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Les motifs de la conduite automobile après avoir consommé du cannabis: revue de portée et validation d'un outil psychométrique

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Les motifs de la conduite automobile après avoir consommé du cannabis : revue de portée et validation d'un outil psychométrique

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Résumé

Contexte : La consommation de cannabis affecte les habiletés de conduite (Capler et al., 2017) et augmente significativement le risque d'accident (Asbridge et al., 2012). Malgré ces risques, 22 % des consommateurs canadiens ont rapporté avoir conduit dans les deux heures suivant sa consommation (Gouvernement du Canada, 2020). Connaitre les motifs de la conduite après avoir consommé du cannabis (CACC) est crucial pour développer des programmes de prévention efficaces visant à réduire la prévalence de ce comportement.

Objectif : Le premier objectif est de rapporter et classer les motifs de la CACC mentionnés dans la littérature scientifique. Le deuxième objectif est de valider les propriétés psychométriques du Questionnaire des motifs de la conduite automobile après avoir consommé du cannabis (QMCACC).

Méthode : Ce mémoire présente deux articles. Le premier article est une revue de portée des motifs de la CACC. Le deuxième article présente les analyses de validation du QMCACC. Un échantillon de 1 765 conducteurs canadiens a été utilisé pour tester la cohérence interne, la validité convergente/discriminante et la structure du questionnaire via une analyse factorielle confirmatoire.

Résultats : La revue de portée a extrait 32 motifs de la CACC. Le QMCACC a une bonne cohérence interne, une validité convergente/discriminante adéquate et une bonne validité factorielle.

Conclusion : Des messages efficaces de santé publique doivent être mis en œuvre pour informer la population des risques de la CACC. Le QMCACC semble évaluer efficacement le concept d'intérêt et peut être utilisé pour contribuer aux efforts de prévention.

Mots-clés : cannabis, conduite avec facultés affaiblies, motifs, questionnaire, validation, Canada

Abstract

Background: Cannabis use affects the ability to drive (Capler et al., 2017) and significantly increases the risk of accidents (Asbridge et al., 2012). Despite these risks, 22 % of Canadian consumers reported driving within two hours of using this substance (Government of Canada, 2020). Increased knowledge of the motives for driving after cannabis use (DACU) is crucial to design effective prevention programs to reduce the prevalence of this behaviour.

Objective: The first objective is to report and categorize the motives for DACU mentioned in the scientific literature. The second objective is to validate the psychometric properties of the Motives for Driving after Cannabis Use Questionnaire (MDACUQ).

Method: This master's project presents two articles. The first article is a scoping review of the motives for DACU. The second article presents the validation analyzes of the MDACUQ. A sample of 1,765 Canadian drivers was used to test the internal consistency, convergent/discriminant validity and the structure of the subscales (factors) of the questionnaire with a confirmatory factor analysis (CFA).

Results: The scoping review extracted 32 motives for DACU. The MDACUQ has good internal consistency, adequate convergent/discriminant validity, and the CFA showed a good factorial validity.

Conclusion: Effective public health messages must be implemented to inform the population of the risks of DACU. The MDACUQ seems to accurately captures the concept of interest and can help prevention efforts to reduce the prevalence of this risky behaviour.

Keywords : cannabis, impaired driving, motives, questionnaire, validation, Canada

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CACC = Conduite après avoir consommé du cannabis

CFA = Confirmatory Factor Analysis

CFI = Comparative Fit Index

DACU = driving after cannabis use

DD = drug driving

DUI = driving under the influence

EFA = Exploratory Factor Analysis

MDACUQ = Motives for Driving after Cannabis Use Questionnaire

PLF = Probit Link Function

QMCACC = Questionnaire des motifs de la conduite automobile après avoir consommé du cannabis

RML = Robust Maximum Likelihood

RMSEA = Root Mean Square Error of Approximation

SRMR = Standardized Root Mean Square Residual

TCP = Théorie du comportement planifié

THC = Δ-9-tétrahydrocannabinol

TPB = Theory of Planned Behaviour

WLSMV = Diagonally Weighted Least Squares

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Chapitre 1

Introduction

Au Canada, l'entrée en vigueur de la Loi sur le cannabis le 17 octobre 2018 était accompagnée d'un cadre juridique pour légaliser le cannabis à des fins non médicales et pour encadrer sa production, sa distribution, sa vente et sa possession partout au pays (Gouvernement du Canada, 2016). Ce changement législatif a soulevé plusieurs questions, notamment son impact sur la sécurité routière (Gouvernement du Canada, 2016). Des études démontrent que la consommation récente de cannabis diminue les facultés cognitives et psychomotrices nécessaires pour la conduite automobile, notamment le temps de réaction, la coordination motrice, la concentration, la mémoire à court terme et l'attention partagée (Bondallaz et al., 2016; Capler et al., 2017; Hartman & Huestis, 2013; Rogeberg & Elvik, 2016). La présence dans le sang de Δ-9-tétrahydrocannabinol (THC), la principale molécule psychoactive du cannabis est aussi associée à une plus grande probabilité de collision et de commettre des erreurs de conduite (Bédard et al., 2007) et augmenterait de 3 à 7 fois les risques d'être impliqué dans un accident de la route (Ramaekers et al. 2004). Au Canada, le cannabis est la deuxième drogue (après l'alcool) la plus fréquemment détectée chez les conducteurs blessés gravement ou mortellement (Brubacher et al., 2016; Woodall et al., 2015). Néanmoins, une enquête canadienne de 2020 a rapporté que 22 % des consommateurs de cannabis ont déclaré avoir conduit dans les deux heures suivant sa consommation (Gouvernement du Canada, 2020).

Le Groupe de travail sur la légalisation et la réglementation du cannabis au Canada a fortement recommandé au gouvernement fédéral de développer une stratégie nationale d'éducation du public pour envoyer le message clair que le cannabis cause l'affaiblissement des facultés de conduite (Gouvernement du Canada, 2016). Néanmoins, des études ont mis en évidence que les programmes de prévention de la conduite sous l'effet de drogue n'atteignent pas toujours les résultats souhaités, particulièrement chez les consommateurs réguliers (Davis & Cismaru, 2020 ; Hornik et al., 2008 ; Stevens et al., 2019). Pour améliorer les initiatives de santé publique, il est primordial de s'intéresser au point de vue des individus concernés et aux éléments sociaux et psychologiques précédents un comportement à risque (Kelly & Barker, 2016). De plus, les programmes de prévention doivent cibler des objectifs opérationnels qui visent essentiellement un changement de comportement (Brisson, 2014). Une façon d'y arriver serait de s'intéresser aux motifs. Un motif

est un élément d'ordre intellectuel ou affectif à l'origine d'un comportement (« motif » Dictionnaire Larousse en ligne, s. d., paragr. 1). Donc, mieux comprendre les motifs de la conduite d'un véhicule moteur après avoir consommé du cannabis (CACC) pourrait permettre de concevoir des campagnes de préventions efficaces qui visent à réduire la prévalence de ce comportement à risque.

Pour améliorer les connaissances sur le sujet, il apparait pertinent de faire une revue méthodique des motifs de la CACC rapportés dans la littérature scientifique. Une revue de portée est généralement utilisée pour faire un inventaire structuré des écrits scientifiques sur un sujet par une démarche rigoureuse assurant, entre autres, sa reproductibilité (Peters et al., 2015). Cette méthode exploratoire vise notamment à : 1) clarifier des concepts clés d'un domaine de recherche; 2) identifier les types de données probantes disponibles; 3) identifier les lacunes dans les connaissances et 4) déterminer la pertinence de faire une revue systématique (Arksey et O'Malley, 2005). Il semble important aussi de pouvoir évaluer les motifs de la CACC grâce à un outil d'évaluation valide. Les personnes qui conduisent après avoir consommé des drogues ne partagent pas toutes les mêmes caractéristiques et peuvent être regroupées notamment, selon le profil de personnalité (Roma et al., 2019) ou l'intensité de la consommation de drogue et l'environnement social (Scherer et al., 2021). Ce type d'outil pourrait notamment, permettre de distinguer les motifs propres à différents profils d'individus.

Le questionnaire des motifs de la conduite automobile après avoir consommé du cannabis.

Le questionnaire des motifs de conduite automobile après avoir consommé du cannabis (QMCACC) est une traduction et adaptation à la population canadienne (le questionnaire entier se retrouve à l'Annexe 2). Il fut développé par Jean-Sébastien Fallu, professeur agrégé au Département de psychoéducation de l'Université de Montréal ; Jacques Bergeron, professeur honoraire au Département de psychologie de l'Université de Montréal et Christophe Huynh, chercheur régulier à l'Institut universitaire sur les dépendances et professeur associé au Département de psychiatrie et d'addictologie et à l'École de psychoéducation de l'Université de Montréal. La moitié des questions de cet outil proviennent d'un questionnaire développé par Bonar et al. (2018) comportant 16 items en anglais sur la conduite automobile sous l'effet des drogues. Le QMCACC reprend 12 de ces 16 items traduits en français et adaptés en remplaçant le mot « drogue » par « cannabis » lorsque nécessaire. Trois items ont été rejetés, car ils ont été jugés trop

semblables à d'autres items et un item a été exclu, car il a été jugé non pertinent dans le contexte du cannabis[1]. Les concepteurs du QMCACC ont regroupé ces 12 items en cinq grands thèmes appuyés par la littérature scientifique sur le sujet : 1) absence de moyens de transport alternatifs; 2) faible risque de conséquences négatives; 3) faible impact des effets du cannabis sur les habiletés de conduite; 4) recherche de sensations et 5) être le chauffeur désigné. Le QMCACC est donc constitué de ces 12 items de l'étude de Bonar et al. et de 12 autres items développés par les concepteurs du QMCACC pour un total de 24 items. De ces 12 autres items, 9 ont été rajoutés pour étoffer chacun des 6 grands thèmes. Les 3 items restants se regroupent en un septième grand thème: la pression des pairs. Cette dernière dimension du QMCACC n'était pas présente dans l'étude de Bonar et al., elle fut ajoutée à la lumière d'informations provenant des plus récentes études sur le sujet ainsi que des connaissances des concepteurs, spécialistes du domaine. Le tableau 1 présente les sous-échelles, les items de l'outil et fait la distinction entre ceux provenant originalement dans l'étude de Bonar et al. de ceux qui ont été rajoutés par les concepteurs du QMCACC. Les 12 items provenant de l'étude de Bonar et al. n'ont jamais été validés et sont inspirés des résultats d'une étude de Rosenberg (1988) dont un des objectifs était de définir les raisons qui mènent à conduire après avoir bu de l'alcool. Dans le cadre de cette dernière étude, les motifs de conduite en état d'ébriété furent établis à l'aide d'entrevues semi-dirigées de type « focus group ». L'objectif de Rosenberg n'était pas de développer un outil d'évaluation.

[1] L'item en question est le suivant : je ne me rappelle pas pourquoi j'ai conduit, car j'ai fait un « black-out » (notre traduction). Selon Léonard and Ben Amar (2002), un « black-out » est un symptôme possible d'une intoxication aiguë à l'alcool.

Tableau 1

Sous-Échelles et Items du QMCACC et leur provenance

Sous-échelle	Item	Adapté de l'étude de Bonar et al.	Ajouté par les concepteurs du QMCACC
Transport alternatif			
	Vous devez revenir à la maison ou quelque part d'autre	X	
	Vous n'avez pas d'autres alternatives		X
	Conduire est plus pratique que marcher, prendre le transport en commun ou se faire conduire	X	
	Vous n'avez pas suffisamment d'argent pour prendre un taxi		X
	Vous avez une urgence et vous devez vous rendre là-bas rapidement	X	
	Il n'y a plus de transports en commun disponibles		X
Faible risque de conséquences négatives			
	Il n'y a pas beaucoup de gens sur la route à ce moment de la journée ou de la nuit	X	
	Vous avez seulement une courte distance à parcourir, ce qui réduit les risques d'accident ou de vous faire prendre	X	
	Vous estimez avoir peu de chances de vous faire prendre	X	
	Vous êtes seul(e) et n'avez pas à composer avec le jugement d'autrui		X

	Vous prenez une route alternative		X
Faible impact des effets du cannabis sur la conduite			
	Vous estimez que vous pouvez compenser, par exemple en conduisant plus lentement		X
	Vous ne pensez pas que conduire serait dangereux	X	
	Vous estimez que cela améliore votre conduite		X
	Vous estimez que cela nuit peu ou ne nuit pas à votre conduite		X
Recherche de sensations			
	Vous voulez prendre un risque	X	
	De toute façon, c'est le destin qui décide		X
Être le chauffeur désigné			
	Vous êtes le/la seul(e) à avoir une voiture	X	
	Vous êtes le/la chauffeur(euse) désigné(e)	X	
	Les autres voulaient que je les conduise quelque part d'autre	X	
	Vous avez consommé moins que les autres qui pouvaient conduire	X	
Pression des pairs			
	Vous voulez impressionner vos ami(e)s		X

	Vos ami(e)s vous encouragent à le faire	X
	Vos ami(e)s le font	X

Objectifs du mémoire

Ce projet de mémoire par article a deux objectifs principaux : 1) rapporter les motifs de la CACC présents dans la littérature scientifique et 2) valider les propriétés psychométriques du QMCACC. Le premier article est une revue de portée des motifs de la CACC. Le deuxième article est le processus de validation qui vise à confirmer que l'outil d'évaluation mesure efficacement le phénomène d'intérêt. La revue de portée a été conduite après la conception du questionnaire. Puisque les bases théoriques du QMCACC reposent partiellement sur une recherche datant de 1988, la revue de portée vise aussi à tester la validité de contenu de l'outil. Autrement dit, si; 1) les items couvrent tous les principaux aspects du construit mesuré; 2) si ces items couvrent ces différents aspects de manière proportionnelle; et 3) si l'instrument contient des items non pertinents (Université de Sherbrooke, s. d.). À notre connaissance, il n'existe aucun outil d'évaluation validé des motifs de la CACC, ni de revue de portée sur le sujet. L'objectif secondaire de ce travail est d'aider les efforts de prévention et de sensibilisation aux risques de la CACC.

Chapitre 2 – Premier article

Motives for Driving After Cannabis Use: A Scoping Review[2]

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Abstract

Context: Understanding the motives for driving after cannabis use (DACU) is crucial to improve road safety and develop effective prevention programs to reduce this behaviour.

Objective: To synthesize and categorize motives for DACU reported in the scientific literature, using the Theory of Planned Behaviour (Ajzen, 1991) as a basis for motive classification and conceptualization.

Method: This scoping review followed the methodological guidelines proposed by Arksey and O'Malley (2005) and Levac et al. (2010). The algorithms used to extract relevant information about the motives for DACU in the scientific literature were designed for Medline, Embase, Web of Science, and PsycINFO search engines. To be included in the review, articles had to describe motives for cannabis use as the main substance used before driving a non-commercial road motor vehicle. Any psychological justification or conscious reason was considered as a motive. A total of 30 articles were selected. A descriptive quantitative analysis and a thematic qualitative analysis were used to synthesize the results.

Results: The studies mainly originated from the USA (k=14), Canada (k=6), Australia (k=6), the UK (k=3) and Spain (k=1). Thirty-two motives for DACU have been classified into six themes: 1) general risk perception; 2) driving is the most convenient option; 3) low risk given the road or traffic conditions; 4) risk-seeking; 5) possibility to compensate for the effect of cannabis and 6) perceptions that DACU is approved by others (i.e., injunctive norms). Risk perception was by far the most frequently reported motive.

