AGE-BASED POLICIES AND ADOLESCENT BRAIN DEVELOPMENT: AN ANALYSIS OF THE JUVENILE JUSTICE ACT, 2015

Trisha Jawahar, Jindal Global Law School, O.P. Jindal Global University

ABSTRACT:

This paper attempts to analyze the Juvenile Justice (Care and Protection of Children) Act, 2015, from a neuroscience lens, with a special focus on the determination of the age of a juvenile. It first goes over a neuroscientific analysis of the adolescent brain, and then applies this analysis to the Juvenile Justice Act, with solutions for the incorporation of a neuroscience-based approach.

Keywords: Neuroscience, Juvenile Justice, Adolescent Brain.

Introduction

Adolescence is defined as the period of transition, during which a child becomes, but doesn't possess the judgement and development of an adult. Biologically, adolescence is characterized by a wide spectrum of hormonal changes, brain development, and even an increase in height and muscle mass. Emotionally, the adolescent stage is also a crossroads for changes in emotions, judgement, identity, and rationality. The body and the mind are in a state of flux, making it hard to not just study adolescent behaviour, but determine the true developmental progress from child to adult. While social studies on adolescence define the phase as a transitional one between childhood and adulthood, the study of the adolescent brain through neuroscience has proven it difficult to adhere to this definition. According to neuroscience, cognitive abilities and brain regions do not develop uniformly among adolescents and are complexly influenced by various factors like culture and environment that make it harder to gauge the exact stages of development. However, in general, longitudinal neuroimaging research has demonstrated that the adolescent brain is continuing to mature up to the early 20s

and doesn't just stop at puberty.[1]

Consequently, this becomes important when at the intersection between adolescents and the law. As a society, the limitation of the adolescent brain seems to be well recognized, specifically when it comes to where they fit in in the legal framework. Juvenile delinquency is taken seriously in many countries, with punishments including those such as a prison term. Some countries, go so far as to punish juveniles accused of committing heinous crimes with the death penalty, or even life imprisonment. Typically, such laws have numerical determinations of adolescence, with age brackets ranging between 10-21 based on the social, cultural and political state of these countries. This paper attempts to apply neuroscientific research on the adolescent brain to understanding and refuting the conception of juvenile delinquents in India, specifically under the Juvenile Justice Act, 2015.[2]

Definition of Juvenile under The Juvenile Justice Act, 2015

The Juvenile Justice (Care and Protection of Children) Act, 2015 (henceforth JJ Act), was an act created in India relating to children alleged and/or found to be in conflict with the law. Under this act, a "child" and "juvenile" are defined to be someone who has not completed eighteen years of age.[3] A "child in conflict with law" is defined to be a child who has either allegedly, or has found to have, committed an offence, wherein the date of commission is before they have attained the age of 18. The Indian Penal Code, 1860[4], in Section 82, states that no offence committed by a child under the age of 7 is punishable by law, owing to their immaturity. Section 83 states that between the ages of 7-12, an offence committed by a child is subject to a case-by-case decision, upon deciding whether the child has attained sufficient majority to understand the nature of their conduct and its consequences.[5] On reading both these Acts together, it can be determined that the purview of the JJ Act can be said to be those between the ages of 7-18, typically defined as the period of adolescence.

The Act provides the protection that any child within its purview, upon committing an offence, will not be tried in the same way an adult would. It, however, does not provide blanket

[1] Johnson, Sara B, et al. "Adolescent Maturity and the Brain: The Promise and Pitfalls of Neuroscience Research in Adolescent Health Policy." *J Adolesc Health*, vol. 45, no. 3, Sept. 2009, pp. 216–221., https://doi.org/doi:10.1016/j.jadohealth.2009.05.016.
[2] Act No. 2 of 2016
[3] Section 2(12) and Section 2(35), The Juvenile Justice (Care and Protection of Children) Act, 2015, Act No. 2 of 2016
[4] Act. No 45 of 1860
[5] The Juvenile Justice (Care and Protection of Children) Act, 2015, Act No. 2 of 2016

