

Neurological Effects of Psychopathy and Potential Rehabilitative Therapies

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Abstract— Psychopathy is a neurological disorder that affects approximately 740 million people worldwide and makes up at least 25% of male offenders in prison today.¹ It is the clinical characterization of a collection of core personality traits (including impulsive behavior, lack of empathy, damaged emotional versatility, pathological lying, etc.) that render the individual impulsive, self-centered and prone to criminal activity. Its uniqueness among psychological disorders has fascinated philosophers and physicians since the time of Aristotle. The majority of cases are caused by sources ranging from genetic disorders which cause increased likelihood of psychopathy, childhood abuse, and even, in rarer cases, damage to certain regions of the prefrontal cortex. No known treatments exist, and the current rehabilitation system employed by the federal justice system to respond to them has no positive effect in the rehabilitation of the individual. However, there do exist certain methods of therapies which have been proven to have positive progress in the process of rehabilitation.

Index Terms— Juvenile Psychopathy, Neurological Effects, Psychopathy, Rehabilitative Therapies

1 HISTORY OF PSYCHOPATHY

1.1 First Attempts of Characterization and General

Understanding of Psychopathy

One of the first recorded instance of psychopathy was by Theophrastus who called them “the unscrupulous,” this term, in translation, means the people without morality or conscience.² This surprisingly accurate first characterization of psychopathy continued as the norm of description, and having no other term for the disorder, people simply recognized the uncaring aspect of it. The fascination with psychopathy continued throughout history and shows itself quite prominently anywhere from Greek mythology with Medea and many other mythological characters to the bible with Cain in the Old Testament and, in the most recent years, movies such as Hannibal and even in non-anti-hero roles such as Sherlock Holmes. This curious fascination with the morally unright is, in itself, fascinating. A reason why this is the case is, at least how TV portrays the disorder, the individual with it is free to do what he/she wants without moral consequences, of course, he/she could be thrown in jail, however, no regret will flaunt them as a result of their actions. One reason why this freedom appeals to audiences is because, while in the little world of the movie or show that they are watching their imagination can run free, unhindered by the possibility of regret or moral consequence in any way. This desire for freedom, as we will call it for now, is seen in almost any product with the primary purpose of entertainment even if it is simply the freedom from responsibilities such that most video games provide.³

1.2 Clinical Characterizations

The first systematic attempt to characterize a psychopath's pathology was in the 1800s when French psychiatrist Philippe Pinel attempted to describe their condition as insanity without confusion, or “*manie sans délire*.” This was in an attempt to

describe the condition of a patient of his who consistently acted instinctively without feeling empathy or regret to his actions.⁴ He therefore, had no confusion about his insanity (or actions resulting in his insanity), hence the description: insanity without confusion. Then, in 1835 English psychiatrist James Crowles Prichard defined the term “moral insanity” which psychopathy fits under. In his publication he says that people with the condition of “moral insanity” don't feel empathetic emotions as well as having antisocial tendencies.⁵ As these examples show, the earlier attempts at characterizing psychopathy focused on the aspect of the disorder which was the lack of morality aspect (although they both do touch on different, more peripheral facets of psychopathy). This is, although a crucial step, merely one component of a long list, all of which fit together to make the condition of psychopathy.

The first successful attempt to define psychopathy and the different facets of behavior associated with it was by Italian physician Cesare Lombroso. His description included antisocial aspect as well as the term “born criminals” which he used to describe the inability to feel empathy that psychopaths have.⁶ However, it wasn't until 1980 when the definition of antisocial personality disorder had been constructed that the term “psychopath” was officially characterized.⁷

1.3 Measurement and Diagnosis of Psychopathy

Clinics characterize psychopathy by three different aspects of behavior: interpersonal (manipulative, deceitful, etc.), affective (callous personality, unemotional, etc.), and behavioral (antisocial, social deviance, etc.). In 1975 Hare started to develop a systematic way of measuring and diagnosing psychopathy using these different facets of psychopathic behavior.