Implications: Prevention programs could greatly benefit from a better understanding of the motives for DACU. Increasing risk awareness appears to be one of the main objectives in addition to providing efficient alternative means of transport and development of prevention initiatives tailored for cannabis users.

Keywords

drug driving – cannabis – motives – prevention – risk perception

Introduction

Studies have shown that cannabis use decreases cognitive and psychomotor skills necessary for driving, including reaction time, motor coordination, concentration, short-term memory, and shared attention (Bondallaz et al., 2016; Capler et al., 2017; Hartman & Huestis, 2013; Rogeberg & Elvik, 2016). In Canada, cannabis is the second most frequently detected drug among seriously and fatally injured drivers after alcohol (Brubacher et al., 2016; Woodall et al., 2015). In 2012, the cost of cannabis driving collisions including property damages, injuries and fatalities in Canadian provinces was about 1,09 billion, and drivers 34 years old and younger account for more than half of this amount (Canadian Center On Substance use and Addiction, 2017). Drug driving (DD) prevention programs aim to reduce the prevalence of this behaviour, but studies have highlighted that these initiatives are not as effective as wanted (Davis & Cismaru, 2020; Hornik et al., 2008; Stevens et al., 2019). Determining risk factors of DACU is central to developing effective prevention programs (Offord & Kraemer, 2000). Several studies have found that risk factors of DACU include being younger (Alcañiz et al., 2018; Domingo-Salvany et al., 2017; Voas et al., 2013), being a man (Alcañiz et al., 2018; Arterberry et al., 2013; Korn et al., 2017; Minaker et al., 2017; O'Malley & Johnston, 2013; Voas et al., 2013; Wilson et al., 2018), frequent cannabis use (Arterberry et al., 2013; Matthews et al., 2014; Whitehill et al., 2019), and having cannabis dependence problems (Cook et al., 2017; Le Strat et al., 2015; Scherer et al., 2013). Given that sociodemographic factors cannot be easily modified, Brisson (2014) argues that prevention programs need to target operational objectives that aim to induce a behavioural change. To achieve this, it is relevant to consider psychological aspects that can be modified, such as motives.

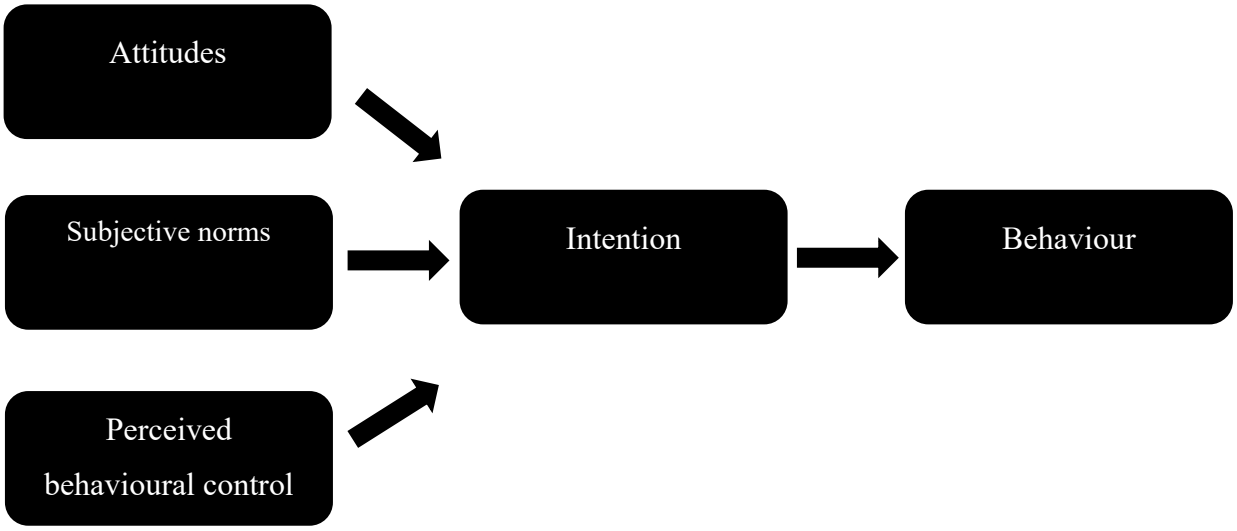
To our knowledge, no review has been conducted to date on the motives for DACU. Two structured review methods may be considered: a systematic or scoping review (Arksey & O'Malley, 2005; Peters et al., 2015). A scoping review is used to map the concepts underpinning a research area and the main sources and types of evidence available (Arksey & O'Malley, 2005). According to Munn et al. (2018) a scoping review is recommended to 1) identify the types of evidence available in a given area; 2) clarify definitions or key concepts in the literature; 3) examine how research is conducted on a certain topic or field; 4) identify the characteristics or factors associated with the concept of interest; 5) identify and analyze current knowledge gaps. Unlike a systematic review, a scoping review does not aim to produce a critically appraised and

synthesized answer to a question, but rather aims to provide an overview or map of the existing evidence. A scoping review may also be a helpful precursor to systematic reviews by confirming the relevance of certain inclusion criteria and potential research questions.

In addition, the scoping review method integrates a qualitative analytic approach using a conceptual framework to chart the information. The framework chosen for the present study was designed from the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The efficiency of this theory for both health-promoting and health-impairing behaviours, including driving under the influence (DUI), has been demonstrated several times in previous research (Armitage et al., 2002; Marcil et al., 2001; Parker et al., 1992). The motives found in the selected articles are classified into three categories: attitude, subjective norms, and perceived behavioural control. According to the TPB model, these constructs are antecedents of intention which then predict behaviour (Figure 1).

Figure 1

Theory of Planned Behaviour



Attitude refers to the degree to which a person has a favourable or unfavourable evaluation of the behaviour of interest. Subjective norm is the perceived social pressure to perform or not the behaviour. To specify the classification in this category, the concepts of injunctive and descriptive norms have been used. An injunctive norm refers to one's perceptions of what is approved or disapproved by others and descriptive norms refers to one's perceptions of how people do in fact

behave (Cialdini et al., 1990). Finally, the perceived behavioural control refers to the perceived ease or difficulty of performing the behaviour. It is assumed to reflect past experience as well as anticipated impediments and obstacles. According to the TPB, an individual's intention to act on the behaviour should rise when the attitudes and subjective norms regarding this behaviour are more favourable, as well as when the individual has greater perceived behavioural control.

The present study aims to identify the motives for DACU in the scientific literature using a structured method and to organize them into categories to lay the groundwork for a conceptual model. Our secondary goal is to determine whether there are evaluation tools to assess motives for DACU. This study has the potential to contribute to prevention efforts in the field of road safety by providing avenues of intervention to change perceptions, habits, and behaviours of people at risk for driving under the influence of cannabis.

Methodology

The methodological framework is based on steps of a scoping review conceptualized by Arksey and O'Malley (2005) and the recommendations proposed by Levac et al. (2010).

Identifying relevant studies.

The literature selection took place between September 2020 and March 2021. The included studies had to be published in English and French without a specific time frame. The combination of four search engines can collect 98.3% of the information on a given topic (Bramer et al., 2017). These search engines are Medline, Embase, Web of Science, and Google Scholar. The Ovid platform was used to build search algorithms. Since Google Scholar is not part of the Ovid platform, it was replaced by PsycINFO, a database oriented towards psychology and social sciences. Google Scholar was also set aside as it can report a lot of gray literature. Considering that the first extraction without Google Scholar brought back a very large amount of scientific literature, using it would have required resources exceeding the capacities of this research. For the same reason, it was decided to focus on scientific articles and official reports and to exclude grey literature. Algorithms for every search engine were designed with four key concepts, which were validated by a librarian specialized in addiction literature from the *Centre québécois de documentation en toxicomanie* (Quebec Center of Drug Addiction Documentation): "car driving," "motives,"

"cannabis" and "survey." The latter keyword enabled us to determine whether questionnaires exist that specifically address motives for DACU. For each of these key concepts, a list of several synonyms was developed (Table 2).

Table 2

Synonyms of Key Concepts

Driving	**Motive**	**Cannabis**	**Questionnaire**
Drive	Motive	Cannabis	Survey
Driver	Reason	Cannabis use	Surveying
Driving	Motivation	Cannabis usage	Questionnaire
Auto	Justification	Cannabis abuse	Question
Automobile	Explanation	Cannabis addiction	Investigation
Car	Incitement	Cannabinoids	Evaluation
Road	Incitation	Marijuana	
Traffic	Determinant	Marijuana use	
Vehicle	Cause	Marijuana usage	
Conductor		Marijuana abuse	
Car driver		Marijuana addiction	
Car driving		Hash	
Driving ability		Hashish	
Distracted driving		Haschisch	
Motorcycle		THC	
DUI		Tetrahydrocannabinol	
Driving under the influence		CBD	

Note. Truncated forms of keywords were also used (see Appendice 1).

Search strategy linked these terms together in an algorithm adapted to the syntax of each search engine (see First Appendix). To fetch as widely as possible, three key concept combinations were used: 1) "car driving" + "cannabis"; 2) "car driving" + "cannabis" + "survey"; and 3) "car driving" + "cannabis" + "motives." Thus, each database had three outputs (one for each combination). Combined, these outputs initially yielded a total of 16,915 articles. Our selection criteria (Table 3) were then applied to each output.

Table 3

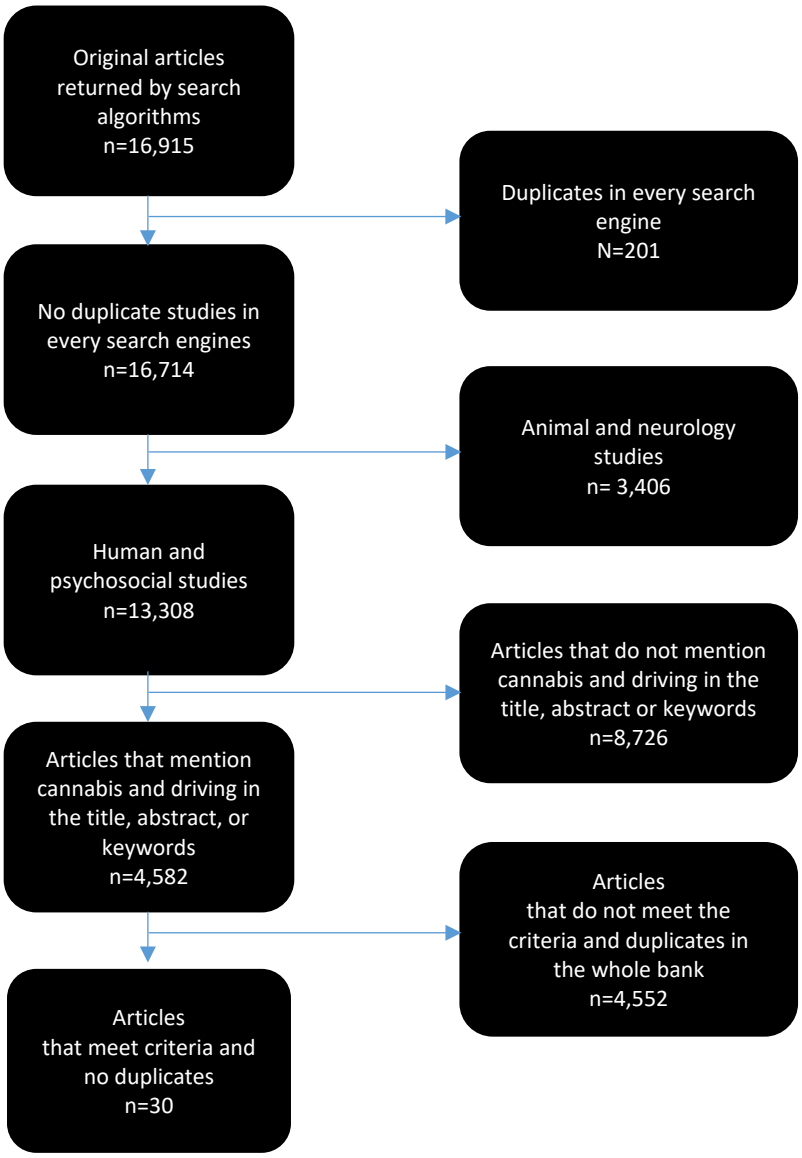
Selection Criteria

Inclusion	Mention of motives for DACU. Any psychological justification or reason expressed by participants was considered a motive. Use of cannabis/marijuana or THC (tetrahydrocannabinol; the main psychoactive substance) before driving as the main substance. If CBD (cannabidiol; another cannabinoid found in cannabis) was mentioned, the main substance had to be THC. If several drugs were mentioned in the studies, the motives reported had to concern DACU specifically. Driving a non-commercial road motor vehicle. Taxi and truck drivers were excluded, as they are specific populations that would not allow inference to the general population.
Exclusion	Studies that did not simultaneously include all inclusion criteria

These criteria were established by three members of the research team (ABT, YW, CH). The total number of articles was reduced to 4,582 after eliminating duplicates and articles that were not about DACU. In the present study, 30 articles met these criteria and were included in the scoping review. An inter-rater (ABT, YW) kappa score of .79 was calculated with the first 20 articles, demonstrating a substantial agreement on article selection (Landis & Koch, 1977). Figure 2 presents a flowchart of every step as well as the number of articles retained at each step.

Figure 2

Flowchart of the Study Selection Process



Summarizing and reporting results

The motives were first categorized into the three sections of the conceptual framework: attitudes, subjective norms, and perceived behavioural control. Then, a thematic analysis refined the classification of motives for DACU. According to Braun and Clarke (2008), this method aims to identify, analyze and report patterns (i.e., themes) in the data. These authors suggest six steps to conduct this analysis: 1) becoming familiarized with the data; 2) generating initial codes; 3)

searching for themes; 4) reviewing themes; 5) defining and naming themes and 6) producing the report. One author (ABT) charted the motives according to this conceptual framework and conducted the thematic analysis. Three reviewers (ABT, CH, YW) agreed on the charting process and the final extracted themes.

Results

The 30 articles selected for this scoping review extend from 1984 to 2020 and only one article was published before the year 2000. Most of the studies were conducted from the USA (k=14; 47%) and Canada (k=6; 20%). They mostly collected primary data (k=25; 83.3%) with a quantitative methodology (k=17; 57%) and 96.7% (k=29) had a cross-sectional design. The design, the year of publication, and the study populations are presented in Table 4.

Table 4

Characteristics of the Articles Selected for the Scoping Review

Characteristics		k	%*
Country	Canada	6	20.0
	USA	14	47.0
	UK	3	10.0
	Australia	6	20.0
	Spain	1	3.0
Year of	1984	1	3.0
Publication	2000	1	3.0
	2001	2	6.7
	2003	2	6.7
	2005	1	3.0
	2006	1	3.0
	2007	2	6.7
	2008	1	3.0
	2010	1	3.0
	2013	1	3.0
	2014	1	3.0
	2015	1	3.0
	2016	3	10.0
	2017	4	13.3
	2018	4	13.3
	2019	3	10.0
	2020	1	3.0
Methodology	Quantitative	17	57.0
	Qualitative	9	30.0
	Mixed	4	13.3
Data	Primary	25	83.3
	Secondary	5	17.0
Population	Adolescents	2	6.7
	Adults	10	32.3
	College students	8	27.0
	Convicted DUI offenders	2	6.7
	Cannabis users	5	16.1

	Drivers	2	6.7
	Patients in treatment for addiction	1	3.0
	Injection drug users	1	3.0
Design	Cross-sectional	29	96.7
	Longitudinal	1	3.0

*The percentage is calculated on the total number of articles (k=30).

