Adolescent reward sensitivity: protector rather than risk?

Enhancing sensitivity to reward may actually promote better mental health among adolescents who have experienced adversity

by Katie McLaughlin
February 20, 2017

What comes to mind when you think about being a teenager? Many of us remember the embarrassment we suddenly felt about our parents, the strong desire to be accepted by our peers, the first time we developed romantic feelings for another person. For most people, reflecting on adolescence also calls to mind memories of being reckless and engaging in risky behaviors that we would never consider as adults, often with the goal of impressing or gaining the acceptance of peers.

Adolescence is marked by a dramatic increase in risky behaviors, including alcohol and substance use, unsafe driving and sexual activity, and even criminal behaviors like shoplifting and vandalism. Why do adolescents behave in such risky ways? Evidence from cognitive neuroscience suggests that the increase in risky behaviors that occur during adolescence likely reflects normative changes in brain networks involved in motivation and reward processing, including the dopaminergic reward circuit—a network in the brain that is centrally involved in reward processing. A key node in this network is a sub-cortical brain structure called the striatum, which influences our desire to pursue rewards, our ability to learn about things in the environment that predict reward, and how much pleasure we feel when we obtain rewards. Evidence suggests that the striatum dopamine circuit changes drastically during adolescence.

Adolescence is a developmental period that is characterized by increased sensitivity to rewards, at both behavioral and neurobiological levels. Compared to children and adults, adolescents are more motivated to pursue rewards and exhibit greater neural response in the striatum during anticipation of rewards and receipt of rewards. These brain patterns suggest that adolescents have a greater desire for rewards and experience more pleasure when receiving them than children or adults. Many have argued that this increase in sensitivity to rewards during adolescence underlies the dramatic increases in risky behaviors that occur during this developmental period.

Although this heightened reward sensitivity is typically conceptualized as a risk factor for adverse outcomes, a recent study from our lab suggests that sensitivity to reward may also confer benefits during this developmental period, particularly among adolescents who have experienced stress and adversity. Specifically, we show that adolescents who have high sensitivity to reward are less likely to develop depression following exposure to child maltreatment, a severe form of environmental adversity that increases risk for depression.

Behaviorally, adolescents who alter their behavior in order to obtain a reward are protected from developing depression following child maltreatment as compared to adolescents who do not exhibit this behavioral sensitivity to reward. The same pattern exists in neural response to reward.
Adolescents who exhibit high response to social rewards are less likely to develop depression following child maltreatment than adolescents with low response to reward. These findings indicate that reward sensitivity is a protective factor that buffers adolescents from developing depression following stress and adversity.

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What might explain this? The striatal dopamine circuit is associated not only with the propensity to engage in risky behaviors, but also with depression. Depression is characterized by low levels of positive emotion as well as reduced neural and behavioral sensitivity to rewards. Chronic exposure to stress is thought to contribute to low reward sensitivity and, in turn, increase risk for depression. However, adolescents who exhibit high sensitivity to rewards may be protected from the detrimental effects of stress, because they are able to maintain engagement with sources of reward and affiliation that promote positive emotions, including social relationships.

These findings may lead to novel interventions for depressed adolescents. Adolescents who have been maltreated respond poorly to evidence-based treatments for depression, like cognitive-behavioral therapy and medication. Treatments that target motivation and engagement with reward (e.g., behavioral activation) are effective at treating depression in adults but have never been tested among youth who have experienced maltreatment.

Enhancing sensitivity to reward—previously thought of as a risk factor—may actually promote better mental health among adolescents who have experienced adversity. More generally, these findings demonstrate the complex relationships between the neural and behavioral changes that accompany adolescence and mental health and adaptive functioning during this period, highlighting the importance of continued research on adolescent health and development.

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