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

Ari Kirshenbaum, PhD 1,2, Chris Lewis, DPT 2, Andy Kaplan, MD 2,3, Jevan Fox 2,4
1 Saint Michael’s College, Colchester, Vermont
2 DriveAbilityVT, LLC, Burlington, Vermont,
3 University of Vermont, Larner College of Medicine, Burlington, Vermont
4 Agency Enterprise Studio, Venice Beach, California

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.

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, $n = 42$).

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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

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.  

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

Subjective "high"  

Not high

Subjective high was self-reported on a scale. 

$r = -0.249^{***}$

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