The classification process revealed 32 motives for DACU. These motives were then classified into six themes. Four of these themes were related to attitudes about DACU: 1) risk perception (since risk perception appeared to be a very broad theme, it was sectioned into three sub-themes: a) general risk perception; b) low or no legal consequences and c) and effects of cannabis not seen as a potential cause of risk for DACU); 2) driving is the most convenient option; 3) low risk given the road or traffic conditions and 4) risk-seeking. 5) perceived behavioural control, namely the possibility to compensate for the effect of cannabis. 6) Subjective norms, i.e., perceptions that DACU is approved by others (injunctive norms). No motive that could be categorized has descriptive norms were found. All motives and their classification are presented in Table 5.

Table 5

Motives for DACU Classified in Themes and Sub-themes According to the Conceptual Framework.

Conceptual Framework	**Themes**	**Sub-Theme** (Risk Perception)	**Motives**	**k**	**% ***
Attitude	Risk perception	General risk perception	DACU is safe	12	40.0
			No risk of accident	5	16.7
			DACU is enjoyable	2	7.7
		Legal consequences	No risk of being caught by police	4	13.3
			No risk of legal consequence	5	16.7
			Roadside test lacks sensibility	2	6.7
			By smoking, they had already accepted that they were breaking the law	1	3.0
		Cannabis effect not seen as a potential cause of risk	Cannabis does not impair driving	13	43.3
			Cannabis improves driving	10	30.0

	DACU is safer than drunk-driving	7	23.3
	Cannabis does not cause cognitive and behavioural impairment	1	3.0
Driving is the most convenient option	DACU is inevitable because cannabis is a fundamental aspect of their life	3	10.0
	Needing to go home	2	6.7
	Was the only one who had a car	1	3.0
	Driving was more convenient than walking, taking a bus, or getting another ride	1	3.0
	Others wanted me to drive them somewhere	1	3.0

		I had an emergency	1	3.0
		I had used less than all the other people who could drive	1	3.0
	Low risk given the road or traffic conditions	Did not have to drive very far	1	3.0
		There were not a lot of other people driving at that time of day or night	1	3.0
		DACU in "certain situations"	2	6.7
	Risk seeking	Wanted to take a risk	1	3.0
Perceived behavioural control	Possibility to compensate for the effect of cannabis	DACU is safe depending on the amount consumed and the type of cannabis	4	13.3
		It is possible to adapt driving to	4	13.3

		the effect of cannabis		
		Cannabis impacts depended on individual characteristics	2	6.7
		Not feeling high	1	3.0
Subjective norm	Perceptions that DACU is approved by others (injunctive norms)	Friend's approval of DACU	3	10.0
		Family approval of DACU	1	3.0
		Perception that DACU is acceptable among cannabis users	2	6.7
		Peer thinks DACU is less dangerous than drunk-driving	1	3.0
		Perception that DACU is generally acceptable	4	13.3

	Only older adults think DACU is dangerous	1	3.0

*The percentage is on the total number of articles (k=30). Articles may mention more than one motive.

The following section reports the studies mentioning the motives for each of the themes and sub-themes. When relevant with the purpose of this research, study results are presented to better understand the motives. Methodological information is mentioned when deem relevant to contextualize the results.

Risk perception (first theme)

General risk perception (first sub-theme)

This sub-theme refers to a general attitude about DACU with no mention of potential effects of cannabis on driving skills nor possible compensatory behaviour for these effects. The sub-theme "cannabis effect not seen as a potential cause of risk" was mentioned in 70% of all studies and includes the second ("Cannabis doesn't impair driving") and third ("Cannabis improves driving") most reported motives.

DACU is safe (first motive of this sub-theme)

Is one of the most reported motives (Aitken et al., 2000; Allen et al., 2016; Arterberry et al., 2013; Aston et al., 2016; Borodovsky et al., 2020; Cavazos-Rehg et al., 2018; Davis et al., 2016; Lenne et al., 2001; McCarthy et al., 2007; Pino et al., 2016; Porath-Waller, 2008; Swift et al., 2010). It was reported in 40% (k=12) of the scoping review articles, out of which 11 indicate that risk perception is lower with higher frequency of consumption. Nine of these articles recruited cannabis users, the other three recruited college students. Davis et al. (2016) reported that perception that it is safe to DACU is the best predictor of this behaviour compared with the knowledge of legal consequences. Their population sample was predominantly individuals aged 35 and over.

No risks of accidents (second motive of this sub-theme)

Goodman et al. (2019), Greene (2018), Jones et al. (2007), Lenne et al. (2001), and Swift et al. (2010) reported that DACU was perceived as a low risk of motor vehicle accidents. Their samples consisted of mostly young adults under 30 years of age, with the exception of Swift et al. (2010) and Jones et al. (2007) who reported an unusually high number of people with an addiction problem. This perception was significantly more prevalent among cannabis users compared to non-users, whether they used cannabis monthly or daily (Goodman et al., 2019). All these studies mentioned a need for educational intervention to increase awareness of the risks and consequences of DACU.

DACU is enjoyable (third motive of this sub-theme)

One study reported that among a small cohort of random Friday daytime and weekend nighttime drivers, those who think that DACU is enjoyable were 3.5 times more likely to report the intention to DACU in the next six months compared to those who don't think DACU is enjoyable (Ward et al., 2017). Swift et al. (2010) report that a minority of their sample (cannabis users) primarily engage in DACU for fun.

Legal consequences (second sub-theme)

No risk of being caught by police (first motive of this sub-theme)

Allen et al. (2016) found that participants who reported being high while taking their survey were significantly more likely to think that if they drove high, they would probably not get caught. Two studies found the same perception among cannabis users (Goodman et al., 2019 and Lenne et al., 2001). Only the study conducted by Danton et al. (2003) mentioned this motive but did not focus explicitly on cannabis users. They carried out focus groups composed mainly of male students.

No risk of legal consequence (second motive of this sub-theme)

Individuals who reported having DACU compared to those who did not, are more likely to perceive the absence or low chance of legal consequences (Berg et al., 2018; Davis et al., 2016). The same perception can be found among regular users compared to nonusers (Goodman et al., 2019), young adults (Greene, 2018; Swift et al., 2010) and individuals reporting past-30-day marijuana use (Berg et al., 2018). Young Americans (18-25 years old) living in rural areas perceive a lack of a

straightforward impairment test and that cannabis testing by authorities is uncommon (Greene, 2018).

Roadside test lacks sensibility (third motive of this sub-theme)

Young adults perceive that roadside drug impairment tests lack sensibility (Danton et al., 2003; Lenne et al., 2001). Lenne et al. (2001) focused on cannabis users.

By smoking, they had already accepted that they were breaking the law (forth motive of this sub-theme)

This motive was highlighted by Danton et al. (2003). They cited one of their participants from a focus group: "... with smoking cannabis, as soon as you smoke you have crossed the line, that's it, so what does it matter if I go driving, I've already crossed the line, I'm already illegal..."

Cannabis effects not seen as a potential risk (third sub-theme)

Cannabis does not impair driving (first motive of this sub-theme)

Believing that cannabis effects do not impair driving abilities is the most mentioned motive in the articles of this scoping review (Fischer et al., 2006; Macdonald et al., 2008; Wechsler et al., 1984). Studies have highlighted the link between the frequency of cannabis use and the likelihood of perceiving less risk of the effects of cannabis on driving (Bonar et al., 2018; Fischer et al., 2014; Malhotra et al., 2017; Terry & Wright, 2005). Other researchers found similar results by conducting roadside surveys (Eichelberger, 2019; Ward et al., 2017). Further research has carried out focus group interviews mostly with cannabis users or individuals with cannabis consumers in their social network. These reports indicate that impairment risks from cannabis were perceived to be low and highlight the importance of designing effective education and prevention initiatives (Danton et al., 2003; Fischer et al., 2006; Lenne et al., 2001; Neale, 2001; Watson et al., 2019).

Cannabis improves driving (second motive of this sub-theme)

Of the studies that reported that cannabis effects were perceived to improve driving (Aitken et al., 2000; Berg et al., 2018; Cavazos-Rehg et al., 2018; Lenne et al., 2001; Macdonald et al., 2008; Neale, 2001; Terry & Wright, 2005; Wickens et al., 2019), only two studies reported the perception of individuals who did not themselves explicitly DACU (Danton et al., 2003; Greene, 2018).

Participants reported that cannabis improves their driving as it increases their worry about other drivers hitting them, keeps them awake, boosts their concentration and control, makes them drive more cautiously, relaxes them, makes them more in tune with the driving task, heightens awareness and reduces their speed when driving.

DACU is safer than drunk-driving (third motive of this sub-theme)

All the studies that compared the perceived effect of cannabis vs. alcohol on driving found that alcohol was perceived to be more disabling than cannabis among both cannabis users and non-users (Cavazos-Rehg et al., 2018; Darke et al., 2004; Fischer et al., 2006; Greene, 2018; McCarthy et al., 2007; Swift et al., 2010; Wickens et al., 2019). Most of the studies highlighting this motive also reported that their participant would never drink and drive over the limit or think that drunk-driving significantly increased the risk of having an accident (Greene, 2018; McCarthy et al., 2007; Swift et al., 2010). Furthermore, cannabis was perceived to be the safest drug to use before driving, compared to alcohol and all other substances (Darke et al., 2004).

Cannabis does not lead to cognitive and behavioural impairment (forth motive of this sub-theme)

A low global negative cannabis effects expectancy among college students recruited from introductory psychology classes was the most consistent predictor of DACU compared to other cannabis effect expectancies, such as relaxation and tension reduction, social and sexual facilitation, perceptual and cognitive enhancement, cravings and physical effects (Arterberry et al., 2013).

Driving is the most convenient option (second theme)

DACU is inevitable because cannabis is a fundamental aspect of their life (first motive of this theme)

Two articles mentioned this motive for DACU and both conducted focus group interviews with cannabis users. Neale (2001) recruited high-level drug users and Watson et al. (2019) recruited participants from a remedial program for drivers convicted of or suspended for impaired driving. Swift et al. (2010) reported that a minority of their sample of cannabis users engaged in DACU because it was part of their everyday life.

Needing to go home (second motive of this theme)

Needing to go home was the most common motive for DD in a sample of emerging adults seeking care in an urban emergency department (Bonar et al., 2018). This finding is consistent with results obtained by Swift et al. (2010) in their study with cannabis users.

Other motives

Other motives related to this second theme were reported only once, and by the same study (Bonar et al., 2018). They are: Was the only one who had a car (third motive of this theme); Others wanted me to drive them somewhere (forth motive of this theme); I had an emergency (fifth motive of this theme); I had used less than all the other people who could drive (sixth motive of this theme); Driving was more convenient than walking, taking a bus, or getting another ride (seventh motive of this theme).

Low risk given the road or traffic conditions (third theme)

Didn't have to drive very far (first motive of this theme) / There were not a lot of other people driving at that time of day or night (second motive of this theme)

These motives were mentioned in the study of Bonar et al. (2018)

DACU in "certain situations" (third motive of this theme)

This motive was mentioned in two studies (Allen et al., 2016; Davis et al., 2016). Both were conducted by the same research team, and they didn't specify the type of situations.

Risk seeking (forth theme)

Although some studies assessed the general tendency to engage in risky behaviour as a predictor of DACU, risk-seeking as a personality trait does not appear to be a conscious motive. Only studies in which participants reported themselves driving or would be driving under the influence of cannabis because they like the risk of it was included.

Wanted to take a risk (only motive of this theme)

Only one study reported participants driving or potentially driving under the influence of cannabis because they wanted to take the risk (Bonar et al., 2018).

Possibility to compensate for the effect of cannabis (fifth theme)

DACU is safe depending on the amount and kind of cannabis (first motive of this theme)

Allen et al. (2016) reported that participants who used cannabis at the time of completing their survey were significantly more likely to agree with the statement "It is OK to drive a little bit stoned." Furthermore, 30.5% of their sample agreed with this statement. Cannabis effects on driving is perceive to be minimal as long as a large amount is not used (Danton et al., 2003; Neale, 2001). Characteristics of cannabis itself can be perceived to influence driving ability. Certain cannabis types were preferable over others (e.g., "those [strains] that wake you up") (Greene, 2018).

It is possible to adapt driving to the effect of cannabis (second motive of this theme)

Three studies conducted with cannabis users reported this motive (Fischer et al., 2006; Greene, 2018; Neale, 2001; Swift et al., 2010). Adaptations involved driving more slowly, sitting more upright, driving at or below the speed limit, staying within the lines, being focused and cautious and avoiding busy roads.

Cannabis impacts depended on individual characteristics (third motive of this theme)

Through participant interviews, Greene (2018) and Wickens et al. (2019) found that people with high drug tolerance believe they can safely DACU.

Not feeling high (forth motive of this theme)

Bonar et al. (2018) reported that certain individuals DACU because they don't feel high after they use cannabis. This motive was the fourth most reported (32%) of their 16 reasons for DD.

Perceptions that DACU is approved by others (injunctive norms) (sixth theme)

Friends' approval of DACU (first motive of this theme)

The perceived friends' approval of DACU is significantly related to the probability to DACU (Aston et al., 2016; McCarthy et al., 2007). Wickens et al. (2019) conducted semi-structured interviews with 20 participants of a remedial program for impaired drivers. The authors reported that participants' friends were generally seen as more accepting of DACU than family, and there

were indications that the opinions of others who used cannabis were regarded as more credible than the opinions of non-users.

Family approval of DACU (second motive of this theme)

Drivers who believed that people important to them would be disappointed that they DACU were more than twice as likely not to report future intention to DACU (Ward et al., 2017).

Perception that DACU is acceptable among cannabis users (third motive of this theme)

The probability of reporting DACU is 1.6 times greater among respondents thinking such behaviour is "normal" for cannabis users (Ward et al., 2017). Fischer et al. (2006) used a qualitative design and conducted interviews with young adults who reported DACU over the past year. The authors mentioned DACU had become "normal" (i.e., a regular behaviour) among cannabis users.

Peers think DACU is less dangerous than drunk-driving (forth motive of this theme)

The study by McCarthy et al. (2007) reported that college students perceived their peers as being more accepting of driving after use of cannabis than after alcohol. Few of their participants (4%) reported DACU in the past 3 months.

Perception that DACU is generally acceptable (fifth motive of this theme)

Danton et al. (2003) conducted focus group interviews with young adults and reported that participants believed DACU was generally socially acceptable. The authors hypothesized that these results might be due to the perception that cannabis does not affect driving or simply the lack of reflection on the subject. A quote from one of their participants lends support to this claim: "I think with drugs there is a lack of conscious decision to drive or not, you just tend to go out."