Table 1
Items in the Hare Psychopathy Checklist—Revised and Their Location in the Traditional Two-Factor Structure

Factor 1: Interpersonal/Affective	Factor 2: Social Deviance	Items that do not load on the two factors
1. Glibness/superficial charm	3. Need for stimulation/proneness to boredom	11. Promiscuous sexual behavior
2. Grandiose sense of self-worth	9. Parasitic lifestyle	17. Many short-term marital relationships
4. Pathological lying	10. Poor behavioral controls	20. Criminal versatility
5. Conning/manipulative	12. Early behavioral problems	
6. Lack of remorse or guilt	13. Lack of realistic, long-term goals	
7. Shallow affect	14. Impulsivity	
8. Callous/lack of empathy	15. Irresponsibility	
9. Failure to accept responsibility for own actions	16. Juvenile delinquency	
	19. Revocation of conditional release	

Table demonstrating the Hare Psychopathy Checklist⁸
This test used to determine the degree of psychopathy exhibited by an individual. It is primarily used by the US criminal justice system and is called the Two-Factor Model or the Hare Psychopathy Checklist (PCL-R), the original version was published and accepted as a standard of diagnosis in 1988, since then there have been multiple revisions adding or revising individual elements in the checklist. It is used to produce a congruence coefficient given a specific patient or sample by testing for the three different aspects of behavior listed above, the test names these “factor 1” (interpersonal/affective) and “factor 2” (social deviance - behavioral) and other traits that don’t really fit under the two main groups (these are generally not necessary for an individual to be psychopathic, they are instead, simply additives that serve to insure that he/she is). It weighs the answers (the individual does exhibit this behavior or does not) from the three sub-traits in the table to produce a congruence coefficient between 0 and 40 where coefficients above 30 are considered statistically significant, coefficients between 20 and 30 are considered mildly statistically significant, and below 20 are not significant. In short, this means that the test compares the answers from the two different factors and produces a coefficient that represents the likelihood of psychopathy in the patient (it assigns two points to every sub-trait). It is worth noting that some conduct this test using four different groups of traits instead of three. In those cases, the facets are Interpersonal, Emotional, Lifestyle, and Antisocial. There is not a large difference in the results of these tests however the test using four different facets is useful in evaluating individuals already known to be psychopathic as the congruence coefficient produced will show the individual’s versatility in psychopathic traits. In other words, it measures the amount of traits across the different fields (facets) of psychopathy that an individual expresses.

To put this in perspective, male convicts in the US generally test in the mildly statistically significant congruence coefficient range, meaning that they exhibit an intermediary amount of psychopathic behavior traits. However, women convicts in the US have a low congruence coefficient even though they generally show a high significance in factor 1 (and therefore a very low significance in factor 2). This is interesting as this suggests that they generally exhibit more manipulative traits rather than the antisocial traits found in nearly all highly psychopathic individuals.⁹

2 DETECTION OF PSYCHOPATHY

2.1 Mirror Neurons

Law enforcement and others use many methods to detect psychopathy in suspects, most of these tests make use of the fact

that psychopaths lack empathy. One such test is called the yawn test, its when a law enforcement official repeatedly yawns during an interview to elicit an empathetic yawn, this behavioral response is present in nearly all mammals with mirror neuron capacity. Mirror neurons act as mimicking devices that allow us to feel the emotions of others (also known as empathy). A famous demonstration of this neuron is called the rubber hand illusion in which the demonstrator tricks the mind into believing that a rubber hand is its own by stroking both the rubber and the real hand simultaneously with a feather. The demonstrator then stabs the rubber hand, this causes the demonstrator to flinch as his/her mirror neurons believe that the rubber hand is his/her own.¹⁰ The yawn test (and others) is effective because psychopaths lack or have badly developed neurological channels needed for mirror neurons to be effective. Therefore, they do not respond by yawning for example, or other empathetic responses generally exhibited by organisms with mirror neurons.

2.2 Guilt/Remorse

Psychopathic tendencies also include inability to feel guilt or remorse, theoretic situational tests such as the Railroad Dilemma (sometimes called the Trolley Problem) test for this. In the Railroad Dilemma subjects are forced to make a split second decision on whether to divert a train that is about to kill three people (specific numbers vary), however, as a result of diverting it you would be killing one person.¹¹ The so called dilemma here is if you do nothing then three people will die, however it will not be your fault in any way. But if you divert the train, then you are directly killing one person with your actions. This is a problem in philosophy of ethics, and there is no ‘right’ answer, but in traumatic situations like these, organisms with remorse freeze up when forced to choose because they are afraid of the remorse that they will feel in the end. This obviously means that people without remorse will have no problem with making the decision to divert the train.

