Brain imaging demonstrates that former smokers have greater willpower

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A study, completed by researchers from Trinity College and the Research Institute for a Tobacco Free Society, Dublin, Ireland, compares former smokers to current smokers, and obtains insight into how to quit smoking might be discovered by studying the brains of those who have successfully managed to do so.

Functional MRI images were obtained while current smokers, former smokers and never smokers performed tasks designed to assess specific cognitive skills that were reasoned to be important for smoking abstinence. These included a response inhibition task to assess impulse control and the ability to monitor one's behavior and an attention task which assessed the ability to avoid distraction from smoking-related images, which tend to elicit an automatic attention response in smokers.

The investigators found that when doing these tasks, the current smokers compared to the never-smokers showed reduced functioning in prefrontal regions that are related to controlling behavior. In addition, the current smokers showed elevated activity in sub-cortical regions such as the nucleus accumbens that respond to the reward value or salience of the nicotine stimuli. However, in marked contrast, the former smokers did not show this sub-cortical activity, but instead showed increased activity in the frontal lobes – the areas that are critically involved in controlling behavior. Moreover, the former smokers were "super-normal", showing greater levels of activity in these prefrontal regions than the never-smokers.

The implication is that the brain regions responsible for what might be considered "willpower" show more activity in those who have quit smoking. This type of willpower can be measured, can be related to specific brain regions, and would appear to be related to being able to quit cigarettes. These results reinforce the value of smoking cessation therapies that stress the importance of, or that help to train, the cognitive skills involved in exercising control over drug desires.

More information: "Differences in "bottom-up" and "top-down" neural activity in current and former cigarette smokers: Evidence for neural substrates which may promote nicotine abstinence through increased cognitive control" (Liam Nestor, Ella McCabe, Jennifer Jones, Luke Clancy, & Hugh Garavan) is published in *NeuroImage* dx.doi.org/10.1016/j.neuroimage.2011.03.054

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