legal Studies* 8, no. 2 (2023): 899–934, https://doi.org/10.15294/jils.v8i2.69332.

researchers use various approaches. A comparative approach is used to compare and understand how the concepts and principles of penal neuroabolitionism are applied in different jurisdictions. A conceptual approach is used to develop and explain the concepts and theories underlying penal neuroabolitionism.[19] Finally, this research has a descriptive-prescriptive nature.[20] This means that this research describes and analyzes existing phenomena and tries to provide recommendations or legal solutions to the issues at hand. The collected data is then analyzed using the content analysis method, or content analysis. Through this method, researchers analyze and interpret the contents of the collected library materials. This involves identifying the main themes or patterns, coding the text, and inferring and making findings based on the data.

A. A Neurological and Biological Understanding of Criminal Behavior Can be Integrated into the Criminal Law System

A neurological and biological understanding of criminal behavior does offer great potential for reform in the criminal justice system.[21] By knowing more about brain function and biology, people can better understand what causes someone to commit a crime. This knowledge can assist in formulating more effective prevention and intervention strategies.[22] Neurological evidence can be used in Court to help

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[19] Zico Junius Fernando et al, "Preventing Bribery in the Private Sector Through Legal Reform Based on Pancasila," *Cogent Social Sciences* 8, no. 1 (2022): 1–14, https://doi.org/10.1080/23311886.2022.2138906.

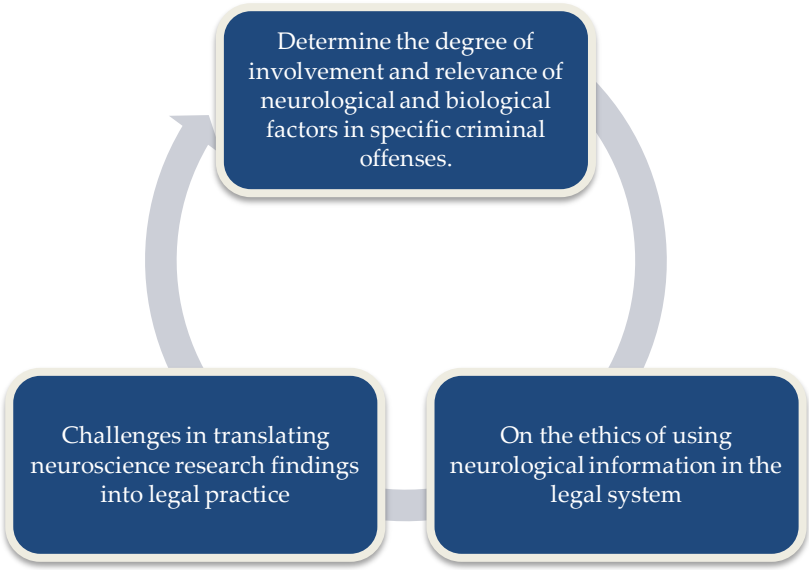
[20] Ria Anggraeni Utami & Zico Junius Fernando Agusalim, "Green Victimology: Sebuah Konsep Perlindungan Korban Dan Penegakan Hukum Lingkungan Di Indonesia," *Bina Hukum Lingkungan* 7, no. 1 (October 2022): 60–79, https://doi.org/10.24970/BHL.V7I1.302.

[21] Anthony Walsh and Huei-Hsia Wu, "Differentiating Antisocial Personality Disorder, Psychopathy, and Sociopathy: Evolutionary, Genetic, Neurological, and Sociological Considerations," *Criminal Justice Studies* 21, no. 2 (June 2008): 135–52, https://doi.org/10.1080/14786010802159814.

[22] Joyce H L Lui et al., "Effects of Genetic and Environmental Explanations of Psychopathy and Gender on Perceptions of Criminal Behaviors," *The Journal of Forensic Psychiatry & Psychology* 30, no. 3 (May 2019): 467–83, https://doi.org/10.1080/14789949.2019.1570542.

determine a person's level of responsibility for their actions. For example, if someone has brain damage or a mental disorder that could affect their ability to distinguish right and wrong, this could influence their judgment and punishment.[23] By understanding that much criminal behavior may be caused by factors beyond an individual's control, such as brain damage, mental illness, or environmental influences, humans may be more inclined towards legal systems that focus on rehabilitation and treatment, not punishment. A better understanding of the neurobiology of criminal behavior can assist in formulating more effective and equitable public policies and legal practices. However, integrating this understanding into the legal system is complex. There are several factors to consider.

Figure 1. Basic Questions About the Integration of Neuroscience in The Criminal Justice System



Source: Authors' Analysis.

[23] Priscilla Savopoulos and Annukka K Lindell, "Born Criminal? Differences in Structural, Functional and Behavioural Lateralization Between Criminals and Noncriminals," *Laterality* 23, no. 6 (November 2018): 738–60, https://doi.org/10.1080/1357650X.2018.1432631.

First is determining the level of involvement and relevance of neurological and biological factors in a particular crime. Much criminal behavior involves many contributing factors, including social, environmental, and psychological conditions. While a neurological understanding may provide essential insights into the individual factors that drive criminal behavior, the challenge is understanding how these factors interact with other factors and influence individual behavior in a broader context.