Only older adults think DACU is dangerous (sixth motive of this theme)

This motive was mentioned in the study by Greene (2018). The author quotes a participant: "…it's a generation thing. I would say for younger people driving under the influence of marijuana is way more acceptable than the older generation cause the older generation is not really into it. They have always just had alcohol or have been driving drunk."

Discussion

This scoping review aimed to identify and classify motives for DACU in the scientific literature. To the best of our knowledge, there is no scoping review on this topic to date, despite the relevance of identifying the reasons behind this behaviour to reduce its prevalence. This study therefore provides the groundwork for a conceptual model of DACU to be developed.

Risk perception. All the articles included in this scoping review mentioned at least one motive related to risk perception, making it the most prevalent theme. Other themes seemed indirectly related to the perception of risk. For example, the fifth theme (i.e., Possibility to compensate for the effect of cannabis) implies the possibility to compensate for the risks of cannabis while driving, which implies a recognition that there are risks associated with this behaviour. Given that one of the general objectives of the present study was to help provide prevention campaigns with operational objectives, low-risk perception of DACU appears to be a key element in modifying this behaviour. This low-risk perception may be due to inconsistencies in traffic studies. Sewell et al. (2009) reported that cannabis smokers tend to compensate effectively while driving by utilizing a variety of behavioural strategies, but they also suggested that patients who smoke cannabis should be counselled to have a designated driver if possible and to wait at least three hours after smoking before driving. According to Böllinger and Quensel (2002), traffic authority actions taken to reduce DACU (e.g., fines, license revocation and prison sentences) are "strategies of anxious, fearful adults." However, more recent systematic reviews and meta-analyses are clear about the risks of DACU (Asbridge et al., 2012; Elvik, 2013; Rogeberg & Elvik, 2016). Another element that could contribute to this misperception of low risk is the comparison with alcohol effect on driving. Results suggest that most people who perceive DACU to be less dangerous than drunk-driving would never drink and drive over the limit. Danton et al. (2003) discuss that their participants had learned at an early age that drunk-driving was an antisocial behaviour and may not see DACU the same way. Moreover, the study by Downey et al. (2013) conducted a double-blind placebo-controlled driving simulation and tested the effect of different amounts of THC and alcohol, alone and in combination, on a cohort of regular and non-regular users and found that THC, just like alcohol, significantly impaired driving abilities. Regarding legal consequences, the lack of an effective way to test for cannabis-induced impairment on driving could explain the absence of fear of roadside testing or to be apprehended by police. Indeed, in its Framework for

the Legalization and Regulation of Cannabis in Canada (Government of Canada, 2016), the Task Force on Cannabis Legalization and Regulation mention that there is uncertainty as to the most appropriate course of action, owing to a lack of means to reliably assess cannabis impairment. Finally, mass media campaigns for DACU are often ineffective due to reliance on fear-based messaging or portrayal of scenarios that are highly unrealistic or derogatory. Effective campaigns rather need to put forward clear, factual, and consistent messages that are relatable to cannabis users' personal experience (Capler et al., 2017).

Driving is the most convenient option. Transportation alternatives can be viewed as time-consuming or needing too much planning (Watson et al., 2019). Some programs provide one-way alternative transport by giving vouchers to bar patrons for low-cost rides home using a taxi service (Rivara et al., 2012; Sprattler, 2010). Operation Red Nose in Canada is a free program that uses volunteer designated drivers to get drinkers home during the holiday season (Opération Nez Rouge, 2021). Another example is the Scooter Patrol program which operates in Los Angeles. Volunteer designated drivers travel by electric scooter and bring clients home with the scooter stored in the trunk (Decina et al., 2009). These programs were first designed to reduce drunk-driving but can be extended to include any drug impairment. A literature review of alternative transport programs to reduce impaired driving made no mention of programs adapted or designed to reduce DACU (Fell et al., 2020). Existing programs should design marketing campaigns to reach cannabis users and adapt their services. For example, vouchers for a reduced taxi or Uber fare could be distributed in cannabis accessories store, online on specialized forums, or in cannabis dispensaries in states or countries that have legalized it. In addition, cities should provide efficient, frequent, and reliable public transportation for citizens to perceive it as a truly viable alternative transit option.

Low risk given the road or traffic conditions. Not having to drive very far was the third most reported motive for DD in the study of Bonar et al. (2018). To our knowledge, no other studies mention this motive for DACU. Further studies could focus on the perception that the risk level for DACU is modulated by traffic conditions. For example, to drive only on roads with low-speed limit or the fact that few people are driving at that time of the day or could be perceived as reducing the risks of DACU.

Risk seeking. This motive was consistent with the results reported by Richer and Bergeron (2009) who found that personality traits such as sensation seeking, and impulsivity were predictors of DACU among men. However, drivers in the general population who had used cannabis or benzodiazepines prior to driving showed a low degree of sensation seeking (Jamt et al. 2020). Therefore, this motive could correspond more to a specific population such as men or impulsive people.

Perceived behavioural control. As mentioned earlier, studies seem to agree that higher frequency cannabis users are more at risk for impaired driving. Wickens et al. (2019) suggested *comparative optimism bias* as a possible explanation; this implies that regular cannabis smokers believe they have a better tolerance of this drug and are therefore at lower risk than others while driving. The perception that cannabis habituation effects lead to a greater ability to drive safely has frequently been reported in the literature (Marks & MacAvoy, 1989; Wright & Terry, 2002). However, the study by Downey et al. (2013) reported opposite results; regular users performed significantly worse in the driving simulation than non-regular users.

Subjective norms. Studies revealed a significant influence of peers on DD (Møller & Haustein, 2014; Sela-Shayovitz, 2008; Weston & Hellier, 2018). To have been a passenger in a vehicle driven by a person under the influence of cannabis was associated with a future probability of driving under the influence of cannabis (Cartwright & Asbridge, 2011; Whitehill et al., 2014). Harakeh and Vollebergh (2012) focused on whether passive (imitation) and/or active (pressure) peer-influence affects young adult cigarette smoking behaviour and found that only passive influence had a significant effect. These results suggest that simply witnessing risky behaviour from peers is more influential than direct encouragement.

Finally, from a more societal perspective, there could be a misperception of cannabis effects among the general population. This substance is often mentioned as a "soft drug" which is rather safe given its medical proprieties. Although several countries (including Canada, Netherlands and Israel) and 23 of 50 states in the United States have legalized the use of cannabis for medical purposes, not all studies agree on the medical potential of cannabinoids. A review of clinical trials on the potential therapeutic effects of cannabis on anxiety, depression and psychosis showed that

the evidence is limited by small sample sizes and trial designs that are susceptible to bias (Lowe et al., 2019). Epidemiological studies on non-medical cannabis users have shown that daily use can increase the risk of psychosis and possibly depressive and anxiety disorders (Arseneault et al., 2004; Gage et al., 2015). Other studies have failed to demonstrate a significant contribution of cannabinoids to improve health of patients with other pathologies such as Parkinson's disease (Crippa et al., 2019), neurological disorders (Koppel et al., 2014), and other chronic non-cancer pain (Campbell et al., 2019). In sum, public health actors in the field of road safety could aim to change perceptions regarding DACU by providing scientific information to rectify the common misconception that cannabis is mostly a medical drug with minor side effects.

Limitations

Our review presents some limitations. The choice of search engines was made based on the recommendation of Bramer et al. (2017), but the replacement of Google Scholar with PsycINFO may have reduced the literature fetching range. This decision also put aside all grey literature which may have led to the exclusion of relevant motives. Moreover, even if it is not required for a scoping review, it is important to mention that no evaluation of the quality of the articles was made. Finally, inter-rater agreement was validated with a quantitative method for our selection of articles, but not for motive classification, which was validated by only one co-author (ABT). Given the exploratory nature of our thematic analysis, it is possible that motives may have been classified under the wrong theme. Further studies should validate the six-theme model.

Conclusion

This study highlights the importance of understanding motives for DACU. A total of 32 motives were found from 30 scientific articles. The conceptual framework based on the TPB and thematic analysis revealed a six-theme model. Risk perception was the most frequently reported theme and appeared to be a key element in practical efforts to reduce the prevalence of this behaviour. Public education strategies need to send a clear message that DACU is risky. Moreover, people need to be informed that DACU is not safer or more socially acceptable than drunk-driving, and that neither a high tolerance to cannabis nor compensatory driving behaviours reduce the risks. For prevention campaigns to have an impact, providing effective alternative transport seems essential. Finally, there may be a general misperception of the effects of cannabis, which may lead to adverse

consequences (e.g., substance use disorder, impaired driving, etc.) To educate people at risk to DACU, it might be interesting to study how cannabis effects are perceived in the general population and portrayed in popular media, compared to research-based facts.

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Chapitre 3 – Deuxième article

Preliminary validation of the Motives for Driving After Cannabis Use Questionnaire[3]

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Abstract

Context: Effective evaluation tools assessing motives for driving after cannabis use (DACU) can provide valuable information to counsellors and public health actors who work to reduce the prevalence of this risky behaviour.

Objective: To validate the psychometric properties of the Motives for Driving After Cannabis Use Questionnaire (MDACUQ).

Method: The internal consistency, factorial validity, and convergent/discriminant validity were assessed with a sample of 1,765 Canadian drivers (17–35 years old) who have used cannabis in the past 12 months and completed an online survey.

Results: The MDACUQ showed good internal consistency and adequate convergent/discriminant validity. The six subscales structure was tested with a confirmatory factor analysis (CFA) which presented good adjustment fit indices. These subscales are: 1) lack of alternative transport; 2) low impact of the effects of cannabis on driving; 3) low-risk perception of negative outcomes; 4) risk-seeking; 5) being the designated driver and 6) peer pressure.

Conclusion: The MDACUQ has an overall good validity and can be used for evaluation, research purposes, and to build effective prevention programs to reduce the prevalence of DACU.

Keywords: cannabis, driving under the influence, motives, questionnaire, validation, Canada

Introduction

In 2020, a Canadian survey revealed that 22 % of people who had used cannabis in the past 12 months had driven within two hours of smoking or vaping cannabis (Government of Canada, 2020). Studies have shown that cannabis use prior to driving reduces cognitive faculties and psychomotor skills including reaction time, motor coordination, concentration, short-term memory, and shared attention (Bondallaz et al., 2016; Capler et al., 2017; Hartman & Huestis, 2013; Rogeberg & Elvik, 2016). Regardless of age, gender, and history of misconduct, the presence in the blood of Δ-9-tetrahydrocannabinol (THC, the major psychoactive molecule in cannabis) is associated with a greater likelihood of driving mistakes and collision (Bédard et al., 2007). In a 2016 report, the Task Force on Cannabis Legalization and Regulation in Canada strongly recommended that the federal government develop a national public education strategy to send a clear message that cannabis causes driving impairment. In addition, various health professionals claim that they do not feel sufficiently well informed about the specific risks associated with cannabis use, which leads them to barely discuss the issue with their patients (Brooks et al., 2017). Therefore, to provide practical information to counsellors, public health workers, and the general population, it is important to understand why some people drive after cannabis use (DACU).

Several studies have looked at risk factors of DACU such as being younger (Alcañiz et al., 2018; Aston et al., 2016; Domingo-Salvany et al., 2017; Korn et al., 2017; Voas et al., 2013), being male (Arterberry et al., 2013; O'Malley & Johnston, 2013; Whitehill et al., 2019), as well as cannabis use frequency and dependence (Arterberry et al., 2017; Davis et al., 2016; Scherer et al., 2013). Although these results can help counsellors and prevention programs developers target specific populations, the studies do not provide sufficient information about which perceptions, habits, and behaviours among users need to be changed. Brisson (2014) argued that prevention programs need to target operational objectives that essentially aim to a behavioural change. To achieve this, it appears relevant to consider psychological aspects that can be modified, such as motives, rather than physiological attributes. Moreover, considering the social, psychological and political complexity that leads some individuals to adopt risky behaviours, it is fundamental to treat these people has knowledgeable actors and to grasp their understanding of their own conduct (Kelly & Barker, 2016). Thus, focussing on motives for driving after cannabis use appears essential to

understand this complex health problem but also to find solutions and to build effective prevention programs.

Previous studies have identified the following psychological and behavioural predictors of DACU: lack of alternative transport (Danton et al., 2003; Watson et al., 2019), low perception that DACU is unsafe (Aitken et al., 2000; Arterberry et al., 2013; Berg, 2018; Cavazos-Rehg et al., 2018; Davis et al., 2016; Greene, 2018; Lenne et al., 2001; Matthews et al., 2014; Neale, 2001; Watson et al., 2019), lack of awareness of legal consequences (Danton et al., 2003; Davis et al., 2016), risk seeking (Richer & Bergeron, 2009), and peer influence (Bingham et al., 2008; Cartwright & Asbridge, 2011; Sela-Shayovitz, 2008; Whitehill et al., 2019).

To our knowledge, there is no validated questionnaire that focuses on the motives for cannabis-impaired driving. The present study aims to validate the psychometric properties of the Motives for Driving After Cannabis Use Questionnaire (MDACUQ). Internal consistency, factorial validity, and convergent/discriminant validity were evaluated with a sample of 17 to 35-year-old Canadian cannabis smokers who responded to an online survey. The validation process ensures the quality of the information provided by the questionnaire. This step in the creation of a psychometric tool aims to confirm that it does reliably measure the phenomenon of interest. The present study has a number of important practical applications. Namely, to help counsellors and public health actors to determine the factors to be targeted in the context of psychosocial interventions, through awareness and prevention programs to change the perception of DACU and reduce the prevalence of this behaviour.

Methods

Study Population

This validation process used secondary data from the study of Huỳnh et al. (2021). Participants were between 17 and 35 years old, were residents of Canada, had used cannabis in the past 12 months, and had a regular or a probationary driver's license. The sample was restricted to young adults, considering that previous literature found they were the age that was most inclined to DACU (Davis et al., 2016; Domingo-Salvany et al., 2017; Voas et al., 2013). Participants were

recruited via Facebook paid advertising between August 7, 2018, and March 7, 2019. All questionnaires were administered online. The median duration of the questionnaire was 21 minutes. A CA$15 coupon for an online store was given after completion. Of the 3,796 individuals who accessed the survey's website, 2,270 participants gave their consent to participate. Cases were excluded if they had entire missing datasets (n = 562) or if they were deemed careless respondents (n = 99), i.e., participants who gave inconsistent or improbable answers throughout the questionnaires. Following data checking and cleaning, 1,765 participants were included in the final sample. This study was approved by the local institutional review board (#DIS-1920–22) and was conducted in accordance with the ethical standards outlined in the 1964 Declaration of Helsinki and its amendments.

Measures

Sociodemographic variables

Participants self-reported their exact age and the gender to which they identify: female, male, cultural gender (two-spirit, agowka, etc.), and other gender identities (gender-fluid, non-binary, etc.). For statistical reasons, these last two identities have been computed into a single category named "other genders." Other sociodemographic variables included occupation (studying exclusively, working exclusively, both studying and working, other [unemployed, on disability leave, a stay-at-home parent, etc.]), and attained educational level (high school or vocational training, college or certificate, and university).

