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The Psychopath's Brain: Is it Structurally Different from the Normal Brain?

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ABSTRACT

Antisocial personality disorder, also called psychopathy, is caused by an individual's brain structure. This paper analyzes the methods, limitations, and findings of the research that supports this claim. Case studies and correlational studies show a connection between gray matter volume in brain regions and psychopathic emotionlessness. Experiments show the inner workings of a psychopath's brain as they display dishonesty and lack of empathy. Furthermore, this paper will also explain the relevance of this research to the field of psychology, and the practical applications of the research in society as a whole outside, including in the fields of law and medicine.

Introduction

Psychopathy, as defined by the American Heritage Dictionary, is a "mental disorder, especially when manifested by antisocial behavior" (Houghton Mifflin Company, 2006). This behavior stems from a psychopath's traits of chronic dishonesty, a lack of emotion, and impulsivity (Ortega-Escobara et al., 2017). Current research suggests that structural differences in the brain are the root causes of the psychopathic traits that are expressed in the antisocial behavior, often criminal behavior, that defines psychopathy. This paper will analyze the methods, limitations, findings, potential applications, and relevance of said research.

Data and Analysis

For this paper, I used the online databases Gale and EBSCO to find research papers about neuroscience and antisocial personality disorder recently published in reputable scientific journals. After I found 3 articles, I examined the research methods used in the papers, the limitations of the research, and the findings. I then analyzed the findings by drawing connections between the findings, exploring the possible future implications of the research, and explaining the relevance of the research to society.

Research Methods of Study 1

A meta-analysis paper titled "Psychopathy: Legal and Neuroscientific Aspects" published in the Anuario de Psicología Jurídica (Annual Review of Legal Psychology) reviewed a multitude of case studies on psychopaths to explore the connection between their brain structure and their antisocial behavior and thinking. The paper first explored subjects who had developed psychopathic tendencies after suffering brain trauma. Researchers had examined the behaviors of the subjects after the traumatic injury. The subjects had become more impulsive, more hostile, more aggravated, more immoral, and also developed an inability to recognize emotions in others. The paper also examined correlational studies between psychopathic behavior and significant structural differences in the brain. In these studies, researchers

performed brain scans on known psychopaths to note differences in volume or activity of certain brain regions compared to the normal human brain (Ortega-Escobara et al., 2017).

Limitations of Study 1

A limit of this meta-analysis is that some case studies contradicted each others' findings. For example, some studies would show that the amygdala was more active in psychopaths during fear conditioning, while other studies would show the opposite (Ortega-Escobara et al., 2017). This limits the conclusivity of the research and weakens the correlation between brain activity and psychopathy. Furthermore, another limitation of this study is that the definition of psychopathy has not always been clear. For instance, the paper brought up the term pseudopsychopathy for individuals who developed psychopathic tendencies for a short period of time after traumatic brain injury that eventually went away (Ortega-Escobara et al., 2017). This pseudopsychopathy affects the conclusivity of the research because some of the psychopaths studied were not true psychopaths, and had only temporary psychopathic tendencies, which means that the correlation found cannot be generalized to the entire psychopathic population.

Known Information of Study 1

"Psychopathy: Legal and Neuroscientific Aspects" concludes that there is a significant correlation between gray matter volume and psychopathy. Psychopaths had less gray matter in the prefrontal cortex and the amygdala compared to normal human brains (Ortega-Escobara et al., 2017). Since the amygdala processes emotion, a smaller amygdala would explain the emotionless characteristic of psychopaths. Moreover, the paper also concluded that there was a connection between white matter volume and psychopathy as well. Psychopaths had a weaker connection between the amygdala and the prefrontal cortex (Ortega-Escobara et al., 2017). This would explain the poor behavioral control and impulsive, antisocial behavior found in psychopaths.

Research Methods of Study 2

Researchers Nobuhito Abe, Joshua D. Greene, and Kent A. Kiehl conducted an experiment on brain activity during dishonest decision-making using prison inmates as participants. In the experiment, the inmates were divided into 3 groups based on level of psychopathy with the lowest level of psychopathy as the control group. All participants were then given a coin-flip prediction task where they had the opportunity to win a monetary reward for dishonestly reporting their accuracy. Participants would be told how much money they would win or lose for a correct or incorrect prediction. Next, they would predict the result of the coin flip. After observing the coin flip, the participants would then indicate whether their prediction was correct or incorrect, after which they would be given their monetary reward or punishment. In addition, during the task, all participants were given a fMRI to record brain activity as they made their predictions (Abe et al., 2018).

Limitations of Study 2

A limitation of this experiment is that all participants were prison inmates. This affects the generalizability to the entire psychopathic population, as this was not random sampling. This limitation also affects the cause-and-effect relationship found in the experiment between the psychopathy and brain activity during dishonest decision-making, as the prolonged prison environment could have affected the brain activity of the participants (Abe et al., 2018). Another limitation of this experiment is that the participants may have suspected that the experiment was related to

their dishonesty (Abe et al., 2018). This would have affected the decisions the participants made as well as their decision-making process and therefore their brain activity during the experiment.

Known Information of Study 2

The experiment found that participants who ranked highly on psychopathy showed about the same amount of dishonesty as the control group. However, the psychopaths took less time to make a dishonest decision, and their anterior cingulate cortex showed significantly less activity than the controls. Thus, the experiment concluded that the anterior cingulate cortex was responsible for the decision-making process between honesty and dishonesty, and that this structure was less active in psychopaths, explaining their dishonest behavior (Abe et al., 2018).