Second, translating neuroscience research findings into legal practice presents challenges. Although neuroscience has provided many new insights into human behavior, much debate exists about how these findings should be interpreted and applied. For example, how should evidence about brain damage or mental disorders be interpreted in a legal context? How should this evidence influence judgments about liability and punishment? These are questions that are still being debated among researchers and legal practitioners around the world.[24]

Third, ethical questions exist about how to use neurological information in the legal system. For example, how to ensure that this information is not used to discriminate against or stigmatize specific individuals? How to protect privacy and human rights while using increasingly sophisticated neuroscience technology? These questions must be answered to ensure a neuroscience-based approach to criminal law is genuinely just and rehabilitation-oriented.

Although the neurological and biological understanding of criminal behavior offers many opportunities for criminal law reform, it is important to look critically at the existing challenges and develop a balanced and ethical approach. Neurology and behavioral biology have provided new knowledge to help understand criminal behavior and how it might be integrated into the criminal justice system. In recent years, developments in neuroscience have provided new insights into brain function and how it influences human behavior, including criminal behavior.[25]

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[24] Indra Ardiansyah et al., "Taking Restitution Seriously?: Victim-Oriented Gaps in the Criminal Justice System," *IJCLS (Indonesian Journal of Criminal Law Studies)* 10, no. 1 (2025), https://doi.org/10.15294/ijcls.v10i1.19636.

[25] Julia Marshall et al., "The Role of Neurological and Psychological Explanations in Legal Judgments of Psychopathic Wrongdoers," *The Journal of Forensic Psychiatry*

Neuroscience, or the nervous system, plays a vital role in many fields, including law.[26] The use of neuroscience in law often relates to knowledge of how the human brain works, how it influences human behavior, and the ability to make decisions. Neuroscience can assist in determining punishment. By understanding how the offender's brain works, the legal system can make more informed and fair decisions about appropriate sentences.[27]

For example, if someone has a brain disorder that affects their ability to make decisions or control their behavior, this may need to be considered when determining punishment. In addition, neuroscience can also help in proof. Lawyers and judges can use neuroscientific evidence to support or refute claims about certain mental conditions, such as post-traumatic stress disorder or amnesia.

A better understanding of the brain can assist in determining whether a person is capable of discerning the difference between right and wrong at the time of an incident or whether they have the mental capacity to stand in Court. Neuroscience also has the potential to change the way we understand legal liability. If neuroscience can show that criminal behavior is controlled by factors beyond a person's control (for example, genetic predisposition or brain injury), this could influence how we understand the concepts of "wrongdoing" and "liability" in law.

Neuroscience also has the potential to change the way we understand legal liability. If neuroscience can show that criminal behavior is controlled by factors beyond a person's control (for example, genetic predisposition or brain injury), this could influence how we understand the concepts of "wrongdoing" and "liability" in law. Neuroscience also has the potential to change the way we understand legal liability. If neuroscience can show that criminal behavior is controlled by factors beyond a person's control (for example, genetic

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& Psychology 28, no. 3 (May 2017): 412–36, https://doi.org/10.1080/14789949.2017.1291706.

[26] Shane S. Bush and Chriscelyn M. Tussey, "Neuroscience and Neurolaw," *Psychological Injury and Law* 6, no. 1 (2013): 1–2, https://doi.org/10.1007/s12207-013-9144-0.

[27] Armin Alimardani, "An Empirical Study of the Use of Neuroscience in Sentencing in New South Wales, Australia," *Frontiers in Psychology* 14 (August 2023): 1–7, https://doi.org/10.3389/FPSYG.2023.1228354/BIBTEX.

predisposition or brain injury), this could influence how we understand the concepts of "wrongdoing" and "liability" in law.

Neuroscience has come a long way in the last few decades. The following are some of the latest developments in the field of neuroscience:

a. Neuroimaging
   Techniques such as fMRI (functional magnetic resonance imaging) and PET (positron emission tomography) have allowed scientists to see the human brain at work in real time.[28] In recent years, neuroimaging techniques have become increasingly sophisticated and detailed, enabling researchers to understand better how different brain parts interact and work together to process information.
b. Neuroplasticity Research
   In the past, scientists believed the human brain stopped developing after childhood. However, recent studies have shown that the human brain can change and develop throughout life, a concept known as neuroplasticity.[29]
c. Neurogenetics
   Genetic research has allowed us to better understand how human genes influence brain structure and function.[30] This has paved the way for more in-depth research into how genetic disorders can affect brain health.
d. Brain-based therapy
   A new understanding of the brain has helped develop new therapies for neurological and psychological disorders, such as deep brain stimulation therapy for Parkinson's and gene therapy for neurological disorders.

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[28] Saxby Pridmore, Amber Chambers, and Milford Mcarthur, "Neuroimaging in Psychopathy," *Australian and New Zealand Journal of Psychiatry* 39, no. 10 (January 2005): 856–65, https://doi.org/10.1080/j.1440-1614.2005.01679.x.

