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Neurolaw and moral competence of corruption offenders: A criminal law analysis

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Abstract*:* This article examines the relevance and limits of neurolaw in assessing the moral competence of corruption offenders within criminal law. The study responds to the growing use of neuroscience in criminal justice while recognizing that corruption remains a deliberate abuse of entrusted power that must not be excused through biological reductionism. Using normative legal research with statutory, conceptual, and comparative approaches, this article analyzes the relationship between mens rea, moral competence, neurocognitive impairment, and proportional criminal responsibility. The study finds that neurolaw may assist courts in understanding exceptional cases involving serious impairment of impulse control, moral reasoning, or executive function, but it should not be treated as a general defense for corruption. In an Indonesian context, its use must be limited, carefully regulated, and supported by strict evidentiary safeguards, independent forensic assessment, judicial gatekeeping, and protection against elite impunity. The article argues that neurolaw is relevant not to weaken anti-corruption enforcement, but to refine the assessment of culpability in rare and scientifically verifiable circumstances. Therefore, neuroscience-based evidence should complement, not replace, legal proof of intent, accountability, and public trust protection.
Keywords: Neurolaw; Corruption; Moral Competence; Criminal Responsibility; Neuroscience Evidence; Anti-Corruption Law

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Introduction

The relationship between neuroscience and criminal law, commonly referred to as neurolaw, has opened an important debate on how courts ought to understand human responsibility in criminal cases. In corruption cases, this debate is particularly sensitive because corruption is not merely an individual offense, but an abuse of entrusted public power that damages institutional integrity, public trust, and the effectiveness of governance. For this reason, any attempt to introduce neuroscientific evidence into corruption adjudication must be placed within the framework of anti-corruption enforcement, not as a justification for impunity. (Aono et al., 2019). Neurolaw is relevant only when it helps the court examine whether an offender's cognitive and moral capacities were seriously impaired in a scientifically verifiable manner. it is a complimentary function: it may refine the assessment of culpability, but it must not replace the legal requirement to prove intent, abuse of authority, and responsibility. (A Vincent, 2014).

Previous studies on neurolaw have mostly focused on violent crimes, juvenile justice, mental illness, psychopathy, or sentencing mitigation. Meanwhile, corruption has been examined through institutional, political, economic, and sociological perspectives. This creates a gap in legal scholarship where: the moral and neurocognitive dimensions of corruption offenders rarely are discussed in relation to criminal responsibility and anti-corruption adjudication. This article does not argue that corruption should be medicalized or that offenders should escape punishment through neuroscientific claims. Instead, it offers a limited and precautionary framework for understanding how neuroscience may assist legal analysis in exceptional cases, particularly where moral reasoning, executive control, or impulse regulation is genuinely impaired.

The legal foundation of criminal responsibility lies in the principle of *mens rea* the mental state of the offender at the time of the crime. Traditionally, this has been assessed through behavioral evidence, witness testimony, and judicial interpretation. However, advances in neuroscience

suggest that underlying neurological conditions may impair decision-making, moral judgment, or impulse control, thereby affecting the capacity to form criminal intent (Yoder & Decety, 2018). The emergence of neurolaw challenges a classical dichotomy of free will versus determinism in criminal justice and invites the re-examination of how culpability is assigned particularly in corruption cases, where the lines between deliberate misconduct and cognitive distortion may blur (Prescott et al., 2024).

Globally, high-profile corruption cases have prompted increasing interest not only in their legal implications but also in the psychological and neurobiological profiles of offenders. In Brazil, while there is no direct neuroscientific research conducted specifically on the imprisoned political figures from the Operação Lava Jato (Operation Car Wash) scandal, broader studies on white-collar crime have explored the possible role of neurocognitive traits such as impaired moral judgment, heightened reward sensitivity, or diminished empathy in unethical decision-making. For example, research in the fields of neurocriminology and forensic psychology has identified atypical activation patterns in the prefrontal cortex an area responsible for executive function and moral evaluation among certain individuals convicted of economic crimes. Although these findings are still in early stages and not universally accepted, they suggest that neuroscience could complement traditional legal and sociological approaches by offering deeper insight into the cognitive and emotional mechanisms underlying corrupt behavior.

In the Indonesian context, the use of neurolaw in corruption cases must be approached realistically. Indonesia still faces challenges in law enforcement integrity, forensic capacity, judicial consistency, and unequal access to expert evidence. Therefore, neurolaw cannot be proposed as an immediate operational mechanism for all corruption cases. Its relevance lies in developing a future-oriented legal framework that sets clear limits before neuroscience-based evidence enters the courtroom. Without such limits, neurolaw may become a sophisticated tool for powerful defendants to construct medical excuses. With proper safeguards, it may contribute to a more precise and proportionate understanding of criminal responsibility while preserving the core objective of corruption eradication.

Table 1. Selected Neurolaw Evidence and Anti-Corruption Lessons

Legal experience	Type of evidence	Legal function	Lesson for corruption cases
United States	fMRI, neuropsychological reports, and expert testimony	Reliability screening through judicial gatekeeping and methodological scrutiny	Scientific evidence must be relevant, testable, and legally connected to mens rea or culpability; it should not be accepted merely because it appears objective.
Germany	Independent forensic and psychiatric assessment	Institutional control of expert evidence to support responsibility and sentencing analysis	Expert evidence should be evaluated by independent institutions to reduce manipulation by wealthy or powerful defendants.
Brazil	Interdisciplinary research on corruption, neuroscience, and cognitive decision-making	Policy-oriented understanding of unethical decision-making and neuroethical risks	Neuroscience may enrich anti-corruption studies, but it must not be used to justify political or elite impunity.
Indonesia	No specific neurolaw regulation in criminal procedure	Potential use only as limited expert evidence under strict safeguards	Indonesia requires judicial guidelines, forensic independence, adversarial testing, and clear admissibility standards before neuroscience-based evidence is used in corruption cases.

Source: Author's construction based on comparative legal analysis.

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The comparative experiences summarized in Table 1 show that neurolaw cannot be introduced into corruption cases as a free-standing justification for reduced responsibility. Its legal value depends on the existence of strict admissibility standards, reliable scientific methods, independent forensic assessment, and judicial control. These lessons are important for Indonesia because corruption cases often involve powerful defendants, complex institutional networks, and unequal access to expert evidence. Therefore, the central issue is not whether neuroscience should be used broadly in corruption trials, but how its use can be limited, tested, and subordinated to criminal law principles.

This article aims to answer three main questions. First, how can neurolaw contribute to the assessment of moral competence and mens rea in corruption cases? Second, what are the ethical, evidentiary, and doctrinal limits of using neuroscience-based evidence in criminal proceedings? Third, what model of legal safeguards is appropriate for Indonesia to prevent neurolaw from being misused as a justification for elite impunity while still allowing courts to consider scientifically valid evidence in exceptional cases?

Methods

This study uses normative legal research to examine the conceptual and doctrinal relationship between neurolaw, moral competence, and criminal responsibility in corruption cases. (Effendi et al., 2023). The research applies statutory, conceptual, and comparative approaches. The statutory approach is used to analyze the legal construction of criminal responsibility, evidentiary principles, and anti-corruption enforcement. The conceptual approach is used to explain mens rea, culpability, moral competence, neurocognitive impairment, and proportional punishment. The comparative approach is used to examine selected experiences from the United States, Germany, and Brazil in regulating or limiting neuroscience-based evidence in criminal proceedings. The legal materials consist of legislation, court decisions, journal articles, books, and interdisciplinary literature on criminal law, neuroscience, forensic evidence, and corruption studies. (Karianga & Fernando, 2024). These materials are analyzed through content analysis by identifying relevant concepts, comparing legal models, and formulating a normative framework suitable for Indonesia. (Akhmad et al., 2023).

Results and Discussion

Neurolaw, Anti-Corruption Relevance, and Limits on Immediate Application

The first issue that must be clarified is the relationship between neurolaw and corruption eradication. Neurolaw should not be understood as a scientific shortcut to excuse corruption offenders. Corruption remains a serious crime against public trust, public finance, and institutional integrity. The relevance of neurolaw lies in its capacity to assist courts in examining exceptional conditions that may affect the quality of an offender's moral and cognitive responsibility. This means that neuroscience-based evidence should only be considered when there is a concrete indication of neurocognitive impairment, supported by reliable expert assessment, and directly connected to the legal issue of intent or culpability.

In this sense, neurolaw has a limited but important function. It may help differentiate ordinary corrupt intent from rare cases involving serious impairment in executive function, impulse control, or moral reasoning. However, such differentiation must never weaken the public character of corruption as an abuse of power, but also whether that decision was connected to a position of authority, access to public resources, and breach of public trus, neurolaw must be placed under the control of criminal law doctrine, not above it.

Corruption, as a form of white-collar crime, is often associated with malicious intent, rational planning, and full awareness of one's actions (Slamkov et al., 2021). In Indonesia's positive criminal law system, this is reflected in the emphasis on the element of *mens rea* in establishing criminal liability. However, developments in neuroscience and neuropsychology have begun to challenge the assumption that all acts of corruption are committed by individuals with fully intact moral and cognitive capacities (Mourão, 2018). This is where neurolaw emerges as an interdisciplinary

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approach that seeks to reconstruct the legal understanding of criminal responsibility by integrating scientific findings about brain function and human behavior (Dash et al., 2020).

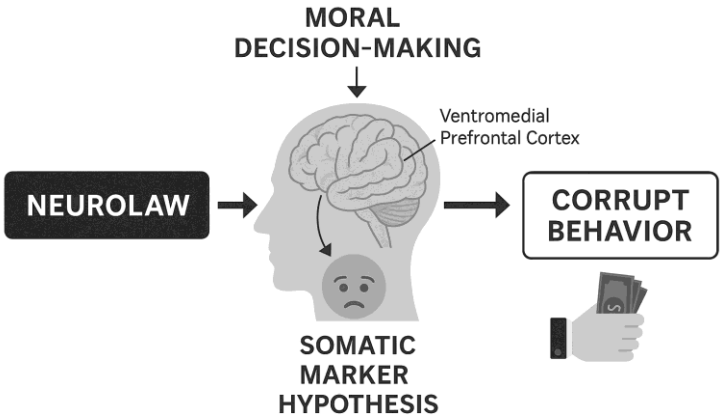


Figure 1. Neurolaw and Moral Decision-Making (Source: Author's construction)

Neurolaw introduces a scientific lens through which the legal system can assess an offender's capacity to comprehend moral values and then regulate actions according to prevailing social norms (Belcher & Sinnott-Armstrong, 2010). One of the most relevant theoretical frameworks in this context is Antonio Damasio's Somatic Marker Hypothesis, which provides a neurobiological explanation for how emotions influence moral reasoning and decision-making. According to Damasio, the ventromedial prefrontal cortex (vmPFC) plays a vital role in encoding emotional signals so-called "somatic markers" that guide individuals in making ethically appropriate decisions. These markers serve as internal warning systems, drawing upon past emotional experiences to help individuals anticipate the outcomes of their actions, especially in complex or morally ambiguous situations. When this specific region of the brain is impaired due to trauma, neurological disorders, or developmental abnormalities the individual may retain intact intellectual and cognitive faculties (i.e., the ability to reason, plan, and understand rules), but can lacks the emotional feedback necessary to evaluate actions through a moral lens. This neurological condition creates a disconnect between rational cognition and emotional conscience (Brown, 2019). In the context of corruption, this means that a perpetrator might fully understand that accepting a bribe or manipulating public funds is illegal and may result in legal punishment. However, they may not experience the emotional weight such as guilt, shame, or empathy for victims that typically serves as a deterrent to such behavior. As a result, their behavior may appear calculated and intentional from a legal standpoint, while it may in fact be partially influenced by neurobiological deficiencies in moral-emotional processing. This raises a significant point of contention within criminal law: should legal systems consider impaired moral affect despite preserved rationality as grounds for partial or alternative forms of criminal responsibility? Traditional doctrines of criminal liability rely heavily on the presence of mens rea, or guilty mind, which presupposes the offender's ability to understand and emotionally grasp the wrongfulness of their conduct. Neurolaw, however, compels us to question whether the mere presence of rational cognition is sufficient to attribute full blameworthiness, especially in white-collar crimes that may involve moral disengagement due to neurological factors (Fagan, 2022). This perspective doesn't absolve corrupt actors of responsibility but instead suggests a more nuanced framework of evaluation one that may combine legal analysis with neuroscientific assessments to determine the extent and quality of criminal intent. It opens the door to integrating neuropsychological evaluations in corruption trials, especially when cognitive or affective impairments are suspected.

The application of a neurolaw approach in assessing the moral capacity of corruption offenders challenges the traditional understanding of criminal responsibility within Indonesian criminal law. Historically, both the Indonesian Penal Code (KUHP) and the Anti-Corruption Law (UU Tipikor) have based criminal liability on the offender's awareness and free will. However, in certain cases, individuals involved in corruption may suffer from executive function impairments that

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affect impulse control, empathy, and moral reasoning. A notable study conducted in Brazil on corruption offenders revealed diminished brain activity in the prefrontal cortex an area crucial for moral regulation and social behavior. This neurological finding suggests that some offenders may not fully respond to social stimuli in a normative way. In legal terms, such conditions could have significant implications for the assessment of mens rea, as it raises questions about whether the individual has the mental and emotional capacity to understand and internalize the wrongfulness of their actions.

