



## The Teenage Brain

### The interviewee

Dr John Coleman is a clinical psychologist and one of his key research interests is adolescent brain development. He runs training workshops about the development of the teenage brain with parents and frontline practitioners working with young people.

This resource summarises some of the key themes relating to adolescent brain development, and the possible implications of this for practitioners working with young people who have experienced exploitation that emerged from the discussion with Dr Coleman.

### Background

Until the beginning of the 21<sup>st</sup> century it was generally believed that the brain stopped developing at the end of childhood. There was no understanding about what was going on in adolescent brains. Over the past 20 years that has drastically changed. We now know that significant changes take place in the teenage brain – and that the brain changes more during this time than at any other time apart from the very early years. Furthermore, these changes can continue into an individual's early 20s.

### Key changes in the adolescent brain

The teenage brain is **maturing, contracting and reorganising** itself. The coverings of nerve fibres, which are responsible for transmitting messages in the brain, are becoming stronger. This helps both sides of the brain to become more connected and helps improve our thinking, reasoning and language skills. Simultaneously, the grey matter in the brain is also contracting. Towards the end of childhood, there is a significant increase in the number of neurons in the brain. This means that as we enter adolescence, we effectively have too many neurons and over the following ten years at least, our brain gets rid of these unwanted neurons (around a 17% reduction in grey matter). This is also known as 'pruning'. As a result the brain is restructuring itself. Pruning allows our brains to become '*leaner, meaner machines*' – but it is also a very complex process that can take its toll on an adolescent – for example leading to feelings of confusion, uncertainty and anxiety.

Another key difference in the adolescent brain is the **variation in hormone levels**. Hormone levels fluctuate a lot more in the teenage brain. This can perhaps explain why teenagers can experience mood swings and sometimes find it difficult to self-regulate their emotions. For example, teenagers experience greater variation in their levels of serotonin, a hormone which help to stabilise our mood. This may explain why teenagers can sometimes be prone to low moods and feelings of depression. Furthermore, melatonin (sleep hormone) levels rise much more slowly in the adolescent brain, which may partly explain why many teenagers can struggle with sleep. Dopamine is known as the 'reward hormone' and it works in two ways. When dopamine levels rise in the brain it pushes you to seek out pleasurable experiences, and when you experience pleasure this also causes your dopamine levels to rise. Adolescent brains have many more dopamine receptors and are particularly sensitive to reward. This means that when presented with rewards or experiencing rewards – their dopamine levels rise higher and stay high for longer than in adult brains.

The **pre-frontal cortex**, also known as the command and control centre, where you are assessing and making decisions, is also continuing to develop in the adolescent brain. The pre-frontal cortex of the brain can become overwhelmed by the amygdala - the part of your brain that deals with emotions. The less developed the pre-frontal cortex is, the more likely for it to become overwhelmed by the amygdala, or one's emotions.

When considering all these changes going on in the adolescent brain, it is important to understand that **brain development can happen at different rates** for every teenager. Whilst very little is known about the links between pubertal development and brain development, it may also be reasonable to assume that delays in pubertal development could be linked to delays in brain development.

It is also important to understand that the **environment will have an impact upon adolescent brain development**. Several studies on adolescent brain development that have followed young people growing up in severe deprivation and poverty show that restrictive environments can cause delays in brain development. Similarly, supportive environments will help the brain develop, particularly the prefrontal cortex, which in turn can help with emotional regulation and managing impulsivity.

More recently, research is beginning to emerge around the **impact of early trauma on adolescent brain development**. It is early days but it is worth cautiously highlighting two key findings. Firstly, adolescents who have experienced trauma early on are more sensitised to threats. They respond more quickly and are more vigilant in response to threatening stimuli. Secondly, young people who have experienced early trauma also struggle with memory tasks. They seem to manage their memory processes differently, perhaps due to blocking out and resisting difficult memories.

### **Implications for practitioners working with young people who have been exploited**

It is important for practitioners to understand how much change is occurring in the adolescent brain. The nature of the changes require a lot of adjustment and can have a significant impact on young people's behaviour and the choices they make. Understanding adolescent brain development can also help practitioners contextualise and understand (alongside other information) the young people they are working with, including those who have been exploited.

