

The social brain and its role in teaching adolescents

Nicola Davies reports on research presented at the British Psychological Society annual conference 2015 on the social brain and its role in teaching adolescents.

Three major factors shape the behaviour of young people – childhood experiences, the environment in which a young person has their adolescence, and their genetic make-up. Through the discoveries being made in the neuro-scientific field we are better able to understand the vulnerabilities and, indeed, the abilities of adolescents, during this stage of turmoil, as they become aware of their own identities and develop a consciousness of self. This is significant in terms of our role in teaching adolescents.

Through examination of children's brain scans and by following their development into their twenties, scientists have found that the gray matter, which forms the outer folds of the cortex, changes. After increasing in scale, it then declines, with the high point being in early adolescence. Parity with an adult brain is only achieved in the early twenties.

Why the decline – surely we need all those cells? It has been posited that, through experience and use, certain synapses are strengthened while those that are not necessary tend to fall by the

wayside as some of the grey matter converts to white matter during myelination, which is the process of the myelin sheath production. Myelin is an electrically insulating material that creates a layer known as the myelin sheath to cover the axon of neurons within the brain.

Risk-taking behaviour

Quite complicated changes occur in the brain both before and after puberty. As neurons develop, a sheath of myelin forms around their extension from supporting glial cells. The myelin sheath works as an insulator, thus increasing the speed of transmission of electrical impulses between neurons. The motor and sensory regions of the brain are myelinated in the first few years of life, yet the axons in the frontal cortex continue with the process of myelination for a much longer period; this is only complete in some cases at the age of 25 years. This demonstrates the logic of insurance companies reducing premiums only after this age for young drivers, for it is during this stage that risk-taking behaviour occurs.

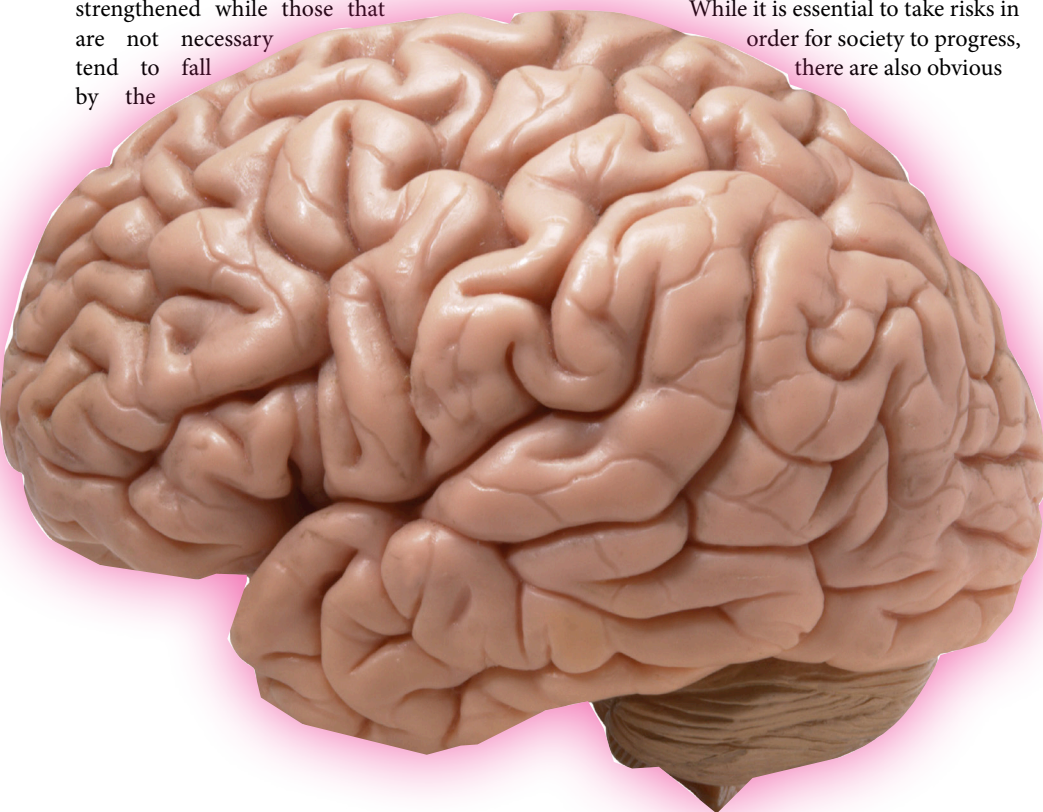
While it is essential to take risks in order for society to progress, there are also obvious

