

# Mobile app detection of THC-related cognitive impairment in heavy users



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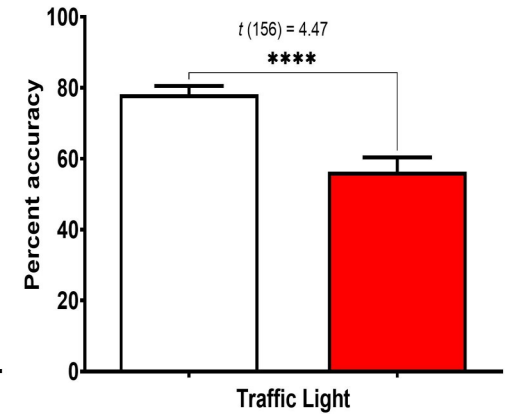
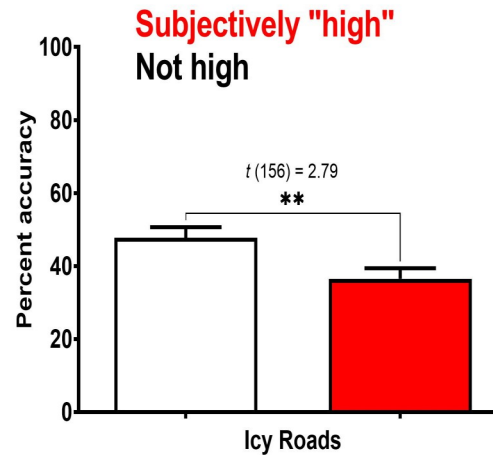


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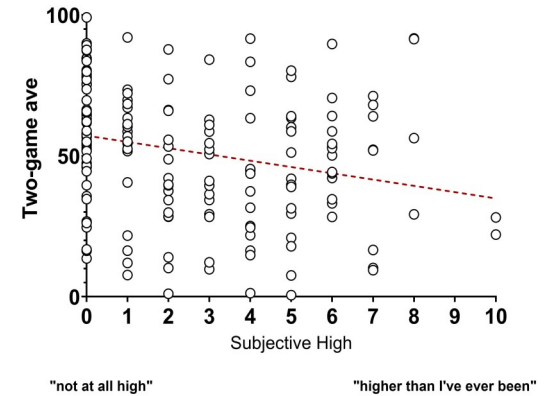
**ABSTRACT**

The degree to which frequent users of cannabis experience cognitive impairment from acute self-administration has been questioned on the basis of behavioral tolerance to THC. "indicator" is a downloadable mobile software app that assesses cognitive, perceptual, and motor skills using a variety of brief videogames. In the course of one month (April 2021), the app was used by 199 adult users who self-identified as either use cannabis "frequently" or "continuously." Seventy-two of these heavy users played at least two of the games available in the app while sober, and this was on the first occasion of using the app. Eighty-five used the app while intoxicated by cannabis, and also on their first instance of using the app. Independent-samples *t*-tests were performed to compare sober-versus-intoxicated performance on two separate videogames, and these videogames specifically assessed (a) time perception and (b) reaction speed and accuracy (i.e. critical tracking). Clear evidence of cannabis-related impairment was evident for both videogames (*p*'s < 0.01) for this heavy-using population. This evidence suggests that neurocognitive performance-related deficits are apparent in a population of users who are well-accustomed to the psychopharmacological influence of THC.



Figures above represent two independent groups of participants on each of two videogames, each on their first occasion of app use. Participants consented to research, and responded to subjective surveys of intoxication prior to app use. Each participant self-reported no other drug or alcohol use, nor prescription medication use, while utilizing the app. Results from testing were immediately available to participants.

Subjective high was self-reported on a scale.  
 $r = -0.249^{***}$



Left: Screenshot of the reaction speed and accuracy (critical tracking) task called "icy roads." The car moves horizontally in a random pattern as the lane advances, and the joystick (bottom) is used to make adjustments to keep the car in the lane.

$$DV = \text{time-to-failure} / 60 \text{ s.}$$

Right: Image from the time perception-recreation task, called "traffic light." During observation trails, the participant is asked to track the timing of the movement of the light from green-to-yellow-to-red. Then during testing, the participant is asked the question depicted in the image.

$$DV = |\text{actual time} - \text{response time}| / \text{actual time}$$

Correlations of subjective, self-reported high were correlated with mean percent accuracy results from the two videogames.

\*Other data collected from the app includes time-course of drugs action by method of self absorption.

Heavy users were by far the most common users to access the app during 4/1/2021-4/30/2021. Infrequent users ("rare" or "occasional" users, n = 42).

We would like to acknowledge the Office of the Vermont Attorney General (TJ Donovan) and the New England Regional Drug Recognition Expert Training Coordinator Lt. Jim Roy, for their support.

**indicator** is a free app available on Apple App Store. All human subjects protocols were approved by NEIRB. This research was supported by NSF SBIR 2014649 PI: Ari Kirshenbaum, PhD