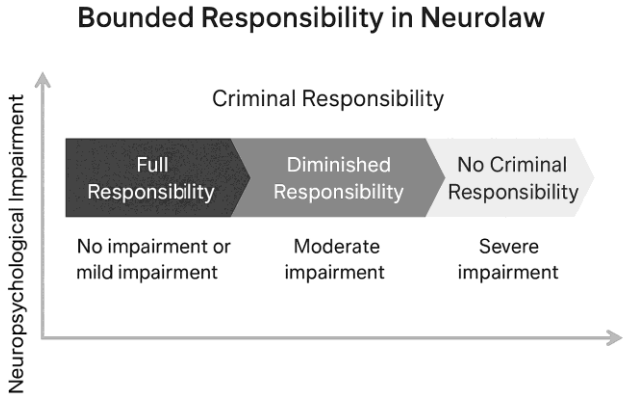


Figure 2. Bounded Responsibility: A Neurolaw-Based Framework for Proportional Criminal Liability in Corruption Cases (Source: Author's construction)

Reconstructing criminal liability through the lens of neurolaw requires a doctrinal shift within the framework of positive criminal law. One theoretical model that can be applied is the concept of "bounded responsibility," which views criminal responsibility not as a binary between full capacity and total incapacity, but as a spectrum. Within this model, offenders with neuropsychological impairments are not automatically exempt from liability; instead, the type and degree of their responsibility is adjusted according to the extent of their neurological dysfunction. This approach aligns with the principle of proportionality in sentencing, ensuring that punishments corresponds not only to the harm caused but also to the offender's actual cognitive and moral capacities. Incorporating this concept into the legal treatment of corruption cases would allow for special provisions that take into account the neurological conditions of the offender without undermining the accountability required for crimes of public trust.

However, the use of neurolaw is not without controversy. Critics have raised concerns about the risk of "neurodeterminism" or the belief that human behavior is entirely dictated by brain structure, thereby blurring the line between free will and medical condition (Cardoso, 2021). This notion stands in tension with a fundamental principle of criminal law: that individuals are legal subjects responsible for their actions. As such, the acceptance of neurolaw must be confined within strict ethical and legal boundaries, including the scientific validity of neuroimaging evidence and the presence of cross-examination mechanisms involving both legal and neurological experts during judicial proceedings. In other countries, such as the United States and Germany, the use of neuroscience-based evidence in criminal cases has begun to gain selective traction. The Herbert Weinstein case (1991) in New York marked a pivotal moment, where the defendant in a murder case presented evidence of a large brain cyst pressing on areas responsible for regulating impulsivity and emotion. Although not a corruption case, this precedent opened the door for defenses to be ground in neurological conditions. In the context of white-collar crime, several defendants in embezzlement and fraud cases have started to invoke diminished executive function as a factor influencing their malicious intent. While courts remain cautious, this trend indicates that the neurolaw approach is gradually evolving and gaining relevance in the assessment of criminal responsibility.

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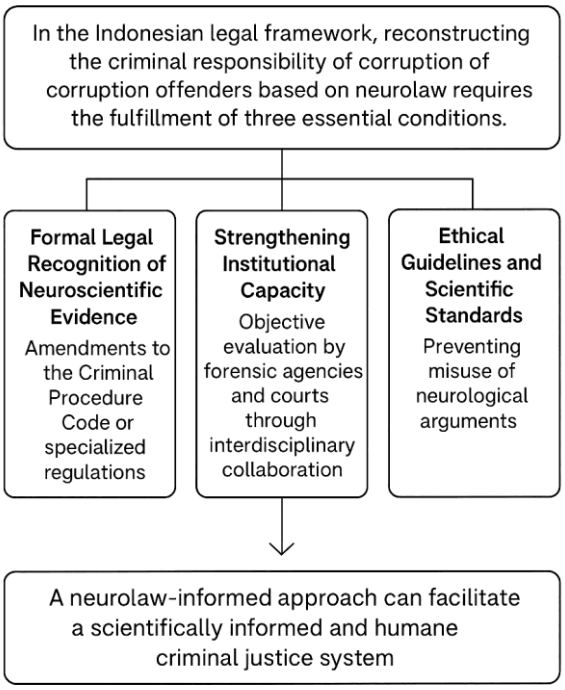


Figure 3. Framework for Neurolaw-Based Criminal Responsibility in Indonesian Corruption Cases (Source: Author's construction)

In the Indonesian legal framework, reconstructing the criminal responsibility of corruption offenders based on neurolaw requires the fulfillment of three essential conditions. First, there must be formal legal recognition of neuroscientific evidence as an admissible component in criminal trials. This necessitates amendments to the Indonesian Criminal Procedure Code (KUHAP) or the enactment of specialized regulations to accommodate such evidence within the evidentiary system. Second, it is crucial to strengthen the institutional capacity of forensic agencies and courts to objectively evaluate neuroscientific findings through interdisciplinary collaboration, ensuring that judgments are grounded in both legal principles and scientific validity. Third, ethical guidelines and scientific standards must be established to prevent the misuse of neurological arguments as tools for impunity or legal manipulation. The purpose of integrating neurolaw into anti-corruption enforcement is not to absolve offenders of accountability, but to provide a more precise and evidence-based instrument for assessing the moral and cognitive dimensions of individual responsibility. This aligns with the trajectory of modern criminal law, which increasingly emphasizes substantive justice and proportionality in sentencing. By adopting a neurolaw-informed approach, Indonesia has the opportunity to build a criminal justice system that moves beyond rigid legalism toward a model that is both scientifically informed and fundamentally humane.

Moral Competence, Mens Rea, and Bounded Responsibility in Corruption Cases

The concept of moral competence is closely related to the criminal law doctrine of mens rea. In conventional criminal law, mens rea is usually inferred from external conduct, surrounding circumstances, documentary evidence, witness testimony, and the logical relationship between action and consequence. In corruption cases, this inference is often strengthened by evidence of planning, concealment, financial benefit, abuse of authority, or coordinated conduct. Neurolaw does not abolish this method of proof. Rather, it raises a narrower question: whether a defendant had the cognitive and moral capacity required to understand the wrongfulness of the conduct and to control their behavior according to that understanding.

A bounded responsibility model is useful in this regard. Responsibility should not be reduced to a simple binary between full responsibility and no responsibility. In exceptional cases, a person may understand the legal rule but suffer from a serious impairment that affects moral-emotional

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processing or executive control. Such impairment may not eliminate criminal liability, but it may be relevant to the degree of culpability and the proportionality of punishment. This approach is consistent with the idea that criminal punishment must respond not only to the harm caused, but also to the offender's actual blameworthiness.

Nevertheless, the bounded responsibility model must be applied with caution in corruption cases. Many corruption offenses involve the use of calculation, concealment, repeated transactions, abuse of institutional procedures, and coordinated networks. These features usually indicate rational planning rather than diminished capacity. For that reason, neuroscience-based claims should not be accepted unless they meet strict standards of relevance, reliability, and causal connection to the specific criminal conduct. The mere existence of a brain abnormality cannot automatically reduce responsibility.

The integration of neuroscience into the evidentiary process of corruption cases introduces a new dimension to the criminal justice system, which has long been grounded in traditional concepts of individual responsibility. On one hand, this approach offers a pathway to uncover hidden aspects of the defendant's mental capacity; on the other hand, it also presents significant epistemological and normative risks if applied without a robust ethical and legal framework. Neuroscience, as the discipline that studies the relationship between brain structure and function and human behavior, is increasingly being considered as a tool to assess whether an individual truly possessed criminal intent (*mens rea*) at the time of committing an offense, including acts of corruption (Maoz & Yaffe, 2016).

In corruption cases, offenders can typically come from elite circles, possessing advanced educational backgrounds and occupying strategic positions within the bureaucracy or private sector. Their actions are often executed through systematically designed schemes involving manipulation of administrative procedures, exploitation of structural power, and collaboration within organized networks. These characteristics reinforce the conventional assumption in criminal law that corruption results from free will and fully intact rationality. Consequently, the element of mens rea, or criminal intent, becomes central to proving the offender's culpability. Advances in neuroscience are beginning to challenge this traditional understanding. Scientific findings reveal that moral decision-making and impulse control two critical components of corrupt behavior are not governed solely by conscious logic, but are also influenced by specific neurological conditions (Hu et al., 2021). Impairments in brain regions such as the prefrontal cortex or the amygdala, for example, can result in individuals who remain analytically capable but exhibit diminished empathy, impaired moral-affective responses, or weakened self-regulation. This raises a profound dilemma: can individuals who outwardly appear rational be assumed to possess full moral and cognitive capacity at the time of committing acts of corruption? Were their actions entirely conscious and deliberate, or might there be hidden dysfunctions behind their performance? If so, then criminal responsibility in corruption cases should not be assessed solely based on the normative construction of mens rea, but must also take into account the offender's neuropsychological capacity as a factor influencing culpability and the appropriate level of punishment.

Technologies such as functional Magnetic Resonance Imaging (fMRI), Electroencephalography (EEG), and neuropsychological testing offer sophisticated means of visualizing and measuring brain activity linked to critical cognitive and emotional processes, including decision-making, empathy, impulse control, and moral awareness (Yen et al., 2023). When introduced as evidence in legal proceedings, particularly in complex cases such as corruption, these tools can reveal the presence of neurological abnormalities that may significantly affect an individual's behavior. For example, damage to or dysfunction in the prefrontal cortex, a region responsible for executive functions like planning, moral evaluation, and behavioral regulation, can impair a person's ability to foresee the consequences of their actions or to inhibit unethical impulses, despite otherwise appearing rational and composed (Khalid et al., 2024). Such impairments are often not outwardly visible in normal social interactions, making them difficult to detect without scientific investigation. However, their influence on behavior can be profound, potentially undermining the emotional and moral self-regulation required for lawful conduct. In this context, neuroscience-based evidence does not necessarily negate criminal responsibility, but it provides a deeper and

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more nuanced understanding of the offender's mental state, potentially informing the degree of culpability and guiding appropriate sentencing.

The primary opportunity offered by the neurolaw approach lies in its potential to promote substantive justice. Rather than punishing solely based on the consequences of an act, the legal system can more deeply assess the internal mental state of the offender. If it is demonstrated that the perpetrator suffers from neurocognitive impairments that affect their awareness or control over their actions, criminal liability can be reconsidered through the principle of proportionality. This can prevent the criminal justice system from becoming overly retributive and neglecting the psychobiological complexities of human behavior.

The use of neuroscience-based evidence in corruption trials presents three major categories of challenges: ethical, technical, and normative. From an ethical perspective, there is concern that defendants may exploit neurological test results as a strategy to evade punishment. In legal systems plagued by corruption, there is a high risk of manipulating medical assessments, especially when oversight mechanisms are weak. In such contexts, neuroscience could be misused but as a new shield for elite impunity. On the technical level, the scientific validity of tools like fMRI and EEG remains under ongoing scrutiny. While these technologies can detect brain activity, they do not inherently establish a causal relationship between brain states and criminal behavior. For example, increased activation in a specific brain region does not automatically mean the individual lacked understanding of their actions. In courtroom settings, this creates the danger that seemingly objective but probabilistic scientific evidence could distort legal assessments that are supposed to be grounded in the standard of beyond reasonable doubt. From a normative standpoint, Indonesia's criminal procedure law has yet to explicitly regulate the use of neuroscientific evidence in judicial processes. The current Criminal Procedure Code (KUHAP) does not specifically recognize such evidence, and there are no Supreme Court guidelines providing standardized criteria for its admissibility or limitations. This legal vacuum opens the door to disparities in legal practice, depending heavily on a judge's interpretation or the negotiating power between defense counsel and prosecutors. In neurolaw literature, this situation is often referred to as "epistemic authority" or the dominance of scientific expertise within the courtroom. When judges and prosecutors lack sufficient understanding of neuroscience, they risk ceding legal judgment to expert witnesses, who may carry their own biases or conflicts of interest. This is a dangerous shift, as it may lead to substituting the principle of justice with scientific claims that cannot be thoroughly tested through juridical standards.

