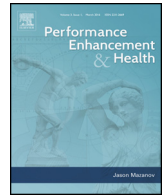




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A pilot study to explore the effects of substances on cognition, mood, performance, and experience of daily activities

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ABSTRACT

Purpose: This pilot study was designed to deliberately examine the enhancement effects and experiences of substances used among professionals and students in professional programs.

Methods: A mixed methods design was implemented, involving ecological momentary assessment (EMA) and interviews. The analysis presents interpretations about the perceived impact of substance use on the performance and experience of everyday activities.

Results: Caffeine, alcohol, antidepressants, pain suppressant, and cannabis were used by the most participant. Participants reported effects of substances that directly or indirectly enhanced performance (e.g., sleep, socialisation), mood (e.g., manage stress, relax), cognition (e.g., energy and clarity of thought), and the general experience of activities (e.g., enjoyment). Less common effects included impaired work, school, or leisure performance, injury, sleep disruption, and pain or discomfort. Reactivity was an unexpected effect, with almost half of the interviewees reporting changes in their thoughts about their substance use, and 30% of interviewees making active changes.

Conclusion: This study was novel in population and data collection. Complex perspectives about substance use were offered by recruiting professionals and students outside at-risk populations or addiction-related services. By examining effects of substances, this research offers nuanced understandings of self-reported effects of psychoactive substances on performance, mood, cognition, and quality of experience.

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1. Introduction

Psychoactive substances alter brain function, affecting consciousness, mood, and perceptions. They encompass licit substances (e.g., caffeine, alcohol, over-the-counter medication), prescribed medication (e.g., oxycodone, benzodiazepines), illicit substances (those not socially condoned e.g., marijuana, cocaine, MDMA), and healing plants (e.g., peyote). Substance use as a social concept tends to dichotomise types of substances (e.g., therapeutic; recreational) and effects (e.g., beneficial/desired; harmful) (Kiepek & Baron, 2017). When substances are used according to scientific or medical standards, they tend to be accepted and even promoted. Substances used in other ways or settings are often framed as potentially harmful, morally dubious, and associated with a propensity for physiological and psychological addiction.

This pilot research tested a mixed methods design to examine the effects of psychoactive substances among professionals and students in professional programs. We designed a mixed methods approach that would gather real time reports of anticipated and experienced effects, as well as allow in-depth discussion of participant substance use, contest of use, and the impact on cognition, mood, performance, and experience of daily activities. We explored the desired and undesired effects, and the potential positive and negative effects of substance use from the perspective of the person using the substance, including licit, illicit, and prescribed substances. Employing ecological momentary assessment (EMA) capitalizes on the widespread use of mobile devices among professionals and students, with software designed to easily collect real-time data in situated contexts. The use of an 'App' facilitates recruitment into an interview component, which enables enriched understanding of respondent reasoning.

Individuals use a wide range of substances, with decision to use influenced – at least in part – by the anticipated impact of a substance on the performance or experience of valued activities (e.g., caffeine to improve performance at school; ecstasy to enhance enjoyment at a dance club) (Boys et al., 1999; Patrick,

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Bray, & Berglund, 2016; van Boekel, Brouwers, van Weeghel, & Garretsen, 2014; Witteveen, Van Ameijden, Prins, & Schippers, 2007). Substances that effect mood and cognition are increasingly associated with efforts to perform better at academically or at work (Bloomfield, Brian, Dale, & Karen, 2015; Enck, 2014; Outram, 2010). A study of surgeons found high rates of substance use for both cognitive enhancement and mood enhancement, in attempt to meet expectations and demand of work (Franke et al., 2013). There is an increasing body of literature about methylphenidate (Ritalin) and other substances being used for cognitive enhancement (Brühl & Sahakian, 2016; Racine & Forlini, 2010) and use of prescribed substances for emotion or mood enhancement is relatively common (Conrad & Slodden, 2013). While using substances in sports is more likely perceived as “cheating,” cognitive enhancers are more likely to be viewed as necessary performance enhancement in a competitive workforce (Vargo et al., 2014).

Despite evidence suggesting substances can have desired effects, most research focuses on negative effects and potential risks (Kiepek & Baron, 2017). Further complicating research about substance use are issues of social stigma and repercussions that prevent individuals from disclosing personal experiences and/or voicing perspectives that oppose dominant paradigms. Negative consequences that could result from disclosure of the use of some substances include child custody investigation, loss of employment or future opportunities, stigma and ostracism, legal charges, and subpar health care (van Boekel, Brouwers, van Weeghel, & Garretsen, 2013; van Boekel et al., 2014). These consequences may be unrelated to the direct effects of the substance on the person, their performance, or their capabilities. Moreover, too often research on substance use relies on study samples drawn from addiction treatment programs, tending to over-sample those who have low-income, inadequate social supports, concurrent mental illness, and/or developmental delay and struggle with problematic use, while omitting the experiences of those whose substance use may be non-problematic (Centre for Addiction and Mental Health, 2001; Didden, Embregts, van der Toorn, & Laarhoven, 2009; Granfield & Cloud, 2001). Accordingly, experiences of substance use for many people remain hidden and silenced.