2.3 Manipulative Tendencies

The manipulative nature of psychopaths also allows them to lie without giving any signs that they are doing so. These tell-tale signs aren’t only limited to body language (i.e. dilation of pupil, sweating), it also extends to the electrical activity of the brain, when humans lie, their brain activity spikes (trying to conceal the lie). Researchers have found that we can detect these spikes with electroencephalograms (EEG).¹² However, psychopaths don’t assign the same weight to lying as people without the condition do, therefore, they don’t give off significant amounts of electricity in the brain when lying. In short, there is no practical way of detecting deception by just body language or neurological activity of a psychopath, however, this principle can also be used to detect psychopaths. They can be asked basic questions that the answer is known to while under an EEG reading and if the individual is able to lie without detection by the EEG then there is a significant chance that the individual may be a psychopath, or at least exhibit some of the characteristics of one.¹³ A psychopathic individual is likely to do this because, along with many other traits, they are gen-

erally pathological liars, thus, making them compulsively lie without reason.

2.4 Juveniles

The problem here is in the early detection of psychopathy in juvenile individuals. As a study focused on the development of psychopathic traits in young individuals (followed individuals from the age of 12 to 16) found, the traits aren't developed enough to be able to tell for certain whether an individual has this disorder or not.¹⁴ As a result of this most psychopathic individuals go undiagnosed, and therefore untreated, throughout their childhood, resulting in a fully developed psychopath that does not fit into society in any way. The fact that traits of psychopathy in juveniles aren't totally set in stone furthers the possibility of rehabilitation.

For this reason, it is obvious why the detection of psychopathy in juveniles is more difficult than it is in adults. Several different methods of detection have been hypothesized and tested. An example of one of these is the extended child psychopathy test that uses an extensive questionnaire inquiring about topics from the individual's unwillingness to plan to tendencies of parasitic lifestyle.¹⁵ However, almost all of these tests are optimized for individuals above the age of 10.¹⁶ This presents a large problem as, by that time, most traits have been deeply implemented into the juvenile's personality. Although still treatable at this somewhat young age, it is extremely favorable to not wait this long.

One test does test for psychopathic tendencies in young children (as young as 4). That test is called the Antisocial Process Screening Device (APSD) first published by Frick and Hare, it works by evaluating solely the antisocial/narcissistic and impulsive traits that make up psychopathy.¹⁷ This test was not originally meant for use in adolescents, however, that is included in its range. This is because, even though the manipulative and callous personality traits have not had time to set in, the extremely young individual with the disorder will show increased antisocial tendencies and a reduced ability to control their impulsive emotions. This test is evaluated the same way as the Hare Psychopathy Checklist - testing conceptual items on a list and evaluating the likelihood of psychopathy based on a coefficient produced by the individual's answers. It is worth noting that, while most psychopathic adolescents do not express callous/unemotional traits, some do, and therefore, the APSD has a secondary function of evaluating some of those as well. However, if these are not expressed, those secondary traits do not contribute to the final coefficient.¹⁸

3 NEUROLOGICAL DAMAGE IN RELATION TO PSYCHOPATHY

Although there are no studies explicitly testing neurologically damaged individuals for psychopathy (using the Hare Psychopathy Checklist), there are certain regions, that if damaged, can cause traits resembling psychopathic traits.