protection for all children who fall under its purview and differentiates between them based on the nature of the crime committed. The JJ Act divides these offences into three main categories: petty offences, serious offences, and heinous offences. According to Section 2(33) of the JJ Act, "heinous offences" are offences for which the Indian Penal Code, or any other applicable legislation, mandates a minimum punishment of seven years in prison. Under Section 18(3), children in conflict with the law, specifically those between the age of 16-18, may be tried as adults if the offence they have committed is considered a 'heinous' in nature under the JJ Act.[6] The JJ Board under the Act must therefore evaluate whether the juvenile has turned sixteen in cases involving a minor charged with a "heinous offence," given that the consequence of the punishment is so high. It is therefore necessary to determine whether these arbitrary age ranges determined under the Act align with neuroscientific research on mental maturity, brain development and decision-making in juveniles/adolescents.

Neuroscientific Analysis of the Adolescent Brain

Recent developments in neuroimaging technologies and behavioural evaluations have substantially aided research into the relationship between ageing and brain changes. According to long-term neuroimaging studies, adolescence is a time when the brain continues to develop and change. Scientists have revealed that the grey matter in the teenage brain—the part of the brain responsible for "thinking"—undergoes an enormous overproduction.[7] After that, a phase known as "pruning" begins, during which the brain rapidly discards grey matter. This process is accompanied by the development of white matter, a process known as myelination. White matter is a fatty tissue that acts as insulation for the brain's circuitry, enhancing the accuracy and effectiveness of brain function.[8] Neural connections that make it through the pruning process improve in their myelination-mediated information transmission abilities. The fatty cell coating known as myelin that surrounds neuronal axons serves as "insulation" for neural connections. The rate and intensity of these alterations have been closely examined by researchers, who have discovered that they persist well into a person's early 20s. Consequently, it cannot be expected of a juvenile below the age of 18 to be functioning at peak brain capacity, as an adult would, and therefore to be tried as one.

---

[6] Ibid.
[7] Sowell, Elizabeth R, Paul M. Thompson, Colin J. Holems, Terry L. Jernigan and Arthur W. Toga. *In vivo evidence for post-adolescent brain maturation in frontal and striatal regions.* 2 Nature Neuroscience 10 (1999) AND Paus, Tomas, Jay Giedd, et. al. *Structural maturation of neural pathways in children and adolescents: in vivo study.* Science, 283 (1999).
[8] Ibid.

Specifically, evidence suggests that the frontal lobe, including the pre-frontal complex, is one of the last parts of the brain to fully mature, with research suggesting this process can go into a person's 30s.[9] The frontal lobe is especially important in understanding adolescent behaviour in relation to criminal behaviour, as it is home to the neural networks responsible for the executive functions of the brain.[10] This includes planning, decision-making, impulse control, working memory, judgments, and even emotions. These abilities enable a person to take a moment to gather their thoughts, weigh their alternatives, plan a course of action, and carry it out. All the challenges that come with poor executive functioning due to a developing prefrontal cortex can impair judgement and decision-making.[11] Considering the prefrontal cortex plays such an important role in the modulation of cognitive control, it makes it even more significant to study when assigning criminal culpability to juveniles. This scientific revelation ought to be taken into account as mitigating circumstances when juveniles are being prosecuted for crimes and should serve as a further reminder that kids shouldn't be tried as adults in adult courts.

In studying the adolescent brain, researchers also differentiate between what is called "hot cognition" and "cold cognition." Hot cognition refers to the processing of information purely based on reward, emotion and motivation, while cold cognition refers to the processing of emotion based solely on cognitive processing. While in general parlance it is accepted that, by the age of 16, under ideal circumstances, an adolescent's level of intellect and reasoning ability, or their cold cognition, is comparable to that of an adult. However, as various psychosocial studies have shown, teenagers and adolescents are much less likely and able to make good judgments while under pressure or in certain kinds of situations, and end up relying on emotional executive functioning, or their hot cognition.[12] The years during which these two cognitions don't align and aren't in sync is titled the "immaturity gap," typically falling within the ages of adolescence.[13] In addition to this, further research suggests that teenagers' increased susceptibility to reward is what motivates hazardous conduct.[14] They can frequently identify