Jurisprudence from countries such as the United States and Germany illustrates that neuroscience-based evidence cannot be accepted uncritically in criminal proceedings. In U.S. v. Semrau, a federal court rejected the use of fMRI as a lie detection tool, citing insufficient scientific reliability. Similarly, in Germany, the Federal Court of Justice requires a test between the legal relevance and scientific validity of neuroscientific evidence before it can be admitted in criminal trials. These precedents underscore the crucial role of judges as gatekeepers, safeguarding the integrity of the legal system against premature or unverified scientific claims. For Indonesia, an initial step would be to establish judicial guidelines that set minimum standards for the admissibility of neuroscience in court. For instance, only experts with specific certifications should be allowed to testify, or only certain types of neuroscientific examinations should be formally recognized. Furthermore, reforming the Indonesian Criminal Procedure Code (KUHAP) is essential to accommodate emerging forms of evidence without undermining the fundamental principle of the due process of law. The second necessary step involves interdisciplinary training for legal professionals. Judges, prosecutors, and defense attorneys must gain a foundational understanding of neuroscience, including its limitations and proper applications. Without adequate scientific literacy, legal actors may struggle to properly assess highly technical evidence. Universities and legal training institutions can play an active role by developing interdisciplinary educational modules that bridge the gap between legal doctrine and neuroscientific knowledge. The third step would be to reinforce the precautionary principle in evaluating neuroscience-based evidence. This principle holds that new technologies must be subject to stringent standards, and any scientific claims must be thoroughly validated within a legal context. In other words, neuroscience should not replace the legal pursuit of justice, but rather serve as a complementary tool operating

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within accountable legal boundaries. In corruption cases, where defendants often come from dominant social classes with access to significant resources, this level of caution must be heightened. There is a substantial risk of neuroscience being misused as a sophisticated shield for elite impunity. Therefore, the legal system must develop dual-layer control mechanisms, including independent audits of medical evidence and strict evidentiary protocols to scrutinize any claims of neurological impairment. Importantly, the integration of neuroscience into criminal law is not an attempt to absolve offenders of responsibility, it is meant to ensure that criminal accountability is delivered fairly and proportionately. In corruption trials, this approach can help differentiate between those who genuinely suffer from neurocognitive disorders and those who exploit medical arguments as a legal strategy to escape punishment. When applied correctly, neurolaw can strengthen the justice system, rather than weaken it. Ultimately, what is needed is not only regulation but also a paradigm shift. Law can no longer operate in isolation; it must open itself to engagement with other disciplines. In addressing complex modern crimes such as corruption, a multidisciplinary approach is indispensable. Neuroscience should not be viewed as a threat to the law, but as an invitation to reconstruct our understanding of culpability, responsibility, and justice in light of contemporary scientific knowledge.

Evidentiary Safeguards (Reliability, Admissibility, and Protection against Elite Impunity)

The most serious risk of introducing neurolaw into corruption cases is its possible misuse by powerful defendants. Corruption offenders often have access to financial resources, elite lawyers, private experts, and institutional influence. If neuroscience-based evidence is accepted without strict safeguards, it may become a new form of elite privilege rather than an instrument of justice. Therefore, the Indonesian legal system must treat neurolaw with a precautionary approach.

At least six safeguards are necessary. First, neuroscience-based evidence must be legally relevant to the issue being decided, especially mens rea, culpability, or sentencing. Second, the scientific method used must be valid, peer-reviewed, and capable of being tested. Third, the assessment must be conducted by independent forensic experts rather than experts privately controlled by one party. Fourth, the evidence must be open to adversarial testing through cross-examination by prosecutors and defense counsel. Fifth, judges must act as gatekeepers who assess whether the evidence has sufficient probative value and whether its use may mislead the court. Sixth, neuroscience-based evidence must never shift the burden of proof away from the prosecution or weaken the presumption of innocence.

These safeguards are particularly important in Indonesia because the country continues to face institutional challenges in law enforcement. The purpose of neurolaw should not be to create an additional escape route for corruption offenders, but to ensure that scientific evidence, when exceptionally relevant, is examined within a transparent and accountable legal process. Without these safeguards, neurolaw would be normatively dangerous. With them, it may serve as a limited instrument for improving the quality of judicial reasoning.

Comparative Study on the Application of Neurolaw in Criminal Justice Systems: Implications for Addressing Corruption Cases in Indonesia

The application of neurolaw within criminal justice systems shows significant variation across countries, depending on legal structures, openness to scientific evidence, and the development of forensic technologies. In the United States, the use of neuroscience-based evidence in criminal courts began gaining attention following the Herbert Weinstein case (1991), in which brain scan results were introduced as part of the defense against a murder charge. Since then, courts in various states have started to consider fMRI and EEG findings in evaluating a defendant's intent (*mens rea*), moral capacity, and impulse control. The role of judges as gatekeepers is central to the American criminal justice system, especially under the Daubert standard. Established in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* (1993), this framework requires judges to evaluate the scientific validity and legal relevance of expert evidence before it is presented in court. The Daubert standard outlines four key criteria: (1) whether the theory or technique can be and has been tested; (2) whether it has been subjected to peer review and publication; (3) the known or potential error rate; and (4) general acceptance within the relevant scientific community (Smith,

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2009). Under this standard, neuroscience-based evidence including fMRI results and neuropsychological assessments is not admitted simply because it appears "scientific"; it must pass rigorous methodological scrutiny and demonstrate direct relevance to the legal issue at hand. In the context of white-collar crime, including corruption, this approach has begun to open space for the integration of neuropsychological evaluations in defense strategies. While still limited and not yet mainstream, the trend indicates growing recognition of the psychological and neurological dimensions of white-collar offenders. Cases such as *U.S. v. Fishman* and several tax fraud trials have shown how neuropsychological reports are submitted to demonstrate cognitive impairments affecting decision-making (Clem, 2024). However, it is important to note that courts do not automatically accept these findings as grounds for eliminating criminal liability. Judges conduct a critical review and consider whether such impairments significantly contributed to the legal violation or are merely employed as exculpatory tactics. In this way, the principle of a fair trial is tested by ensuring that defendants are judged based on a comprehensive understanding of their condition, including mental and cognitive states. Analytically, the U.S. approach demonstrates a balanced model, combining openness to scientific innovation with firm legal standards. By designating judges as scientific gatekeepers, the system guards against an overflow of technical evidence that may confuse juries or distort the truth-seeking process. More importantly, it reflects a commitment to procedural justice, ensuring that legal proceedings are fair not only in outcomes but also in the methods used to reach them. The relevance of this model to corruption cases is particularly strategic. Corruption is often disguised under layers of administrative sophistication and formal legitimacy, which means that a purely formalistic legal approach may fail to capture the subjective complexity of the offender. Here, neuropsychological tools offer added value not to absolve individuals of responsibility, but to assess whether their moral and cognitive capacities were truly intact at the time of making unlawful decisions. This aligns with the principle of individualized criminal responsibility, where each defendant is judged based on their full personal circumstances, including psychological and neurological conditions.

Germany's approach to neurolaw reflects the hallmark characteristics of the civil law system, which emphasizes codification, clarity of norms, and the integrity of the legal system as a whole. Unlike the more flexible evidentiary framework found in adversarial systems, the German legal system adopts a cautious yet structured procedure in filtering and evaluating science-based evidence, including neuroscience (Langleben & Moriarty, 2013). One of the core strengths of the German model lies in the state's monopoly over forensic expertise. Neuroscientific evidence cannot be submitted unilaterally by either the defense or the prosecution and must undergo examination and validation by independent official forensic institutions. This minimizes the risk of manipulation by interested parties and ensures that any neuroscience-based findings are grounded in rigorous methodology and do not violate due process principles (Scarpazza et al., 2018). This strict validation process also strengthens the legitimacy of scientific evidence in the eyes of the law without compromising legal certainty, which remains the cornerstone of the German legal system. Additionally, Germany enforces a strict ethical framework regarding the use of neurotechnology in legal proceedings. The state actively restricts the commercialization of neuroimaging or neurotesting services for individual litigation purposes, preventing the emergence of a private market for "brain evidence" as a defense commodity (Fuss et al., 2015). This stands in stark contrast to some common law countries, where parties can often purchase expert services and strategically construct scientific narratives to support their legal position. In economic crimes, including white-collar offenses, German courts are increasingly open to considering defendants' neuropsychological conditions particularly in cases involving impulse control disorders, cognitive deterioration, or psychiatric conditions affecting executive brain function. However, such recognition does not automatically reduce culpability; rather, it is used to calibrate the proportionality of sentencing. For instance, if mental impairments affect a defendant's partial capacity to understand the consequences of their actions, punishment may still be imposed but could take a more rehabilitative form or include strict clinical supervision. Germany's model demonstrates that neurolaw integration not to enrich legal understanding of the biological dimensions of human behavior. This approach preserves the rule of law by not granting absolute authority to the

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scientific community, instead subjecting scientific findings to rigorous ethical and legal oversight. Law, in this framework, remains the architect of justice not merely a translator of technology.

Brazil's approach to neurolaw is more progressive and application-oriented, especially in addressing white-collar crimes and political corruption that have long undermined the country's institutional legitimacy. Unlike Germany's strict normative approach or the judicial gatekeeping model seen in the United States, Brazil appears more exploratory in opening interdisciplinary path-ways among law, neuroscience, and cognitive criminology. This trend is largely influenced by Brazil's sociopolitical context, particularly the fallout from major corruption scandals like Petrobras and *Operação Lava Jato*, which have prompted a deeper inquiry into corruption as a legal deviation but also as a potential expression of specific psychobiological conditions. Research from institutions such as the University of São Paulo and leading neuroscience centers has begun to reveal correlations between reduced activity in the prefrontal cortex responsible for planning, impulse control, and moral judgment and a tendency among corrupt actors to disregard social norms and public ethics. These findings do not justify corrupt behavior but provide a more nuanced understanding of why seemingly rational and well-educated individuals might still choose criminal paths. Such insights offer new frameworks for assessing mental capacity in judicial processes. Furthermore, the Brazilian government's involvement in funding interdisciplinary research in neuroforensics reflects a serious effort to establish a scientific foundation for criminal justice reform (da Rocha, 2013). This approach serves dual functions: first, as a tool to assess individual culpability in large and complex cases; second, as a preventive strategy for systemic crime by mapping the cognitive and neuroethical risks among public officials and policymakers. However, this approach also raises critical concerns. When a state sponsors neuroscience research in a criminal law context, tensions may arise between scientific objectivity and political agendas. There is a risk that neuroforensic findings could be used to legitimize or delegitimize certain political figures during corruption trials especially in Brazil's highly polarized political climate. Conceptually, Brazil's development of neurolaw underscores that criminal sentencing for corruption cannot be divorced from an understanding of the offender's internal conditions, including moral control capacity and neurologically shaped personality structures. Yet, strict ethical, legal, and scientific standards are essential to prevent this integration from devolving into biological determinism that undermines personal accountability. In landmark cases such as *Lava Jato*, neuropsychological analysis must be conducted transparently, through cross-examination procedures involving both the scientific and judicial communities equally.

Lessons from the United States, Germany, and Brazil demonstrate that the integration of neurolaw into criminal justice systems is not only possible but can also be contextually tailored to suit the unique characteristics of national legal frameworks. In the Indonesian context, these three models offer strategic directions that can be adapted to strengthen evidentiary systems in corruption cases and enhance the quality of criminal accountability. Substantively, Indonesian criminal law still adheres to a classical approach, where criminal responsibility is based on the presence of fault (*mens rea*), which is assumed to be the product of free will and rationality. However, developments in neuroscience challenge this assumption by showing that a person's capacity for criminal intent may be impaired by certain neuropsychological conditions that are not externally visible. In corruption cases, this becomes particularly relevant, as offenders are often under pressure, face complex administrative decisions, or may suffer from hidden impulse control disorders. Therefore, the substantive approach of Indonesian criminal law must begin to accommodate neurological dimensions in assessing culpability. This does not mean replacing the principle of *mens rea*, but rather enriching the framework of criminal responsibility with scientific tools. Assessments of a defendant's moral and cognitive capacity can be conducted through neuropsychological evaluations supervised by official forensic institutions, thereby preventing manipulative misuse (Jurjako & Malatesti, 2018). Procedurally, the use of neuroscience-based evidence is not yet explicitly regulated within Indonesia's criminal procedure system. The Indonesian Criminal Procedure Code (KUHAP) does not recognize any classification or screening mechanisms for scientific evidence, such as the *Daubert* standard used in the United States. This legal vacuum creates risks of disparity and uncertainty. Indonesia needs specific regulations that provide technical and legal guidelines on the admissibility of neuroscience evidence in court. A

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concrete step would be the revision of KUHAP to include new clauses on interdisciplinary scientific evidence, with strict parameters regarding validity, methodology, and legal relevance. Alternatively, the Supreme Court could issue a Supreme Court Regulation (*Peraturan Mahkamah Agung* or *Perma*) to offer a provisional normative framework without having to wait for legislative amendments.

