Press Release

Stress Research: Experiencing Violence Can Negatively Affect Adolescent Brain Development

MRI study with 65 adolescents from inner-city Los Angeles

Berlin, July 19, 2018 – A study conducted by the Max Planck Institute for Human Development and the University of Southern California has examined the relationship between stress in the form of community violence and the brain structure of adolescents. The results were recently published in the journal *Human Brain Mapping*.

Drug trafficking, shootings or burglary—even if we are not directly affected by it, impressions of violence and crime probably will not pass us by without a trace. Scientists at the Max Planck Institute for Human Development and the University of Southern California have studied the brains and cognition of 65 healthy adolescents, aged 14–18, living in high-crime neighborhoods in Los Angeles. “From previous studies, we know that life in conflict-ridden environments is associated with lower cognitive performance and an increased risk of mental illness, including post-traumatic stress disorder (PTSD), for adolescents. In addition, adolescence is a key period for brain development, but there has not been a study to date of how community violence exposure may affect the brains of adolescents,” says first author Oisin Butler of the Max Planck Institute for Human Development in Berlin.

The results of the study support the assumption that indirect experiences of violence influence adolescent brain development. The researchers found that adolescents with higher levels of violence exposure showed lower IQ and smaller gray matter volume in the anterior cingulate cortex and the left inferior frontal gyrus. These brain regions are important for higher order cognitive functions, especially for cognitive control, language production and emotion. “The thinning of gray matter is part of normal brain maturation in adolescence. However, the slower this process is, the more time cognitive functions have to mature. Further studies are needed to find out how much stress accelerates the loss of gray matter in adolescence and how this may impact cognition,” adds Butler.

Without becoming victims or perpetrators themselves, most of the young people involved in the study had heard of crimes or violence in their immediate neighborhood, had witnessed them, or had been threatened. The adolescents were healthy and came from intact, low income families and had experienced neither abuse nor neglect in their parents’ home. “We wanted to make sure that the results are not influenced by other factors, such as mental illness or abuse, which are known to be associated with changes in brain structure,” says senior author Mary Helen Immordino-Yang of the University of Southern California. Study participants completed an intelligence test and their brain structure was measured using magnetic resonance imaging (MRI).
The findings essentially resemble a study of the impact of military operations on the brain. Researchers at the Max Planck Institute for Human Development were able to show that the duration of military deployment in healthy soldiers is associated with reduced gray matter in the same brain region. "Chronic stress, for example in the form of experiences of violence, can affect the healthy brain. The affected brain structures show similarities to those of patients with PTSD, even if the people examined here have no such disorder," says co-author Simone Kühn, who led the military deployment study at the Max Planck Institute for Human Development.

Previous work has primarily focused on the study of stress and trauma in individuals with clinical symptoms, and these two studies examine the influence of stress on the brain in healthy individuals. "The majority of individuals exposed to violence do not develop clinical symptoms, such as PTSD. These findings should allow us to draw a much more nuanced picture of stress influences on the brain and make a contribution to the generalizability of the results of neuroscientific stress research," continues Kühn.

**Background information**

**Original studies**


**Max Planck Institute for Human Development**

The Max Planck Institute for Human Development in Berlin was founded in 1963. It is an interdisciplinary research institution dedicated to the study of human development and education. The Institute belongs to the Max Planck Society for the Advancement of Science, one of the leading organizations for basic research in Europe.

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