Understanding the Teenage Boy's Brain

Our brain reaches its full size in early adolescence. However, its wiring is still a work in progress and will continue – albeit to a lesser extent – even throughout later life.

Brain development during the first months and years of life is characterised by an overproduction of neurons and connecting synapses.

This provides the developmental plasticity needed to adapt to and learn from the avalanche of new information that infants and young children receive.

In contrast, brain development from late childhood through adolescence is dominated by processes that remove neurons and synapses. While this may seem unintuitive or even detrimental, it is an integral part of brain maturation and key to the behavioural, emotional, and cognitive changes that occur during the transition to adulthood.

While the death of excess neurons is pre-programmed, the reduction of synaptic connections – a process called synaptic pruning – is subject to experience.

...as teenagers grow into adults, they acquire a greater cognitive ability to plan, organise and prioritise tasks

Frequently used connections, say those used when playing a musical instrument, are reinforced, and become hardwired. Unused connections are removed. Teenagers lose about 1% of their grey matter every year until their early twenties. Meanwhile, the amount of white matter increases.

But these changes do not affect all brain areas simultaneously. The sensory and motor areas mature first, followed by regions involved in language and spatial orientation, and then those involved in higher-order cognitive processes and executive functions, such as flexible thinking, reasoning, and self-control.

The last to mature is the dorsolateral prefrontal cortex at the very front of the frontal lobe. This area is involved in planning, judgement and decision making, and it also processes emotional information sent from the amygdala - the fight or flight centre of the brain.

This delay in maturation may help explain typical risky, short-sighted teenage behaviour and the often-apparent lack of control over impulses and emotions.

During this period, the adolescent brain remains highly malleable and still acts like a sponge for learning. Yet lacking impulse and emotional control makes teens vulnerable to stress and mental health problems.

Parents can play an important role in supporting their son during their teenage years while their brain is developing and that they fulfil their responsibilities as a young adult. This could include:

- Discussing the consequences of their actions can help teenage boys to link impulsive thinking with facts. This helps the brain make these connections and wires the brain to make this link more often.
- Remind your teenage son that they're resilient and competent. Because they're so focused on the moment, adolescents have trouble seeing they can play a part in changing bad situations. It can help to remind them of times in the past they thought would be devastating but turned out for the best.

- Become familiar with things that are important to your son. It doesn't mean you have to like their music but showing an interest in the things they're involved in shows them they're important to you.
- Ask your teenage son if they want you to respond when they come to you with problems, or if they just want you to listen.

QBI researchers are exploring how the brain changes during these critical periods of growth.

DEFINITIONS

Grey matter
Tissue composed of neuron cell bodies, glial cells, and unmyelinated axons, where most processing occurs.

White matter
Areas of the central nervous system containing mostly myelinated axons and only a few neuron cell bodies. Its main function is signal transmission between grey matter areas.

Epidemiological studies
Epidemiological studies track the prevalence and course of a disease or condition in population groups over time, helping to define the disease or condition's development and outcomes, determine risk factors and identify targets for prevention or treatment.

Extract: Queensland Brain Institute