[29] Bruce D Gynther, Mike B Calford, and Pankaj Sah, "Neuroplasticity and Psychiatry," *Australian and New Zealand Journal of Psychiatry* 32, no. 1 (January 1998): 119–28, https://doi.org/10.3109/00048679809062718.

[30] Chun-Fang Wu and Mani Ramaswami, "Editorial: The Origins Of Neurogenetics," *Journal of Neurogenetics* 21, no. 4 (January 2007): 165–67, https://doi.org/10.1080/01677060701686119.

e. AI and Neuroscience

With developments in artificial intelligence and machine learning, new models of the brain have been created that can deepen our understanding of how the brain works.[31]

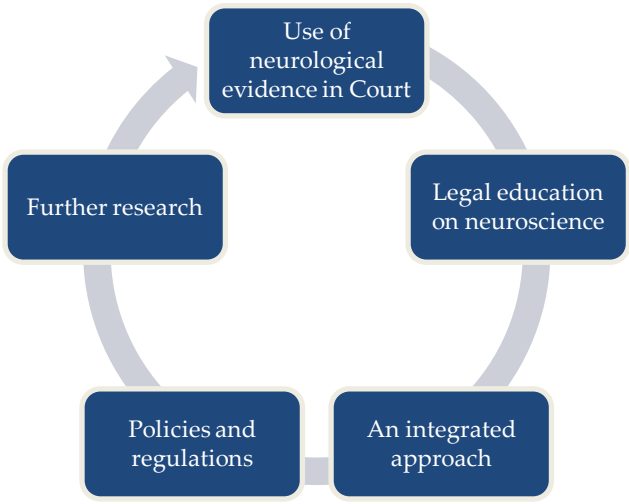
Ethical and social questions are also increasingly urgent in this era of rapid neuroscientific progress. Like any other technology, neuroscience developments can profoundly impact society, requiring careful ethical review and understanding. One of the ethical questions that arises is about the privacy of the mind. With the increased ability to monitor and analyze brain activity, the extent to which humans can protect their minds and thoughts from surveillance is becoming increasingly relevant.

Privacy of thoughts is a fundamental right that must be protected, but how humans do it in the context of increasingly sophisticated neuroscientific technologies such as neuroimaging is still a subject of discussion. In addition, there are also questions about human rights. Technologies that modify or enhance brain function, such as deep brain stimulation or gene therapy, can bring great potential benefits but also pose risks of abuse. Ensuring these technologies are appropriately regulated to protect human rights is essential.

Integrating neurological and biological understanding into the criminal justice system requires a balanced and careful approach. Some possible ways to achieve this might include:

[31] Robert Monsour et al., "Neuroimaging in the Era of Artificial Intelligence: Current Applications," *Federal Practitioner* 39, no. 1 (April 2022): 14–20, https://doi.org/10.12788/FP.0231.

Figure 2. Ways of Integration of Neuroscience in the Criminal Justice System



Source: Authors' Analysis.

a. Use of neurological evidence in Trials
   Neurological evidence, such as brain imaging or a diagnosis of a neurological condition, may be used in court proceedings to provide context or explain certain behaviors. For example, if someone is diagnosed with a neurological condition that affects impulsivity or self-control, this can be used to help explain why they might commit a crime. However, it is essential to remember that this kind of evidence should be used cautiously and not as an absolute excuse for behavior.
b. Legal education on neuroscience
   Judges, lawyers, and other legal professionals must understand neuroscience and how it can influence behavior. This will allow them to make more informed decisions about how and when to use neurological evidence.
c. Integrated Approach
   Because many factors can influence criminal behavior, it is essential to take an integrated approach that considers neurological, biological factors, along with social, environmental, and psychological factors. This means working

collaboratively and drawing on knowledge from various fields, including sociology, psychology, and neuroscience.

d. Policies and regulations
   Clear policies and regulations are needed to use neurological and biological understanding in the legal system to be applied fairly and ethically. For example, there may be a need for rules on how neurological evidence can be used in Court or guidance on how neurological and biological knowledge can be used in sentencing and rehabilitation decisions.
e. Advanced research
   Further research is needed to continue to utilize neurological and biological understanding in the criminal justice system. This should include research into how neurological and biological factors interact with other factors to influence behavior and how this knowledge can be used most effectively and ethically within the legal system.

Furthermore, by understanding the mechanisms of the human brain and behavior in greater detail, humans can embrace more effective rehabilitation and crime prevention concepts instead of just imposing punishment. A deeper understanding of the mechanics of the brain and human behavior can pave the way for more effective approaches to rehabilitation and crime prevention. Previously, the main focus of the justice system was often on punishment and retribution. Still, with new understandings of the brain, humans can move towards a more preventative and restorative model.

Neuroscience research has changed how we understand the brain's ability to learn and change. This gives hope that, with appropriate interventions, individuals involved in criminal behavior can learn to change their behavior. Rehabilitation programs can be designed to help them develop new skills, improve their ability to control impulses, and understand the consequences of their actions.