associated dangers for young people. If healthy outlets for this behaviour are not provided, risk-taking behaviour can become allied to negative influences, such as drug abuse, smoking, excessive alcohol consumption, as well as participation in dangerous 'sports,' such as train surfing and illegal drag racing.

At this stage, with adventure and risk-taking being very high on the adolescent list of priorities, lessons that involve an element of danger will gain their full attention. According to Liam, who is aged 16, "I really woke up in science class when our teacher issued dire warnings about the possibly lethal results if we messed up our experiments. He was probably exaggerating – but he got our attention – and what a sense of achievement there was when our experiments worked. Of course, his warning about blowing up the science lab did have us wondering if it might earn us a few days off school!" Lisa, aged 18, seems to share a similar perspective: "Some of my best memories of school are of hiking trips with the geography club, where we studied rock formations after abseiling down a sheer cliff. It was so awesome and such a rush. I also enjoyed the leadership courses where we built rafts and raced them across the river." The implications of these findings for the classroom setting are clear; teachers should try to include more dramatic and adventurous scenarios in their classes to capture the adolescent's attention.

Emotional responsiveness

Another important aspect of this stage of adolescent brain development is that the emotional responses to images and activities is higher than is the case with young children or adults. "I found that in our Life Orientation classes," says teacher Jeanie Beales, an educator at a single sex school, "the topic of unwanted pregnancies was hugely enhanced when I took girls to a local abandoned babies home. There the staff would give them the history of babies, who the girls also had a chance to play with and bathe. The babies had various origins: abandoned at the hospital after birth; found in a plastic bag; passed to an unwitting old lady with a request to hold the baby; found alive in an open field with ants between the toes and rats nibbling the ears. The girls bonded with the real life products of an unwanted pregnancy



and realised the consequences of unprotected sexual activity. What was very heartening was the fact that after the initial introduction many went back to the babies' home of their own accord in their free time to assist the staff and would report back on what developmental stages were being reached by 'their' babies." This strategy worked better than anything they could have learned from a textbook. First hand they saw the developmental delays as a result of premature birth and fetal alcohol syndrome, and also learned to see the resilience of babies who had been removed from abusive homes. "It encouraged them to focus on others rather than themselves," says Beales.

Intellectual maturation

The intellectual ability of the brain is at its height during adolescence, yet while on a par in this respect with older people, adolescents approach problems differently to adults in tests that require either calculations or impulse control. Maths teachers know how difficult it is to keep pupils on a logical path when solving problems.

The different sections of the cortex mature at different rates; the last parts to develop fully are the frontal and prefrontal cortexes, which are responsible for control of impulses and the ability to plan ahead instead of living in the moment. This is why adolescents may fully understand the consequences of certain risk-taking behaviour and state that this is not something they wish to participate in – yet a teacher may find they will do precisely the opposite. They were not lying and fully intended to comply, but their immature brain took over and made them act on impulse.

The process of maturation takes years, and as it starts at the back of the brain and slowly moves forward towards the frontal and prefrontal cortexes, where insight, empathy and risk-taking are controlled. This is why teens need help in planning and with tidiness, as both activities require a sophisticated level of cognitive control, as any teacher confronted with a file that looks like an explosion in a stationery store will realise.

Social development

At the adolescent stage, the hormones governing reproduction control not only affect behaviour related to sex, but also social behaviour. For example boys notice girls and vice versa because of the existence of attentional bias; their brains filter out distractors, enabling the opposite sex to become dominant in their brains – this explains the boys who hide magazines under their beds and girls who swoon over male pop idols.

