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Detecting cannabis use with a portable exhaled breath device

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Progress Report

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The Cannabis Exhaled Breath Analysis study was designed to identify the impact of Cannabis on a person's way of thinking, moving, and responding. D9-Tetrahydrocannabinol (THC) is one of the main compounds of cannabis, and responsible for the psychoactive effects. Our study will explore the relationship between THC levels in a person's blood, breath, urine, thinking, moving, and responding over a 5-hour period.

The purpose of this study is to research the feasibility of developing a non-invasive portable breath analysis device, the Cannabis Exhaled Breath Analyzer (CEBA), that detects Δ9-Tetrahydrocannabinol (THC) [1] at the roadside. The research was able to identify semi quantitative results (Low, Med, High) to indicate that THC is present in the breath from recent cannabis use, within 1–3 hours of inhalation (Active Use).

We aim to isolate a breath signature, called a BreathPrint, that correlates the exhaled THC breath levels with the proposed criminal code levels. The limit of < 2 nanograms (ng) per ml (milliliter) will be Low, Medium between 2ng-5ng of THC/ml of blood, and High of > 5ng of THC/ml of blood

The participants were recruited via social media from the medical cannabis community in Southwestern Ontario, Canada. Three hundred participants signed up for the study, of which 30 completed a medical interview via a telemedicine service to verify eligibility for the study. Twenty-three participants reported to the study, but one withdrew early due to experiencing some discomfort after smoking cannabis. Thus, a total of 22 participants completed the full design. The study was conducted on a single day, from 8:30 AM to 3:00 PM.

The research protocol included the following steps: 1) Checking in: participants arrived to the study site, read and signed the consent form; 2) Nurses conducted a basic health assessment: vitals including respiratory rate, heart rate, and blood pressure; 3) First round of cognitive testing was performed ("Baseline"); 4) Biosamples (blood, breath, and urine) were collected; 5) Cannabis (20% THC) was consumed by participants via vapes, cannabis cigarettes (joints) and dabs for 10 minutes and then asked to report their subjective sense of intoxication on a visual analogue scale; 6) Participants had 30 minutes of down-time to relax and eat before; 7) Vitals and biosamples (blood and breath) were collected again; 8) Second round of cognitive testing was performed ("THC"); 9) Down-time with intermittent biosample collection; 10) Final, third round of cognitive testing ("Recovery") was performed; 11) Participants were discharged from the study.

In summary, the same brief neuropsychological battery was administered three times to all participants: once in the morning, at the beginning of the study (Baseline), once after

participants smoked cannabis (THC), and once towards the end of the day (Recovery). Psychometric testing was administered by research assistants (RAs) under the supervision of a licensed clinical neuropsychologist. RAs received extensive training in test administration and scoring, and had previous experience administering these measures in research and clinical settings. The clinical vitals and breath samples were collected by registered nurses, and blood was collected by trained phlebotomists. A medical doctor was available for the full duration of the study.