Furthermore, by better understanding how genetics, environment, and mental health influence behavior, humans can be more proactive in preventing crime. This can involve everything from early intervention for at-risk children to better mental health strategies for adults. Moreover, mental health affects behavior; humans can be more proactive in preventing crime. This can involve everything from early intervention for

at-risk children to better mental health strategies for adults. Moreover, mental health affects behavior; humans can be more proactive in preventing crime. This can involve everything from early intervention for at-risk children to better mental health strategies for adults.

Neuroscience can make essential contributions in a variety of fields, which go beyond human understanding of the brain and nervous system, such as:

a. Contribution to law
   Integrating neuroscience into the legal system could provide a more appropriate and rehabilitation-oriented framework. For example, neurological evidence of a brain disorder or mental condition can influence how a defendant is prosecuted and convicted. Furthermore, the legal system can move from an understanding that focuses on punishment to one that focuses more on the understanding, rehabilitation, and reintegration of the accused into society.
b. Contribution to Ethics
   By understanding the relationship between brain function and behavior, we can better understand ethical concepts such as free will, responsibility, and morality. This can lead to a more equitable and compassionate approach to people with mental or cerebral disorders.
c. Contributions to neuroscience
   This research may also help advance neuroscience itself. By applying this understanding in practical contexts such as criminal law, one can better understand how neuroscientific theory is applied and how neuroscience findings affect society.
d. Contribution to social justice
   Finally, a deeper understanding of the relationship between neuroscience and behavior can help promote social justice. For example, if neuroscience findings show that factors such as poverty, trauma, or discrimination contribute to criminal behavior, this could lead to social and legal reforms to address these problems.

B. Neuroscience for Better Justice: A View of Penal Neuroabolitionism

Neuroscience, or the study of the nervous system, has advanced rapidly in recent decades, thanks to advances in technology such as brain imaging and an increased understanding of genetics. The following are some examples of essential developments in neuroscience and how they have been applied in areas such as medicine and mental health; developments in neuroscience have led to an increased understanding of various medical and mental conditions, such as schizophrenia, autism, and Alzheimer's.

For example, neuroscience research has helped better understand how brain structure and function changes may contribute to these conditions. This, in turn, has helped develop new therapies and drugs. The field of education, neuroscience, has helped inform new approaches to education; for example, research into how the brain learns and processes information has been used to develop more effective teaching techniques and curricula. For example, the concept of the "growth mindset," developed by Carol Dweck, is based on understanding how the brain can develop and change throughout human life.[32] In neuroscience, technology has also contributed to the development of new technologies, such as the brain-computer interface. By understanding how the brain sends and receives information, researchers have developed technology that can read signals from the brain and use them to control computers or prosthetic devices.

In economics and marketing, neuroscience has also been used in "neuroeconomics" and "neuromarketing," which use understanding of the brain to help understand consumer behavior. For example, technologies such as functional MRI could be used to see how people's brains react to certain advertisements or products. In the field of law and criminology, as discussed, Neurological knowledge can provide new insights into criminal behavior and how it might be integrated into the

[32] Eleanore Hargreaves, Laura Quick, and Denise Buchanan, "Systemic Threats to the Growth Mindset: Classroom Experiences of Agency Among Children Designated as 'Lower-Attaining,'" *Cambridge Journal of Education* 51, no. 3 (May 2021): 283–99, https://doi.org/10.1080/0305764X.2020.1829547.

criminal law system. Examples of things that develop in the field of neuroscience include:

a. Brain Imaging
   Techniques such as fMRI and PET can provide evidence about brain conditions or patterns of brain activity in court proceedings.[33] For example, brain imaging might be used to prove that someone has brain damage that could affect their behavior or to show differences in brain activity between criminals and noncriminals.
b. Forensic Neuropsychology
   Neuropsychology is a branch of psychology that focuses on the relationship between the brain and behaviour.[34] In a forensic context, this can include assessing neurological or psychiatric conditions that may affect criminal behaviour or a person's ability to stand before a court of law.
c. Lie Detector
   Several studies have shown that neuroscientific technology may be used to detect lying by measuring brain activity.[35] However, this topic is still highly debated and has yet to be widely accepted or used within the legal system.
d. Neurolaw
   This is a growing field that includes the interaction between law and neuroscience.[36] This includes questions about how findings from neuroscience should be applied in law and how the law should respond to new developments in neuroscience.

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[33] Kevin A Johnson et al., "The Neuroscience of Functional Magnetic Resonance Imaging FMRI for Deception Detection," *The American Journal of Bioethics* 7, no. 9 (September 2007): 58–60, https://doi.org/10.1080/15265160701518755.

[34] Jerry J Sweet et al., "Forensic Neuropsychology: History and Current Status," *The Clinical Neuropsychologist* 37, no. 3 (April 2023): 459–74, https://doi.org/10.1080/13854046.2022.2078740.