[9] Sowell ER, Thompson PM, Holmes CJ, et al. In vivo evidence for post-adolescent brain maturation in frontal and striatal regions. *Nature Neurosci.* 1999;2:859–61.
[10] Johnson, Sara B, et al. "Adolescent Maturity and the Brain: The Promise and Pitfalls of Neuroscience Research in Adolescent Health Policy." *J Adolesc Health*, vol. 45, no. 3, Sept. 2009, pp. 216–221., https://doi.org/doi:10.1016/j.jadohealth.2009.05.016.
[11] Ibid.
[12] Steinberg, Lawrence, editor. McArthur Foundation Research Network, 2004, pp. 1–4, Less Guilty by Reason of Adolescence.
[13] Ibid.
[14] Somerville LH, Casey BJ. Developmental neurobiology of cognitive control and motivational systems. Curr Opin Neurobiol. 2010 Apr;20(2):236-41.

hazards, but their propensity to take action to minimise impulsive conduct is diminished by the insufficient development of brain systems connected to risk recognition.[15]

Another approach taken by neuroscience is the effect of the limbic system on decision-making during the adolescent years. The limbic system, which includes the amygdala, is known to be important in interpreting emotion and, in particular, in detecting if an object or circumstance is threatening. As a result, the amygdala is a key element of the brain system that recognises danger and triggers fear reactions. Researchers particularly focused on the role of the amygdala in recognizing facial expressions as well as the ability to attach emotional meaning to these expressions. They discovered that when teenagers engaged in facial recognition tasks, the amygdala became extremely active.[16] Additionally, they discovered that teenagers had the propensity to interpret terrified facial expressions as angry, perplexed, startled, and delighted. In particular, they discovered that adults significantly rely on the amygdala and therefore have substantially more frontal lobe activity throughout this process than teenagers.[17] Consequently, while adults relied on the area of the brain associated with "planning, goal-directed conduct, judgement, [and] insight," teenagers relied on "the more emotional region or that gut response region."[18] This research builds on to the idea of hot and cold cognition, and further substantiates the argument that children should not be tried as adults, as well as showcases further reasoning as to why it is harder to assign criminal culpability to adolescents in their developmental years.

Additionally, the turmoil associated with adolescent development can result in poor decisions and antisocial behaviours in teenagers. For example, a recently completed study analyzed the traumatic experiences in the lives of juvenile offenders who were on death row in the United States.[19] It was found that 74% experienced family dysfunction, 60% were victims of abuse and/or neglect, 43% had a diagnosed psychiatric disorder, 38% suffered from substance addictions and 38% had lived in poverty.[20] A large percentage of juvenile offenders had also experienced six or more distinct areas of childhood trauma. The adolescent years are a period of major transformation, and neuroscientific research supports this on a scientific level. It helps shed light on the riddles of adolescence and shows that there are serious brain problems in

[15] Ibid.
[16] Abigail A. Baird et al., Functional Magnetic Resonance Imaging of Facial Affect Recognition in Children and Adolescents, 38 J. AM. ACAD. CHILD & ADOLESC. PSYCHIATRY 195 (1999).
[17] Ibid.
[18] Ibid.
[19] Mallett, Chris. *Socio-Historical Analysis of Juvenile Offenders on Death Row,* 3 Juv. Corr. Mental Health Report 65 (2003).
[20] Ibid.

young people that lead to severe limitations in judgement. Research indicates that these constraints might create psychological conditions for aggression when combined with risk factors (neglect, abuse, poverty, etc.), as mentioned above.

Applicability of Neuroscientific Analysis to Juvenile Justice

Based on the neuroscientific viewpoints on adolescent brain development discussed above, it is evident that teenagers are less morally responsible for their conduct than a competent adult. While this does not absolve young people who commit violent crimes from punishment, this new perspective of adolescence diminishes their responsibility. This raises the question of whether the age limits underlined in the JJ Act align with scientific understandings of teenage brains. The immediate answer would be a no; science has time and again proved that an adolescent brain is still growing and developing, and mens rea towards an action should not always be immediately attributed. The law, however, does so and doesn't take into consideration the adolescent's incapacity to understand and have full knowledge of the actions and their consequences.

