

Interactive effects of e-cigarette and cannabis use on neural reactivity among adolescent dual-users

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Conclusions

- Results support previous observations of an interactive neurobiological relationship between nicotine and cannabis in reward-processing regions.
- Important to consider *both* EC and cannabis use patterns when assessing the effects of either substance on the adolescent brain.

Background

E-cigarette (EC) use has increased among adolescents; high rates of EC and cannabis dual-use^{1,2}

Interactive effects remain understudied; preclinical evidence of functional interactions^{1,2}

Associations: heavier substance use, poorer educational, behavioral, neuropsychiatric outcomes^{1,2}

1)Hernandez et al. Biol Psychiatry, 2021
2)Kuhns et al. Addict Biol, 2021

Study Aims

Assess specific neural activation to EC-related stimuli (cue reactivity) in adolescents

Compare profile of EC cue-reactivity between dual-users and non-users

Investigate how EC and cannabis use patterns impact EC cue-reactivity in dual-users

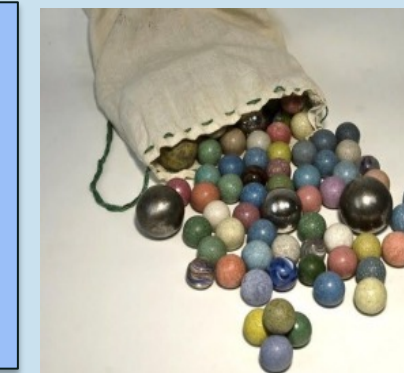
Methods

Cue-reactivity task – participants presented with photographic blocks of EC and neutral cues during a 3T BOLD fMRI sequence acquisition.

fMRI analysis – FSL FEAT with default processing steps used to model and extract estimates of individual-level activation (cue-activation > neutral images contrast z-map) in four bilateral ROIs from the Harvard-Oxford atlas: Amygdala, Nucleus Accumbens (NAcc), Putamen, and Caudate.

Statistical analyses – performed two sample t-tests comparing EC cue-reactivity contrast estimates in each ROI between dual-users and non-users. In dual-users, performed linear regression modeling of use-status variables (EC use, cannabis use, and their interactions) on cue-reactivity contrast estimates in each region.

Participants – Twenty-five adolescents participated in this study: 15 dual-users (16.8±1.2yo; 9F/6M) endorsing use of both ECs and cannabis in the past 30-days, and 10 non-users (16.8±1.5yo; 7F/3M).



Results

Whole-group analysis:

- No significant differences between dual-users and non-users in specific neural activation to EC cues in any of the 4 bilateral ROIs.

Sub-group analysis (dual-users only):

- # EC sessions per day was negatively associated with cue-reactivity in the right and left amygdala ($p = .0281$ and $.0144$, respectively).
- # of cannabis use-days over the past year was positively associated with cue-reactivity in the right caudate ($p = .0455$).
 - The interaction between sense of EC addiction and cannabis use-days (past month) was negatively associated with cue-reactivity in the right and left NAcc ($p = .00869$ and $.0327$, respectively), and the right and left putamen ($p = .0480$ and $.0229$).
 - The interaction between #EC sessions per day and cannabis use-days (past month) was negatively associated with cue-reactivity in the right NAcc ($p = .00796$).

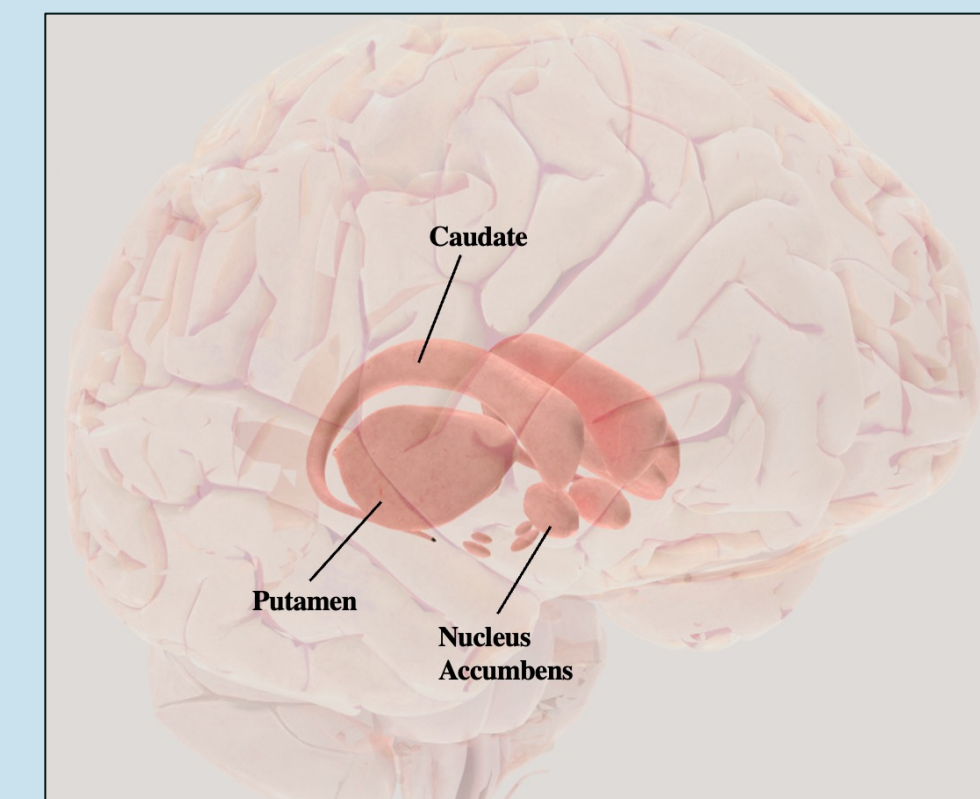


Figure 1: striatal ROIs in which interactive effects of EC and cannabis use variables were observed on EC cue-reactivity. Image based on Society of Neuroscience (2017) 3D anatomy tool.