[35] Putu Tissya Poppy Aristiani and I Wayan Bela Siki Layang, "Pengaturan Alat Bantu Pendeteksi Kebohongan (Lie Detector) Di Pengadilan Dalam Pembuktian Perkara Pidana," *Kertha Semaya : Journal Ilmu Hukum* 10, no. 3 (2022): 506–16, https://doi.org/10.24843/ks.2022.v10.i03.p02.

[36] Nicole A Vincent, "Neurolaw and Direct Brain Interventions," *Criminal Law and Philosophy* 8, no. 1 (2014): 43–50, https://doi.org/10.1007/s11572-012-9164-y.

e. Neurofeedback & Rehabilitation
Neurofeedback is a form of biofeedback that uses real-time brain imaging, usually via electroencephalography (EEG), to train individuals to control their brain functions. In other words, neurofeedback is a process by which individuals learn to change their brain wave activity through practice and ongoing monitoring.[37] In some cases, neurofeedback technology may be used as part of a rehabilitation program for criminals to help change patterns of behaviour or thinking that contribute to criminal behaviour.

Neuroscience contributes to understanding how the human brain works, including how the brain relates to behaviour and decision-making. This can include knowledge of how brain damage, mental disorders, or genetic influences can influence criminal behaviour. In penal neuroabolitionism, this understanding can challenge traditional assumptions about guilt, blame, and punishment in criminal law. For example, suppose criminal behaviour can be traced back to neurobiological factors beyond the individual's control. In that case, humans must reconsider how they determine responsibility and respond to such criminal behaviour.

In this respect, neuroscience can be considered a tool to help people better understand the nature of criminality and how the criminal justice system should react to it. This approach may focus more on rehabilitation or behaviour change than punishment and prevention rather than retribution. These are just a few examples of how neuroscience has developed and been applied in various fields. With the advancement of technology and knowledge, humans can expect more breakthroughs and new applications in the future.

In the legal context, especially criminal law, penal neuroabolitionism is a school of thought in the field of criminal law which argues that neuroscientific knowledge can and should be used to reform the criminal justice system. This school emphasizes the understanding that criminal behaviour is often the result of factors beyond an individual's control, such as genetics, early environment, or

[37] D Corydon Hammond, "What Is Neurofeedback?," *Journal of Neurotherapy* 10, no. 4 (March 2007): 25–36, https://doi.org/10.1300/J184v10n04_04.

brain disorders. This understanding aligns with the claim that neuroscience can help humans better understand the nature of crime. Suppose humans understand that these factors can influence criminal behaviour. In that case, this strengthens the argument that the criminal justice system should focus more on rehabilitation and behaviour change rather than punishment and retribution. In other words, it may be necessary to shift our approach to crime from one that focuses on punishment to one that focuses on understanding and remedy. Penal neuroabolitionism also emphasizes the importance of prevention. If humans understand what factors make someone more likely to commit a crime, they can design interventions that address those factors before they lead to criminal behaviour. This also aligns with the idea that neuroscience can help prevent crime. Humans can design interventions that address these factors before they lead to criminal behaviour. This also aligns with the idea that neuroscience can help prevent crime. Humans can design interventions that address these factors before they lead to criminal behaviour. This also aligns with the idea that neuroscience can help prevent crime.

Implementing the principles of penal neuroabolitionism into the existing criminal law system certainly has challenges and obstacles. Here are some of them:

a. Determination of accountability
   Determining the extent to which neurological and biological factors influence criminal behaviour and the extent to which they can or should influence judgments about criminal responsibility is a significant challenge. Neuroscience findings may describe brain disorders or damage in individuals who behave criminally, but interpreting the meaning and impact of these findings on criminal responsibility requires a deep and complex understanding of the relationship between the brain and behaviour.
b. Ethical and human rights issues
   Understanding how the brain and other biological functions contribute to criminal behaviour can open doors to various ethical questions and human rights issues. For example, how do we ensure that neurological information is not used to discriminate against or stigmatize specific individuals? How to

protect privacy and human rights while using increasingly sophisticated neuroscience technologies?

c. Use of neurological evidence in Court
   Another challenge is interpreting and applying neurological evidence in a criminal law context. For example, how should neurological evidence be presented and interpreted in Court, and to what extent should it influence decisions?
d. Education and training
   To integrate neurological understanding into the criminal law system, it is essential for those working within the legal system, including judges, lawyers, and others, to have a sound understanding of neuroscience and how the results of neuroscience research can and should be translated into legal practice. This may require the development and implementation of special training and education programs.
e. The legal system is not willing to change.
   Legal systems, like many other institutions, are often resistant to change. Accepting and adapting the principles of penal neuroabolitionism may require significant changes in how the current criminal law system operates, and this may meet resistance from those who are comfortable with the current system.

While these challenges are considerable, with continued research and open dialogue between neuroscience researchers and legal practitioners, humanity may find ways to integrate new understandings of the brain and human behaviour into the criminal justice system, thereby creating a more just and effective system.[38] Cross-country comparisons are also engaging in this context, as US criminal law has seen increased use of neuroscientific evidence, especially in defenses for the effects of mental disorders and in efforts to avoid the death penalty.

