The majority of drug addiction research agrees that two behavioral traits, sensation seeking and impulsivity, largely contribute to substance use. Despite this agreement, the neuroanatomical correlates of these behaviors have been unexplored. This is partially due to genuine lack of research in the area, yet also due to evidence which suggests brain anatomy is effected by drug use. Therefore, it can be difficult to tease out the “truth of the anatomy”. One’s brain may be “biased” in the sense that impairments in their cognitive control system may lead to sensation seeking, impulsivity and substance use. Alternatively, substance use may have altered the system, resulting in these behaviors. The authors of current study speculate the bias stance. The main goal was to identify the brain regions common to each of these behaviors and understand the extent to which these areas could contribute.

The authors were able to conclude in two independent populations (N=1234; N=219) of healthy, young participants, that sensation seeking and motor impulsivity were correlated with reduced cortical thickness in regions of the cognitive control system. Interestingly, the decreased cortical thickness observed in many of the regions that correlated with sensation seeking and impulsivity, also strongly correlated with the frequency of alcohol, tobacco and caffeine use. Self-reports further supported this evidence, showing that relations among sensation seeking and impulsivity correlated with increased use of alcohol, tobacco, and caffeine.

In conclusion, the authors provide interesting data that makes some strong suggestions for the association between these behavioral traits and substance use. However, one major limitation of the study is that it's primarily based on correlative inferences. I would expect future studies to address these topics, which do indeed relate, as the current study has shown, with the ability to draw causal conclusions.
Individual differences in cognitive control circuit anatomy link sensation seeking, impulsivity and substance use

Seeking stimulation and impulsivity are normal traits that well-adapted individuals can regulate, but if these behaviors are left unregulated, they can lead to poor outcomes such as substance abuse. Certain cortical regions, including reduced thickness of the middle frontal gyrus and anterior cingulate cortex are associated with disorders of impulsivity, as seen in attention-deficit hyperactivity disorder (ADHD) and drug use. It is unclear whether reduced cortical thickness predisposes individuals to impulsive behaviors, or whether it is a result of the behaviors themselves.

This study used MRI to measure cortical thickness in 1,234 subjects. Additional information was collected from the patients, including history of drug/alcohol/caffeine usage, and a measure of sensation seeking and impulsivity. The results showed that sensation seeking was correlated with decreased cortical thickness in the anterior cingulate cortex and middle frontal gyrus in both left and right hemispheres. Decreased cortical thickness in the ACC and prefrontal cortex was also correlated with increased impulsivity. As hypothesized, these cortical areas were also thinner in drug, alcohol and caffeine users. Importantly, the correlation between sensation seeking and thinner cortex was true whether or not the subjects had a history of substance use. This demonstrates that the cortical changes are not caused by the substance use itself.

One question I would like to ask the presenter is: what do you think causes the individuals who have thinner ACC and middle frontal gyrus cortices, and display high levels of impulsivity and sensation seeking, to transition into substance abusers? Is it as simple as an environment/genetic interaction?