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Adolescent brain may be especially sensitive to new memories, social stress, and drug use

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Adolescence, like infancy, has been said to include distinct sensitive periods during which brain plasticity is heightened; but in a review of the neuroscience literature published on September 23 in *Trends in Cognitive Sciences*, University College London (UCL) researchers saw little evidence for this claim. However, a small number of studies do support that memory formation, social stress, and drug use are processed differently in the adolescent brain compared to other periods of life.

"Conclusively proving that adolescent sensitive periods exist will require studies comparing children, adolescents, and adults and will need to take into account individual differences in adolescent development," says Delia Fuhrmann, a PhD student in UCL's Institute of Cognitive Neuroscience Developmental Group. "Adolescents are much more likely than children to choose their own environments and choose what they want to experience."

Humans retain some plasticity—changes in brain and behavior in response to environmental demands, experiences, and physiological changes—throughout life. However, during sensitive periods plasticity is heightened and the brain "expects" to be exposed to a particular stimulus. For example, the brains of infants are primed to process visual input and language.

The ability to form memories seems to be augmented during adolescence, one example for how it may be a sensitive period. Memory tests in different cultures show a "reminiscence bump"; at 35 or later, we

are more likely to recall autobiographic memories from ages 10 to 30 years than memories prior or subsequent. The recall of music, books, films, and public events from adolescence is also superior compared with that from other periods.

Further, they point out that simple aspects of working memory or ongoing information processing may reach maturity in childhood, while more complex, self-organized working memory abilities continue to improve during early adolescence and recruit frontal brain regions that are still developing. "Working memory can be trained in adolescents, but we don't know how these training effects differ from other age groups," Fuhrmann says. "Such data would be useful for planning curricula because it would tell us what to teach when."

Many mental illnesses have their onset in adolescence and early adulthood, possibly triggered by stress exposure. The UCL team explored studies indicating that both social stress and social exclusion have a disproportionate impact during adolescence. They also argue that adolescence may be a vulnerable period for recovery from these negative experiences.

"Adolescents are slower to forget frightening or negative memories," says Fuhrmann. "This might mean that some treatments for anxiety disorders, which are based on controlled exposure to whatever a patient is afraid of, might be less effective in adolescents and alternative treatments might be needed."

Finally, studies showed that adolescence is also a time of heightened engagement in risky health behaviors, such experimenting with alcohol and other drugs. Young adolescents seem to be particularly susceptible to peer influence on risk perception and risk taking compared with other age groups. Research in rodents also supports that adolescent brains might have an increased sensitivity to marijuana.

More information: *Trends in Cognitive Sciences*, Fuhrmann et al.: "Adolescence as a Sensitive Period of Brain Development" dx.doi.org/10.1016/j.tics.2015.07.008