Mobile technology helps explore nicotine addiction

Some people quit smoking on the first try while others have to quit repeatedly. Using such mobile technology as hand-held computers and smartphones, a team of researchers from Penn State and the University of Pittsburgh is trying to find out why.
"One thing that really stood out among the relapsers is how their urge to smoke just never dropped, in contrast to those who were successful in quitting for a month -- their urge dropped quickly and systematically -- almost immediately upon quitting," said Stephanie Lanza, scientific director of The Methodology Center at Penn State. "That was surprising to see."

With a new statistical model to interpret data and the ability to collect data via mobile devices, the researchers looked at how baseline nicotine dependence and negative emotional states influenced people's urge to smoke while they were trying to quit.

The Centers for Disease Control found in a 2010 National Health Interview Survey of 27,157 adults that about 52 percent of cigarette smokers tried to quit during the year. Six percent of all smokers -- who had been smoking for two years or more -- quit for at least six months. Also in 2010, the CDC reported that even though cigarette smoking is the leading cause of preventable death and disease in the U.S., nearly one in five Americans smokes.

The team found that those who successfully quit during the four-week study period had a weaker association between their urge to smoke and their ability to quit. However, those who were unable to abstain did not show any association between their urge to smoke and their self-confidence.

Saul Shiffman, professor of psychology at the University of Pittsburgh, followed 304 long-term cigarette smokers as they tried to quit. On average, the participants smoked more than a pack a day for 23 years. Forty participants quit smoking for the initial 24 hours, but subsequently relapsed. During the two weeks after quitting, 207 participants remained relatively tobacco-free. If smokers relapsed but smoked less than five cigarettes per day, they were considered successful quitters in this study. The remaining 57 participants were unable to quit for even 24 hours.

Five times randomly throughout the day, mobile devices prompted participants to answer questions. These questions asked the smokers about their emotional state, their urge to smoke and if they were smoking. They rated their urge to smoke at that moment on a scale of zero to 10. Using this data collection method, the researchers collected data from subjects in their natural environments.

Researchers followed subjects for two weeks prior to their attempt to quit, and for

four weeks after their attempt to quit, the researchers report online in Prevention Science.

The Penn State team used a flexible statistical model -- a time-varying effect model -- that allows the researchers to look at more than one variable at a time. This model is a decade old, but until now was not user-friendly. The Methodology Center created accessible software (methodology.psu.edu/downloads/tvem [1]) to analyze data that vary over time.

"To me, the biggest innovation here is looking at how something like baseline dependence is predictive of that behavior over time or (specifically) the urge to smoke over time," said Lanza. "It's now expressed as a function of time. Instead of saying 'if you're higher on dependence you're going to have a higher urge to smoke over time,' you can now depict how that association between baseline dependence and urge to smoke varies with time in a very fluid and naturalistic way."

One advantages of this model is that researchers are not confined to changes in one dimension. Researchers can look at time in a smooth way, viewing it as a gradual and constant variable and simultaneously view two or more variables that can change over time, such as smoking urges and negative affect. Lanza noted that this method could be used to look at addiction and behavior in many other areas, such as obesity, alcohol dependence, stress and more.

"Our goal is to work hand-in-hand with tobacco (and other) researchers, to help them understand these really intricate processes that are happening," said Lanza. "We want to really understand addiction and how to break addiction, so that interventions can be targeted and adaptable."

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