With this approach, Indonesian judges can assume an active gatekeeping role by filtering scientific evidence based on methodological integrity and legal relevance not merely relying on visual impressions or inaccessible technical jargon. At the sentencing level, Indonesia must also move away from uniform punitive models toward a more *differentiated* approach that aligns sanctions with the psychological, cognitive, and neurological conditions of the offender. This aligns with principles of corrective and rehabilitative justice, which are gaining ground in modern judicial practices. Lessons from Germany and Brazil demonstrate that sentencing in corruption cases need not always be guided by deterrence or retribution. It can also take into account the internal capacities of the offender. For example, a person suffering from executive dysfunction due to a neurological disorder may be more appropriately subjected to rehabilitative sanctions or clinical supervision, rather than conventional imprisonment. However, this principle of differentiation must remain within the bounds of accountability. Neuropsychological disorders should never serve as a basis to eliminate criminal responsibility; rather, they should inform the *form* and *intensity* of punishment, making it more humane and targeted. This policy must also be supported by a correctional system that seriously addresses mental health needs. This statement underscores the fundamental need for interdisciplinarity and institutional vigilance in adopting neurolaw into Indonesia's criminal justice system. The integration of neuroscience cannot be treated merely as a technological innovation or procedural reform. It represents an epistemological shift in how the law interprets intent, culpability, and human responsibility. Therefore, its adoption demands a high degree of caution and genuine cross-disciplinary collaboration. First, collaboration among legal scholars, neuroscientists, forensic psychiatrists, and law enforcement officials is not just important it is fundamental. Without a shared language and adequate interdisciplinary understanding, neuroscientific findings can be easily misunderstood, misused, or reduced to mere defense gimmicks. For example, an fMRI image showing "low brain activity" in areas associated with moral judgment does not automatically mean the defendant lacks moral capacity. Interpretation must link that evidence to legal function and the actor's social context. This is why ethical and technical frameworks must be developed through interprofessional dialogue not monopolized by a single profession. Second, a strict balance must be maintained between substantive justice and the protection of legal principles. Recognition of neurological conditions must not blur the core tenets of criminal law *nullum crimen sine lege, nulla poena sine lege* (no crime and no punishment without clear legal grounds). The use of neuroscience evidence must never override procedural safeguards such as the presumption of innocence, the right to defense, and the burden of proof on the prosecution. On the contrary, neuroscience-based evidence must be scrutinized *intra-normatively*, meaning it must submit to the framework and hierarchy of positive law. In this regard, international practices demonstrate that legal innovation does not always require abandoning tradition, but rather a careful reinterpretation of fundamental legal principles in light of new knowledge. In the United States, cautious gatekeeping through the Daubert test ensures that scientific technologies do not dominate the courtroom. In Germany, legal ethics prevent the commercialization of neuroscience in litigation. In Brazil, the state promotes the integration of neuroscience to reform economic criminal law, while still operating within the boundaries of public accountability. Together, these models offer blueprints for Indonesia. With the right approach, Indonesia can develop a distinctive model of its own for a criminal justice system that is adaptive, evidence-based, and rooted in constitutional justice. Neurolaw can become a transformative legal instrument, modern in its methods and humanistic in its orientation. It enables the legal system to see the offender not merely as an object of punishment, but as a subject whose behavior is shaped by complex biological, social, and moral dimensions. Particularly in the context of economic crimes and corruption, this approach is highly relevant, as it reaches into the deeper layers of motive and responsibility beyond the dominant formal legal narratives.

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Conclusion

This article concludes that neurolaw has limited but important relevance in assessing the moral competence of corruption offenders. Its contribution lies not in excusing corruption, but in refining the legal understanding of culpability where serious and scientifically verifiable neurocognitive impairment is present. In corruption cases, the ordinary presumption remains that offenders act with awareness, planning, and abuse of entrusted power. Therefore, neuroscience-based evidence should not be treated as a general defense or as a mechanism to weaken anti-corruption enforcement. The use of neurolaw in Indonesia must be developed through a cautious and institutionally controlled framework. It requires strict evidentiary safeguards, independent forensic assessment, judicial gatekeeping, adversarial testing, and clear limits on admissibility. Without these safeguards, neurolaw may be misused by elite defendants as a sophisticated instrument of impunity. With proper regulation, however, it may assist courts in exceptional cases by supporting a more precise and proportionate assessment of criminal responsibility. The Indonesian model should therefore adopt neurolaw gradually, not as a replacement for criminal law doctrine, but as a complementary instrument that remains subordinate to accountability, public trust, and the goals of corruption eradication.

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Neurolaw dan kompetensi moral pelaku korupsi: Analisis hukum pidana

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Abstrak*:* Artikel ini mengkaji relevansi dan batas-batas neurolaw dalam menilai *moral competence* pelaku korupsi dalam hukum pidana. Kajian ini merespons meningkatnya penggunaan *neuroscience* dalam *criminal justice*, sekaligus menegaskan bahwa korupsi tetap merupakan penyalahgunaan kekuasaan yang dipercayakan secara sengaja dan tidak boleh dimaafkan melalui *biological reductionism*. Dengan menggunakan penelitian hukum normatif melalui pendekatan *statutory*, *conceptual*, dan *comparative*, artikel ini menganalisis hubungan antara *mens rea, moral competence, neurocognitive impairment*, dan *criminal responsibility* yang proporsional. Kajian ini menemukan bahwa neurolaw dapat membantu pengadilan memahami kasus-kasus luar biasa yang melibatkan *impairment* serius terhadap *impulse control*, *moral reasoning*, atau *executive function*, tetapi tidak boleh diperlakukan sebagai *general defense* bagi korupsi. Dalam konteks Indonesia, penggunaannya harus dibatasi, diatur secara hati-hati, dan didukung oleh *evidentiary safeguards* yang ketat, *independent forensic assessment*, *judicial gatekeeping*, serta perlindungan dari *elite impunity*. Artikel ini berargumen bahwa *neurolaw relevan* bukan untuk melemahkan pemberantasan korupsi, melainkan untuk memperhalus penilaian *culpability* dalam keadaan yang langka dan dapat dibuktikan secara ilmiah. Oleh karena itu, *neuroscience-based evidence* harus melengkapi, bukan menggantikan, pembuktian hukum mengenai *intent*, *accountability*, dan perlindungan *public trust*.
Kata Kunci: Neurolaw; Korupsi; *Moral competence*; *Criminal responsibility*; *Neuroscience Evidence*; Anti-Corruption Law

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Pendahuluan

Hubungan antara neuroscience dan hukum pidana, yang lazim disebut neurolaw, telah membuka perdebatan penting tentang bagaimana pengadilan seharusnya memahami tanggung jawab manusia dalam perkara pidana. Dalam perkara korupsi, perdebatan ini sangat sensitif karena korupsi bukan sekadar pelanggaran individual, melainkan penyalahgunaan kekuasaan publik yang dipercayakan yang merusak integritas kelembagaan, *public trust*, dan efektivitas tata kelola. Karena itu, setiap upaya untuk menghadirkan *neuroscientific evidence* dalam adjudikasi korupsi harus ditempatkan dalam kerangka pemberantasan korupsi, bukan sebagai pembenaran bagi *impunity* (Aono et al., 2019). Neurolaw hanya relevan ketika membantu pengadilan memeriksa apakah kapasitas kognitif dan moral pelaku benar-benar mengalami *impairment* serius yang dapat diverifikasi secara ilmiah. Fungsinya karena itu bersifat komplementer: neurolaw dapat memperhalus penilaian *culpability*, tetapi tidak boleh menggantikan persyaratan hukum untuk membuktikan *intent*, *abuse of authority*, dan *responsibility* (A Vincent, 2014).

Kajian-kajian sebelumnya tentang neurolaw sebagian besar berfokus pada *violent crimes*, *juvenile justice*, *mental illness*, *psychopathy*, atau *sentencing mitigation*. Sementara itu, korupsi umumnya dikaji melalui perspektif kelembagaan, politik, ekonomi, dan sosiologis. Keadaan ini menciptakan kesenjangan dalam *scholarship* hukum: dimensi moral dan neurokognitif pelaku korupsi jarang dibahas dalam hubungannya dengan *criminal responsibility* dan adjudikasi antikorupsi. Artikel ini tidak berargumen bahwa korupsi harus dimedikalisasi atau bahwa pelaku harus bebas dari hukuman melalui klaim *neuroscientific*. Sebaliknya, artikel ini menawarkan kerangka yang terbatas dan penuh kehati-hatian untuk memahami bagaimana neuroscience dapat membantu analisis hukum dalam kasus-kasus luar biasa, khususnya ketika *moral reasoning*, *executive control*, atau *impulse regulation* benar-benar mengalami *impairment*.

Fondasi hukum dari *criminal responsibility* terletak pada prinsip *mens rea*, yaitu keadaan batin pelaku pada saat tindak pidana dilakukan. Secara tradisional, hal ini dinilai melalui *behavioral evidence*, keterangan saksi, dan interpretasi hakim. Namun, perkembangan *neuroscience* menunjukkan bahwa kondisi neurologis tertentu dapat mengganggu decision-making, *moral judgment*, atau *impulse control*, sehingga memengaruhi kapasitas untuk membentuk *criminal intent* (Yoder & Decety, 2018). Munculnya neurolaw menantang dikotomi klasik antara *free will* dan determinism dalam *criminal justice* serta mengundang peninjauan kembali tentang bagaimana *culpability* dilekatkan, khususnya dalam perkara korupsi, ketika batas antara deliberate misconduct dan *cognitive distortion* dapat menjadi kabur (Prescott et al., 2024).

Secara global, perkara-perkara korupsi *high-profile* telah mendorong meningkatnya perhatian bukan hanya pada implikasi hukumnya, tetapi juga pada profil psikologis dan neurobiologis pelaku. Di Brasil, meskipun belum ada penelitian neuroscientific langsung yang secara khusus dilakukan terhadap figur politik yang dipenjara dalam skandal *Operação Lava Jato* (*Operation Car Wash*), kajian yang lebih luas mengenai *white-collar crime* telah mengeksplorasi kemungkinan peran sifat neurokognitif seperti *impaired moral judgment*, *heightened reward sensitivity*, atau *diminished empathy* dalam *unethical decision-making*. Misalnya, penelitian dalam bidang *neurocriminology* dan *forensic psychology* mengidentifikasi pola aktivasi yang tidak lazim pada *prefrontal cortex*, yakni area yang bertanggung jawab atas *executive function* dan *moral evaluation*, pada individu tertentu yang dihukum karena *economic crimes*. Walaupun temuan-temuan ini masih berada pada tahap awal dan belum diterima secara universal, temuan tersebut menunjukkan bahwa neuroscience dapat melengkapi pendekatan hukum dan sosiologis tradisional dengan menawarkan pemahaman yang lebih dalam tentang mekanisme kognitif dan emosional yang melandasi *corrupt behavior*.

Tabel 1. Selected Neurolaw Evidence dan Pelajaran Antikorupsi

Pengalaman hukum	Jenis evidence	Fungsi hukum	Pelajaran bagi perkara korupsi
Amerika Serikat	fMRI, *neuropsychological reports*, dan *expert testimony*	*Reliability screening* melalui *judicial gatekeeping* dan *methodological scrutiny*	*Scientific evidence* harus relevan, dapat diuji, dan terhubung secara hukum dengan *mens rea* atau *culpability*; bukti tidak boleh diterima hanya karena tampak objektif.
Jerman	*Independent forensic and psychiatric assessment*	Kontrol kelembagaan terhadap *expert evidence* untuk mendukung analisis *responsibility* dan *sentencing*	*Expert evidence* harus dievaluasi oleh lembaga independen untuk mengurangi manipulasi oleh terdakwa yang kaya atau berkuasa.
Brasil	Penelitian interdisipliner tentang korupsi, neuroscience, dan *cognitive decision-making*	Pemahaman berorientasi kebijakan tentang *unethical decision-making* dan *neuroethical risks*	Neuroscience dapat memperkaya studi antikorupsi, tetapi tidak boleh digunakan untuk membenarkan *political* atau *elite impunity*.
Indonesia	Belum ada regulasi khusus neurolaw dalam hukum acara pidana	Potensi penggunaan hanya sebagai *expert evidence* terbatas dengan *safeguards* yang ketat	Indonesia memerlukan *judicial guidelines, forensic independence, adversarial testing*, dan standar *admissibility* yang jelas sebelum *neuroscience-based evidence* digunakan dalam perkara korupsi.

Sumber: Konstruksi penulis berdasarkan analisis hukum komparatif.

Dalam konteks Indonesia, penggunaan neurolaw dalam perkara korupsi harus didekati secara realistis. Indonesia masih menghadapi tantangan dalam integritas penegakan hukum, kapasitas

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forensik, konsistensi peradilan, dan akses yang tidak setara terhadap *expert evidence*. Karena itu, neurolaw tidak dapat diajukan sebagai mekanisme operasional langsung untuk semua perkara korupsi. Relevansinya terletak pada pengembangan kerangka hukum berorientasi masa depan yang menetapkan batas-batas yang jelas sebelum *neuroscience-based evidence* masuk ke ruang sidang. Tanpa batas tersebut, neurolaw dapat menjadi alat canggih bagi terdakwa yang berkuasa untuk membangun alasan medis. Namun, dengan safeguards yang tepat, neurolaw dapat berkontribusi pada pemahaman *criminal responsibility* yang lebih presisi dan proporsional sambil tetap mempertahankan tujuan utama pemberantasan korupsi.

Pengalaman komparatif yang diringkas dalam Tabel 1 menunjukkan bahwa neurolaw tidak dapat diperkenalkan ke dalam perkara korupsi sebagai pembenaran yang berdiri sendiri untuk mengurangi responsibility. Nilai hukumnya bergantung pada adanya standar *admissibility* yang ketat, metode ilmiah yang reliabel, *independent forensic assessment*, dan *judicial control*. Pelajaran ini penting bagi Indonesia karena perkara korupsi sering melibatkan terdakwa yang berkuasa, jaringan kelembagaan yang kompleks, dan akses yang tidak setara terhadap *expert evidence*. Oleh sebab itu, isu sentralnya bukan apakah *neuroscience* harus digunakan secara luas dalam persidangan korupsi, melainkan bagaimana penggunaannya dapat dibatasi, diuji, dan ditempatkan di bawah prinsip-prinsip hukum pidana.

Artikel ini bertujuan menjawab tiga pertanyaan utama. Pertama, bagaimana neurolaw dapat berkontribusi terhadap penilaian *moral competence* dan *mens rea* dalam perkara korupsi? Kedua, apa batas etik, pembuktian, dan *doktrinal* dalam penggunaan *neuroscience-based evidence* dalam proses pidana? Ketiga, *model legal safeguards* apa yang tepat bagi Indonesia untuk mencegah neurolaw disalahgunakan sebagai pembenaran bagi *elite impunity*, sambil tetap memungkinkan pengadilan mempertimbangkan bukti ilmiah yang valid dalam kasus-kasus luar biasa?

