

# Neuroscience: Decision Making and The Teenage Brain

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Although the legal system assigns the arbitrary age of 18 years to the onset of adulthood, sophisticated neuroimaging studies demonstrate that the human brain doesn't actually stop developing until we reach our mid-twenties, a fact that is beginning to be recognised in the criminal justice systems both in the UK and the USA (1,2). The last abilities to fully develop within the human brain are our 'executive functions'; these are complex and include self-restraint, emotional control, the ability to appreciate nuance, the ability to plan, prioritise and strategise to achieve long term goals and the ability to weigh up information to make decisions.

Recent brain imaging studies have found that teen brains work differently from those of younger children and adults when it comes to decision making (3). As Dr Joseph Campellone, a Neurologist from the University of Rochester explains,

*"adults think with the prefrontal cortex, the brain's rational part. This is the part of the brain that responds to situations with good judgment and an awareness of long-term consequences. However, teens process information with the amygdala. This is the emotional part. In teens' brains, the connections between the emotional part of the brain and the decision-making center are still developing—and not always at the same rate. That's why when teens have overwhelming emotional input, they can't explain later what they were thinking. They weren't thinking as much as they were feeling.(4)*

In addition to prioritising feelings over facts, brain imaging studies have also shown us that teenagers assess risk in different ways from both younger children and adults (5). Many of the choices teenagers make carry consequences that unfold over the course of their adult lives. The ability to accurately 'value' an outcome in the future, attached to a decision taken today requires a complex network to develop within the brain (cortico-striatal connectivity), a process that isn't complete until adulthood. Whilst these connections are being established, teenagers are not good at judging the 'value' of likely outcomes in the future, particularly if they are far in the future and outside their experience to date.

Researchers have begun to explore the impact of context on decision making in teenagers, particularly when they are in a state of heightened arousal or excitement, and in situations involving their peers. Studies have shown that in exciting situations where consequences are immediate and direct, adolescents are less influenced by their explicit knowledge of the

probabilities of potential negative outcomes, and are more willing to take risks to obtain potential rewards.

The influence of peers is another uniquely powerful factor that impacts decision making in teenagers. Adolescence is a period of life in which peer relationships become increasingly important. This appears to be hard wired. One brain imaging study found that merely being observed by a peer was sufficient to induce uniquely high levels of physiological arousal in adolescents and modulation of the corticostriatal valuation systems (6). Another study found that young adolescents are more strongly influenced by other teenagers than adults when it comes to the assessment of risk. For early adolescents, the opinions of other teenagers about risk matter more than the opinions of adults (7).

Neuroscience has much to tell us about the adolescent brain and the way in which teenagers understand the world and make decisions. This knowledge must be integrated into the provision of any medical treatments which may have a long term, irrevocable impact on their lives as adults.

#### References:

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