Teens experimenting with their lives: Gardening in the brain

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One of the biggest concerns of today's society is teens experimenting with their lives. Teens experiment with diet, appearance, social situations, running away from home, sex, drugs, and sometimes crime. The impacts of these experiments on thinking, emotions, and behaviour are evident to most people. Mood takes unpredictable swings. There is proneness to lack of motivation, poor memory, and depression. Even though teens are a concern to many, who takes the time to study or even to care about teens? Hopefully, if we take a few minutes, the information we learn might help us improve our understanding of the teens in our community.

When I think of the teen years, I am reminded of a cartoon that expresses the course of child development as one might expect it – until the viewer is faced with a rather ominous monster labelled "teenager". Why are the teen years seen as so ominous?

Perhaps there's an answer in how the brain develops, but first let's explore who teens are. Surely, teens are enduring the time of life that is most filled with potential. This potential has built up over the course of years of being told what to do. Then, along comes an intense feeling of readiness to do "what I want" that is combined with an uncertainty about how to go about doing it. By the time they get a little older, we hope they have figured out how. So, teens are people who are literally stuck between one identity (child) and another (adult). Now, what's causing this build-up of "stuck" potential?

If you've been following along the last few weeks of Perspectives, you probably guessed it. The brain is at work again. Recent high-tech images of the functioning brain (so-called MRI scans) have shown that well before puberty, neural circuits in the frontal areas of the brain are growing very rapidly. The frontal areas control goal-setting, concentration, and language. At puberty, these areas slow down and show significant loss during adolescence and adulthood. In other words, during adolescence, it's as though a gardener is pruning the neural "orchard". Combined with this, teens with depression have a smaller hippocampus, the brain structure that has an important role in memory and motivation. But even the non-depressed teen brain is not thinking so clearly. Brain structures responsible for concentration and planning are being cut back.

At the same time, requirements for biological adulthood are being set in place that will permit the development of the ability to reproduce. A recent article by researchers from the University of Michigan reviews our knowledge of sexual development. This involves two main events. First, brain cells containing the hormone that stimulates reproductive maturation are located in a tiny structure called the "hypothalamus". In the first phase, most commonly called "puberty", these cells are activated and begin to release the hormone ultimately responsible for the physical changes necessary for successful mating. In contrast, before puberty, this area of the brain is quiet. It is thought that a "developmental clock" is responsible for the timing of puberty, but its mechanism is still poorly understood. In any case, the story doesn't end with "raging hormones". If it were, injecting animals before puberty with sex hormones would cause them to reproduce. But this doesn't happen.

The second phase of developing into an adult is the growth of cognitive and social processes during adolescence, which is timed a little bit beyond puberty. Although we might not think this is best, the pattern is this. First, the structure is made ready. Then, the person is set loose to experiment. Then, through experimentation, the brain learns how to use it. As this occurs, research has shown that

numerous different areas of the brain are being re-modelled to notice sexual cues, to be more responsive to sexual thoughts and motivations, and to actually perform sexual acts. It is challenging, even for a well-educated adult, to explain these processes. So, it is no surprise that teens are left to fathom overwhelming changes in their thoughts, feelings, and bodies, often unprepared for the radical adjustments they are required to make.

So, how can we make sense of the complex changes going on during biological, psychological, and social development in the teen-years? Taken together, the rearrangements in the teenage brain clearly contribute to adolescent decision-making, risk-taking, drug sensitivity, ability to plan, and responsiveness to reward. Taken separately, teens are experiencing two key processes going on at the same time. Growth of reproductive potential is going on simultaneous with cutting back areas involving control of impulses, careful planning, and goal-setting. Guess what's going to happen! Teens will take risks. In other words, they will conduct experiments.

On top of that, although the emotional energy is greater than the intellectual sense they usually make of it, teens begin to feel the importance of their own understanding. If they are able to put this understanding into words, it can be reflected in questions like: "Why should I have to listen to you when you never listen to me?" and "Why can't I party, smoke, drink, do drugs, and fight? I know adults who say they don't, but do anyway." As the childhood brain reaches beyond sheltered innocence to these double-standards, teens begin to see adult guidance as less reliable and come to rely more on their own devices. In spite of adult rule-making and attempts to reinforce good behaviour, teens sometimes take their lives into their own hands.

During the teen years, then, changes in a large number of factors – physical, emotional, and intellectual changes – are colliding. A new field of science called chaos theory suggests that, when multiple factors collide, sudden explosions of energy can occur. The teenage build-up of explosive energy can sure look like disrespect or even outright rebellion. In fact, it is part of the natural process of brain development. Through a radical burst of sprouting and pruning in the brain, teens are developing the capacity to focus their thoughts on the contradictions they have observed in the adult world. The oppositional lessons they learned in childhood are not exploding with energy.

Picture the teenage brain as an orchard full of fruit-bearing trees. Imagine there are two gardeners in the orchard. One is fertilizing the trees yet to bear fruit. The other is pruning back trees that have already born fruit or are over-grown. Now, these gardeners get into fights once in a while. When they do, the fight explodes with an energy way beyond what was available before puberty. Clearly, this conflict contributes to the ominous sense of confusion experienced by teens. As well, it puts into perspective a growing awareness of "real-life" contradictions that once faced their parents.

In summary, things to expect during teenage development are:

1. Clear claims (even cries) for independence and the right to "be who I am";
2. Confusion about "who I am" and "why I am here"; and,
3. Experimentation, which supports the brain's natural process of growth and pruning.

To respond, I would suggest that parents:

1. Listen attentively with an open mind to what teens have to say;
2. Caution teens to experiment safely; and
3. Accept that, chances are, they will get through it.

Despite the chaos that is the major crisis of the teen years, the result will hopefully be the formation of a healthy adult identity.

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