3.1 Ventromedial

Damages to the ventromedial region (vmPFC) of the brain

have been found to cause behavioral changes such as damaged emotional ability, this causes reduced frustration tolerance, lability, anxiety disorders, and in some cases effective psychopathy.¹⁹ In studies regarding the implications of an individual with a damaged Ventromedial, it is found that individuals with the damaged region of the brain exhibit multiple different psychopathic traits. Firstly, they exhibit a hypersensitivity to immediate positive payoffs. Secondly, they exhibit an insensitivity to punishment similar to how psychopaths do not respond to negative reinforcement. Finally, they exhibit an insensitivity to future consequences. This shows how their decisions are guided by immediate consequences instead of long term consequences/punishments. Therefore, they are likely to choose immediate yet small positive consequences without regard for the long term higher losses. This is extremely similar to how psychopathic individuals are generally highly impulsive and irresponsible about long term consequences. This portion of the brain is located in the bottom of the cerebral hemisphere in the prefrontal cortex and is involved in the processing of risk.²⁰

3.2 Orbitofrontal Cortex

The Orbitofrontal Cortex (OFC) has also been linked to learning deficits that can lead to individuals exhibiting traits that are somewhat psychopathic. The OFC is primarily used for emotional learning - learning using emotions rather than pure logical memory, or methods. This is important as it allows much faster recognition of objects/situations, and without it, causes impaired visual discrimination/recognition. This can potentially lead to sub average emotional and social behavior. Without the ability to assign affective value, the individual is likely to be unable to emotionally connect to others, and therefore, further be removed from society, thus possibly causing antisocial tendencies. This region of the brain is located directly above the orbits (eye sockets) and is in the forefront of the prefrontal cortex.²¹

3.3 Amygdala

The amygdala is also linked in the development of psychopathy, if damaged, it can potentially cause inability to remember emotional associations, reduced ability to recognize negative facial emotions, and reduced social learning skills in imprinting ages. These individual traits could cause extreme social deviance and antisocial traits. On top of this, associations between social learning deficiency and individuals with damaged Amygdalas have been found. This serves to further the antisocial tendencies these individuals would tend to exhibit. This portion of the brain is located close to the hippocampus, in the frontal portion of the temporal lobe.²² In addition to other studies, neuroimaging has shown statistically significant correlations between low activity in the amygdala and criminal activity similar to psychopathic actions.²³

4 REHABILITATIVE THERAPY FOR PSYCHOPATHIC INDIVIDUALS

There are no known 'cures' for psychopathy. Currently, the best option is management or therapy, however, the traditional treatment of punishment (negative operant conditioning) does not work in any way. If anything, this method of treatment has negative connotations for the individual's social behavior. This is because psychopaths do not fear being social outcasts and do not believe that there is anything wrong with them, in fact they believe, given their extremely inflated self-image, that they are superior to all others. Therefore, they are indifferent to the negative opinions of society of their criminal behavior. This means that the federal justice system does not work in rehabilitation since psychopaths don't respond to negative reinforcement (negative operant conditioning).²⁴ They, instead, are more likely than the usual offender to use the opportunity to manipulate the administrators of rehabilitation therapy into releasing them early and have a much higher rate of being a repeat offender than the usual one.²⁵

4.1 Positive Operant Conditioning

However, they do respond to reward-based treatments, this means that for everything good they do they get some positive consequence. This is particularly effective because, along with many other conditions psychopaths generally show some form of obsessive compulsive disorder (OCD), therefore the patients will become obsessed with the possibility of receiving a particular reward and thus compulsively work harder (behave better) to obtain it. Through this repeated behavior, the individuals are able to learn good social behaviors from bad ones through means of habituation.²⁶

In other words, the exploitation of their uncaring and extremely high self-opinion could lead to potential rehabilitative therapies. This means that if therapists or rehabilitation systems leverage their inflated self-opinion and manipulate them into behaving well because they think that it will benefit them in the short term or prove that they are the best at something. This, effectively, is what positive operant conditioning is doing, it is giving them uniquely personal gain and showing them that they are the only ones capable of doing something, and that reinforces the behavior that they got rewarded for (the good behavior).