Assigning criminal culpability to juveniles under the JJ Act, negates this scientific evidence, and results in the treatment of those under 18 as just slightly lower than adults, and not as the vulnerable juveniles that they are. A potential solution can be for the law to soften the punishments against juveniles, and conduct studies into increasing the age of juveniles to 21. While some may argue this allows for a widened scope for perpetrators under the age of 21 to engage in heinous offences, it is important to remember that the law must take a reformative and holistic approach towards juveniles, meaning that all factors must be taken into consideration when assigning liability, and the punishment must be such as to ensure that welfare and the rehabilitation of the adolescent is kept at the forefront. While some provisions of the JJ Act provide for this kind of approach, it is negated by the fact that the age bracket for the same remains at the age of 18, especially when science suggests that cognitive development doesn't complete till the early 20s.

It is further argued that brain imaging studies should be utilized to provide hard evidence about problems with determining age under the JJ Act. In conducting a preliminary enquiry on whether a juvenile felon has committed a "heinous crime," it is mandatory to determine the age at which the offence was committed, as per Rule 10A (1) of the JJ Model Rules, 2016. A proposed solution to this has been the Brain Age Gap Estimation (brainAGE). This uses various methods to predict chronological age from structural magnetic resonance images (MRI), which

can help reveal discrepancies between an individual's chronological age and their brain age.[21] This estimated brain age gap can either represent accelerated or decelerated brain ageing, which is measured relative to one's chronological age.[22] The results of this neuroimaging can arguably be categorized as hard evidence as well, given that results from behavioural science research are sometimes seen as subjective in a court of law. Such research can not just be applied to adolescent's brain, but also across the entire lifespan of adults. It can help conclusively determine not just the age of the person, but specifically the brainAGE, which can then be used to lighten or increase liability.

But how can the law ensure that it maintains parity between the reformative justice for juvenile delinquents, as well as maintaining the standard of criminal liability that is expected from it as a system? The answer lies in the reasonable person standard that exists in law. A reasonable person standard states that all members of the community owe a duty to act as a reasonable person in undertaking or avoiding actions with the risk to harm others. Given the understanding of the adolescent brain, it is therefore argued, that the reasonable man standard that applies to adult when it comes to law, is not adequate for teenagers in their adolescent stage. A new standard of "reasonable adolescent" is necessary, based on the scientific and sociological understanding of teen brain anatomy and behavior.[23] This can be determined through a combination of social, psychological, biological and neuroscientific research, resulting in an acceptable standard of what actions can and cannot be justified by adolescents. In assessing adolescent actions, this would help determine criminal culpability for things like rape and murder, as compared to things like mutually consented adolescent sexual activities.

Conclusion

In conclusion, it is therefore argued that neuroscience and law go a long way in contributing to each other. Neuroscience has immense potential to offer the jurisprudence of law, with the field of juvenile justice being a primary area for this intersection to happen. Determining a juvenile's legal duty and making necessary modifications can only be successful if we bring the law's fundamental principles and goals closer to new scientific discoveries. It is also necessary at this moment in the development of law to engage a collaborative, multidisciplinary research

[21] Franke, K and Gaser, C. (2019). 10 years of BrainAGE as an neuroimaging biomarker of brain aging: what insights did we gain? *Front. Nuerol.* 10:789. Doi: 10.3389/FNEUR.2019.00789
[22] Ibid.
[23] Simmie Baer, Teleconference at the American Bar Association Center for Continuing Legal Education: Roper v. Simmons: How Will this Case Change Practice in the Courtroom? (June 22, 2005)

approach that explicitly seeks to relate brain anatomy to function as well as teenage behavior and policy consequences. The policy consequence focused on in this paper in particular is that of the JJ Act in India, but the possibilities of application of the research and solutions in this paper are widespread, and can affect other legal policy decisions like the age of consent, the age of marriage and the age of sexual consent. Until such research takes progress and leaves an impact on the criminal justice system, the allure of biological explanations to explain actions will never be fully accepted in the court of law.