Accident Analysis and Prevention 92 (2016) 219–229

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Drug Recognition Expert (DRE) examination characteristics of cannabis impairment

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ARTICLE INFO

Article history:
Received 30 December 2015
Received in revised form 8 March 2016
Accepted 9 April 2016
Available online 22 April 2016

Keywords:
Drug Recognition Expert
Drug Evaluation and Classification Program
Cannabis
Driving
Impairment
THC

ABSTRACT

Background: The Drug Evaluation and Classification Program (DECP) is commonly utilized in driving under the influence (DUI) cases to help determine category(ies) of impairing drug(s) present in drivers. Cannabis, one of the categories, is associated with approximately doubled crash risk. Our objective was to determine the most reliable DECP metrics for identifying cannabis-driving impairment.
Methods: We evaluated 302 toxicologically-confirmed (blood Δ^9-tetrahydrocannabinol [THC] ≥1 μg/L) cannabis-only DECP cases, wherein examiners successfully identified cannabis, compared to normative data (302 non-impaired individuals). Physiological measures, pupil size/light reaction, and performance on psychophysical tests (one leg stand [OLS], walk and turn [WAT], finger to nose [FTN], Modified Romberg Balance [MRB]) were included.
Results: Cases significantly differed from controls ($p < 0.05$) in pulse (increased), systolic blood pressure (elevated), and pupil size (dilated). Blood collection time after arrest significantly decreased THC concentrations; no significant differences were detected between cases with blood THC <5 μg/L versus ≥5 μg/L. The FTN best predicted cannabis impairment (sensitivity, specificity, positive/negative predictive value, and efficiency ≥87.1%) utilizing ≥3 misses as the deciding criterion; MRB eyelid tremors produced ≥86.1% for all diagnostic characteristics. Other strong indicators included OLS sway, ≥2 WAT clues, and pupil rebound dilation. Requiring ≥2/4 of: ≥3 FTN misses, MRB eyelid tremors, ≥2 OLS clues, and/or ≥2 WAT clues produced the best results (all characteristics ≥96.7%).
Conclusions: Blood specimens should be collected as early as possible. The frequently-debated 5 μg/L blood THC per se cutoff showed limited relevance. Combined observations on psychophysical and eye exams produced the best cannabis-impairment indicators.

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1. Introduction

Drugged driving increased in recent decades, even as driving under the influence (DUI) of alcohol decreased (Berning et al., 2015). In the recent 2013–2014 National Roadside Survey, drug prevalence in weekend nighttime drivers increased to 20.0% from 16.3% in 2007 (Berning et al., 2015). In an effort to combat drugged driving, the Drug Evaluation and Classification Program (DECP) was developed by the US Department of Transportation National Highway Traffic Safety Administration (NHTSA) and the International Association of Chiefs of Police (IACP) (International Association of Chiefs of Police, 2013a, 2015a, 2015b). When an officer suspects alcohol or drug impairment at the roadside based upon observations and results of standardized field sobriety tests (SFSTs; i.e., horizontal gaze nystagmus [HGN], one-leg stand [OLS], and walk and turn [WAT] tests validated to predict 0.08% blood alcohol concentration [BAC] (Stuster and Burns, 1998; Stuster, 2006)), the arrest is made and a drug recognition expert (DRE) evaluation is requested when the suspect's BAC is not consistent with observed impairment. A DRE is a police officer trained in the DECP and certified to conduct examinations of drug-impaired drivers. The DRE drug influence evaluation occurs at a precinct, jail or similar location as soon as possible (Richman et al., 2004). DREs utilize a standardized 12-step procedure combining medical, psychophysical, and observational evidence to formulate an opinion regarding

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http://dx.doi.org/10.1016/j.aap.2016.04.012
0001-4575/Published by Elsevier Ltd.

the drug category(ies) (CNS depressants, CNS stimulants, hallucinogens, dissociative anesthetics, narcotic analgesics, inhalants, cannabis) likely causing the impairment (Clarkson et al., 2004; Cochems et al., 2007; Heishman et al., 1996; Kunsman et al., 1997; Logan, 2009; Richman et al., 2004; Smith et al., 2002).

Cannabis, the most common illicit drug detected in drivers (Berning et al., 2015; Legrand et al., 2013; Pilkinton et al., 2013), is associated with approximately doubled crash risk (Asbridge et al., 2012; Li et al., 2012). Its prevalence increased 48% in weekend nighttime drivers since 2007, with 12.6% positive for its primary psychoactive compound Δ^9-tetrahydrocannabinol (THC) in blood and/or oral fluid (Berning et al., 2015). However, polypharmacy is common and cannabis is often detected in combination with other drugs (Legrand et al., 2013); this presents challenges for evaluating impairment due to cannabis only. Cannabis impairs divided attention, a crucial driving skill, particularly in occasional smokers (Ramaekers et al., 2009; Theunissen et al., 2012; Desrosiers et al., 2015). The 12-step DRE evaluation includes four tests specifically designed to target and challenge this ability. Previous research evaluated SFST performance for cannabis after controlled administration, with mixed results (Bosker et al., 2012a, 2012b; Downey et al., 2012; Papafotiou et al., 2005a, 2005b). However, limited data exist evaluating cannabis-impaired individuals undergoing the full DRE evaluation (Heishman et al., 1996; Schechtman and Shinar, 2005).