Metode

Penelitian ini menggunakan penelitian hukum normatif untuk mengkaji hubungan konseptual dan doktrinal antara neurolaw, *moral competence*, dan *criminal responsibility* dalam perkara korupsi (Effendi et al., 2023). Penelitian ini menerapkan pendekatan *statutory*, *conceptual*, dan *comparative*. Pendekatan *statutory* digunakan untuk menganalisis konstruksi hukum *criminal responsibility*, prinsip pembuktian, dan penegakan antikorupsi. Pendekatan *conceptual* digunakan untuk menjelaskan *mens rea*, *culpability*, *moral competence*, neurocognitive *impairment*, dan proportional *punishment*. Pendekatan *comparative* digunakan untuk mengkaji pengalaman terpilih dari Amerika Serikat, Jerman, dan Brasil dalam mengatur atau membatasi *neuroscience-based evidence* dalam proses pidana. Bahan hukum terdiri dari peraturan perundang-undangan, putusan pengadilan, artikel jurnal, buku, serta literatur interdisipliner tentang hukum pidana, *neuroscience*, *forensic evidence*, dan *corruption studies* (Karianga & Fernando, 2024). Bahan-bahan tersebut dianalisis melalui *content analysis* dengan mengidentifikasi konsep yang relevan, membandingkan model hukum, dan merumuskan kerangka normatif yang sesuai bagi Indonesia (Akhmad et al., 2023).

Hasil dan Pembahasan

Neurolaw, Relevansi Antikorupsi, dan Batas Penerapan Langsung

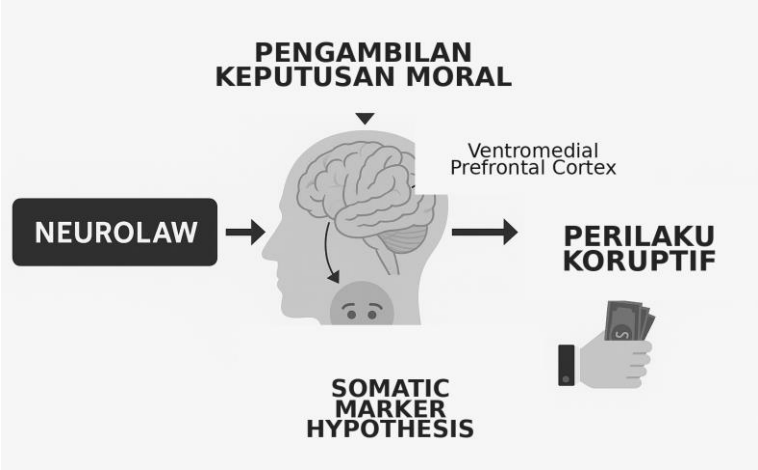
Isu pertama yang harus diperjelas adalah hubungan antara neurolaw dan pemberantasan korupsi. Neurolaw tidak boleh dipahami sebagai jalan pintas ilmiah untuk memaafkan pelaku korupsi. Korupsi tetap merupakan kejahatan serius terhadap *public trust*, keuangan publik, dan integritas kelembagaan. Relevansi neurolaw terletak pada kapasitasnya untuk membantu pengadilan memeriksa kondisi-kondisi luar biasa yang dapat memengaruhi kualitas *responsibility moral* dan kognitif pelaku. Artinya, *neuroscience-based evidence* hanya dapat dipertimbangkan ketika terdapat indikasi konkret adanya neurocognitive *impairment*, didukung oleh *expert assessment* yang reliabel, dan berkaitan langsung dengan isu hukum mengenai intent atau *culpability*.

Dalam pengertian ini, neurolaw memiliki fungsi yang terbatas tetapi penting. Neurolaw dapat membantu membedakan *corrupt intent* biasa dari kasus langka yang melibatkan *impairment* se-

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rius pada *executive function*, *impulse control*, atau *moral reasoning*. Namun, pembedaan tersebut tidak boleh pernah melemahkan karakter publik korupsi sebagai *abuse of power*. Perhatian utama dalam perkara korupsi bukan hanya apakah pelaku mengambil keputusan yang salah secara moral, melainkan juga apakah keputusan tersebut berkaitan dengan posisi kewenangan, akses terhadap sumber daya publik, dan pelanggaran *public trust*. Karena itu, neurolaw harus ditempatkan di bawah kontrol doktrin hukum pidana, bukan di atasnya.

Korupsi, sebagai bentuk *white-collar crime*, sering dikaitkan dengan *malicious intent*, perencanaan rasional, dan kesadaran penuh atas tindakan seseorang (Slamkov et al., 2021). Dalam sistem hukum pidana positif Indonesia, hal ini tercermin dalam penekanan pada unsur *mens rea* dalam menetapkan *criminal liability*. Namun, perkembangan *neuroscience* dan *neuropsychology* mulai menantang asumsi bahwa semua perbuatan korupsi dilakukan oleh individu dengan kapasitas moral dan kognitif yang sepenuhnya utuh (Mourão, 2018). Di sinilah neurolaw muncul sebagai pendekatan interdisipliner yang berupaya merekonstruksi pemahaman hukum tentang *criminal responsibility* dengan mengintegrasikan temuan ilmiah mengenai fungsi otak dan perilaku manusia (Dash et al., 2020).



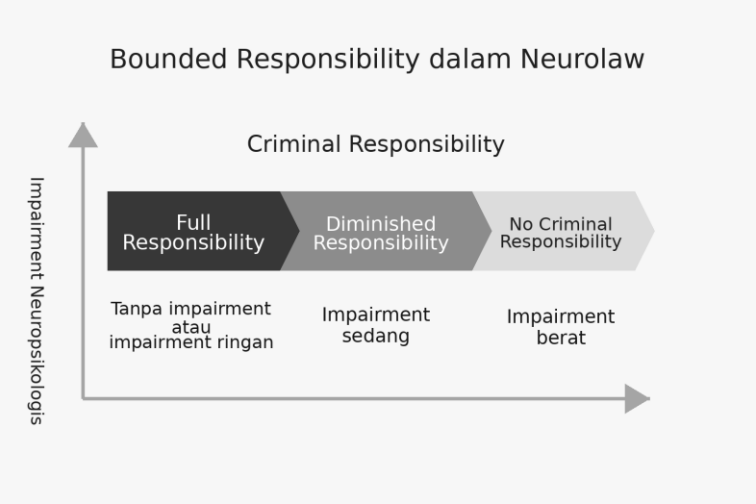
Gambar 1. Neurolaw dan *Moral Decision-Making* (Sumber: Konstruksi penulis)

Neurolaw memperkenalkan lensa ilmiah yang memungkinkan sistem hukum menilai kapasitas pelaku untuk memahami nilai moral dan mengatur tindakan sesuai dengan norma sosial yang berlaku (Belcher & Sinnott-Armstrong, 2010). Salah satu kerangka teoretis yang paling relevan dalam konteks ini adalah *Somatic Marker Hypothesis* dari Antonio Damasio, yang memberikan penjelasan neurobiologis tentang bagaimana emosi memengaruhi *moral reasoning* dan *decision-making*. Menurut Damasio, *ventromedial prefrontal cortex* (vmPFC) memainkan peran penting dalam mengodekan sinyal emosional yang disebut *somatic markers*, yang membimbing individu dalam mengambil keputusan etis. Marker ini berfungsi sebagai sistem peringatan internal, berdasarkan pengalaman emosional masa lalu, untuk membantu individu mengantisipasi akibat tindakannya, terutama dalam situasi yang kompleks atau ambigu secara moral. Ketika wilayah otak tertentu ini mengalami *impairment* karena trauma, gangguan neurologis, atau abnormalitas perkembangan, individu dapat tetap memiliki kemampuan intelektual dan kognitif yang utuh (yaitu kemampuan bernalar, merencanakan, dan memahami aturan), tetapi tidak memiliki *emotional feedback* yang diperlukan untuk mengevaluasi tindakan melalui lensa moral. Kondisi neurologis ini menciptakan keterputusan antara kognisi rasional dan hati nurani emosional (Brown, 2019). Dalam konteks korupsi, hal ini berarti seorang pelaku dapat sepenuhnya memahami bahwa menerima suap atau memanipulasi dana publik adalah ilegal dan dapat berakibat pada hukuman. Namun, pelaku tersebut mungkin tidak merasakan bobot emosional seperti rasa bersalah, malu, atau empati terhadap korban yang biasanya berfungsi sebagai pencegah perilaku demikian. Akibatnya, perilakunya dapat tampak terhitung dan disengaja dari sudut pandang hukum, padahal sebagian dipengaruhi oleh kekurangan neurobiologis dalam *moral-emotional processing*. Hal ini menimbulkan titik perdebatan penting dalam hukum pidana: apakah sistem hukum harus mempertimbangkan *impaired moral affect*, meskipun rasionalitas masih terpelihara, sebagai dasar bagi bentuk *criminal respon-*

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sibility yang parsial atau alternatif? Doktrin tradisional *criminal liability* sangat bergantung pada keberadaan *mens rea*, atau guilty mind, yang mengandaikan kemampuan pelaku untuk memahami dan merasakan secara emosional kesalahan perbuatannya. Namun, neurolaw memaksa kita mempertanyakan apakah keberadaan kognisi rasional saja cukup untuk melekatkan *blameworthiness* penuh, terutama dalam *white-collar crime*s yang dapat melibatkan *moral disengagement* karena faktor neurologis (Fagan, 2022). Perspektif ini tidak membebaskan pelaku korupsi dari *responsibility*, tetapi menawarkan kerangka evaluasi yang lebih bernuansa, yakni kerangka yang dapat menggabungkan analisis hukum dengan *neuroscientific assessments* untuk menentukan tingkat dan kualitas *criminal intent*. Hal ini membuka ruang integrasi *neuropsychological evaluations* dalam persidangan korupsi, terutama ketika dicurigai adanya *cognitive* atau *affective impairments*.

Penerapan pendekatan neurolaw dalam menilai kapasitas moral pelaku korupsi menantang pemahaman tradisional mengenai *criminal responsibility* dalam hukum pidana Indonesia. Secara historis, baik Kitab Undang-Undang Hukum Pidana (KUHP) maupun Undang-Undang Pemberantasan Tindak Pidana Korupsi (UU Tipikor) mendasarkan *criminal liability* pada kesadaran dan free will pelaku. Namun, dalam kasus tertentu, individu yang terlibat korupsi dapat mengalami *executive function impairment*s yang memengaruhi *impulse control*, empati, dan *moral reasoning*. Studi penting di Brasil terhadap pelaku korupsi menunjukkan berkurangnya aktivitas otak pada *prefrontal cortex*, yaitu area yang krusial bagi regulasi moral dan perilaku sosial. Temuan neurologis ini menunjukkan bahwa sebagian pelaku mungkin tidak sepenuhnya merespons stimulus sosial secara normatif. Dalam istilah hukum, kondisi semacam ini dapat memiliki implikasi signifikan bagi penilaian *mens rea*, karena memunculkan pertanyaan apakah individu tersebut memiliki kapasitas mental dan emosional yang penuh untuk memahami serta menginternalisasi kesalahan tindakannya.



Gambar 2. *Bounded Responsibility*: Kerangka Berbasis Neurolaw untuk *Criminal liability* yang Proporsional dalam Perkara Korupsi (Sumber: Konstruksi penulis)

Merekonstruksi *criminal liability* melalui lensa neurolaw memerlukan pergeseran doktrinal dalam kerangka hukum pidana positif. Salah satu model teoretis yang dapat diterapkan adalah konsep "*bounded responsibility*," yang memandang *criminal responsibility* bukan sebagai pilihan biner antara kapasitas penuh dan ketidakmampuan total, melainkan sebagai spektrum. Dalam model ini, pelaku dengan *neuropsychological impairment*s tidak secara otomatis bebas dari *liability*; sebaliknya, jenis dan derajat *responsibility* mereka disesuaikan dengan tingkat *neurological dysfunction* yang dialami. Pendekatan ini sejalan dengan prinsip *proportionality* dalam *sentencing*, yang memastikan bahwa *punishment* tidak hanya bersesuaian dengan kerugian yang ditimbulkan, tetapi juga dengan kapasitas kognitif dan moral aktual pelaku. Memasukkan konsep ini ke dalam perlakuan hukum terhadap perkara korupsi akan memungkinkan ketentuan khusus yang mempertimbangkan kondisi neurologis pelaku tanpa melemahkan *accountability* yang diwajibkan bagi *crimes of public trust*.