Social hierarchy is also very important at this stage, as no one wants to be the class pariah. There is a continuous scrutiny of self in relation to others. The need to establish their own identity is important, so teens adopt ways of dressing and behaving, sometimes even adorning themselves

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with tattoos and piercings to indicate their 'uniqueness,' yet at the same time identifying their conformity with a particular sub-group in order to gain acceptance.

While teachers may feel that pupils are not concentrating on their academic work, as their social lives take precedence, the establishment of a healthy social network is important as they move from being dependent on their primary family to a form of independence with the support of a group of peers. Only when an adolescent feels comfortable socially can proper learning take place. This is why teachers and counsellors may need to intervene if a child is not socially well adjusted. These are the adolescents who, in order to gain recognition from peers, tend to engage in activities such as drug abuse, sexually promiscuous behaviour, anti-social activities, and excessive alcohol consumption.

Interestingly, it was found in a research study that adolescent rats would drink an alcohol solution with other rats of the same age, but not with the parent rats. In a different study, 'Adolescent Rats Help Prove that Early Exposure to Alcohol can Quickly Lead to Heavy Drinking Patterns,' Nicole Schramm-Sapyta, research associate in the Department of Pharmacology and Cancer Biology at Duke University Medical Center, found that drinking patterns for alcohol were established after only just a few exposures for some of the rats.

In Australia it is estimated that around 90 per cent of adolescents, aged 14, have consumed alcohol at least once, while around 50 per cent of those over the age of 14 consume alcohol at least once a week. Researchers at Deakin University, however, found in a study led by John Toumbourou, that binge drinking was reduced by 25 per cent in schools that were assigned to the 'Resilient Families Programme'. The program involved parents being given information on the harmful effects of alcohol and encouraged not to allow their children access to or use of the substance, which many parents regard as less serious than other drugs. While adolescents cannot be monitored 24/7, a firm approach on the part of teachers and parents in relation to the dangers of alcohol, combined with provision of information on the long-term damage associated with its abuse, particularly on the adolescent brain, could help reduce teen drinking.

Self-consciousness

Adolescents, as many teachers will attest, are also extremely self-conscious and seem to think others have nothing to do but focus on them. This aspect is fully discussed in a paper written by Suparna Choudhury, Sarah-Jayne Blakemore and Tony Charman titled 'Social cognitive development during adolescence.' "The brain regions that undergo the most significant development during adolescence," it is written in the paper, "overlap with those that have been linked to the ability to take other people's perspectives and infer mental states." Indeed, adolescents seem to have difficulty in distinguishing between the first person perspective and third person perspective, but as the maturation takes place in the adolescent brain, so they become more aware of the mental states and emotions of others. Young adolescents also find it difficult to read people's body language and neutral facial expressions, according to Choudhury, although they do react to fearful facial expressions. This seems to account for misbehaviour as they have not correctly interpreted a teacher's facial expression or mood, making it necessary to spell out to them what is expected.

Teachers will know how difficult it can be to deal with Grade 9 to 10 pupils going through the early stages of their 'brain change,' but by the end of Grade 12 many of them have matured into pleasant individuals, and will even sometimes reflect on what they used to be like. Beales reports that, "I had a Grade 12 student who said to me, 'I used to be awful – how on earth did you manage to put up with me?' I told her there was a good person inside waiting to emerge from the trauma of adolescence. She had experienced a particularly torrid time coping with parental divorces, step-parents and moves between parents depending on convenience."

What adolescents need is to know that they are loved and that their teachers believe in them. In dysfunctional families, it is often the teacher who is the only adult the adolescent may feel safe with. It is important not to withdraw that support, even though teachers are often stretched to their limits. Adolescents are very aware of all the media rants about teenagers and their behaviour and just want someone who 'gets' them, is perceived to be on their side, and who will reassure them that they will emerge from the tumultuous wave of adolescence onto the calmer beach of adulthood.

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