However, there is also significant debate about how this evidence should be interpreted and when it should be used. With more substantial

[38] Indah Sri Utari et al., "A Criminological Perspective on Corruption as a Catalyst of Economic Breakdown: Socio-Legal Challenges in Indonesian Environmental Governance," *Jambe Law Journal* 9, no. 1 (2026): 205–47, https://doi.org/10.22437/jmj4ac47.

human rights and rehabilitation laws, Europe is perhaps more open to a neuroscience-based approach to criminal law. However, there is also significant debate on this issue, and the use of neuroscientific evidence still varies widely among European countries. Asian countries, such as China and Japan, have also seen increased interest in neuroscience and law, but their approaches to these issues can be very different. For example, China has shown a strong interest in using advanced technology, such as brain scans, in its legal system. At the same time, Japan may be more conservative in accepting this kind of evidence. This area is still evolving, and practice in different countries will continue to change with developments in neuroscience and law.

Neuroscience has become an increasingly important field for the legal world, and several companies and organizations have taken advantage of it. This usually involves using technology to understand human behaviour and decision-making processes, which can then be used to assist in legal proceedings. Here are some examples:

a. No Lie MRI and Cephos Corporation
   The two companies are focused on developing neuroscience-based lie detection technology. They use fMRI (Functional et al.) brain scans to determine whether someone is lying or telling the truth.[39] Although these technologies are still controversial and not widely accepted within the legal system, they offer examples of how neuroscience can be used in legal contexts.
b. Nita Farahany
   Nita Farahany is a law and philosophy professor at Duke University and the director of the Duke Initiative for Science & Society. He has spoken and written extensively on neuroscience and law and has researched how brain-based evidence is used in Court. Nita Farahany has researched and written extensively on how neuroscience is used in law. He has studied how brain-based evidence, such as brain imaging results or behavioural genetics, is used in court proceedings and how this evidence can

[39] Stacey A. Tovino, "Functional Neuroimaging and the Law: Trends and Directions for Future Scholarship," *The American Journal of Bioethics* 7, no. 9 (September 2007): 44–56, https://doi.org/10.1080/15265160701518714.

influence trial outcomes and convictions.[40] Through her work, Nita Farahany seeks to answer these questions and help shape how we think about neuroscience and law. He believes that we can create a more just and effective legal system with a better understanding of how the human brain works.

c. Reilly Center for Science, Technology, and Values
This research center at the University of Notre Dame has conducted extensive research on how neuroscience can and should be used in law, including evaluating the ethical and societal impact of technologies such as detecting brain lies and determining brain pathologies.

C. Future Developments of Penal Neuroabolitionism

Thomas Mathiesen, a well-known sociologist, has contributed significantly to critical thinking about the criminal law system, particularly the prison system. In his work published in 2006, Mathiesen made the strong argument that prisons are a total failure when measured by the goals stated by the penal system itself.[41] So far, many of the goals of correctional institutions, such as rehabilitation, law enforcement, and prevention of future crimes, have not been achieved by the existing prison system. According to Mathiesen, prison is not an effective tool for rehabilitation. In contrast, empirical evidence shows that prison often does not help improve individual behaviour but can worsen their condition mentally and physically, and often reinforces criminal behaviour rather than changing it.[42] Furthermore, Mathiesen shows that prison is also not effective in preventing future crimes. Many studies have shown that recidivism rates, or ex-convicts' tendency to commit crimes again, remain high even after serving prison time. This suggests that prisons are unsuccessful at preventing future crimes and perhaps even

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[40] Nita Farahany and Khara M Ramos, "Neuroethics: Fostering Collaborations to Enable Neuroscientific Discovery," *AJOB Neuroscience* 11, no. 3 (July 2020): 148–54, https://doi.org/10.1080/21507740.2020.1778117.

[41] Borbón, "Neurosociology and Penal Neuroabolitionism: Rethinking Justice With Neuroscience."

[42] Adhyasta Dirgantara, "Penjara Bisa Mengubah Perilaku Orang, Ini Fakta Ilmiahnya," https://www.idntimes.com/, 2021.

contribute to a continuous crime cycle. In other words, if the goal of the penitentiary system is to rehabilitate individuals and prevent future crimes, evidence suggests that the prison system does not achieve this goal. Mathiesen's argument invites us to question the effectiveness of prisons and encourages us to look for more just and effective alternatives.[43]

Predicting the future development of penal neuroabolitionism can be challenging, but several possibilities can be considered based on current trends and developments in neuroscience and law.

a. Wider acceptance of neurological evidence
   As knowledge of the brain and human behaviour increases, we may see wider acceptance of neurological evidence in Court. For example, courts may begin to consider evidence of brain impairment or damage more frequently when determining criminal liability or when considering appropriate sentences.
b. More dialogue between neuroscience and law
   We may see more dialogue and collaboration between neuroscience researchers and legal practitioners. This could involve further training and education of judges, lawyers, and others in neuroscience and more research explicitly devoted to exploring the legal implications of neuroscience discoveries.
c. Neuroscience-based legal reform
   In the longer term, we may see broader legal reforms that reflect a better understanding of the human brain and behaviour. For example, sentencing may be oriented more towards rehabilitation than punishment, emphasizing mental and neurological treatment for offenders.
d. Development of neuroscience technology
   Advances in neuroscience technology may also impact the development of penal neuroabolitionism. Neuroimaging, which can provide detailed images of brain structure and