4.2 Juveniles

Here is where the age of the offender comes into play, adult psychopaths have, their entire lives, learned how to manipulate and remain unaffected by traditional treatments, such as what is currently offered in the federal justice rehabilitation system. This is because, due to their extreme narcissism they believe that nothing can make them better than they already are, and thus, they learn how to remain the way they are, blocking out all outside help/suggestions. However, juveniles with this disorder are still in their imprinting age, and therefore, are able to learn social rights from wrongs if taught in an environment which makes them feel like it is beneficial to them to do so. This, compounded with the fact that they don't

have the natural resistance to treatment that adult psychopaths do, allows them to be much more affected by treatments and thus learn good social behaviors through habituation.²⁷

Given this result, it is obvious that it would be much more beneficial and have a higher success rate if the individual was exposed to therapy specifically suited to psychopathic individuals at a younger age. Clinics such as the Mendota Juvenile Treatment Center in Wisconsin are doing just this, offering one-on-one care to non-matured psychopathic individuals (this method of treatment has shown promise due to the decreased need to compete, resulting in less impulsively violent actions). This specific clinic has shown immense promise, in that the success rate of the therapy offered is statistically significant.²⁸

4 CONCLUSION

Although psychopathy is one of, if not the most, dangerous psychological condition known, the current rehabilitative therapies used in the federal correction system have been shown to have no positive impact upon the individual. As a result of this, there have been numerous methods developed and used for detection and therapy of psychopathic individuals. Through these methods, we are able to detect juvenile individuals expressing psychopathic tendencies, and, due to their impressionable nature, subject them to rehabilitative therapies that have been shown to work with a higher confidence level than the methods used with mature individuals.

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REFERENCES

- [1] Parry, Wynne. "How to Spot Psychopaths: Speech Patterns Give Them Away." *LiveScience*, Purch, 20 Oct. 2011, www.livescience.com/16585-psychopaths-speech-language.html.
- [2] Millon Theodore, et al. Historical Conceptions of Psychopathy in the United States and Europe. In: Millon, et al., editors. *Psychopathy: Antisocial, Criminal and Violent Behavior*. 1998. p. 3.p. 3.
- [3] Pement, Jack. "Why Do We Like Psychopaths?" *Psychology Today*, Sussex Publishers, 3 Oct. 2017, www.psychologytoday.com/blog/blame-the-amygdala/201710/why-do-we-psychopaths.
- [4] Toch, H. Chapter 9: Psychopathy or Antisocial Personality in Forensic Settings. In T. Millon & E. Simonsen (Eds.) (2002) *Psychopathy: Antisocial, criminal, and violent behavior* New York, NY, US: Guildford Press
- [5] Whitlock, F. A. (1 April 1982). "A Note on Moral Insanity and Psychopathic Disorders". *Psychiatric Bulletin*. 6 (4): 57-59. doi:10.1192/pb.6.4.57.
- [6] Benning TB (December 2003). "Neuroimaging psychopathy: lessons from Lombroso". *The British Journal of Psychiatry*. 183 (6): 563-4. doi:10.1192/bjp.183.6.563.
- [7] Patrick, Christopher J. *Handbook of Psychopathy* Page 62
- [8] Grann, M., N. Langström, A. Tengström and G. Kullgren. "Psychopathy (PCL-R) predicts violent recidivism among criminal