MDACUQ

Bonar et al. (2018) developed a 16-item questionnaire about reasons for drug driving (DD). Based on Bonar et al. items and scientific literature, our team developed the MDACUQ. This tool includes 12 of Bonar's 16 items and adapted them by replacing the word "drug" with "cannabis" when necessary. Three items were considered too similar to others, and one item was excluded because it was deemed irrelevant in the context of cannabis usage. The designers of the MDACUQ grouped these 12 items into five major themes (subscales): 1) *lack of alternative transport* assesses the perception of not having other options to get somewhere; 2) *low impact of the effects of cannabis on driving* targets the perception of low effects of this drug on the ability to drive; 3) *low-risk perception of negative outcomes* addresses the perception of possible outcomes and

external factors like accidents or to get caught by police; 4) *being the designated driver* assesses the obligation to drive because others are unfit to do so; 5) *risk seeking* examines DACU as a desire to take a risk. The MDACUQ, therefore, consists of these 12 items from the Bonar et al. study and 12 other items developed for the current study for a total of 24 items. As the scientific literature identified other motives than those of Bonar et al., of these 12 other items, nine were added to flesh out each of the five major themes. The three that remained are grouped into a sixth major theme: *peer pressure,* which assesses the influence of friends. Table 6 present the items of the MDACUQ and where they come from. The Bonar et al. (2018) questionnaire have never been validated and were inspired by a study by Rosenberg (1988). Participants in our study self-reported how frequently each motive explained why they engage in DACU. The 24 items had a frequency response format and were polychotomous (four categories) ranging from 1 ("never") to 4 ("always"). The MDACUQ is presented in supplemental materials (Appendice 2).

Hypotheses for convergent/discriminant validity

The validation process requests to establish hypotheses on the relationship between the subscales of the MDACUQ and validation criteria. These latter come from other questionnaires and are theoretically related to their corresponding subscales. Convergent validity is demonstrated if the subscale correlates with other variables designed to measure a similar construct. Discriminant validity is indicated by predictably low or weak correlations between the subscale and other measures that are supposedly not measuring the same variable or concept (Churchill, 1979). Some subscales convergent/discriminant validity is assessed with a single item as validation criterion. Single items could be more effective than a composite of multiple items to assess a psychological construct (Hoeppner et al., 2011). Table 7 presents a summary of the expected relationships.

Transport

The *Lack of alternative transport* subscale was expected to be negatively related to the *Perceived Accessibility Scale* third item: *"*It is possible to go where I want to with public transport" (divergent validity) (Danton et al., 2003). The *Perceived Accessibility Scale* (Lättman et al., 2016) consists of four Likert-type items (1 = totally disagree; 7 = totally agree) that assess different aspects of the perceived accessibility of public transport.

Table 6

Items of the MDACUQ and where they come from

Factor	Item	Adapted from Bonar et al.	Added by the MDACUQ designers
Alternative transport			
	You need to go home or somewhere else	X	
	You do not have any other alternatives		X
	Driving is more convenient than walking, taking a bus, or getting another ride	X	
	You do not have enough money to take a taxi		X
	You have an emergency and have to go there quickly	X	
	There was no more public transportation		X
Low risk of negative outcomes			
	There are not a lot of other people driving at that time of day or night	X	
	You only have a short distance to make, which reduces the risk of accident or getting caught	X	
	You consider having few chances of getting caught	X	
	You are alone, and you do not have to deal with the judgment of others		X

	You take an alternate route		X
Low-impact			
	You consider that you can compensate, such as by driving more slowly		X
	You do not think driving under the influence of cannabis would be dangerous	X	
	You consider that it improves your driving		X
	You consider that it causes little or no harm to your driving		X
Risk seeking			
	You want to take a risk	X	
	In any case, it is destiny that decides		X
Designated driver			
	You are the only one who has a car	X	
	You are the designated driver	X	
	Others want you to drive them somewhere	X	
	You have used less cannabis than all the other people who could drive	X	
Peer influence			
	You want to impress your friends		X
	Your friends encourage you to do it		X
	Your friends also do it		X

Openness to driving while high

The fifth item of the *Openness to Driving While High*: "I can safely drive under the influence of cannabis," (α=.87[4]) assessed the general risk perception of DACU whether it's because of the effects of cannabis on driving or the possible negative outcomes. Therefore, it was expected to be positively related with the *Low impact of the effects of cannabis on driving* and the *Low-risk perception of negative outcomes* (convergent validity) (Bonar et al., 2018). The *Openness to Driving While High* is an 8 Likert-type item (1 = strongly disagree; 5 = strongly agree) questionnaire examines the participant's beliefs regarding risk perception of DACU (Davis et al., 2016).

Likeliness of being apprehended by police for DACU

The *Low-risk perception of negative outcomes* subscale was also expected to be related to the perception that it is likely to be apprehended by police when DACU (Jones et al., 2006). Perception of likeliness of being apprehended by police for DACU was assessed by a single Likert-type item (1 = strongly disagree; 5 = strongly agree): "The cops can catch a driver and quickly detect if they used cannabis within two hours before driving."

Risky driving

The *Risk seeking* subscale should also be positively related to risky driving behaviours (Richer & Bergeron, 2009). Risky driving was assessed by the *Dula Dangerous Driving Index*, a 29-item (1 = "never" and 5 = "always") questionnaire (Dula & Ballard, 2003). The French version has been validated by Richer and Bergeron (2012). It has three subscales with good internal consistency: *Aggressive driving* (α = .79), *Negative emotions and cognitions experienced on the road* (α = .80) and *Risky driving* (α = .81), total (α = .90). Only the last subscale was used for this study.

Peer variable

The number of friends passengers of a driver under the influence of cannabis was expected to be positively related to the *Being the designated driver* and the *Peer pressure* subscales (Sela-Shayovitz, 2008). A negative relation was also expected between the *Peer pressure* subscale and

[4] In this section, the reported Cronbach alpha are those of the authors in original papers.

the score at the *Resistance to Peer Influence* questionnaire. The number of friends who get into a vehicle that they know the driver has used cannabis was a five-anchor scale ranging from 1 (none of them) to 5 (all of them). The score of the *Resistance to Peer Influence* questionnaire developed by Steinberg and Monahan (2007) measures the degree of integration of friends' opinions, behaviour, and assertiveness (α=.74). The total score was generated with the mean of the nine Likert-type items ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 7

Expected Relationships Between MDACUQ Constructs (rows) and Validation Criteria (columns)

	Lack of alternative transport	Low impact of the effects of cannabis on driving	Low-risk perception of negative outcomes	Risk seeking	Being the designated driver	Peer pressure
Perceived accessibility to public transport	-					
I can safely drive under the influence of cannabis		+	+			
The cops can catch a driver and quickly detect if they used cannabis within two hours before driving			-			
DULA risky driving				+		
Number of friends passengers of a driver under the influence of cannabis					+	+
Resistance to peer influence						-

Statistical Analyses

Descriptive analyses were obtained using IBM SPSS Statistics 25. To assess internal consistency of the factors, the nonlinear structural equation modeling (SEM) reliability coefficient for categorical items ($\Omega_{u\text{-}cat}$) of Yang and Green (2015) was used following recommendations and procedure of Flora (2020). The internal consistency and factor validity were assessed with confirmatory factor analysis (CFA) conducted in R software (R Core Team, 2020 and RStudio version 1.3.1093) with the Lavaan packages (Rosseel, 2012) for the CFA and the SemTools package (Jorgensen et al., 2021) for the factors $\Omega_{u\text{-}cat}$ coefficients.

A common tool validation method is the one described by Timothy Hinkin (1998) which proposed to first conduct an exploratory factor analysis (EFA) and in a second time a CFA. However, according to Levine (2005), EFA would be a good choice when there is very little preconception about the factor model. The author also mentioned that CFA can be performed without a strong theory behind the tool structure; in many cases, an a priori idea of items and their factors is enough. Hinkin's method would require two independent samples (one for each factor analysis) which may be time-consuming and require considerable resources. Some researchers simply split their sample into two or even three if large enough (Krzystofiak et al., 1988; Stalikas et al., 2018; Terhorst et al., 2013). However, Fokkema and Greiff (2017) demonstrated that doing so can overfit the model by capitalizing on chance characteristics of the data. Also, if the sample covariances are small (relative to the sample variances) it would be easy for any model to reproduce them well and show a good model fit. Moreover, these authors advise researchers to not use EFA to assess the internal structure of a model. In short, the conduct of a single CFA in addition to the convergent/discriminant validity and internal consistency indices was deemed appropriate for the objectives of the present study.

Since the MDACUQ items are ordinal variables (four anchors), the Diagonally Weighted Least Squares (WLSMV) was chosen as an estimator for the CFA. WLSMV was designed specifically for ordinal data and is less biased and more accurate than Robust Maximum Likelihood (RML), especially with a large sample size of over 200 participants (Li, 2016). The first step was to obtain a model with good fit indices and at least two items per latent variable (Antonakis & House, 2014) using the model chi-square (Exact-fit test), the Root mean square error of approximation (RMSEA;

Steiger, 1998), the Comparative Fit Index (CFI; Bentler, 1990) and the Standardized Root Mean Square Residual (SRMR) as suggested by Kline (2015) for structural equation model. The model chi-square checks if there is no difference between the expected and observed variance / covariance matrices in the population and should not be significant for a good model fit but this test is known to be overly sensitive to large sample size and minor misspecifications. The *RMSEA* compares the expected and observed variance / covariance matrices and assesses whether there is a "good" fit given the degrees of freedom. It indicates a good fit under .05 or if the upper limit of the confidence interval (90%) is less than .08 (Browne & Cudeck, 1992). CFI compares the predicted model to a model where all links would be set to 0 and indicates the percentage of improvement in the model's fit. SRMR is the average of the differences between the expected and observed correlations (average of the residuals). A CFI above .95 and a SRMR below .08 indicate a good model fit (Hu & Bentler, 1999).

Next, to assess divergent and convergent validity, validation criteria were added to the model as predictors of the six factors. They were added as a manifest composite which is an unmeasured quantity, like a latent variable but with no error variance and with indicators driving the variable, rather than having the unmeasured variable causing the expression of its indicators (Jebyrnes, 2011). Unlike typical convergent/discriminant validity validation tests which use simple correlations that may be biased or based on omitted confounds, this process creates a nomological network based on a theoretical framework and constraints as suggested by Cronbach and Meehl (1955) for convergent/discriminant validity. Moreover, adding criteria to a formerly fitted model can increase validity since it creates new hurdles to the factor structure with the added variables that provide new testable implications not contained in the initial model (Rosman et al., 2021).

To assess the relationship between latent constructs and validation criteria, the Lavaan packages for CFA use the Probit Link Function (PLF) which is closely related to logistic regression (Razzaghi, 2013). In the probit model, the inverse standard normal distribution of the probability is modelled as a linear combination of the predictors. The regression coefficient gives the change in z-score, or probit index, for a one-unit change in the predictor. The Lavaan output also presents the coefficient standard errors, the z-statistic and associated p-values.

Results

Table 8 present participants' sociodemographic characteristics.

Table 8

Sociodemographic Characteristics (n=1,765)

Age	25.30 (5.47)
Language	
French	330 (18.7%)
English	1,435 (81.3%)
Gender Identity	
Women	851 (48.2%)
Men	801 (45.4%)
Other genders	113 (6.4%)
Occupation	
Study only	382 (21.6%)
Work only	1,093 (61.9%)
Work and study	236 (13.4%)
Other (unemployed, on disability leave, etc.)	52 (2.9%)
Education Level	
Elementary/High school/Vocational training	1,035 (58.6%)
College	340 (19.3%)
University level (bachelor, master's, Ph.D.)	390 (22.1%)

Note: The figures in parentheses present the percentage of membership in each of the categories of categorical variables and the standard deviation for the continuous variables.

The first model of the MDACUQ in his original form showed a good internal consistency (average $\Omega_{u\text{-}cat} = .825$). The model also had good adjustment fit indices ($\chi 2 = 2275.306$, $df = 237$, $p < .001$, CFI = .993, RMSEA = .070 [.067 - .072], SRMR = .068). As expected given the sample size, the Exact-fit test (chi-square) was significant. The average standardized loading was .834, which means that items explain 69% of latent variables variance. A few items had cross-loadings with other factors (e.g., the item: "Your friends also do it" from the *Peer influence* factor had a .803 loading with the *Designated driver* factor). However, since it already had good fit indices, the

model has not been modified. The second model that included validation criteria showed an overall slightly better fit ($\chi 2$ = 1819.806, df = 345, $p < .001$, CFI = .978, RMSEA = .051 [.049 - .053], SRMR = .054). The CFI was slightly lower, which could be explained by the fact that, unlike the other indices, it does not consider the sampling error as it does not depend on the n. Table 9 present items with the internal consistency of subscales, fit indices of both models with factor loadings, and standardized loadings. Endorsement proportions of the four answer choices and the means of the six subscales are presented in supplemental materials (Appendices 3 and 4).

Table 9

Internal Consistency, Fit Indices, Factor Loading and Standardized Loading of Both Models

		Model 1				Model 2 with Validation Criteria			
		χ^2	CFI	RMSEA	SRMR	χ^2	CFI	RMSEA	SRMR
		.000	.993	.070	.068	.000	.978	.051	.054
		Factor loading		Standardized loading		Factor loading		Standardized loading	
Factor	**Item**								
Alternative transport $\Omega_{u\text{-}cat}$ = .883									
	You need to go home or somewhere else	1.000		0.848		1.000		0.864	
	You do not have any other alternatives	0.961		0.815		0.973		0.849	
	Driving is more convenient than walking, taking a bus, or getting another ride	0.997		0.845		0.939		0.830	
	You do not have enough money to take a taxi	0.954		0.809		0.948		0.835	
	You have an emergency and have to go there quickly	0.935		0.793		0.803		0.745	
	There was no more public transportation	0.952		0.807		0.946		0.834	
Low risk of negative outcomes $\Omega_{u\text{-}cat}$ = .864									
	There are not a lot of other people driving at that time of day or night	1.000		0.843		1.000		0.874	

	You only have a short distance to make, which reduces the risk of accident or getting caught	0.990	0.835	0.999	0.874
	You consider having few chances of getting caught	0.968	0.816	0.865	0.795
	You are alone, and you do not have to deal with the judgment of others	0.964	0.813	0.869	0.797
	You take an alternate route	0.965	0.814	0.872	0.799
Low-impact $\Omega_{u\text{-}cat}$ = .865					
	You consider that you can compensate, such as by driving more slowly	1.000	0.881	1.000	0.892
	You do not think driving under the influence of cannabis would be dangerous	0.965	0.979	0.927	0.860
	You consider that it improves your driving	0.885	0.856	0.871	0.834
	You consider that it causes little or no harm to your driving	0.981	0.796	0.769	0.779
Risk seeking $\Omega_{u\text{-}cat}$ = .692					
	You want to take a risk	1.000	0.840	1.000	0.849

	In any case, it is destiny that decides	0.975	0.819	0.923	0.811
Designated driver $\Omega_{u\text{-}cat}$ = .842					
	You are the only one who has a car	1.000	0.855	1.000	0.882
	You are the designated driver	0.934	0.799	0.825	0.777
	Others want you to drive them somewhere	0.988	0.845	0.895	0.822
	You have used less cannabis than all the other people who could drive	0.964	0.824	0.935	0.846
Peer influence $\Omega_{u\text{-}cat}$ = .805					
	You want to impress your friends	1.000	0.880	1.000	0.849
	Your friends encourage you to do it	0.982	0.865	1.038	0.867
	Your friends also do it	0.957	0.842	0.944	0.820

Note: $\Omega_{u\text{-}cat}$ = the nonlinear SEM reliability coefficient for categorical items of Yang and Green (2015)

Table 10 present the standardized covariance coefficient between factors.