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Namun, penggunaan neurolaw bukan tanpa kontroversi. Kritik mengemukakan kekhawatiran tentang risiko "*neurodeterminism*," yaitu keyakinan bahwa perilaku manusia sepenuhnya ditentukan oleh struktur otak, sehingga mengaburkan batas antara *free will* dan kondisi medis (Cardoso, 2021). Gagasan ini bertentangan dengan prinsip fundamental hukum pidana bahwa individu adalah subjek hukum yang bertanggung jawab atas tindakannya. Karena itu, penerimaan neurolaw harus dibatasi dalam batas etik dan hukum yang ketat, termasuk validitas ilmiah *neuroimaging evidence* dan adanya mekanisme *cross-examination* yang melibatkan ahli hukum dan ahli neurologis dalam proses peradilan. Di negara lain, seperti Amerika Serikat dan Jerman, penggunaan *neuroscience-based evidence* dalam perkara pidana mulai memperoleh daya tarik secara selektif. Kasus Herbert Weinstein (1991) di New York menjadi momen penting, ketika terdakwa dalam perkara pembunuhan mengajukan bukti adanya kista otak besar yang menekan area yang bertanggung jawab mengatur impulsivitas dan emosi. Meskipun bukan perkara korupsi, preseden ini membuka pintu bagi defense yang didasarkan pada kondisi neurologis. Dalam konteks *white-collar crime*, beberapa terdakwa dalam perkara penggelapan dan penipuan mulai mengajukan *diminished executive function* sebagai faktor yang memengaruhi *malicious intent* mereka. Walaupun pengadilan tetap berhati-hati, tren ini menunjukkan bahwa pendekatan neurolaw berkembang secara bertahap dan semakin relevan dalam penilaian *criminal responsibility*.



Gambar 3. Kerangka *Criminal responsibility* Berbasis Neurolaw dalam Perkara Korupsi di Indonesia (Sumber: Konstruksi penulis)

Dalam kerangka hukum Indonesia, rekonstruksi *criminal responsibility* pelaku korupsi berbasis neurolaw memerlukan pemenuhan tiga syarat esensial. Pertama, harus ada pengakuan hukum formal terhadap *neuroscientific evidence* sebagai komponen yang *admissible* dalam persidangan pidana. Hal ini membutuhkan perubahan terhadap Kitab Undang-Undang Hukum Acara Pidana (KUHAP) atau pembentukan regulasi khusus untuk mengakomodasi bukti tersebut dalam sistem pembuktian. Kedua, penting untuk memperkuat kapasitas kelembagaan lembaga forensik dan pengadilan agar mampu mengevaluasi temuan *neuroscientific* secara objektif melalui kolaborasi interdisipliner, sehingga putusan didasarkan pada prinsip hukum dan validitas ilmiah. Ketiga, *ethical guidelines* dan *scientific standards* harus dibentuk untuk mencegah penyalahgunaan argumen neurologis sebagai alat *impunity* atau manipulasi hukum. Tujuan integrasi neurolaw ke dalam penegakan antikorupsi bukanlah untuk membebaskan pelaku dari *accountability*, melainkan menyediakan instrumen yang lebih presisi dan berbasis bukti untuk menilai dimensi moral dan kognitif dari *individual responsibility*. Hal ini sejalan dengan arah hukum pidana modern yang

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semakin menekankan *substantive justice* dan proportionality dalam *sentencing*. Dengan mengadopsi pendekatan *neurolaw-informed*, Indonesia memiliki kesempatan membangun *criminal justice system* yang bergerak melampaui legalisme kaku menuju model yang *scientifically informed* sekaligus secara fundamental humanis.

Moral competence, *Mens rea*, dan *Bounded Responsibility* dalam Perkara Korupsi

Konsep *moral competence* berkaitan erat dengan doktrin hukum pidana tentang *mens rea*. Dalam hukum pidana konvensional, *mens rea* biasanya disimpulkan dari perilaku eksternal, keadaan yang melingkupi, *documentary evidence*, keterangan saksi, dan hubungan logis antara tindakan dan akibat. Dalam perkara korupsi, inferensi ini sering diperkuat oleh bukti adanya perencanaan, penyembunyian, keuntungan finansial, *abuse of authority*, atau tindakan terkoordinasi. Neurolaw tidak menghapus metode pembuktian ini. Sebaliknya, neurolaw mengajukan pertanyaan yang lebih sempit: apakah terdakwa memiliki kapasitas kognitif dan moral yang diperlukan untuk memahami kesalahan perbuatan serta mengendalikan perilaku sesuai pemahaman tersebut.

Model bounded responsibility berguna dalam hal ini. *Responsibility* tidak boleh direduksi menjadi biner sederhana antara *full responsibility* dan *no responsibility*. Dalam kasus-kasus luar biasa, seseorang mungkin memahami aturan hukum tetapi mengalami *impairment* serius yang memengaruhi *moral-emotional processing* atau *executive control*. *Impairment* semacam itu mungkin tidak menghapus *criminal liability*, tetapi dapat relevan terhadap derajat *culpability* dan *proportionality of punishment*. Pendekatan ini konsisten dengan gagasan bahwa *criminal punishment* harus merespons bukan hanya kerugian yang ditimbulkan, melainkan juga blameworthiness aktual dari pelaku.

Meskipun demikian, *model bounded responsibility* harus diterapkan secara hati-hati dalam perkara korupsi. Banyak tindak pidana korupsi melibatkan kalkulasi, *concealment*, transaksi berulang, penyalahgunaan prosedur kelembagaan, dan jaringan terkoordinasi. Ciri-ciri ini biasanya menunjukkan perencanaan rasional, bukan *diminished capacity*. Karena itu, klaim berbasis *neuroscience* tidak boleh diterima kecuali memenuhi standar ketat mengenai relevansi, reliabilitas, dan hubungan kausal dengan perbuatan pidana tertentu. Keberadaan *brain abnormality* semata tidak dapat secara otomatis mengurangi responsibility.

Integrasi neuroscience ke dalam proses pembuktian perkara korupsi memperkenalkan dimensi baru dalam *criminal justice* system yang selama ini bertumpu pada konsep tradisional *individual responsibility*. Di satu sisi, pendekatan ini menawarkan jalan untuk mengungkap aspek tersembunyi dari kapasitas mental terdakwa; di sisi lain, pendekatan ini juga menghadirkan risiko epistemologis dan normatif yang signifikan apabila diterapkan tanpa kerangka etik dan hukum yang kuat. Neuroscience, sebagai disiplin yang mempelajari hubungan antara struktur dan fungsi otak dengan perilaku manusia, semakin dipertimbangkan sebagai alat untuk menilai apakah seseorang benar-benar memiliki *criminal intent* (*mens rea*) pada saat melakukan tindak pidana, termasuk perbuatan korupsi (Maoz & Yaffe, 2016).

Dalam perkara korupsi, pelaku umumnya berasal dari lingkaran elite, memiliki latar belakang pendidikan tinggi, dan menduduki posisi strategis dalam birokrasi atau sektor swasta. Tindakan mereka sering dilakukan melalui skema yang dirancang secara sistematis, melibatkan manipulasi prosedur administratif, eksploitasi kekuasaan struktural, dan kolaborasi dalam jaringan terorganisasi. Karakteristik ini memperkuat asumsi konvensional dalam hukum pidana bahwa korupsi lahir dari free will dan rasionalitas yang sepenuhnya utuh. Konsekuensinya, unsur *mens rea*, atau *criminal intent*, menjadi pusat pembuktian *culpability* pelaku. Namun, perkembangan *neuroscience* mulai menantang pemahaman tradisional ini. Temuan ilmiah menunjukkan bahwa moral decision-making dan *impulse control*, dua komponen penting dari perilaku koruptif, tidak hanya diatur oleh logika sadar, tetapi juga dipengaruhi oleh kondisi neurologis tertentu (Hu et al., 2021). *Impairment* pada wilayah otak seperti *prefrontal cortex* atau *amygdala*, misalnya, dapat menghasilkan individu yang tetap mampu secara analitis tetapi menunjukkan *diminished empathy*, *impaired moral-affective responses*, atau *weakened self-regulation*. Hal ini memunculkan dilema mendalam: apakah individu yang secara lahiriah tampak rasional dapat diasumsikan memiliki kapasitas moral dan kognitif penuh pada saat melakukan korupsi? Apakah tindakannya sepenuhnya sadar dan disengaja, atau terdapat *dysfunction* tersembunyi di balik performa intelektualnya? Jika

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demikian, *criminal responsibility* dalam perkara korupsi tidak boleh dinilai semata-mata berdasarkan konstruksi normatif *mens rea*, tetapi juga harus mempertimbangkan kapasitas *neuropsychological* pelaku sebagai faktor yang memengaruhi *culpability* dan tingkat *punishment* yang tepat.

Teknologi seperti *functional Magnetic Resonance Imaging* (fMRI), *Electroencephalography* (EEG), dan *neuropsychological testing* menawarkan sarana canggih untuk memvisualisasikan dan mengukur aktivitas otak yang berkaitan dengan proses kognitif dan emosional penting, termasuk *decision-making*, empati, *impulse control*, dan *moral awareness* (Yen et al., 2023). Ketika diajukan sebagai *evidence* dalam proses hukum, khususnya dalam perkara kompleks seperti korupsi, alat-alat ini dapat mengungkap adanya kelainan neurologis yang secara signifikan memengaruhi perilaku seseorang. Misalnya, kerusakan atau *dysfunction* pada *prefrontal cortex*, yaitu wilayah yang bertanggung jawab atas *executive function*s seperti perencanaan, *moral evaluation*, dan *behavioral regulation*, dapat mengganggu kemampuan seseorang untuk memperkirakan akibat tindakannya atau menahan *impuls* yang tidak etis, meskipun secara lahiriah ia tampak rasional dan tenang (Khalid et al., 2024). *Impairment* semacam ini sering tidak tampak dalam interaksi sosial biasa sehingga sulit dideteksi tanpa penyelidikan ilmiah. Namun, pengaruhnya terhadap perilaku dapat sangat besar dan berpotensi melemahkan *emotional* and *moral self-regulation* yang dibutuhkan untuk bertindak sesuai hukum. Dalam konteks ini, *neuroscience-based evidence* tidak serta-merta meniadakan *criminal responsibility*, tetapi memberikan pemahaman yang lebih dalam dan bernuansa tentang keadaan mental pelaku, yang dapat menginformasikan derajat *culpability* dan membimbing *sentencing* yang tepat.

Peluang utama yang ditawarkan pendekatan neurolaw terletak pada potensinya untuk memajukan *substantive justice*. Alih-alih menghukum semata-mata berdasarkan akibat suatu perbuatan, sistem hukum dapat menilai secara lebih mendalam keadaan mental internal pelaku. Jika terbukti bahwa pelaku menderita *neurocognitive impairment*s yang memengaruhi kesadaran atau kendali atas tindakannya, *criminal liability* dapat dipertimbangkan kembali melalui prinsip *proportionality*. Hal ini penting untuk mencegah *criminal justice* system menjadi terlalu retributif dan mengabaikan kompleksitas psikobiologis perilaku manusia. Namun, potensi ini tidak lepas dari risiko yang signifikan. Penggunaan *neuroscience-based evidence* dalam persidangan korupsi menghadirkan tiga kategori tantangan utama: etik, teknis, dan normatif. Dari perspektif etik, terdapat kekhawatiran bahwa terdakwa dapat mengeksploitasi hasil tes neurologis sebagai strategi untuk menghindari hukuman. Dalam sistem hukum yang masih dibayangi korupsi, risiko manipulasi penilaian medis sangat tinggi, terutama ketika mekanisme pengawasan lemah. Dalam konteks semacam itu, neuroscience dapat disalahgunakan bukan sebagai instrumen keadilan, melainkan sebagai perisai baru bagi *elite impunity*. Pada level teknis, validitas ilmiah alat seperti fMRI dan EEG masih terus diperdebatkan. Meskipun teknologi ini dapat mendeteksi aktivitas otak, teknologi tersebut tidak dengan sendirinya membuktikan hubungan kausal antara keadaan otak dan perilaku kriminal. Misalnya, peningkatan aktivasi pada wilayah otak tertentu tidak otomatis berarti individu tersebut tidak memahami tindakannya. Dalam ruang sidang, hal ini menciptakan bahaya bahwa bukti ilmiah yang tampak objektif tetapi bersifat probabilistik dapat mendistorsi penilaian hukum yang seharusnya didasarkan pada standar *beyond reasonable doubt*. Dari sudut normatif, hukum acara pidana Indonesia belum secara eksplisit mengatur penggunaan *neuroscientific evidence* dalam proses peradilan. KUHAP yang berlaku belum secara khusus mengakui bukti semacam itu, dan belum ada pedoman Mahkamah Agung yang memberikan kriteria standar mengenai admissibility atau batas penggunaannya. Kekosongan hukum ini membuka ruang disparitas praktik hukum, sangat bergantung pada interpretasi hakim atau kekuatan negosiasi antara penasihat hukum dan penuntut umum. Dalam literatur neurolaw, situasi ini sering disebut sebagai "*epistemic authority*," yaitu dominasi *scientific expertise* di dalam ruang sidang. Ketika hakim dan jaksa tidak memiliki pemahaman memadai tentang neuroscience, mereka berisiko menyerahkan penilaian hukum kepada *expert witnesses* yang mungkin memiliki bias atau konflik kepentingan. Pergeseran ini berbahaya karena dapat menggantikan prinsip keadilan dengan klaim ilmiah yang tidak dapat diuji secara memadai melalui standar yuridis.