Examining substance use (prescribed, licit, illicit) in terms of effects (e.g., altered perception, consciousness, emotional regulation, cognition, behaviour), facilitates exploration of potential similarities and differences in both use and implications of use. Taking up an insider perspective on decision-making about substance use and assessment of effects challenges pervasive assumptions that demarcate substance use based on social acceptability. Though the majority of existing research is limited to pharmacy, medicine, nursing, and dentistry, it indicates unique patterns of substance use among professionals and students (Kiepek & Baron, 2017). Studies of motivations for use are scant, but reported desired effects include improved sleep, stress management, alleviation of boredom, and improved productivity (Dabney & Hollinger, 1999; Merlo, Cummings, & Cottler, 2014). These studies tend to be informed by participants involved in treatment programs or those identified by professional regulatory bodies as needing intervention. Students in professional programs have reported using substances to improve concentration, productivity, or grades, to enhance energy, to facilitate weight loss, and to aid in socialization (Aslam et al., 2013; McNiel et al., 2011; Volger, McLendon, Fuller, & Herring, 2014).

Perhaps because disclosure of substance use risks professional censure or loss of license, previous studies exploring incentives or reasons for use tend use anonymous surveys (Kiepek & Baron, 2017), which draw on sociological and psychological theories to identify ‘reasons for use’. Response options often require meta-cognition and personal insight, including categories such as ‘peer pressure’, ‘social gesture’, ‘habit’, and ‘financial problems’. Surveys are susceptible to retrospective self-report biases, related to per-

sonal and subtle external influences, such as social desirability, and are prone to errors resulting from memory deficits and cognitive judgement biases (Voogt et al., 2013).

This is the first study of its kind to elicit data from a broad range of professionals, about a broad range of potential effects from a broad range of substances, reported in real time. The methods enabled the inclusion of participants from higher socioeconomic strata, professionals and students in professional programs – who need not be involved with addiction treatment programs or regulatory bodies. We propose that research about substance use could more deliberately collect data about the enhancement effects and experiences of substances and piloted an EMA instrument that was designed for this purpose. We examine the effectiveness of the data collection instrument to inform understandings about the effects of psychoactive substances on performance, mood, cognition, and quality of experience among professionals and students in professional programs.

2. Methods

2.1. The EMA data collection instrument

Informed by the principal applicant’s prior research and expertise with respect to substance use (Kiepek, 2016; Kiepek & Baron, 2017), the EMA data collection instrument was designed using MetricWire, a technology specialised to support ecological momentary assessment for Android and iOS platforms. The instrument enabled users to easily and quickly record substance(s) used, social context, general setting/location, activities engaged in while using or experiencing substance effects, perceived immediate and longer-term effects on performance and quality of experience. An instruction manual was provided by email and posted on the project website. Instructions were also provided in the information section of the App.

EMA data are submitted immediately and not stored directly on the device, thereby maximising security (Runyan et al., 2013). Participants could not revise individual entries after reporting. Each entry was automatically time-stamped. Participants could retrospective report if they were in a situation that prohibited use of their device. The instrument was designed to *not allow* access to the location feature of the device (e.g., GPS). The data were securely uploaded and stored by MetricWire, a Canadian-owned company, with access to data only permitted to the researchers. Participant data are automatically encrypted. Access to MetricWire software is a paid service and the data are owned by the researchers.

2.2. Inclusion criteria

Participants were English-speaking, residing in Canada, 19-years or older, used at least one psychoactive substance, and identified as professionals or students in professional programs. Eligibility criteria included one of the following: i) approximately daily use of a non-prescribed psychoactive substance; ii) approximately weekly non-prescribed use of one or more psychoactive substances, though the type of substance used may vary (e.g., substances used might differ week-to-week), and *some* of the substances may be prescribed, or iii) infrequent (less than weekly) but heavy use (e.g., heavy use over a discrete period in a month; binge use) of a psychoactive substance. Participants needed to have access to a mobile device and WiFi in order to use the App.

2.2.1. Recruitment

Professionals are members of a profession-specific society, association, college, and/or regulatory body; subject to a code of professional ethics or code of conduct; and/or subject to professional licensure or accreditation. Recruitment involved emailing

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