The objective of this investigation was to evaluate toxicologically confirmed cannabis-only cases for which DRE examinations were conducted and cannabis intake successfully identified. In these cases, the officer's opinion was cannabis impairment only, providing data to identify cannabis' characteristic effects on cognitive and psychomotor function. We sought to determine the most reliable DECP metrics and optimal combinations of metrics for identifying cannabis driving impairment. To achieve this aim, our approach was to examine the most cannabis-sensitive outcomes for combinations of observations with discrete outcomes that produced the best overall cannabis impairment indication.

2. Methods

2.1. Study population

Inclusion criteria for this investigation were: cases with an available complete DRE evaluation, including face sheet and narrative report that contained the reason for the traffic stop; DRE opinion reporting impairment by cannabis only; no breath alcohol detected; blood toxicological results reporting quantifiable THC, with no non-cannabinoid drugs detected; and suspect did not admit to taking any drugs other than cannabis (to prevent self-reported cannabis intake as the reason for correct identification). Individuals aged ≥60 years were excluded from cases and controls (International Association of Chiefs of Police, 2013a, 2015a), because of possible age limitations described in the original SFST validation studies and included in the SFST training curricula (Stuster, 2006; Stuster and Burns, 1998).

2.2. Control population

Police officers and volunteers evaluated as part of DRE training programs served as a comparison group for these data. Although toxicology was not performed, all police officers reported no impairing drug use. For all controls, the DRE opinion was "not impaired".

2.3. Evaluation procedures

The DECP evaluation process is a systematic, standardized 12-step procedure based on observable signs and symptoms to determine (a) whether a suspect is impaired; (b) whether impairment is due to drugs or a medical condition; and c) if drugs are suspected, the category(ies) likely causing impairment (International Association of Chiefs of Police, 2013a, 2015a, 2015b). The 12 steps include: (1) breath alcohol test, (2) DRE interview of the arresting officer, (3) preliminary examination and first pulse, (4) eye examination (including HGN, vertical gaze nystagmus [VGN], and lack of convergence [LOC] tests), (5) divided attention psychophysical tests (including Modified Romberg Balance [MRB], WAT, OLS, and finger to nose [FTN]), (6) vital signs (including blood pressure, body temperature, and second pulse reading), (7) dark room examinations (pupil examination under three different lighting conditions: room light, near-total darkness, and direct light), (8) muscle tone examination, (9) check for injection sites and third pulse, (10) interview of the suspect, (11) analysis and opinions of the evaluator, and (12) toxicological examination. Detailed descriptions of each step are presented in Supplemental Text and previous publications (Richman et al., 2004; Smith et al., 2002).

The psychophysical tests challenge suspects' coordination and ability to divide attention and follow directions. In each exam, the DRE provides instructions and asks whether the suspect understands the instructions. The MRB test consists of standing with feet together, head tilted backward with eyes closed, and estimating the passage of 30 s. This modified version of the Romberg Test (Richman, 2010) detects the inability to maintain a steady standing posture with eyes closed, as well as divided attention and time sense impairment. Documented observations include body sway and direction, actual time elapsed over the suspect's estimated 30 s, and eyelid and body tremors. The WAT requires the suspect to take nine heel-to-toe steps along a straight line, counting steps aloud, followed by turning in a prescribed manner [turning on the planted foot using a series of small steps with the opposite foot] and returning in the opposite direction in the same fashion. The eight possible impairment clues are: losing balance during instructions, starting too soon (prior to instruction to start), stopping while walking, missing heel-to-toe, stepping off the line, using arms to balance, incorrect number of steps, and improper/incorrect turn. The "impairment" criterion is ≥2 WAT clues. Other observations such as tremors also are recorded. The OLS involves standing with one foot ~6″ off the floor, and counting aloud by thousands ("one thousand one. . ." etc.) until told to put the foot down (30 s timed). Clues are body sway, using arms to balance, hopping, or putting foot down (≥2 clues is "impairment" criterion). Additional observations (tremors and the count reached in 30 s) also are recorded. In the FTN test, the suspect attempts to touch the tip of his/her nose with the tip of the index finger 6 times (3 per hand); number of misses (missed fingertip-to-nose tip or incorrect part of finger utilized) were recorded (6 maximum).

The eye examination consists of oculomotor control and eye convergence assessment. HGN comprises three measures of eye movement function integrity: lack of smooth pursuit (eyes' ability to fixate and track a moving target smoothly); nystagmus at maximum deviation (ability to hold eyes steady in fixed position on a non-moving target without nystagmus [involuntary jerking of the eye]); and nystagmus onset prior to 45° (ability to fixate and track a slow-moving target without nystagmus). A maximum of six clues may be recorded (3/eye). VGN assesses presence/absence of nystagmus at maximum deviation in upward vertical gaze. LOC assesses the eyes' inability to converge ("cross") while attempting to focus on a stimulus pushed slowly toward the bridge of the nose. LOC was present if the subject could not converge the eyes to a minimum of 2 inches from the bridge of the nose. The