- offenders with personality disorders in Sweden." *Law and Human Behavior* 23, no. 2 (April, 1999): 205-217.
- [9] Nott, Laura. "Psychopathy, Antisocial Personality Disorder Differences." *Addiction Treatment | Elements | Drug Rehab Treatment Centers*, 31 July 2013, www.elementsbehavioralhealth.com/mental-health/psychopathy-vs-antisocial-personality-disorder/.
- [10] Rundle, Brian K., et al. "Contagious Yawning and Psychopathy." *Personality and Individual Differences*, Pergamon, 5 June 2015, www.sciencedirect.com/science/article/pii/S0191886915003645.
- [11] D'Olimpio, Laura. "The Trolley Dilemma: Would You Kill One Person to Save Five?" *The Conversation*, 10 Apr. 2018, theconversation.com/the-trolley-dilemma-would-you-kill-one-person-to-save-five-57111.
- [12] Jekyll. "Lie Detection Using Brain Waves: It's Just as Creepy as It Sounds..." *Lunatic Laboratories*, 23 Sept. 2014, loonylabs.org/2014/09/23/brain-waves-recollection/.
- [13] Radowitz, John von. "Psychopaths Can Give Themselves Away by Lying Too Well, Study Finds." *The Independent*, Independent Digital News and Media, 25 July 2017, www.independent.co.uk/news/science/psychopaths-lying-give-themselves-away-study-finds-a7860151.html.
- [14] Salihovic, S. et al (2013). Trajectories of Adolescent Psychopathic Traits, *Journal of Psychopathology and Behavioral Assessment*. DOI 10.1007/s10862-013-9375-0
- [15] Bezdjian, S., et al. "Psychopathic Personality in Children: Genetic and Environmental Contributions." *Psychological Medicine*, U.S. National Library of Medicine, 20 May 2011, www.ncbi.nlm.nih.gov/pmc/articles/PMC3113684/.
- [16] van, Y, et al. "Measuring Psychopathic Traits in Children through Self-Report. The Development of the Youth Psychopathic Traits Inventory-Child Version." *International Journal of Law and Psychiatry*, U.S. National Library of Medicine, 2 June 2008, www.ncbi.nlm.nih.gov/pubmed/18514316.
- [17] Colins, Olivier F., et al. "A New Measure to Assess Psychopathic Personality in Children: The Child Problematic Traits Inventory." *Journal of Psychopathology and Behavioral Assessment*, Springer US, 13 Sept. 2013, www.ncbi.nlm.nih.gov/pmc/articles/PMC3935116/#!po=2.27273.
- [18] Vitacco, MJ, and R. Rogers. "The Antisocial Process Screening Device - An Examination of Its Construct and Criterion-Related Validity." *ScholarWorks*, 2003, scholarworks.umass.edu/cgi/viewcontent.cgi?article=1122&context=resec_faculty_pubs.
- [19] Cato, M A, et al. "Assessing the Elusive Cognitive Deficits Associated with Ventromedial Prefrontal Damage: a Case of a Modern-Day Phineas Gage." *Journal of the International Neuropsychological Society : JINS.*, U.S. National Library of Medicine, 10 May 2004, www.ncbi.nlm.nih.gov/pubmed/15147602.
- [20] Bechara, A, et al. "Characterization of the Decision-Making Deficit of Patients with Ventromedial Prefrontal Cortex Lesions." *Brain : a Journal of Neurology.*, U.S. National Library of Medicine, Nov. 2000, www.ncbi.nlm.nih.gov/pubmed/11050020/.
- [21] Shamay-Tsoory, Simone G., et al. "The Role of the Orbitofrontal Cortex in Affective Theory of Mind Deficits in Criminal Offenders with Psychopathic Tendencies." *ScienceDirect*, ScienceDirect, May 2010, www.sciencedirect.com/laneproxy.stanford.edu/science/article/pii/S0010945209001464?via%3Dihub.
- [22] Motzkin, J C, et al. "Ventromedial Prefrontal Cortex Is Critical for the Regulation of Amygdala Activity in Humans." *Biological Psychiatry.*, U.S. National Library of Medicine, 1 Feb. 2015, www.ncbi.nlm.nih.gov/pubmed/24673881.
- [23] Ermer, E, et al. "Aberrant Paralimbic Gray Matter in Criminal Psychopathy." *Journal of Abnormal Psychology.*, U.S. National Library of Medicine, 12 Dec. 2012, www.ncbi.nlm.nih.gov/pubmed/22149911.
- [24] Bonn, Scott. "Psychopathic Criminals Cannot Be Cured." *Psychology Today*, Sussex Publishers, 11 Aug. 2014, www.psychologytoday.com/blog/wicked-deeds/201408/psychopathic-criminals-cannot-be-cured.
- [25] Porter S, Brinke L, Wilson K. Crime Profiles and conditional release performance of psychopathic and non-psychopathic sexual offenders. *Legal Criminol. Psych.* 2009;14(1):109-111.
- [26] Harris, Grant T., and Marnie E. Rice. "Treatment of Psychopathy." *A Review of Empirical Findings*, 2006.
- [27] Anderson, Nathaniel E., and Kent A. Kiehl. "Psychopathy: Developmental Perspectives and Their Implications for Treatment." *Restorative Neurology and Neuroscience*, U.S. National Library of Medicine, 1 Jan. 2014, www.ncbi.nlm.nih.gov/pmc/articles/PMC4321752/.
- [28] Caldwell MF, Van Rybroek GJ. Efficacy of a decompression treatment model in the clinical management of violent juvenile offenders. *Int. J. Offender Ther.* 2001;45(4):469-477.