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Cannabis effects on driving lateral control with and without alcohol

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Abstract

Background: Effects of cannabis, the most commonly encountered non-alcohol drug in driving under the influence cases, are heavily debated. We aim to determine how blood Δ(9)-tetrahydrocannabinol (THC) concentrations relate to driving impairment, with and without alcohol.

Methods: Current occasional (≥1×/last 3 months, ≤3days/week) cannabis smokers drank placebo or low-dose alcohol, and inhaled 500mg placebo, low (2.9%)-THC, or high (6.7%)-THC vaporized cannabis over 10min ad libitum in separate sessions (within-subject design, 6 conditions). Participants drove (National Advanced Driving Simulator, University of Iowa) simulated drives (~0.8h duration). Blood, oral fluid (OF), and breath alcohol samples were collected before (0.17h, 0.42h) and after (1.4h, 2.3h) driving that occurred 0.5-1.3h after inhalation. We evaluated standard deviations of lateral position (lane weave, SDLP) and steering angle, lane departures/min, and maximum lateral acceleration.

Results: In N=18 completers (13 men, ages 21-37years), cannabis and alcohol increased SDLP. Blood THC concentrations of 8.2 and 13.1μg/L during driving increased SDLP similar to 0.05 and 0.08g/210L breath alcohol concentrations, the most common legal alcohol limits. Cannabis-alcohol SDLP effects were additive rather than synergistic, with 5μg/L THC+0.05g/210L alcohol showing similar SDLP to 0.08g/210L alcohol alone. Only alcohol increased lateral acceleration and the less-sensitive lane departures/min parameters. OF effectively documented cannabis exposure, although with greater THC concentration variability than paired blood samples.

Conclusions: SDLP was a sensitive cannabis-related lateral control impairment measure. During drive blood THC ≥8.2μg/L increased SDLP similar to notably-impairing alcohol concentrations. Despite OF's screening value, OF variability poses challenges in concentration-based effects interpretation.

Keywords: Alcohol; Cannabis; Driving; Lateral control; Oral fluid; THC.

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Figures

Figure 1 The National Advanced Driving Simulator:...

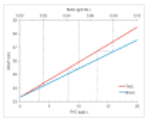

Figure 2 GLM Select modeled standard deviation...

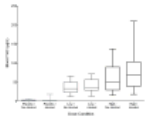

Figure 3 Box plot of maximum blood...

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