Jurisprudensi dari negara seperti Amerika Serikat dan Jerman menunjukkan bahwa *neuroscience-based evidence* tidak dapat diterima secara tidak kritis dalam proses pidana. Dalam U.S. v. Semrau, pengadilan federal menolak penggunaan fMRI sebagai alat *lie detection* dengan alasan

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reliabilitas ilmiahnya belum memadai. Demikian pula di Jerman, *Federal Court of Justice* mensyaratkan *balancing test* yang hati-hati antara relevansi hukum dan validitas ilmiah *neuroscientific evidence* sebelum bukti tersebut dapat diterima dalam persidangan pidana. Preseden ini menegaskan peran krusial hakim sebagai gatekeepers yang menjaga integritas sistem hukum dari klaim ilmiah yang prematur atau belum terverifikasi. Bagi Indonesia, langkah awal adalah membentuk *judicial guidelines* yang menetapkan standar minimum *admissibility neuroscience* di pengadilan. Misalnya, hanya ahli dengan sertifikasi khusus yang boleh memberikan keterangan, atau hanya jenis pemeriksaan *neuroscientific* tertentu yang dapat diakui secara formal. Selain itu, pembaruan KUHAP penting untuk mengakomodasi bentuk-bentuk *evidence* baru tanpa melemahkan prinsip *due process of law*. Langkah kedua yang diperlukan adalah *interdisciplinary training* bagi para legal professionals. Hakim, jaksa, dan penasihat hukum harus memperoleh pemahaman dasar tentang *neuroscience*, termasuk keterbatasan dan penggunaan yang tepat. Tanpa *scientific literacy* yang memadai, aktor hukum dapat kesulitan menilai *evidence* yang sangat teknis. Perguruan tinggi dan lembaga pendidikan hukum dapat berperan aktif dengan mengembangkan modul pendidikan interdisipliner yang menjembatani doktrin hukum dan pengetahuan neuroscience. Langkah ketiga dan mungkin paling kritis adalah memperkuat *precautionary principle* dalam menilai *neuroscience-based evidence*. Prinsip ini menegaskan bahwa teknologi baru harus tunduk pada standar yang ketat, dan setiap klaim ilmiah harus divalidasi secara menyeluruh dalam konteks hukum. Dengan kata lain, *neuroscience* tidak boleh menggantikan pencarian keadilan oleh hukum, tetapi harus menjadi alat komplementer yang bekerja dalam batas hukum yang akuntabel. Dalam perkara korupsi, ketika terdakwa sering berasal dari kelas sosial dominan dengan akses sumber daya besar, kehati-hatian ini harus ditingkatkan. Terdapat risiko besar bahwa *neuroscience* disalahgunakan sebagai perisai canggih bagi *elite impunity*. Karena itu, sistem hukum harus mengembangkan mekanisme kontrol berlapis, termasuk audit independen terhadap *medical evidence* dan protokol pembuktian yang ketat untuk menguji setiap klaim neurological *impairment*. Penting ditegaskan bahwa integrasi neuroscience ke dalam hukum pidana bukanlah upaya membebaskan pelaku dari *responsibility*, melainkan untuk memastikan bahwa *criminal accountability* dijalankan secara adil dan proporsional. Dalam persidangan korupsi, pendekatan ini dapat membantu membedakan antara pihak yang benar-benar menderita *neurocognitive disorders* dan pihak yang mengeksploitasi argumen medis sebagai strategi hukum untuk lolos dari hukuman. Apabila diterapkan dengan benar, neurolaw dapat memperkuat sistem peradilan, bukan melemahkannya. Pada akhirnya, yang dibutuhkan bukan hanya regulasi, tetapi juga pergeseran paradigma. Hukum tidak dapat lagi bekerja dalam isolasi; hukum harus membuka diri terhadap keterlibatan disiplin lain. Dalam menangani kejahatan modern yang kompleks seperti korupsi, pendekatan multidisipliner sangat diperlukan. *Neuroscience* tidak perlu dipandang sebagai ancaman bagi hukum, melainkan sebagai undangan untuk merekonstruksi pemahaman kita tentang *culpability*, responsibility, dan *justice* berdasarkan pengetahuan ilmiah kontemporer.

Evidentiary safeguards (*Reliability, Admissibility*, dan Perlindungan terhadap *Elite impunity*)

Risiko paling serius dari pengenalan neurolaw ke dalam perkara korupsi adalah kemungkinan penyalahgunaannya oleh terdakwa yang berkuasa. Pelaku korupsi sering memiliki akses terhadap sumber daya finansial, *elite lawyers, private experts*, dan pengaruh kelembagaan. Jika *neuroscience-based evidence* diterima tanpa safeguards yang ketat, bukti tersebut dapat menjadi bentuk baru *privilege elite*, bukan instrumen keadilan. Oleh karena itu, sistem hukum Indonesia harus memperlakukan neurolaw dengan *precautionary approach*.

Setidaknya terdapat enam *safeguards* yang diperlukan. Pertama, *neuroscience-based evidence* harus relevan secara hukum dengan isu yang sedang diputus, terutama *mens rea*, *culpability*, atau *sentencing*. Kedua, metode ilmiah yang digunakan harus valid, *peer-reviewed*, dan dapat diuji. Ketiga, *assessment* harus dilakukan oleh *independent forensic experts*, bukan oleh ahli yang dikendalikan secara privat oleh salah satu pihak. Keempat, *evidence* harus terbuka untuk *adversarial testing* melalui *cross-examination* oleh penuntut umum dan penasihat hukum. Kelima, hakim harus bertindak sebagai *gatekeepers* yang menilai apakah *evidence* memiliki *probative value* yang memadai dan apakah penggunaannya dapat menyesatkan pengadilan. Keenam, *neuroscience-*

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based evidence tidak boleh pernah menggeser *burden of proof* dari penuntut umum atau melemahkan *presumption of innocence*.

Safeguards tersebut sangat penting bagi Indonesia karena negara ini masih menghadapi tantangan kelembagaan dalam penegakan hukum. Tujuan neurolaw bukanlah menciptakan jalur pelarian tambahan bagi pelaku korupsi, melainkan memastikan bahwa *scientific evidence*, ketika secara luar biasa relevan, diperiksa dalam proses hukum yang transparan dan akuntabel. Tanpa *safeguards* ini, neurolaw akan berbahaya secara normatif. Dengan *safeguards* tersebut, neurolaw dapat berfungsi sebagai instrumen terbatas untuk meningkatkan kualitas *judicial reasoning*.

Studi Komparatif Penerapan Neurolaw dalam *Criminal justice* Systems: Implikasi bagi Penanganan Perkara Korupsi di Indonesia

Penerapan neurolaw dalam *criminal justice* systems menunjukkan variasi yang signifikan antarnegara, bergantung pada struktur hukum, keterbukaan terhadap *scientific evidence*, dan perkembangan teknologi forensik. Di Amerika Serikat, penggunaan *neuroscience-based evidence* di pengadilan pidana mulai mendapat perhatian setelah kasus Herbert Weinstein (1991), ketika hasil *brain scan* diajukan sebagai bagian dari *defense* terhadap dakwaan pembunuhan. Sejak saat itu, pengadilan di berbagai negara bagian mulai mempertimbangkan temuan fMRI dan EEG dalam menilai *intent* (*mens rea*) terdakwa, kapasitas moral, dan *impulse control*. Peran hakim sebagai *gatekeepers* menjadi sentral dalam sistem peradilan pidana Amerika, terutama di bawah Daubert standard. Ditetapkan dalam Daubert v. Merrell Dow Pharmaceuticals, Inc. (1993), kerangka ini mewajibkan hakim mengevaluasi validitas ilmiah dan relevansi hukum *expert evidence* sebelum diajukan di pengadilan. Daubert standard menetapkan empat kriteria utama: (1) apakah teori atau teknik dapat dan telah diuji; (2) apakah telah melalui *peer review* dan *publication*; (3) *known or potential error rate*; dan (4) *general acceptance* dalam komunitas ilmiah yang relevan (Smith, 2009). Di bawah standar ini, *neuroscience-based evidence*, termasuk hasil fMRI dan *neuropsychological assessments*, tidak diterima semata-mata karena tampak "scientific"; bukti tersebut harus lolos *scrutiny* metodologis yang ketat dan menunjukkan relevansi langsung dengan isu hukum yang diperiksa. Dalam konteks *white-collar crime*, termasuk korupsi, pendekatan ini mulai membuka ruang bagi integrasi *neuropsychological evaluations* dalam strategi *defense*. Walaupun masih terbatas dan belum *mainstream*, tren ini menunjukkan pengakuan yang meningkat terhadap dimensi psikologis dan neurologis *white-collar offenders*. Kasus seperti U.S. v. Fishman dan beberapa perkara *tax fraud* memperlihatkan bagaimana *neuropsychological reports* diajukan untuk menunjukkan *cognitive impairments* yang memengaruhi *decision-making* (Clem, 2024). Namun, penting dicatat bahwa pengadilan tidak otomatis menerima temuan tersebut sebagai dasar untuk menghapus *criminal liability*. Hakim melakukan telaah kritis, menimbang apakah *impairment* tersebut secara signifikan berkontribusi pada pelanggaran hukum atau hanya digunakan sebagai *exculpatory tactics*. Dengan demikian, prinsip *fair trial* diuji bukan dengan menoleransi *impunity*, melainkan dengan memastikan bahwa terdakwa dinilai berdasarkan pemahaman komprehensif terhadap kondisinya, termasuk *mental and cognitive states*. Secara analitis, pendekatan Amerika Serikat menunjukkan model yang seimbang, yang menggabungkan keterbukaan terhadap inovasi ilmiah dengan standar hukum yang tegas. Dengan menempatkan hakim sebagai *scientific gatekeepers*, sistem ini melindungi proses pencarian kebenaran dari banjir evidence teknis yang dapat membingungkan juri atau mendistorsi kebenaran. Lebih penting lagi, model ini mencerminkan komitmen pada *procedural justice*, dengan memastikan bahwa proses hukum adil bukan hanya dalam hasil, tetapi juga dalam metode yang digunakan untuk mencapainya. Relevansi model ini bagi perkara korupsi sangat strategis. Korupsi sering disamarkan melalui lapisan administrative *sophistication* dan legitimasi formal, sehingga pendekatan hukum yang semata-mata formalistik dapat gagal menangkap kompleksitas subjektif pelaku. Di sini, *neuropsychological tools* memberi nilai tambah bukan untuk membebaskan individu dari responsibility, melainkan untuk menilai apakah kapasitas moral dan kognitif mereka benar-benar utuh pada saat mengambil keputusan melawan hukum. Hal ini sejalan dengan prinsip *individualized criminal responsibility*, ketika setiap terdakwa dinilai berdasarkan keseluruhan keadaan personalnya, termasuk kondisi psikologis dan neurologis.

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Pendekatan Jerman terhadap neurolaw mencerminkan karakter utama *civil law system*, yaitu penekanan pada kodifikasi, kejelasan norma, dan integritas sistem hukum secara keseluruhan. Berbeda dari *evidentiary framework* yang lebih fleksibel dalam *adversarial systems*, sistem hukum Jerman mengadopsi prosedur yang hati-hati tetapi terstruktur dalam menyaring dan mengevaluasi *science-based evidence*, termasuk *neuroscience* (Langleben & Moriarty, 2013). Salah satu kekuatan utama model Jerman terletak pada monopoli negara atas *forensic expertise*. *Neuroscientific evidence* tidak dapat diajukan secara sepihak oleh *defense* atau *prosecution*, melainkan harus melalui pemeriksaan dan validasi oleh lembaga forensik resmi yang independen. Hal ini meminimalkan risiko manipulasi oleh pihak berkepentingan dan memastikan bahwa setiap *neuroscience-based findings* bertumpu pada metodologi yang ketat serta tidak melanggar *due process principles* (Scarpazza et al., 2018). Proses validasi yang ketat ini juga memperkuat *legitimasi scientific evidence* di mata hukum tanpa mengorbankan *legal certainty*, yang tetap menjadi dasar sistem hukum Jerman. Selain itu, Jerman memberlakukan kerangka etik yang ketat terkait penggunaan *neurotechnology* dalam proses hukum. Negara secara aktif membatasi komersialisasi *neuroimaging* atau *neurotesting services* untuk kepentingan litigasi individual, sehingga mencegah munculnya pasar privat "*brain evidence*" sebagai komoditas *defense* (Fuss et al., 2015). Hal ini sangat kontras dengan beberapa *common law countries*, ketika para pihak sering dapat membeli jasa *expert* dan secara strategis menyusun narasi ilmiah untuk mendukung posisi hukumnya. Dalam *economic crimes*, termasuk *white-collar offenses*, pengadilan Jerman semakin terbuka mempertimbangkan kondisi *neuropsychological* terdakwa, terutama dalam kasus yang melibatkan *impulse control disorders*, *cognitive deterioration*, atau kondisi psikiatris yang memengaruhi executive *brain function*. Namun, pengakuan semacam itu tidak otomatis mengurangi *culpability*; sebaliknya, digunakan untuk mengalibrasi *proportionality of sentencing*. Misalnya, apabila *mental impairment*s memengaruhi kapasitas parsial terdakwa untuk memahami akibat tindakannya, *punishment* tetap dapat dijatuhkan tetapi dapat mengambil bentuk yang lebih rehabilitatif atau disertai *clinical supervision* yang ketat. Model Jerman menunjukkan bahwa integrasi neurolaw tidak dimaksudkan untuk membongkar fondasi *criminal responsibility*, melainkan memperkaya pemahaman hukum atas dimensi biologis perilaku manusia. Pendekatan ini menjaga rule of law dengan tidak memberikan otoritas absolut kepada komunitas ilmiah, tetapi menundukkan *scientific findings* pada pengawasan etik dan hukum yang ketat. Dalam kerangka ini, hukum tetap menjadi arsitek keadilan, bukan sekadar penerjemah teknologi.