[43] Karen T Y Tang, "Retribution Versus Rehabilitation: Why North America Should Adopt the Nordic Prison Model," *Canadian Graduate Journal of Sociology and Criminology* 6, no. 1 (September 2023): 1–11, https://doi.org/10.15353/CGJSC-RCESSC.V6I1.4958.

function, may become increasingly important in evaluating and understanding criminal behaviour.

e. The Influence of public policy and public opinion
Changes in public opinion and public policy may also influence the development of penal neuroabolitionism. If society becomes more aware of and receptive to neuroscientific ideas in law, this could lead to broader acceptance of the principles of penal neuroabolitionism.

Overall, the future development of penal neuroabolitionism is likely to be significantly influenced by various factors, including advances in neuroscience research, changes in law and legal practice, and shifts in public opinion and public policy. However, it is essential to remember that these advances must always consider ethical and human rights issues.

In the discussion of penal neuroabolitionism, several important cases and cross-country comparisons can be used as references.

a. The case of Donta Page in the United States
In this case, lawyer Donta Page, a defendant in a murder case, used neuroscientific evidence to prove that he has brain damage affecting his ability to control his behaviour. Even though Page was found guilty, the evidence was used to argue against the death penalty in this case.[44]

b. The case of R v. Golds in England
In this case, the defendant, Golds, killed his girlfriend during an argument. His defense argued that he suffered from an adjustment disorder that affected his ability to control his behaviour.[45] This argument is supported by neurological evidence, including images of the defendant's brain showing anomalies. However, this evidence was rejected by the Court because it was deemed irrelevant to whether the defendant could understand that his actions were wrong.

In the international context, countries have different approaches to using neurological evidence in criminal law. For example, in the

[44] Adrian Raine and Sally Satel, "Can Brain Scans Explain Crime?," https://www.washingtonpost.com/, 2013.

[45] LawTeacher, "R v Golds," https://www.lawteacher.net/, 2021.

United States, courts have been more open to accepting neurological evidence than in the United Kingdom or Canada. This may be partly due to differences in legal systems, with the United States following the Common Law legal system, whereas many other countries follow the Civil Law legal system. However, many countries still need help with questions about how neurological evidence should be interpreted and used in Court.

This reflects the challenges of integrating complex and nuanced neurological understandings into legal systems that often require clarity and simplicity.[46] It also shows that, while there are differences between countries, these challenges are universal and must be addressed to build a more just and effective criminal justice system. The concept of penal neuroabolitionism has not been widely studied or applied in Indonesia.

One reason may be that Indonesia, like many other countries, is still in the process of understanding and navigating the challenges and opportunities offered by neuroscience in the context of criminal law. In addition, infrastructure challenges, such as the availability of neuroscience technology and access to neuroscience knowledge and training, may also affect how this concept can be adopted in Indonesia. However, even so, the potential to apply the principle of penal neuroabolitionism in Indonesia remains.

Figure 3. How to Develop Penal Neuroabolitionism in Indonesia



Source: Authors' Analysis.

[46] Bellesi et al., "Pediatric Traumatic Brain Injury and Antisocial Behavior: Are They Linked? A Systematic Review."

a. Considering neurological factors in determining the sentence
   As neuroscience advances, there may be room to consider neurological factors when determining sentences. For example, if a defendant is found to have a neurological disorder or psychological condition that may influence their behaviour, this may be considered when determining the appropriate sentence.
b. Education and training in neuroscience
   To integrate neurological understanding into the legal system, it is essential for those who work within the legal system, including judges, lawyers, and others, to have a sound understanding of neuroscience. This may require the development and implementation of special training and education programs.
c. Neuroscience Infrastructure Development
   To apply the principles of penal neuroabolitionism, adequate infrastructure is required. This may exist in neuroscience technology, such as neuroimaging tools, research, and mental health treatment facilities.

The concept of penal neuroabolitionism is a revolutionary idea that views the criminal justice system differently. Its basic principles rely on understanding how the brain and other biological factors can influence criminal behaviour. This idea encourages people to understand why someone commits a crime from a neurological and biological point of view, not just a social and psychological one. Although this concept is still new in Indonesia and perhaps needs to be fully understood or accepted, the potential is enormous. Appropriately applied, these principles can lead to radical and profound criminal law reforms. However, it is also important to underline that this understanding does not mean ignoring or underestimating other factors, such as the social environment or psychological influences that may also contribute to criminal behaviour. Applying the principles of penal neuroabolitionism requires an open and constructive dialogue between neuroscience researchers and legal practitioners. Legal practitioners need to understand the knowledge and methods of neuroscience, and conversely, neuroscience can understand how the criminal justice system works. Only in this way in this way can humanity formulate the most effective

and equitable policies and practices. However, there are also challenges to be faced in applying these principles. One of the biggest challenges is translating neuroscience findings into criminal law and policy.