Research Methods of Study 3

The research article "Brain Structural Correlates of Emotion Recognition in Psychopaths" describes an experiment conducted using criminal psychopaths as participants to examine the relationship between brain structure, specifically volume of brain regions, and the ability to recognize emotions in others. In the experiment, participants from both the experimental group (made up of 19 psychopathic convicts) and the control group were shown a neutral human face that would incrementally morphed through ten stages into a recognizable emotion. This process was executed 12 times for each participant to cover each of the emotions of happiness, surprise, fear, sadness, disgust, and anger twice. Participants were instructed to identify the emotion as early as possible. Scores were given based on how many steps it took for the participant to recognize the emotion, with lower scores indicating faster recognition. Afterwards, MRIs were performed on the participants to examine the volume of specific brain regions (Pera-Guardiola et al. 2016).

Limitations of Study 3

One major limitation of this experiment is the same limitation that was present in study 2: the experimental group was made of only criminal psychopaths (Pera-Guardiola et al., 2016). This means that there was a confounding variable present, as the relationship found between psychopathy and brain region volume could actually be attributed to a prison environment. In other words, the relationship may not be generalizable to the entire psychopathic population. Furthermore, another limitation of this study is that there was nothing to account for incorrect emotion identifications by the participants. The researchers neither recorded identification accuracy nor attempted to explain why a participant failed to recognize the correct emotion (Pera-Guardiola et al., 2016).

Known Information of Study 3

The experiment showed that the experimental participants, the psychopaths, took longer to recognize emotion in others based on facial expressions and had different amounts of brain volume in specific brain regions compared to the controls and compared to other psychopaths based on performance in the task. For example, psychopaths who did better at fear recognition had greater gray matter volume in the cerebellum, while the controls who did better had greater gray matter volume in the amygdala, posterior insula, and parahippocampus (Pera-Guardiola et al., 2016). This suggests that psychopaths not only have structural differences in the brain compared to normal people but that psychopaths use their brains differently, accomplishing the same task, albeit less efficiently, while utilizing different brain regions.

Patterns and Trends in Research

The research on the topic of the neuroscience of psychopathy shows that the psychopath's different cognition and behavior is linked to structural differences in their brain. Specifically, the psychopath's brains cause a decreased ability to process emotion, act honestly, and recognize emotion in others. Examples of this include: decreased gray matter volume in areas dedicated to emotion and decision-making (Ortega-Escobara et al., 2017), decreased brain activity when debating whether or not to act dishonestly especially in regions dedicated to empathy and perspective-taking (Abe et al., 2018), and decreased gray matter volume in regions dedicated to recognizing emotion in others (Pera-Guardiola et al., 2016). In summary, the psychopath's brain works differently from others because it is different from others, especially when it comes to how humans process emotions, honesty, and empathy.

Applications

Research in this area can be applied in the field of law and justice. According to an article from NPR, a debate has sparked in Oklahoma whether one can use psychopathy as a not guilty by insanity defense. According to the article, the insanity defense was redefined by lawmakers to exclude psychopaths (Jacewicz, 2016). The research can be applied in this situation because it makes a case against the new definition of insanity. Psychopaths cannot control the structural differences in their brain that cause their antisocial behavior, and therefore cannot always be held accountable for their actions.

Moreover, this research can be used in the medical field. Psychopathy, like all mental illnesses, cannot be cured, only treated. Since this research shows that the psychopath's brain is responsible for their behavior, medical experts are looking at methods of rewiring the psychopath's brain to treat the psychopath's antisocial behavior. An article from Vox states, "If this is the case, then it might be possible to rewire psychopaths' brains to be less psychopathic. And that's what Arielle Baskin-Sommers and her colleagues are trying to do with a group of specially designed computer games; 'The hope is you're training those neural pathways that will help them self-regulate better and not take advantage of people,'" (Locke, 2014).

Relevance

Studying the topic of the neuroscience behind psychopathy is relevant to the field of psychology because it seeks to answer the question of why some people think, feel, and behave differently than others. By examining the brain structure of psychopaths, psychologists have learned that psychopaths think without empathy, feel less emotion, and act more dishonestly because their brains are not built to function the way normal brains do.

The topic of psychopathy is also relevant to the world outside the field of psychology as well. While only making up 1% of the general population, psychopaths make up between 15% and 25% of the prison population (Ortega-Escobar et al., 2017) and 12% of corporate leaders in the world (Croom, 2021). The same structural differences set psychopaths apart from everyone else, yet some of these psychopaths become violent criminals while others become wealthy CEOs. Understanding how these structural differences manifest in the cognition and behavior of these different psychopaths can help answer one of humanity's most important questions: why does one person succeed while another fails, despite having the same brain structure?

Limitations

There are limitations to this meta-analysis paper apart from the limitations in the studies being researched. The use of only three papers in the meta-analysis means that conflicting findings in other studies may have been excluded. Furthermore, my personal biases may have influenced the interpretation of the findings of the studies.

Conclusion

In conclusion, psychopathy is a condition caused by structural differences in the brain, as shown by multiple case studies and experiments. Smaller amygdalas cause emotionlessness, weaker connections in the prefrontal cortex cause impulsivity, weaker anterior cingulate cortices cause dishonesty, and different uses of brain regions cause lack of empathy. This research is impactful, not just to the field of psychology, but elsewhere, including law and medicine, because it helps to answer why some people act the way they do. It is known that brain structure is different in psychopaths, but it remains to be seen where the difference in brain structure comes from and if it can be cured.

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