Pendekatan Brasil terhadap neurolaw lebih progresif dan berorientasi aplikasi, terutama dalam menangani *white-collar crime*s dan *political corruption* yang lama merusak legitimasi kelembagaan negara tersebut. Berbeda dari pendekatan normatif Jerman yang ketat atau model *judicial gatekeeping* di Amerika Serikat, Brasil tampak lebih eksploratif dalam membuka jalur interdisipliner antara hukum, *neuroscience*, dan *cognitive criminology*. Tren ini sangat dipengaruhi oleh konteks sosiopolitik Brasil, khususnya dampak skandal korupsi besar seperti Petrobras dan *Operação Lava Jato*, yang mendorong penyelidikan lebih mendalam tentang korupsi bukan semata-mata sebagai penyimpangan hukum, tetapi juga sebagai kemungkinan ekspresi kondisi psikobiologis tertentu. Penelitian dari lembaga seperti University of São Paulo dan pusat *neuroscience* terkemuka mulai mengungkap korelasi antara berkurangnya aktivitas *prefrontal cortex* yang bertanggung jawab atas perencanaan, *impulse control*, dan moral judgment dengan kecenderungan pelaku korupsi untuk mengabaikan norma sosial dan etika publik. Temuan ini tidak membenarkan perilaku koruptif, tetapi memberikan pemahaman yang lebih bernuansa tentang mengapa individu yang tampak rasional dan berpendidikan tinggi tetap dapat memilih jalan kriminal. Wawasan semacam itu menawarkan kerangka baru untuk menilai kapasitas mental dalam proses peradilan. Selain itu, keterlibatan pemerintah Brasil dalam pendanaan penelitian interdisipliner di bidang neuroforensics mencerminkan upaya serius membangun dasar ilmiah bagi reformasi *criminal justice* (da Rocha, 2013). Pendekatan ini memiliki dua fungsi: pertama, sebagai alat untuk menilai *culpability* individual dalam kasus besar dan kompleks; kedua, sebagai strategi pencegahan kejahatan sistemik dengan memetakan risiko kognitif dan neuroetik di kalangan pejabat publik dan pembuat kebijakan. Namun, pendekatan ini juga menimbulkan kekhawatiran kritis. Ketika negara mensponsori penelitian *neuroscience* dalam konteks hukum pidana, ketegangan dapat muncul antara objektivitas ilmiah dan agenda politik. Terdapat risiko bahwa temuan *neuroforensic* digu-

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nakan untuk melegitimasi atau mendelegitimasi figur politik tertentu selama persidangan korupsi, terutama dalam iklim politik Brasil yang sangat terpolarisasi. Secara konseptual, perkembangan neurolaw di Brasil menegaskan bahwa *criminal sentencing* atas korupsi tidak dapat dipisahkan dari pemahaman atas kondisi internal pelaku, termasuk kapasitas *moral control* dan struktur kepribadian yang dibentuk secara neurologis. Namun, standar etik, hukum, dan ilmiah yang ketat tetap diperlukan untuk mencegah integrasi ini berubah menjadi *biological determinism* yang melemahkan personal *accountability*. Dalam landmark cases seperti *Lava Jato*, *neuropsychological analysis* harus dilakukan secara transparan melalui *prosedur cross-examination* yang melibatkan komunitas ilmiah dan peradilan secara seimbang.

Pelajaran dari Amerika Serikat, Jerman, dan Brasil menunjukkan bahwa integrasi neurolaw ke dalam *criminal justice* systems tidak hanya mungkin dilakukan, tetapi juga dapat disesuaikan secara kontekstual dengan karakteristik unik kerangka hukum nasional. Dalam konteks Indonesia, ketiga model tersebut menawarkan arah strategis yang dapat diadaptasi untuk memperkuat sistem pembuktian dalam perkara korupsi dan meningkatkan kualitas criminal *accountability*. Secara substantif, hukum pidana Indonesia masih menganut pendekatan klasik, ketika *criminal responsibility* didasarkan pada adanya kesalahan (*mens rea*), yang diasumsikan sebagai produk *free will* dan rasionalitas. Namun, perkembangan neuroscience menantang asumsi ini dengan menunjukkan bahwa kapasitas seseorang untuk memiliki *criminal intent* dapat mengalami *impairment* karena kondisi *neuropsychological* tertentu yang tidak tampak dari luar. Dalam perkara korupsi, hal ini menjadi sangat relevan karena pelaku sering berada di bawah tekanan, menghadapi keputusan administratif yang kompleks, atau mungkin menderita hidden *impulse control disorders*. Karena itu, pendekatan substantif hukum pidana Indonesia harus mulai mengakomodasi dimensi neurologis dalam menilai *culpability*. Hal ini bukan berarti mengganti prinsip *mens rea*, melainkan memperkaya kerangka *criminal responsibility* dengan *scientific tools*. *Assessment* terhadap kapasitas moral dan kognitif terdakwa dapat dilakukan melalui *neuropsychological* evaluations yang diawasi oleh lembaga forensik resmi, sehingga mencegah penyalahgunaan manipulatif (Jurjako & Malatesti, 2018). Secara prosedural, penggunaan *neuroscience-based evidence* belum diatur secara eksplisit dalam sistem hukum acara pidana Indonesia. KUHAP tidak mengenal klasifikasi atau mekanisme penyaringan *scientific evidence*, seperti *Daubert standard* yang digunakan di Amerika Serikat. Kekosongan hukum ini menimbulkan risiko disparitas dan ketidakpastian. Karena itu, Indonesia membutuhkan regulasi khusus yang memberikan pedoman teknis dan hukum tentang *admissibility of neuroscience evidence* di pengadilan. Langkah konkret dapat berupa revisi KUHAP untuk memasukkan klausul baru tentang interdisciplinary scientific *evidence* dengan parameter ketat mengenai *validity*, *methodology*, dan *legal relevance*. Alternatifnya, Mahkamah Agung dapat menerbitkan Peraturan Mahkamah Agung (Perma) untuk memberikan kerangka normatif sementara tanpa harus menunggu perubahan legislasi.

Dengan pendekatan ini, hakim Indonesia dapat menjalankan peran *gatekeeping* secara aktif dengan menyaring *scientific evidence* berdasarkan integritas metodologis dan *legal relevance*, bukan sekadar mengandalkan kesan visual atau jargon teknis yang sulit diakses. Pada tingkat *sentencing*, Indonesia juga harus bergerak meninggalkan *model punitive* yang seragam menuju pendekatan yang lebih terdiferensiasi, yang menyelaraskan sanksi dengan kondisi psikologis, kognitif, dan neurologis pelaku. Hal ini sejalan dengan prinsip *corrective* dan *rehabilitative justice* yang semakin berkembang dalam praktik peradilan modern. Pelajaran dari Jerman dan Brasil menunjukkan bahwa *sentencing* dalam perkara korupsi tidak selalu harus dipandu oleh deterrence atau *retribution*. *Sentencing* juga dapat mempertimbangkan kapasitas internal pelaku. Misalnya, seseorang yang menderita *executive dysfunction* akibat gangguan neurologis mungkin lebih tepat dikenai sanksi rehabilitatif atau *clinical supervision* daripada *imprisonment konvensional*. Namun, prinsip *differentiation* ini harus tetap berada dalam batas *accountability*. *Neuropsychological disorders* tidak boleh pernah menjadi dasar untuk menghapus *criminal responsibility*; sebaliknya, gangguan tersebut harus menginformasikan bentuk dan intensitas punishment agar lebih humanis dan tepat sasaran. Kebijakan ini juga harus didukung oleh *correctional system* yang serius menangani kebutuhan *mental health*. Pernyataan ini menegaskan kebutuhan fundamental atas *interdisciplinarity* dan *institutional vigilance* dalam mengadopsi neurolaw ke dalam *criminal justice system* Indonesia. Integrasi *neuroscience* tidak dapat diperlakukan semata-mata sebagai inovasi tekno-

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logi atau reformasi prosedural. Ia merepresentasikan pergeseran epistemologis dalam cara hukum memahami *intent*, *culpability*, dan human responsibility. Karena itu, adopsinya menuntut kehati-hatian tinggi dan kolaborasi lintas disiplin yang sungguh-sungguh. Pertama, kolaborasi antara sarjana hukum, *neuroscientists*, *forensic psychiatrists*, dan aparat penegak hukum bukan hanya penting, tetapi fundamental. Tanpa bahasa bersama dan pemahaman interdisipliner yang memadai, temuan *neuroscientific* dapat dengan mudah disalahpahami, disalahgunakan, atau direduksi menjadi sekadar *defense gimmicks*. Misalnya, gambar fMRI yang menunjukkan "*low brain activity*" pada area yang berkaitan dengan *moral judgment* tidak otomatis berarti terdakwa tidak memiliki kapasitas moral. Interpretasi harus menghubungkan *evidence* tersebut dengan fungsi hukum dan konteks sosial pelaku. Karena itu, kerangka etik dan teknis harus dikembangkan melalui dialog interprofesional, bukan dimonopoli oleh satu profesi. Kedua, keseimbangan yang ketat harus dijaga antara *substantive justice* dan perlindungan prinsip hukum. Pengakuan terhadap kondisi neurologis tidak boleh mengaburkan asas dasar hukum pidana *nullum crimen sine lege, nulla poena sine lege* (*no crime and no punishment without clear legal grounds*). Penggunaan *neuroscience evidence* tidak boleh pernah melampaui *procedural safeguards* seperti *presumption of innocence*, *right to defense*, dan *burden of proof* pada *prosecution*. Sebaliknya, *neuroscience-based evidence* harus diperiksa secara intra-normatif, artinya harus tunduk pada kerangka dan hierarki hukum positif. Dalam hal ini, praktik internasional menunjukkan bahwa inovasi hukum tidak selalu menuntut meninggalkan tradisi, melainkan penafsiran ulang yang hati-hati terhadap prinsip-prinsip hukum fundamental berdasarkan pengetahuan baru. Di Amerika Serikat, gatekeeping yang hati-hati melalui *Daubert test* memastikan teknologi ilmiah tidak mendominasi ruang sidang. Di Jerman, etika hukum mencegah komersialisasi *neuroscience* dalam litigasi. Di Brasil, negara mendorong integrasi *neuroscience* untuk mereformasi hukum pidana ekonomi sambil tetap berada dalam batas *public accountability*. Bersama-sama, model-model ini menawarkan blueprint bagi Indonesia. Dengan pendekatan yang tepat, Indonesia tidak hanya dapat mengejar ketertinggalan, tetapi juga mengembangkan model khasnya sendiri: *criminal justice system* yang adaptif, *evidence-based*, dan berakar pada *constitutional justice*. Neurolaw dapat menjadi instrumen hukum transformatif, modern dalam metode dan humanistik dalam orientasi. Neurolaw memungkinkan sistem hukum melihat pelaku bukan hanya sebagai objek *punishment*, tetapi sebagai subjek yang perilakunya dibentuk oleh dimensi biologis, sosial, dan moral yang kompleks. Khususnya dalam konteks economic crimes dan korupsi, pendekatan ini sangat relevan karena mampu menjangkau lapisan motif dan *responsibility* yang lebih dalam melampaui narasi hukum formal yang dominan.

Simpulan

Artikel ini menyimpulkan bahwa neurolaw memiliki relevansi yang terbatas tetapi penting dalam menilai *moral competence* pelaku korupsi. Kontribusinya bukan terletak pada pembenaran korupsi, melainkan pada penyempurnaan pemahaman hukum tentang *culpability* ketika terdapat neurocognitive *impairment* yang serius dan dapat diverifikasi secara ilmiah. Dalam perkara korupsi, presumsi biasa tetap bahwa pelaku bertindak dengan kesadaran, perencanaan, dan *abuse of entrusted power*. Karena itu, *neuroscience-based evidence* tidak boleh diperlakukan sebagai *general defense* atau mekanisme untuk melemahkan pemberantasan korupsi. Penggunaan neurolaw di Indonesia harus dikembangkan melalui kerangka yang hati-hati dan dikendalikan secara kelembagaan. Hal ini memerlukan *evidentiary safeguards* yang ketat, *independent forensic assessment*, *judicial gatekeeping*, adversarial testing, serta batas *admissibility* yang jelas. Tanpa *safeguards* tersebut, neurolaw dapat disalahgunakan oleh *elite defendants* sebagai instrumen *impunity* yang canggih. Namun, dengan pengaturan yang tepat, neurolaw dapat membantu pengadilan dalam kasus-kasus luar biasa dengan mendukung penilaian *criminal responsibility* yang lebih presisi dan proporsional. Karena itu, model Indonesia sebaiknya mengadopsi neurolaw secara bertahap, bukan sebagai pengganti doktrin hukum pidana, melainkan sebagai instrumen komplementer yang tetap tunduk pada *accountability*, *public trust*, dan tujuan pemberantasan korupsi.

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