How to determine what is considered "normal" or "abnormal" in the context of brain and behaviour? How to ensure that neurological evidence is correctly used and understood? How can individual rights be protected when using neurological evidence in Court? In addition, there are also ethical questions that arise. For example, is it right to reduce individuals and their actions solely to their biology? Does this not reduce man to a collection of biological and neurological processes? These questions need to be addressed when applying the principles of penal neuroabolitionism. While this concept may be new and challenging, the potential for applying these principles exists. With ongoing research and open dialogue between neuroscience researchers and legal practitioners, there is hope that this concept can help shape Indonesia's more just and effective criminal justice system. However, it is important to consider ethical and human rights issues when applying these principles.[47] Implementing the principles of penal neuroabolitionism also means encouraging a transformation in how criminals are viewed and treated. Rather than seeing them as "evil" or "defective" individuals, these principles encourage viewing them as individuals who may have a neurological or biological disorder that affects their behaviour. This can potentially change how the rehabilitation and recovery of criminals are handled. For example, suppose it can be shown that a criminal has a neurological disorder that affects their ability to control their behaviour. In that case, their sentence can focus more on rehabilitation than punishment.

This could mean increased use of therapeutics and medical interventions in the criminal justice system, as well as increased support for perpetrators of crime in their recovery process and reintegration into society. In addition, by better understanding how the brain and other biological factors influence criminal behaviour, we can be more design by targeting neurological and biological risk factors, and it may be

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[47] Luis Justo and Fabiana Erazun, "Neuroethics and Human Rights," *The American Journal of Bioethics* 7, no. 5 (May 2007): 16–18, https://doi.org/10.1080/15265160701290272.

possible to design more effective and targeted crime prevention strategies. However, it is important to stress that applying these principles is challenging. It requires adequate knowledge, expertise, and resources, as well as a commitment to protect the rights and justice of all individuals. In addition, we also need to be careful not to reduce humans only to their neurological and biological factors and remember that they are complex individuals with different experiences and life contexts. Ultimately, penal neuroabolitionism offers a challenging and innovative vision of how we can create a more just and effective criminal justice system. While there are challenges and questions to be faced, its potential to help create better justice and crime prevention is worth exploring and developing further.

Conclusion

It can potentially change how a new paradigm is viewed and provide a perspective that has the potential to change the way we understand and apply criminal law. This concept prompted the legal system to take more excellent account of insights from neuroscience about human brain behaviour and function. Thus, there is an opportunity to design a more just and effective legal system in which criminal responsibility and sentencing better reflect our evolving understanding of the human brain and behaviour. Nonetheless, various challenges arise in the implementation of penal neuroabolitionism. One of them is the legal system's interpretation and use of neurological evidence. Other challenges involve infrastructure, including research and education areas, and knowledge and training in neuroscience. Research and education are vital in harnessing the potential of penal neuroabolitionism. Dialogue and collaboration between neuroscience researchers and legal practitioners should be increased, and specialized education and training programs should be developed and implemented.

Although the concept of penal neuroabolitionism is relatively new in Indonesia, Doing is the potential to apply these principles in the country's criminal and. To do so will require adaptation to local legal and cultural contexts as well as investment in neuroscience and educational infrastructure. However, in all this, ethical considerations and human rights must remain a top priority. Penal neuroabolitionism should be

used to promote justice and humanity, not to increase control or discrimination. Penal neuroabolitionism offers promising potential for reforming the criminal justice system. Through continuous research and open dialogue, we expect to see future developments of this concept.

In the context of penal neuroabolitionism, the following suggestions can be made:

a. Further research is needed to understand the implications of neuroscience in criminal law. This research should engage multiple disciplines, including neuroscience, law, ethics, and psychology, to create a more holistic and integrated understanding.
b. To ensure that the principles of penal neuroabolitionism are applied in the most fruitful ways, there needs to be a collaboration between neuroscience researchers and legal practitioners. By working together, they can help bring about a more just and effective legal system.
c. Countries like Indonesia may need to invest in neuroscience infrastructure, such as neuroimaging technology and research facilities, to exploit the potential of penal neuroabolitionism fully.
d. In any application of penal neuroabolitionism, it is essential to maintain a strong focus on ethics and human rights. In determining how neurological evidence is used in Court, for example, one must always consider how this affects the rights and justice of the accused.

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Acknowledgment

We extend our heartfelt thanks to all those who have contributed to the completion of this article, particularly the authors of the books and journals we have referenced, whose work has enriched the academic quality of our research. We recognize that our article may have imperfections and are open to receiving feedback from all perspectives. We hope that this article will prove valuable to scholars, practitioners, and the broader public in deepening their understanding of legal phenomena within society.

Funding Information

None

Conflicting Interest Statement

The authors state that there is no conflict of interest in the publication of this article.

Publishing Ethical and Originality Statement

All authors declared that this work is original and has never been published in any form and in any media, nor is it under consideration for publication in any journal, and all sources cited in this work refer to the basic standards of scientific citation.

Generative AI Statement

None.