Table 10

Standardized covariance coefficient between factors

	Lack of Alternative Transport	Low Impact of the Effects of Cannabis on Driving	Low Risk Perception of Negative Outcomes	Risk Seeking	Being the Designated Driver	Peer Pressure
Lack of Alternative Transport	1					
Low Impact of the Effects of Cannabis on Driving	0.848	1				
Low Risk Perception of Negative Outcomes	0.929	0.845	1			
Risk Seeking	0.874	0.794	0.905	1		
Being the Designated Driver	0.924	0.785	0.899	0.906	1	
Peer Pressure	0.826	0.773	0.881	0.969	0.883	1

As presented in Table 11, regressions within the model between latent variables and validation criteria for convergent/discriminant validity met all the hypotheses except the relation between the *Low-risk perception of negative outcomes* subscale and the perception that it is likely to be apprehended by police when DACU.

Table 11

Results of the Structural Regression Model (Standardized Probit Regression Coefficients)

Validation criteria	**MDACUQ sub-scales**					
	Lack of Alternative Transport	Low Impact of the Effects of Cannabis on Driving	Low Risk Perception of Negative Outcomes	Risk Seeking	Being the Designated Driver	Peer Pressure
Perceived accessibility to public transport	**-.098*** **					
I can safely drive under the influence of cannabis		**.472*** **	**.290*** **			
The cops can catch a driver and quickly detect if they used cannabis within two hours before driving			-.021			
DULA risky driving				**.617*** **		
Number of friends passenger of a driver under the influence of cannabis					**.154*** **	**.121*** **
Resistance to peer influence						**-.302*** **

Note : *** = p < .001

Discussion

The present study aimed to validate the psychometric properties of the MDACUQ. A CFA presented good fit indices and validation criteria were added as manifest composites. The objective in doing so was not to create a better model, but to create a nomological network based on theoretically related constructs. The fact that this second model had a slightly better fit despite new hurdles to the structure suggest a good convergent/divergent validity and factorial validity. Although two probit regression coefficients were significant but weak, validation criteria were significantly related to their respective subs-scales except one. Overall, results suggest that the MDACUQ has an adequate convergent/divergent validity and a good multidimensional factorial validity. His sub-scales contain sufficient uniquely reliable variance to warrant their separate interpretation but together form a coherent model.

People who drive after using drugs are not homogeneous groups and can be clustered based on common characteristics such as different personality profiles (Romano et al., 2019), criminal behaviours and psychiatric comorbidities (Nelson et al., 2019), intensity of drug use, as well as social environment (Scherer et al., 2021). The MDACUQ could help counsellors and public health policymakers to tailor prevention programs based on the motives most reported by a specific population. First, we will discuss the convergent/divergent validity of the subscales. Then, we will suggest possible means of prevention for different motives for DACU.

All hypotheses for convergent/discriminant validity were met except one: the divergent validity of the relation between the *Low-risk perception of negative outcomes* subscale and the perceived likelihood to be apprehended by police for DACU. In the second model, which includes validation criteria, the item: "You consider having few chances of getting caught" is the item that appears to be the closest to the validation construct. However, it has the lowest standardized loading. Other items that have a higher loading with the factor (e.g., "You only have a short distance to make, which reduces the risk of accident or getting caught" or "There are not a lot of other people driving at that time of day or night") might reveal that this subscale more precisely addresses the risk perception given road or traffic conditions. Since the presence of police is a characteristic of road conditions, the item "You consider having few chances of getting caught" still belongs in this subscale. However, it would be interesting to test for convergent validity with a validation criterion

that addresses the perception that a certain traffic condition or state of the road reduces the risk of DACU, for example, “When I DACU, I only choose roads that have a speed limit of 50 kilometres per hour.” Although the other subscales have a significant relationship with their validation criteria, three sub-scales have a low regression coefficient. As predicted, the *Lack of Alternative Transport* sub-scale is significant and inversely related to the *Perceived Accessibility to Public Transport* validation criterion, but the probit regression coefficient is low (- .098). This could be explained by two reasons. First, no distinction was made regarding the place of residence (urban or rural) which could greatly influence the perception of accessibility to public transport. Secondly, it might be possible that for some individuals, cars outperformed public transport not only because of its instrumental function, but also because it represents cultural and psychological values (e.g., symbols of freedom and independence) (Steg, 2003). Some items of this sub-scale also assess the necessity to get somewhere with no mention of public transports (e.g., “You need to go home or somewhere else”). Therefore, even if some people perceive that there are other accessible options, they might simply prefer to drive. The sub-scales *Being the Designated Driver* and *Peer Pressure* had also significant but low probit regression coefficients (respectively .154 and .121). Both had the number of friend passengers of a driver under the influence of cannabis as validation criteria. Regarding the *Being the Designated Driver* sub-scale, it is possible that someone is the designated driver of a few friends but perceive that most of his other friends would not be passengers of a driver under the influence of cannabis. The number of friends that would agree to be our passenger even if we have used cannabis could be a more accurate validation criterion. Regarding the *Peer Pressure* subscale, it is possible that some people experiment peer pressure to drive after cannabis use but only from specific friends and still report a few friend passengers of a driver under the influence of cannabis. Finally, the standardized covariance coefficients between factors were high, ranging from .773 to .969. This has no implication for convergent validity but limit the potential of sub-scales to individually assess divergent validity over a single unique factor. Further studies may attempt to provide stronger convergent/divergent validity indices with more correlated validation criteria.

For people who reported DACU mainly because they do not have alternative means of transport, current transportation alternatives can be perceived as time-consuming or needing too much planning (Watson et al., 2019). Efficient, frequent, and reliable transportation should be developed

and maintained for citizens to perceive it as a truly viable alternative transit option. Some programs provide one-way alternative transport. In some Canadian provinces, Red Nose Operation (Opération Nez Rouge, 2021) is a free service provided during the Christmas season to accompany drunk drivers back home safely and likely decreases the prevalence of road accidents, considering that 69,029 Canadians opted for this service in 2019 (Fell et al., 2020). Local initiatives in Canada are available year long and cost a fee comparable to taxis (e.g., Safe Ride Home in Vancouver, Tolerance Zero 8 in Québec, etc.). These programs were built to reduce drunk-driving but can be extended to any drug impairment. Promotional campaigns should be designed to reach cannabis users and existing programs could adapt their services to target this specific population.

Regarding people who do not believe DACU is risky, it seems this motive could be partly due to a lack of information. Young adults (18-25) have misperceptions about the effects of cannabis, and most admit they don't have any information about it (Greene, 2018). Educational campaigns that aim to provide accurate information without any confrontational or judgmental messages could be effective in reducing the prevalence of DACU (Brown, 2018). Comparing the effects of cannabis with those of alcohol on driving could also lead to risk minimization. Danton et al. (2003) claimed that their participants had learned at an early age that drunk-driving was an antisocial behaviour but may not see DACU the same way. A clear message needs to be sent that THC significantly impairs driving abilities, like alcohol (Downey et al., 2013).

Among young cannabis users, risk-seeking is significantly related to self-report risky driving and DACU (Bergeron et al., 2014). Moreover, the frequency of cannabis use could act as a mediator in the relationship between sensation seeking and risky driving (Cordelier et al., 2021). Richer and Bergeron (2009) found that sensation seeking, and impulsivity were predictors of DACU among a cohort of men. The authors mentioned that intervention messages addressed to high-sensation seekers should include an arousing and unconventional format and that interventions should focus on a very simple sequence of adequate behaviours which must become automatic.

Studies report how the influence of peers can lead to DD (Møller & Haustein, 2014; Sela-Shayovitz, 2008; Weston & Hellier, 2018). A longitudinal study of cannabis-using youth seeking emergency department (ED) treatment for assault revealed that impaired drivers were more likely

than drivers who do not drive under the influence of drugs to report an association with delinquent peers and bad parental influences. This suggests that at-risk youth may benefit from behavioural interventions that address these negative social influences and provide positive role models (Dora-Laskey et al., 2019). For example, sports celebrity influence can be used as positive role models to increase awareness and personal concern about drug use disorder (Brown & de Matviuk, 2010). Peer influence could also be used to reduce risky behaviours. For example, Perkins et al. (2010) demonstrated that social norms media campaigns may be effective at changing drinking-related behaviours using mass media. They studied the impact of a campaign designed to correct misperceptions of drunk-driving norms among people (21 – 34 years old) using phrases such as "Most Montana young adults (4 out of 5) don't drink and drive." Over a period of 18 months, they found an increase in the use of designated drivers and a decrease in drunk-driving among the target population. Finally, there may be a false perception of safety in being the designated driver and therefore only using cannabis. This misperception could stem from the perception that DACU is safer than drunk-driving (Cavazos-Rehg et al., 2018; Darke et al., 2004; Fischer et al., 2006; Greene, 2018). Prevention programs could emphasize that a designated driver is as much recommended to accompany individuals who have drunk alcohol as those who have used cannabis (Government of Canada, 2017; Sewell et al., 2009).

Limitations

This study presents limitations. First, since the motives and the validation criteria are self-evaluations, this could mean that the estimates of the correlations are unduly increased because of the "shared method effect" which implies that some portion of the variance is shared because of the specific measure (or method) rather than the effect the construct of interest (LaGrange & Cole, 2008). Secondly, the "peer pressure" factor has only two items and typically in factor analysis, a minimum of three items is preferable since two items define only a single correlation (Rahn, 2013). Thirdly, data were self-reported, participants could have been reluctant to reveal sensitive information. However, online anonymity and explicit mention of terms of confidentiality should have reduced this bias. Moreover, studies have shown that self-reported criminal behaviours and substance use (especially tobacco and cannabis) constituted valid data, with moderate to strong correlations with official records (Thornberry & Krohn, 2003). Fourth, memory bias may also have occurred, considering that some questions referred to events that happened over the past 12 months.

Fifth, the inclusion criteria restricted the sample to young adults with a probationary legal or regular driver's license. Thus, results may not be generalized to all cannabis users. Self-selection bias may have occurred given that analyses were conducted in a convenience sample of individuals who were motivated to fill out a 20-minute questionnaire and who had internet access. Finally, our definition of DACU captures all individuals who have used any quantity of cannabis. Therefore, it is not possible to make any inference to intoxication level which could be bias since the experience of "feeling high" is subjective.

Conclusion

Overall, the MDACUQ showed good validity and can be used for research purposes or to develop counselling and prevention programs. This study underlines the importance of evaluating motives for DACU. To reach at-risk populations and determine adequate solutions to reduce the prevalence of DACU, it is essential to understand what leads some people to put themselves and others at risk. Motives for DACU could be categorized into six main themes: *lack of alternative transport, low-risk perception of negative outcomes, perception of low effects of cannabis on driving, risk seeking, designated driver* and *peer influence*. Future studies could work to improve the structure of the questionnaire, refining these themes and finding others by working with people at risk.

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Chapitre 4 – Discussion et conclusion

Ce mémoire avait pour objectifs de rapporter et catégoriser les motifs de la CACC dans la littérature scientifique et de valider les propriétés psychométriques du QMCACC. La revue de la littérature a été conduite sous la forme d'une revue de portée. Celle-ci a extrait 32 motifs classés dans six catégories : 1) perception de risque; 2) conduire est l'option la plus pratique; 3) faible risque compte tenu des conditions de la route et du trafic; 4) recherche de sensation; 5) possibilité de compenser les effets du cannabis et 6) perception que la CACC est approuvée par les proches. Le QMCACC présente une bonne cohérence interne, une validité convergente/discriminante adéquate et sa structure en six sous-échelles a été validée par une analyse factorielle confirmatoire. La revue de portée a fourni un élément de validation additionnel puisqu'elle a démontré que le QMCACC semble respecter les trois critères d'une bonne validité de contenu (Université de Sherbrooke, s. d.). Plus spécifiquement, 1) les items du questionnaire couvrent tous les principaux thèmes de la CACC rapportés par la revue de portée; 2) ces items couvrent ces différents thèmes de manière proportionnelle (p. ex., le questionnaire a six sous sous-échelles et la revue de portée a rapporté six thèmes et la perception de risque occupe une place prépondérante tant dans le questionnaire que dans la revue de portée). Finalement, 3) le QMCACC ne semble pas contenir d'items non pertinents.

Forces et limites des articles

La revue de portée a exclu la littérature grise et Google Scholar des moteurs de recherches, car le nombre d'articles à traiter aurait été trop important pour les ressources de cette étude. Cette décision a pu mener à l'exclusion d'autres motifs de la CACC que ceux rapportés. De plus, puisque cela n'est pas requis pour une revue de portée, aucune évaluation de la qualité des articles n'a été faite. Des informations méthodologiques ont tout de même été rapportées pour contextualiser certains résultats. En revanche, la méthodologie systématique et reproductible de la revue de portée ainsi qu'une analyse thématique ayant pour cadre conceptuel la théorie du comportement planifié (TCP) (Ajzen, 1991) ont permis de jeter les bases d'un modèle conceptuel. L'efficacité de la TCP pour comprendre les comportements à risque, y compris la conduite sous l'influence de substance psychoactive, a été démontrée par plusieurs études (Armitage et al., 2002; Marcil et al., 2001; Parker et al., 1992). Des versions modifiées de cette théorie pour la conduite sous l'effet de l'alcool ont été développées en ajoutant au modèle initial la perception d'invulnérabilité comme antécédant

des normes subjectives, de l'attitude et de la perception de contrôle (Potard et al., 2018) ou en ajoutant les normes morales (c.-à-d., la perception de ce qui est bien ou mal en général) comme prédicteur de toutes les autres composantes du modèle (Moan & Rise, 2011). Des études futures pourraient vérifier si une version plus complexe de la TCP améliorerait la compréhension des motifs de la CACC. Finalement, ce premier article répond au besoin criant de travailler avec les personnes à risque et de considérer leur expertise de la situation pour mieux comprendre un problème complexe (Kelly & Barker, 2016). Les résultats de cette étude pourraient contribuer significativement à l'élaboration d'initiatives de santé publique.

