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## Why teenage kicks are in the brain

### Behaviours that can perplex adults are linked to differences in prefrontal cortex

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Teenagers can do the craziest things. They drive at high speeds. They stand around outside loud parties and smoke weed in front of the cops. They guzzle liquor. They insult their parents – or lie to them – and feel no remorse, because, of course, their parents are idiots.

It is easy to blame peer pressure or wilfulness, but scientific studies suggest that at least some of this out-there behaviour has a physiological tie-in: brain mapping technologies show that the average teenagers brain looks slightly different from an adult's. The biggest differences lie in the prefrontal cortex – a part of the brain associated with reasoning – and regions of the brain that are less about reasoning and thinking and more about emotion.

Using such tools as functional magnetic resonance imaging (fMRI) and positron emission tomography (PET), scientists have peered into teen brains and found that typically, until a person hits his early to mid-20s, his prefrontal cortex is still rapidly changing. So are the cell endings and chemical connections that link the cortex to parts of the brain associated with gut impulses.

When people are around 15 or 16 years old, many brain cells in the cortex die off while others are created, and new connections form. A lot of the basic cognitive abilities – advanced reasoning, abstract thinking, self-consciousness – rapidly expand during this time, says Laurence Steinberg, a Temple University psychology professor. “The connections within the brain don’t fully branch out until age 22 or so. [...]”

Susceptible as they are to social feedback, praise and rejection – more so than adults, according to research by Steinberg and others – teens often do what peers want them to do, or what they think peers want them to do, rather than what we might say is rational, Steinberg said.

Yet as difficult as this risk-taking, peer-driven, reward-seeking behaviour can be for parents and other adults to deal with or merely observe, it’s important to see the positives, and to realise that youthful foolishness usually doesn’t last for ever, says Silver Spring, Maryland-based neuropsychologist William Stixrud.

He finds it helpful to point adults to the scan images that show that teenage brains are physically different from theirs and to the research showing that brains change over time. That science has found physical differences between teen and adult brain structures and activity means something to his patients – and their anxious parents, Stixrud says.

He finds it “enormously useful” to be able to explain to teenagers that it’s their “sensitive and reactive amygdala” that causes them to feel things more strongly than others do but also makes it harder to live in their own skins. [...] For Stixrud, an overactive amygdala helps explain why teens’ feelings of aggression, fear and depression may be more intense than those of adults. [...] The sort of brain development that can make teens and young adults take scary risks also motivates them to go out on their own, seek new experiences and sometimes create new things.

Some neurologists worry that too much can be made of scans of the brain’s complex structures. Neurological images “are powerful, but images are not causes” of behaviour, says Tomas Paus, a professor of psychology and psychiatry at the University of Toronto, who has authored research papers with Steinberg but is more sceptical of overarching interpretations. “The causes are in our genes and our environment. The image is just a manifestation of those causes.”

“A 17-year-old has different experiences than a 40-year-old,” he adds. “It’s not only the brain that changes our experience; experience changes the brain.”

[Arthur Allen in THE GUARDIAN WEEKLY, September 12, 2014; 608 words; abridged.]

**Why teenage kicks are in the brain***Arthur Allen* in *The Guardian Weekly*, September 12, 2014; 608 words; abridged**Annotations:**

<b>kicks</b> ( <i>informal</i> )	..... exciting effect, stimulating enthusiasm
<b>to guzzle</b>	..... consume excessively or greedily
<b>remorse</b>	..... a sense of deep regret and guilt for some misdeed
<b>peer</b> ( <i>noun</i> )	..... people of your age
<b>wilfulness</b>	..... quality of being intent on having one's own way
<b>tie-in</b>	..... link, relationship
<b>to peer</b> ( <i>verb</i> )	..... look intently, examine closely
<b>gut impulse</b>	..... impulse derived from a person's instinct and experience
<b>to plateau</b>	..... remain at a stable level for a relatively long period
<b>susceptible</b>	..... easily impressed emotionally
<b>to author</b>	..... write or originate
<b>overarching</b>	..... dominating or embracing all else

**Assignments:**

1. Summarize the reasons why parents should be patient and understanding with their children in their teenager years and early twenties.
2. Analyze the author's style and language.
3. Explain the purpose of the last part of the text, starting from l. 38, "*Some neurologists worry...*".
4. In your opinion, why do teenagers often rebel against their parents and against adults in general? Write a composition of about 200 words.

