Mountain Plains ATTC (HHS Region 8)
ATTC Addiction Technology Transfer Center Network
Funded by Substance Abuse and Mental Health Services Administration

**Stimulant Series Webinar Part 2: Impact of Stimulant Use on the Brain and Body**

Additional Questions and Resources, Prepared by Beth Rutkowski, MPH, and Thomas E. Freese, PhD, Co-Directors, PSATTC, March 18, 2021

**Q: Where does caffeine fit in this model of dopamine/serotonin, etc. stimulation?**

A: Caffeine acts as a central nervous system stimulant. When it reaches your brain, the most noticeable effect is alertness. You will feel more awake and less tired, so it is a common ingredient in medications to treat or manage drowsiness, headaches, and migraines. Caffeine increases energy metabolism throughout the brain but decreases at the same time cerebral blood flow, inducing a relative brain hypoperfusion (inadequate blood flow). Caffeine activates noradrenaline neurons and seems to affect the local release of dopamine.

Further Reading: https://pubmed.ncbi.nlm.nih.gov/1356551/

**Q: Does the route of administration, for meth, change the effects on the brain?**

A: The general effects on the brain are similar, regardless of what route is used to administer methamphetamine. However, the onset of effects differ by route of administration. Smoking or injecting methamphetamine puts the drug very quickly into the bloodstream and brain, causing an immediate, intense "rush" and amplifying the drug's addiction potential and adverse health consequences. The rush, or "flash," lasts only a few minutes and is described as extremely pleasurable. Snorting or oral ingestion produces euphoria—a high, but not an intense rush. Snorting produces effects within 3 to 5 minutes, and oral ingestion produces effects within 15 to 20 minutes.

Further Reading: https://www.drugabuse.gov/publications/research-reports/methamphetamine/how-methamphetamine-misused

**Q: What type of correlation have you seen with effects on the brain and age of first use?**

A: In general, across many substances, earlier age of onset increases risk for more severe SUD symptoms and poorer prognosis overall. In one study by Windle and colleagues, higher levels of alcohol, cigarette, and marijuana use before age 19 correlated with smaller gray matter volume in two brain areas. The amygdala was smaller in youth who had reported higher use of the substances at ages 12 to 15. The pars opercularis, a sub-region of the inferior frontal gyrus, was smaller in those who reported higher use of the substances at ages 16 to 18. To the researchers' knowledge, theirs is the first study to show a relationship between substance exposure and the pars opercularis.

Another study showed that earlier age of onset led to an increased vulnerability to a shorter between age at onset of MA use and MA dependence in a substance treatment cohort.

Further Reading: https://www.drugabuse.gov/news-events/nida-notes/2019/04/research-links-adolescent-substance-use-to-adult-brain-volumes

Yimsaard, P., Maes, M. M., Verachai, V., & Kalayasiri, R. (2018). Pattern of Methamphetamine Use and the Time Lag to Methamphetamine Dependence. *Journal of Addiction Medicine*, *12*(2), 92–98. https://doi.org/10.1097/ADM.0000000000000371

**Q: Do you have statistics related to the percentage of youth whose parents use methamphetamine develop methamphetamine use disorders themselves?**

A: These data do not exist to my knowledge.

**Q: What is the percent of addiction that is attributed to genetics?**

A: Scientists estimate that genetic factors account for between 40 and 60 percent of a person's vulnerability to addiction; this includes the effects of environmental factors on the function and expression of a person's genes. A person's stage of development and other medical conditions they maybe have are also factors. Adolescents and people with mental disorders are at a greater risk of developing a substance use disorder than the general population.

Further Reading: https://www.drugabuse.gov/publications/drugfacts/genetics-epigenetics-addiction

**Q: What are your thoughts about use of amphetamine-based meds (Adderall) to treat ADD/ADHD with stimulant users?**

A: A critical need exists for research to better understand the interrelationship between ADHD and stimulant use disorders. However, in a brief review of research on this topic, Dr. Nora Volkow, Director of the National Institute on Drug Abuse, found that studies indicate that long-term outcomes of individuals treated for ADHD do NOT indicate that current clinical treatment practices lead to increased risk for later substance use or abuse.

Further Reading: Volkow, N. D., & Swanson, J. M. (2008). Does childhood treatment of ADHD with stimulant medication affect substance abuse in adulthood? *The American Journal of Psychiatry*, *165*(5), 553–555. https://doi.org/10.1176/appi.ajp.2008.08020237.

**Q: Do you believe caffeine use interferes with a person's ability to recover from stimulant use disorder?**

A: There is no research literature on this topic that I have been able to find. There is one study that expressed some concern that caffeine may potentiate the acute toxic effects of amphetamine-related drugs, such as seizures, hyperthermia, and tachycardia. The relevance of these interactions remains to be determined, but it should be alarming in view of the popularity of these drug associations and the fact that those toxic effects are an important determinant of the fatalities associated with amphetamine-related drug intake. At minimum, I would exercise caution in the over use of caffeine for someone in recovery.

Further Reading: Ferré S. (2013). Caffeine and Substance Use Disorders. *Journal of Caffeine Research*, *3*(2), 57–58. https://doi.org/10.1089/jcr.2013.0015.

Frau, L. Simola, N., & Morelli M. (2013). Contribution of Caffeine to the Psychostimulant, Neuroinflammatory and Neurotoxic Effects of Amphetamine-Related Drugs. *Journal of Caffeine Research, 3,* 79–84.

**Q: Is there an increase in meth associated psychosis in recent years with the increase in prevalence and strength/purity?**

A: According to a research article published by Wearne and Cornish in 2018, dependency to methamphetamine, together with high doses and recreational methamphetamine use, have all been associated with the induction of psychotic symptoms, including auditory and visual hallucinations, persecutory delusions, ideas of reference, and disorganized speech.

Further Reading: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6191498/