Pour procéder aux analyses de validation du QMCACC, un échantillon de 1765 conducteurs canadiens ayant consommé du cannabis au cours des 12 derniers mois a été utilisé. Les critères d'inclusion restreignaient l'échantillon aux jeunes adultes titulaires d'un permis probatoire légal ou régulier. Ainsi, les résultats peuvent ne pas être généralisables à tous les consommateurs de cannabis. Un biais d'autosélection peut aussi s'être produit étant donné que les analyses ont été menées sur un échantillon de convenance d'individus ayant accès à Internet avec la motivation de remplir un questionnaire en ligne de 20 minutes qui comportait, entre autres, le QMCACC et les critères de validation. Les données étaient autodéclarées. Donc, certains participants auraient pu être réticents à révéler des informations sensibles. Cependant, l'anonymat en ligne et la mention explicite des conditions de confidentialité ont sûrement contribué à réduire ce biais. De plus, des études ont montré que les comportements criminels autodéclarés et la consommation de substances constituaient des données valides, avec des corrélations modérées à fortes avec les dossiers officiels (Thornberry & Krohn, 2003). Un biais de mémoire peut également s'être produit, étant donné que certaines questions faisaient référence à des événements survenus au cours des 12 derniers mois. Puisqu'une seule méthode de collecte de donnée a été utilisée, les estimations des corrélations entre les sous-échelles et les critères de validation ont peut-être été artificiellement gonflées en raison de "l'effet de méthode partagée" qui implique qu'une partie de la variance est partagée à cause de la méthode utilisée plutôt que par l'effet du construit d'intérêt (LaGrange et Cole, 2008). De plus, la validité discriminante d'une sous-échelle n'a pas été démontrée puisque le lien attendu entre cette sous-échelle et son critère de validation était non-significatif. Les autres analyses de validité convergente/discriminante étaient toutes significatives, mais deux d'entre elles suggéraient une relation faible. Donc, dans l'ensemble, la validité de convergence discriminante semble adéquate,

mais elle pourrait être mieux démontrée avec de critères de validation plus corrélés aux sous-échelles du questionnaire. Malgré ces limites, cette validation préliminaire démontre que l'outil a de bonnes qualités psychométriques. Le QMCACC pourra être utilisé pour améliorer les connaissances sur la conduite après la consommation de cannabis. L'objectif général de ce mémoire est d'améliorer la compréhension de ce qui mène à ce comportement à risque pour aider la mise en œuvre de campagnes de prévention efficaces pour en réduire la prévalence.

Dans les dernières décennies, la proportion d'accidents mortels sur la route liés à l'alcool de plusieurs pays occidentaux a diminué considérablement notamment, à cause des campagnes d'information publique et d'efforts de préventions (Christophersen et al., 2020). Néanmoins, les recherches sur le sujet semblent souligner l'importance de varier et d'adapter les méthodes préventives aux caractéristiques de diverses populations. Par exemple, les mesures coercitives (p. ex., suspension du permis) semblent efficaces pour les individus qui en sont à leur première offense, mais pas chez les récidivistes (Freeman & Liossis, 2002). Chez les individus qui ont été arrêtés pour leur première offense de conduite sous l'effet de l'alcool et qui présentaient de signes de dépression, des interventions individuelles brèves et des rencontres de suivis sur une période de quatre à six mois en plus de rencontres de groupe diminuait significativement le risque de récidive, mais pas chez les individus qui ne présentaient pas de signe de dépression (Wells-Parker & Williams, 2002). Donc, pour diminuer la prévalence de la CACC, il semble essentiel d'adapter les interventions aux caractéristiques des différentes populations à risque. À la lumière des résultats des deux articles, la section qui suit rapporte les solutions possibles pour chacun des thèmes propres aux sous-échelles du QMCACC.

Transport alternatif

La revue de portée présente plusieurs motifs concernant le manque de transports alternatifs que le QMCACC regroupe en un seul thème. Au Canada, le manque de transports en commun efficaces en milieu rural est un problème reconnu. En 2021, le gouvernement du Canada a prévu un fond de 250 millions de dollars sur cinq ans pour soutenir l'élaboration de solutions de transport en commun. Plusieurs programmes de raccompagnement visent à prévenir la conduite sous l'effet de l'alcool comme Opération Nez Rouge au Québec ou *Safe Ride Home* à Vancouver. Il existe aussi des partenariats avec des entreprises qui facilitent le covoiturage. Le projet *Survive a DUI* (2021)

donne un rabais de 50$ pour l'utilisation de l'application LYFT et 20$ pour l'application UBER. Considérant la nouvelle réalité des Canadiens avec la légalisation de 2018, des projets similaires visant spécifiquement les consommateurs de cannabis doivent être mis sur pied. Par exemple, les sociétés d'État comme la SQDC au Québec qui font la vente de cannabis pourraient établir des partenariats similaires en offrant des rabais pour des services de covoiturage aux acheteurs de cannabis.

Faible risque de conséquences négatives

Percevoir peu de risque à la CACC est le motif rapporté par le plus d'études de la revue de portée. La majorité d'entre elles mentionnent le besoin de mieux informer la population des risques qui en découlent. Dans son rapport de 2017, la Coalition canadienne des politiques sur les drogues constate que la plupart de consommateurs de cannabis pensent que leur capacité de conduite n'est que faiblement affectée par la consommation de cannabis avant la conduite et plus de la majorité d'entre eux pensent qu'il n'y a pas de risque d'accident (Capler et al., 2017). Ce même rapport affirme que les campagnes de sensibilisation pour diminuer la prévalence doivent maintenir un message clair, cohérent, sans jugement et présenter les faits. À ce propos, des revues systématiques et méta-analyses récentes s'entendent; la consommation de cannabis avant la conduite augmente significativement le risque d'accident (Asbridge et al., 2012; Elvik, 2013; Rogeberg & Elvik, 2016). Selon un principe de diffusion de messages de santé publique, le messager est aussi important que le message (Valente & Myers, 2010). Intégrer des consommateurs dans les campagnes de prévention présentant les mêmes caractéristiques sociodémographiques pourrait être un moyen de rendre le message plus crédible.

Faible impact des effets du cannabis sur les habiletés de conduite

Tous les items de cette sous-échelle du QMCACC ont un motif semblable dans la revue de portée. Celle-ci rapporte plusieurs motifs qui sont captés par un seul item du QMCACC ce qui est un élément de plus qui atteste de la qualité de l'outil puisque la parcimonie est une qualité importante d'un outil psychométrique (Wieland et al., 2017). Par exemple, dans la revue de portée les motifs : « La conduite sous l'effet du cannabis est sécuritaire» et « Le cannabis n'affecte pas les capacités cognitives et motrices en général» sont capté par l'item du questionnaire : « Vous ne pensez pas que conduire serait dangereux ». Certains consommateurs réguliers de cannabis perçoivent qu'ils

ont une meilleure tolérance à cette drogue et sont donc moins à risque au volant après avoir consommé que les consommateurs occasionnels. Selon Wickens et al. (2019), cette perception pourrait être attribuable au *biais d'optimisme comparatif* qui se caractérise par la croyance de certaines personnes que le meilleur leur arrive alors que le pire survient seulement aux autres. Il est essentiel que des messages d'intérêt public s'attardent à changer cette perception en plus d'informer les consommateurs de cannabis et la population générale que le cannabis comme l'alcool affecte significativement les habiletés de conduite et que les consommateurs réguliers sont plus dangereux que les consommateurs occasionnels (Downey et al., 2013).

Recherche de sensations

Un item du questionnaire fait référence aux conduites ordaliques : « De toute façon, c'est le destin qui décide ». Il est possible que ce motif ne soit pas apparu dans la revue puisque les informations à son sujet ne font pas directement référence à la CACC. Dans son livre sur le jeu excessif, Valleur (2005) explique le lien entre les dépendances et les conduites ordaliques qu'il définit par : « le fait, pour un sujet, de s'engager de façon plus ou moins répétitive à des épreuves comportant un risque mortel : épreuve dont l'issue ne doit pas être évidemment prévisible, et qui se distingue de ce fait tant du suicide pur et simple, que du simulacre ». Conduire avec les facultés altérées par une substance pourrait donc être une conduite ordalique chez certaines personnes puisque c'est un comportement risqué aux conséquences imprévisibles. Les conduites ordaliques seraient davantage présentes chez les jeunes (Le Breton, 2001). La recherche de sensations est associée à la CACC chez les hommes (Bergeron et al., 2014; Richer & Bergeron, 2009). Néanmoins, dans la population générale, les conducteurs qui avaient consommé du cannabis ou des benzodiazépines avant de prendre le volant ont montré un faible degré de recherche de sensations (Jamt et al. 2020). Pour rejoindre les individus qui conduisent après avoir consommé du cannabis pour la recherche de sensations, Richer et Bergeron (2009) suggèrent que les interventions de sensibilisation présentent un format stimulant et non conventionnel tout en proposant des solutions de remplacement qui pourront devenir des automatismes.

Être le chauffeur désigné

Certaines personnes pourraient croire qu'elles peuvent être le chauffeur désigné puisqu'elles n'ont consommé que du cannabis et pas d'alcool. La conduite sous l'effet de l'alcool est désormais

considérée comme un comportement antisocial, ce qui n'est peut-être pas le cas de la CACC (Danton et al. 2003). Il est possible qu'avec les efforts de prévention et d'information, ce motif devienne de plus en plus pertinent au fil des années. Les programmes de prévention doivent mettre de l'avant qu'un conducteur désigné est autant recommandé pour accompagner les personnes qui ont bu de l'alcool que celles qui ont consommé du cannabis (Gouvernement du Canada, 2017; Sewell et al., 2009).

Pression des pairs

Les normes sociales peuvent être utilisées dans le cadre de campagne de prévention pour réduire des comportements à risque. Pour corriger les perceptions erronées des normes de conduite en état d'ivresse chez les personnes de 21 à 34 ans, Perkins et al. (2010) ont utilisé des phrases telles que « la plupart des jeunes adultes du Montana (4 sur 5) ne conduisent pas en état d'ébriété ». Sur une période de 18 mois, ils ont constaté une augmentation de l'utilisation de conducteurs désignés et une diminution de l'alcool au volant parmi la population cible. Cette stratégie pourrait être adaptée au Canada. Par exemple, une campagne de prévention pourrait partager l'information : « La plupart des consommateurs de cannabis (6 sur 7) ne conduisent pas sous l'effet du cannabis » (Gouvernement du Canada, 2018).

Conclusion

Ce mémoire met en évidence l'importance de s'intéresser aux motifs de la CACC. Ceux-ci sont importants, car ils renseignent sur les motivations à poser un acte dangereux pour soi-même et pour les autres, mais aussi, car ils permettent de cibler les changements de comportements appropriés ou les solutions potentielles. Au Canada, la légalisation du cannabis demande des ajustements tant pour les décideurs que pour la population générale. Il apparait urgent de mettre en œuvre des moyens pour informer et sensibiliser les citoyens aux risques de la CACC. Pour être efficaces, ces stratégies devraient travailler en partenariat avec les populations à risque et présenter et maintenir un message clair et cohérent sans jugements. Un outil psychométrique peut toujours être peaufiné ou adapté pour divers besoins ou populations. Néanmoins, cette validation préliminaire a fait la démonstration que le QMCACC peut être utilisé à des fins de recherche scientifique et de

prévention en sécurité routière. Il serait intéressant que des études futures explorent quels motifs sont associés à des populations spécifiques pour intervenir de façon ciblée.

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Annexe 1

1. EMBASE (Ovid)

Légende de la syntaxe utilisée	
/	descripteur du vocabulaire contrôlé
TI, AB, KW	Champs «Title» (Titre), «Abstract » (Résumé) et « Key words ».
Exp	« Explode », Permet d'aller chercher tous les sujets se trouvant sous le sujet éclaté dans le thésaurus.
OR, AND, NOT	OU, ET, SANS Opérateurs booléens
ADJn	ADJn est un opérateur de proximité qui permet de récupérer les références qui contiennent les termes recherchés, dans n'importe quel ordre, éloignés d'un certain nombre (n) de mots de l'autre. NOTE : ADJ1 repère les mots un à côté de l'autre, peu importe l'ordre. ADJ2 repère les mots, peu importe l'ordre, avec 0 ou 1 mot entre les deux.
*	Caractère de troncation (NOTE : gene* recherche : gene, genes, genetics, and generation)
?	Caractère de remplacement optionnel remplace 0 ou 1 caractère dans un mot ou à la fin d'un mot.

Stratégie de recherche adaptée à la syntaxe d'EMBASE

#	Équations	Résultats
# 1	Cannabis/	31114
# 2	Exp "Cannabis use"/	10944
# 3	Cannabis addiction/	9575
# 4	Cannabinoid/	11470
# 5	Tetrahydrocannabinol/	4782
# 6	1 OR 2 OR 3 OR 4 OR 5	51511
# 7	(cannabis abuse or cannabis dependence or cannabis dependency or mari?uana or mari?uana abuse or mari?uana use* or mari?uana dependence or mari?uana dependency or cannabinoid* or CBD or hash or Hashish or haschich or THC or Tetrahydrocannabinol).ti,ab,kw.	56625
# 8	6 or 7	80938
# 9	Drive/	1865
# 10	Driver/	15805
# 11	Car driving/	13035
# 12	Distracted driving/	232
# 13	Reckless driving/	15
# 14	"speeding (driving)"/	31
# 15	Car/	8929
# 16	Car driver/	861
# 17	Traffic/	10993
# 18	Motor vehicle/	9615
# 19	Driving ability/	6938
# 20	Motorcycle/	2803
# 21	(driving OR auto OR automobile OR car or cars OR road OR vehicle OR chauffeur OR driver behavior OR driver behaviour OR driving skill OR conductor* OR DUI OR Driving under the influence).ti,ab,kw.	380174
# 22	(DUI? OR DUID? OR DWI OR DWIs).ti,ab. NOT diffusion-weighted.ti,ab.	6230

# 23	9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 or 22	414394
# 24	Motivation/	95776
# 25	(motive OR reason* OR motivations OR justification OR explanation OR incitement OR incitation OR determinant* OR cause). ti,ab,kw.	2189185
# 26	24 or 25	2268281
# 27	Questionnaire/	666509
# 28	Evaluation study/	43,995
# 29	(survey* OR Questionnary OR question* OR investigation* OR "evaluation studies" OR "evaluation tool" OR questionnaire* OR "likert scale" OR "test battery" OR evaluation OR "evaluation criteria" OR scale OR test OR psychometric OR validation OR inventory OR checklist OR instrument).ti,ab,kw.	6,428,865
# 30	27 or 28 or 29	6,535,796
# 31	(8 and 23) (cannabis/conduite)	3,827
# 32	(8 and 23 and 26) (cannabis/conduite/motifs)	349
# 33	(8 and 23 and 30) (cannabis/conduite/questionnaire)	1462

2. Medline (Ovid)

Légende de la syntaxe utilisée	
/	descripteur du vocabulaire contrôlé
TI, AB, KW	Champs «Title» (Titre), «Abstract » (Résumé) et « Key words »
Exp	« Explode », Permet d'aller chercher tous les sujets se trouvant sous le sujet éclaté dans le thésaurus.
OR, AND, NOT	OU, ET, SANS Opérateurs booléens
ADJn	ADJn est un opérateur de proximité qui permet de récupérer les références qui contiennent les termes recherchés, dans n'importe quel ordre, éloignés d'un certain nombre (n) de mots de l'autre. NOTE : ADJ1 repère les mots un à côté de l'autre, peu importe l'ordre. ADJ2 repère les mots, peu importe l'ordre, avec 0 ou 1 mot entre les deux.
*	Caractère de troncation (NOTE : gene* recherche : gene, genes, genetics, and generation)
?	Caractère de remplacement optionnel remplace 0 ou 1 caractère dans un mot ou à la fin d'un mot.