Knowledge about adolescent brain development can also help practitioners further understand how some young people can be especially vulnerable to exploitation. Whilst acknowledging it was early days in this area of research, Dr Coleman argued that there are ways in which brain development might lead to or enhance vulnerability in adolescents, including their vulnerability to exploitation. This includes the maturing, the pruning, the reorganising, the hormone fluctuations, and the struggle between the prefrontal cortex and the amygdala.

*"Imagine that a young person is more likely to be looking for a reward or pleasure (because teenagers are more receptive to rewards due to their dopamine levels), and that a reward is being offered by an older individual, and the young person is being tempted. Some young people would find it easier to be able to think ahead, to imagine what the consequences might be and to back off and say no. But if that pre frontal cortex isn't working particularly well and the dopamine levels are higher for example, it may be very hard to say no. The reward may be so attractive, and the dopamine levels are pushing you to look for pleasurable experiences and you just become tempted by that. I think that our knowledge of [adolescent] brain development tells us is that there are ways in which some young people can become more vulnerable; and that's partly to do with structure, it's partly to do with the way in which different parts of the brain work together, and in part to do with the actual rate of development."*

Furthermore, having knowledge of the particular research around the impact of early trauma on adolescent brain development can increase practitioners' understanding of the ways in which present behaviours and difficulties can be understood in the context of past trauma. This can further support practitioners when developing [trauma-informed practice](#).

It is important for practitioners to appreciate the importance of individual variation in the pace of change of brain development – and that no two teenage brains will develop in the same way. Furthermore, there is still very little knowledge about the link between pubertal development and brain development. Further research and discussion is required about the possible risks for early developers and later developers, and how this affects brain development. For example, early puberty may be linked to differences in hormones balances. These may be related to sexuality and sexual identity. Does this have any implications for young people's behaviours and choices? Might this mean that early developing girls are particularly vulnerable to exploitation?

Research also shows that the adolescent brain is plastic – which means it has the capacity to recover in an extraordinary way. It is important for practitioners to understand that the young people they work with can recover, and that therefore finding the right environment and support for a young person can make all the difference. This is further supported by understanding the impact that a supportive or difficult environment can have on adolescent brain development.

*“Young people’s brains are not set, and so good support, encouragement and positive activities will help brain development.”*

This means that work undertaken to help families, carers and other professionals to put in place supportive structures, and positive work undertaken with individual young people, has real potential to influence longer term outcomes.

### **Future directions**

Dr Coleman runs training sessions for practitioners on adolescent brain development. Accessible resources are required that simplify and summarise key information and are related to and routed in the work that practitioners carry out with young people, those involved in the criminal justice system, those who have been sexually or criminally exploited, and those who have experience childhood trauma. This also connects to the wider issue of the need for more academics and scientists to think about the implications of research for policy and practice and invest more time and resources into creating accessible resources that can be readily used by practitioners.

Different types of models for training and information sharing that are known to exist include: (1) incorporate information about adolescent brain development into existing training sessions that frontline staff already take part in; (2) commission trainers to train up local authority staff to run the training themselves; (3) get a smaller sample of managers to take part in external training with the objective of the trickle-down effect. The latter is not ideal, but funding remains a challenge.

Research in this area is ongoing. There are important questions to be explored about how the language and focus on young people's behaviours and choices within adolescent brain development theory might feed into victim blaming. How can this be avoided? And how can recognition of the impact of the environment on adolescent brain development feed into discussions about contextualised safeguarding? Furthermore, it would be interesting to explore how research on adolescent brain development might feed into narratives about choice and agency amongst young people who are sexually or criminally exploited. It is suggested you consider some of these issues in the 'Questions for reflection' section below.

---

### Questions for reflection

- In light of this information, what is the value of a better understanding of adolescent brain development to training and development for professionals working in the field of child exploitation and extra-familial harm? What are the challenges?
- To what extent do you think that adolescent brain development theory, and specifically the focus on language and focus on young people's behaviours and choices within this, might feed into victim blaming?
- How can understanding the impact of the environment on adolescent brain development feed into discussions about contextualised safeguarding?
- What training, resources and support is available to professionals in your local area? How could these be developed to take account of brain development theory?