

E-cigarette use to reduce cigarette smoking may not increase nicotine dependence

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Electronic cigarettes have attracted media and consumer attention for claims of their addictive nature, variety of flavors and increased use among teens, sparking regulatory oversight and policies. A Penn State

College of Medicine study suggests that these devices may help people decrease their dependence on combustible cigarettes—which contain an array of harmful chemicals called toxicants—without increasing their overall nicotine dependence.

Smoking is a leading cause of death in the U.S., and despite interest in quitting and the availability of FDA-approved cessation methods, smokers still struggle to quit. Some public health experts have proposed e-cigarettes as a "reduced harm" alternative to cigarettes for those not interested or able to quit, citing reports like [one](#) from the National Academies of Sciences, Engineering and Medicine, which found that substitution of e-cigarettes for combustible cigarettes reduced users' exposures to carcinogens and other harmful toxicants.

Jessica Yingst, assistant professor of public health sciences and Penn State Cancer Institute researcher, and colleagues at the Penn State Center for Research on Tobacco and Health study e-cigarettes and whether they can help [nicotine](#) users stop smoking or reduce their exposure to harmful toxicants found in cigarettes. Their latest study investigated a common question—whether initiation of electronic cigarette use to reduce cigarette smoking could potentially increase nicotine dependence.

"Research on this topic is conflicted, because in prior studies, participants used their own devices with unknown nicotine delivery profiles," Yingst said. "Our study used devices with known nicotine delivery profiles, which allowed us to effectively compare how the varying levels of nicotine in a device might affect user nicotine dependence and ability to reduce cigarette consumption."

The researchers enrolled 520 participants interested in reducing their cigarette intake but with no plans or interest to quit smoking, and instructed them to reduce their cigarette consumption over the six-month study period. Participants randomly received an e-cigarette that

delivered 36, 8, or 0 mg/mL of nicotine; or a cigarette substitute that contained no tobacco, as an aid in their efforts to reduce their cigarette consumption.

Participants self-reported their cigarette and e-cigarette dependence at one, three and six months using validated measures of dependence, including a Penn State-developed questionnaire that ranged from 0 (not at all dependent) to 20 (highly dependent). Urine samples were also collected throughout the study to measure cotinine, a biomarker for nicotine exposure.

At six months, all participants in the e-cigarette groups reported significant, decreased cigarette consumption, with those in the 36 mg/mL group smoking the least number of cigarettes per day. Those in the e-cigarette groups reported significantly lower dependence on the Penn State Cigarette Dependence Index than those in the cigarette substitute group.

Participants also reported their e-cigarette dependence using the Penn State E-Cigarette Dependence Index. E-cigarette dependence did not significantly change throughout the study, with the exception of participants in the 36 mg/mL group who saw significant, increased dependence over the course of the study, yet still much lower when compared with cigarette dependence. Urine cotinine levels remained consistent across all groups for the duration of the study, suggesting that there was no increase in overall exposure to nicotine during the study. The results were published in the journal *Nicotine & Tobacco Research*.

"Our results suggest that using e-cigarettes or a cigarette substitute to reduce cigarette consumption can result in a reduction of self-reported cigarette use and dependence," said Yingst, who directs the College of Medicine's Doctor of Public Health Program. "Importantly, use of the high concentration e-cigarette did not increase overall nicotine

dependence, and was associated with a greater reduction in cigarette smoking compared to the cigarette substitute."

While it has been hypothesized that the use of e-cigarettes could increase overall nicotine dependence, the research team said their study found that initiating [e-cigarette use](#) to reduce cigarette consumption resulted in reduced cigarette dependence and low e-cigarette [dependence](#). In the future, they will evaluate the health effects of completely switching from cigarettes to e-cigarettes.

More information: Jessica Yingst et al, Changes in Nicotine Dependence Among Smokers Using Electronic Cigarettes to Reduce Cigarette Smoking in a Randomized Controlled Trial, *Nicotine & Tobacco Research* (2022). [DOI: 10.1093/ntr/ntac153](https://doi.org/10.1093/ntr/ntac153)

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