## **Lösungsvorschlag “Why teenage kicks ...”**

1. Summarize the reasons why parents should be patient and understanding with their children in their teenager years and early twenties.

When teenagers are nasty with their parents, drink alcohol excessively and take risks that may, in some cases, even endanger their lives, parents should be aware of the neurological basis for their children's behaviour. They act the way they do not only because they want to impress their peers or because they object to anything their parents say merely for the sake of objecting. Rather, their brains are different from adults' and are changing at a rapid pace until they are in their early or mid twenties. Therefore, they are often emotionally unbalanced and should not be judged too harshly for that, because their behaviour is not determined by rationality, as parents would like it to be, but rather by the desire to impress their peers at any cost. Those may matter to adults as well, but according to recent research, adolescents' brains are stimulated far more when peers are with them. Generally, young people find it very pleasurable when they are with people their age.

Now, the act of taking high risks is an extremely effective motivational factor for adolescents considering the importance they attach to peers.

However, parents should also know that this irrational behaviour will normally end sooner or later, so they shouldn't give up hope too quickly.

2. Analyze the author's style and language.

The topic the author talks about in his article is quite scientific. Therefore, he uses the corresponding technical terms where necessary or useful, i.e. when referring to research methods in this field, e.g. “brain mapping technologies” (13), “functional magnetic resonance imaging” (21/22) or “positron emission topography” (23), as well as to the brain and its different regions themselves, e.g. “prefrontal cortex” (16/17). In this way, he underlines the fact that the findings he reports about have a scientific basis. The quotes from scientists in this field serve the same purpose.

Apart from these technical terms, however, the author's style is not scientific or formal. On the contrary, he generally refrains, e.g., from long sentences with some subordinate clauses. Moreover, he uses colloquial or informal terms right from the headline (kicks), especially when describing teenagers and their behaviour (weed, 4; cops, 5; guzzle, 5) in order to adapt, so to speak, to their way of talking. Most of the time, his style can be characterized as neutral, aiming at informing his readership succinctly and to the point.

3. Explain the purpose of the last part of the text, starting from l. 38, “*Some neurologists worry...*”.

For most of the text, the author talks about neurologists' findings about teenage brains as well as the conclusions parents and adults in general should draw from them. He interprets new research in detail and also quotes some experts to make his points even clearer. However, at the very end of the article, the author also mentions some scientists who object to attaching too much importance to these recent findings. They warn us of over-interpreting the scans of teenage brains. According to them, they are merely pictures and may show how young people behave. However, they do not show the reasons for their behaviour, which lie in people's genes as well as in the way they are influenced by the world around them. Moreover, they think that there is some interaction between our brains and our experiences. Our brains may make us do certain things and thus have particular experiences; but at the same time, our experiences may also have some influence on our brains and therefore influence our future behaviour. Generally, The author dedicates only a small part of his article to these “skeptics”; on the other hand, he quotes them at the very end, which is always a decisive part of a text as it is given the final words or thoughts.

4. In your opinion, why do teenagers often rebel against their parents and against adults in general? Write a composition of about 200 words.

It's one of the major characteristics of the teenager years: adolescent rebellion, often causing conflicts with parents. But why do so many young people rebel against adults? Adolescence is a time when a lot of changes take place within young people: they turn from children to adults, and the passage can often be painful. In their childhood, they mostly do, at least to some degree, what their parents expect them to. But as they are approaching adulthood, they feel the need to assert themselves, becoming personalities in their own right. And quite often, they hold different views from their parents', which necessarily leads to conflicts.

Moreover, rebellion tends to attract the attention of those around you, and lots of young people seem to have a need to be the centre of attention, which can also be seen in the provocative way they sometimes dress. Young persons of the opposite sex start becoming interesting to them, and in order to be attractive, they sometimes bend over backwards to be different from others.

Finally, the world is in constant progress, and what may have been reasonable or fashionable 25 years ago is not necessarily so any longer these days. Adolescents often feel peer pressure, and in order to be cool and in, they have to adapt to the persons of their age and not to their parents' generation.

There may be some consolation for parents in the fact that teenage rebellion is usually a temporary phenomenon, passing sooner or later and being useful, if not necessary for a healthy development of their children. [261 words]