Stratégie de recherche adaptée à la syntaxe de Medline

#	Équations	Résultats
# 1	Cannabis/	8887
# 2	Cannabinoids/	7318
# 3	Marijuana smoking/	4633
# 4	Marijuana abuse/	6146
# 5	Exp "Marijuana Use"/	5253
# 6	("cannabis use" or "cannabis usage" or "cannabis abuse" or "cannabis addiction" or "mari?uana" or "Marijuana use" or "mari?uana usage" or "mari?uana addiction" or "hash" or "hashish" or "ashisch" or "thc" or "tetrahydrocannabinol").ti,ab,kw.	22976
# 7	1 or 2 or 3 or 4 or 5 or 6	33150
# 8	Drive/	1975
# 9	Automobiles/	6880
# 10	Automobile driving/	18679
# 11	Accidents, Traffic/	42583
# 12	Distracted driving/	171
# 13	Motorcycles/	2431
# 14	Driving under the influence/	532
# 15	("drives" or driving or "driver" or "auto" or "automobile" or "aggressive driving" or "car" or "cars" or "road" or "traffic" or "vehicle" or "conductor*" or "car driver" or "car driving" or "driving ability" or "motorcycle" or "DUI" or "driving under the influence").ti,ab,kw	299295
# 16	(“DUI?” OR “DUID?” OR “DWI” OR “DWIs”).ti,ab. NOT diffusion-weighted.ti,ab.	2185
# 17	8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16	323753
# 18	Motivation/	65618
# 19	("motive*" or "reason*" or "justification*" or "explanation*" or "incitement" or "incitation" or "determinant*" or "cause").ti,ab,kw.	1446045
# 20	18 or 19	1501989

# 21	"Surveys and Questionnaires"/	450408
# 22	Diagnostic Self Evaluation/	3111
# 23	Evaluation Study/	249832
# 24	Drug Evaluation/	41843
# 25	("survey" or "questionnaire" or "surveying" or "question" or "investigation" or "evaluation" OR "likert scale" OR "test battery" OR "evaluation criteria" OR "scale" OR "test" OR "psychometric" OR "validation" OR "inventory" OR "checklist" OR "instrument").ti,ab,kw	2198378
# 26	21 or 22 or 23 or 24 or 25	2583199
# 27	(7 and 17) (cannabis/conduite)	1854
# 28	(7 and 17 and 20) (cannabis/conduite/motifs)	163
# 29	(7 and 17 and 26 (cannabis/conduite/questionnaire)	622

3. Web of Science

Légende de la syntaxe utilisée	
TS	« Topic » : Permet d'effectuer une recherche dans les champs titre, résumé, mots clés de l'auteur (articles 1991+) et champ Keyword Plus (mots clés générés automatiquement à partir du titre et du résumé.
WC	"Web of Science Category", catégories générales à l'aide desquelles les périodiques, et non les articles, sont indexés.
OR, AND, NOT	OU, ET, SANS - Opérateurs booléens
NEAR/n	NEAR/n est un opérateur de position qui permet de récupérer les références qui contiennent les termes recherchés, dans n'importe quel ordre, éloignés d'un certain nombre (n) de mots l'un de l'autre.
*	Caractère de troncation (NOTE : **nurse*** recherche : nurse, nurses, nursed)
$	Représente 0 ou 1 caractère.
" "	Les guillemets permettent de désactiver la "lemmatization" et le "stemming" (recherche des mots dérivés et recherche d'autres temps de verbe) qui se font automatiquement. Par exemple, sans apostrophes **drive** repère aussi driven, drives et driving.

Note : pas de vocabulaire contrôlé dans Web of Science

Stratégie de recherche adaptée à la syntaxe de Web of Science

#	Équations	Résultats
# 1	TS=(Cannabi* OR CBD OR Hash OR Hashish OR Haschich OR Mari$uana OR Tetrahydrocannabinol OR THC)	91.163
# 2	TS=("Drive" OR "Driver" OR "Drivers" OR "Driving")	617,699
# 3	TS=("DUI" OR "DUIs" OR "DUID" OR "DUIDs" OR "DWI" OR "DWIs")	10,950
# 4	TS=(diffusion-weighted)	21,163
# 5	#3 NOT #4	3,355
# 6	TS=(Automobile$ OR "Car" OR "Cars" OR Motorcycle$ OR "Road" OR "Roads" OR Traffic OR Vehicle$)	891,751
# 7	TS=((drugged OR "influence" OR intoxicat* OR impair*) NEAR/3 ("drive" OR "driving" OR "driver" OR "drivers"))	8,890
# 8	#2 OR #5 OR #6 OR #7	1,424,535
# 9	TS=(motive OR reason* OR motivations OR justification OR explanation OR incitement OR incitation OR determinant* OR cause)	4,509,392
# 10	TS=(survey* OR Questionnary OR question* OR investigation* OR “evaluation studies” OR “evaluation tool” OR questionnaire* OR “likert scale” OR “test battery” OR evaluation OR “evaluation criteria” OR scale OR test OR psychometric OR validation OR inventory OR checklist OR instrument)	11,503,117
# 11	#1 AND #8	5,055
# 12	#1 AND #8 AND #9	795
# 13	#1 AND #8 AND #10	2,334
# 14	WC=(Acoustics OR Allergy OR Agricultural Economics & Policy OR Agricultural Engineering OR Agriculture, Dairy & Animal Science OR Agriculture, Multidisciplinary OR Agronomy OR Archaeology OR Architecture OR Astronomy & Astrophysics OR Art OR Audiology & Speech-Language Pathology OR Automation & Control Systems OR Biochemical Research Methods OR Biochemistry & Molecular Biology OR	42,292,225

Biodiversity Conservation OR Biotechnology & Applied Microbiology OR Biophysics OR Business OR Cell & Tissue Engineering OR Cell Biology OR Chemistry OR Computer Science OR Classics OR Dance OR Dentistry, Oral Surgery & Medicine OR Dermatology OR Developmental Biology OR Ecology OR Economics OR Electrochemistry OR Energy & Fuels OR Engineering OR Entomology OR Environmental Sciences OR Crystallography OR Environmental Studies OR Ergonomics OR Evolutionary Biology OR Construction & Building Technology OR Film, Radio, Television OR Fisheries OR Folklore OR Food Science & Technology OR Forestry OR Geochemistry & Geophysics OR Geography OR Geology OR Geosciences, Multidisciplinary OR Green & Sustainable Science & Technology OR Hematology OR History OR History & Philosophy of Science OR Horticulture OR Hospitality, Leisure, Sport & Tourism OR Imaging Science & Photographic Technology OR Immunology OR Infectious Diseases OR Information Science & Library Science OR Language & Linguistics OR Limnology OR Linguistics OR Literary Reviews OR Literary Theory & Criticism OR Literature OR Marine & Freshwater Biology OR Materials Science OR Mathematical & Computational Biology OR Mathematics OR Medical Informatics OR Medieval & Renaissance Studies OR Metallurgy & Metallurgical Engineering OR Meteorology & Atmospheric Sciences OR Microbiology OR Microscopy OR Mineralogy OR Mining & Mineral Processing OR Music OR Mycology OR Nanoscience & Nanotechnology OR Neuroimaging OR Nuclear Science & Technology OR Oceanography OR Ophthalmology OR Optics OR Ornithology OR Orthopedics OR Otorhinolaryngology OR Paleontology OR Parasitology OR Pediatrics OR Peripheral Vascular Disease OR Physics OR Plant Sciences OR Poetry OR Polymer Science OR Radiology, Nuclear Medicine & Medical Imaging OR Religion OR Reproductive Biology OR Soil Science OR Telecommunications OR Theater OR Thermodynamics OR Transplantation OR Tropical Medicine OR Urology & Nephrology OR Veterinary Sciences OR Virology OR Water Resources OR Zoology)

# 15	#11 NOT #14 (cannabis/conduite)	2,632
# 16	#12 NOT #14 (cannabis/conduite/motifs)	462
# 17	#13 NOT #14 (cannabis/conduite/questionnaire)	1,337
# 18	*Pour tous = LANGUAGE: (English OR French) *Timespan=1980-2018*	

4. PsycINFO (Ovid)

Légende de la syntaxe utilisée	
AB, TI	Champs résumé (abstract), descripteur et titre (title)
OR, AND, NOT	OU, ET, SANS - Opérateurs booléens
EXP	Permet d'aller chercher tous les sujets se trouvant sous le sujet éclaté dans le thésaurus.
ADJn	Opérateur de proximité qui permet de récupérer les références qui contiennent les termes recherchés, dans n'importe quel ordre, éloignés d'un certain nombre (n) de mots l'un de l'autre.
*	Caractère de troncation (NOTE : **nurse*** recherche : nurse, nurses, nursed)
#	Remplace 1 caractère, mais pas 0.
$n	Remplace le nombre de caractères suivant la racine du mot (drug$1 recherche drug, drugs)

Stratégie de recherche adaptée à la syntaxe de PsycINFO

#	Équations	Résultats
# 1	Cannabis OR Cannabinoid* OR Hashish OR hash OR ashisch OR Cannabis OR mari?uana OR thc OR tetrahydrocannabinol (Any Field: Cannabis OR Any Field: Cannabinoid* OR Any Field: Hashish OR Any Field: hash OR Any Field: ashisch OR Any Field: Cannabis OR Any Field: mari?uana OR Any Field: thc OR Any Field: tetrahydrocannabinol)	26,625
# 2	Drive OR drives OR driving OR automobile* OR vehicule* OR auto OR road OR roads OR traffic OR motorcycle Any Field: Drive OR Any Field: drives OR Any Field: driving OR Any Field: automobile* OR Any Field: vehicule* OR Any Field: auto OR Any Field: road OR Any Field: roads OR Any Field: traffic OR Any Field: motorcycle	260,919
# 3	Motivation OR reason OR motive* OR justification OR explanation OR incitement OR incitation OR determinant OR cause Any Field: Motivation OR Any Field: reason OR Any Field: motive* OR Any Field: justification OR Any Field: explanation OR Any Field: incitement OR Any Field: incitation OR Any Field: determinant OR Any Field: cause	374,942
# 4	Survey* OR questionnaire* OR question* OR “likert scale” OR “test battery” OR evaluation OR “evaluation criteria” OR scale OR investigation OR test OR psychometric OR validation OR inventory OR checklist OR instrument Any Field: Survey* OR questionnaire* OR question* OR “likert scale” OR “test battery” OR evaluation OR “evaluation criteria” OR scale OR investigation OR test OR psychometric OR validation OR inventory OR checklist OR instrument	1,978,813
# 5	#1 AND #2 (cannabis/conduite)	2,472
# 6	#1 AND #2 AND #3 (cannabis/conduite/motifs)	238
# 7	#1 AND #2 AND #4 (cannabis/conduite/questionnaire)	1,497

Annexe 2

Questionnaire des motifs de la conduite automobile après avoir consommé du cannabis

Au cours des **12 derniers mois**, si vous avez conduit un véhicule moteur alors que vous pensiez être sous l'effet du cannabis, vous l'avez fait parce que…

	Jamais	Rarement	Souvent	Toujours
1. Vous estimez que cela nuit peu ou ne nuit pas à votre conduite	0	1	2	3
2. Vous estimez que cela améliore votre conduite	0	1	2	3
3. Vos ami(e)s le font	0	1	2	3
4. Vous n'avez pas d'autres alternatives	0	1	2	3
5. Vous voulez impressionner vos ami(e)s	0	1	2	3
6. Vous n'avez pas suffisamment d'argent pour prendre un taxi	0	1	2	3
7. Vous estimez que vous pouvez compenser, par exemple en conduisant plus lentement	0	1	2	3
8. Vos ami(e)s vous encouragent à le faire	0	1	2	3
9. Vous estimez avoir peu de chances de vous faire prendre	0	1	2	3
10. Vous avez seulement une courte distance à parcourir, ce qui réduit les risques d'accident ou de vous faire prendre	0	1	2	3
11. Vous êtes seul(e) et n'avez pas à composer avec le jugement d'autrui	0	1	2	3
12. Vous prenez une route alternative	0	1	2	3
13. De toute façon, c'est le destin qui décide	0	1	2	3
14. Il n'y a plus de transports en commun disponibles	0	1	2	3
15. Vous devez revenir à la maison ou quelque part d'autre	0	1	2	3
16. Conduire est plus pratique que marcher, prendre le transport en commun ou se faire conduire	0	1	2	3
17. Vous êtes le/la seul(e) à avoir une voiture	0	1	2	3
18. Vous êtes le/la chauffeur(euse) désigné(e)	0	1	2	3
19. Les autres voulaient que je les conduise quelque part d'autre	0	1	2	3
20. Vous avez une urgence et vous devez vous rendre là-bas rapidement	0	1	2	3
21. Vous avez consommé moins que les autres qui pouvaient conduire	0	1	2	3

22. Il n'y a pas beaucoup de gens sur la route à ce moment de la journée ou de la nuit	0	1	2	3
23. Vous voulez prendre un risque	0	1	2	3
24. Vous ne pensez pas que conduire serait dangereux	0	1	2	3

Annexe 3

Proportions (n/%) d'endossement des quatre choix de réponse

Items	Ancrages			
	Jamais	Rarement	Souvent	Toujours
1. Vous estimez que cela nuit peu ou ne nuit pas à votre conduite	821 (46.52%)	233 (13.20%)	328 (18.58%)	383 (21.70%)
2. Vous estimez que cela améliore votre conduite	1096 (62.10%)	287 (16.26%)	247 (13.99%)	135 (7.65%)
3. Vos ami(e)s le font	1057 (59.89%)	281 (15.92%)	266 (15.07%)	161 (9.12%)
4. Vous n'avez pas d'autres alternatives	997 (56.49%)	315 (17.85%)	272 (15.41%)	181 (10.25%)
5. Vous voulez impressionner vos ami(e)s	1482 (83.97%)	135 (7.65%)	104 (5.89%)	44 (2.49%)
6. Vous n'avez pas suffisamment d'argent pour prendre un taxi	1137 (64.42%)	218 (12.35%)	215 (12.18%)	195 (11.05%)
7. Vous estimez que vous pouvez compenser, par exemple en conduisant plus lentement	1184 (67.08%)	301 (17.05%)	209 (11.84%)	71 (4.02%)
8. Vos ami(e)s vous encouragent à le faire	1406 (79.66%)	204 (11.56%)	108 (6.12%)	47 (2.66%)
9. Vous estimez avoir peu de chances de vous faire prendre	1052 (59.60%)	285 (16.15%)	284 (16.09%)	144 (8.16%)
10. Vous avez seulement une courte distance à parcourir, ce qui réduit les risques d'accident ou de vous faire prendre	1041 (58.98%)	301 (17.05%)	306 (17.34%)	117 (6.63%)
11. Vous êtes seul(e) et n'avez pas à composer avec le jugement d'autrui	1177 (66.69%)	233 (13.20%)	256 (14.50%)	99 (5.61%)
12. Vous prenez une route alternative	1215 (68.84%)	302 (17.11%)	179 (10.14%)	69 (3.91%)
13. De toute façon, c'est le destin qui décide	1301 (73.71%)	188 (10.65%)	155 (8.78%)	121 (6.86%)

14. Il n'y a plus de transports en commun disponibles	1113 (63.06%)	237 (13.43%)	228 (12.92%)	187 (10.59%)
15. Vous devez revenir à la maison ou quelque part d'autre	854 (48.39%)	253 (14.33%)	353 (20.00%)	305 (17.28%)
16. Conduire est plus pratique que marcher, prendre le transport en commun ou se faire conduire	958 (54.28%)	227 (12.86%)	287 (16.26%)	293 (16.60%)
17. Vous êtes le/la seul(e) à avoir une voiture	1083 (61.36%)	273 (15.47%)	261 (14.79%)	148 (8.39%)
18. Vous êtes le/la chauffeur(euse) désigné(e)	1141 (64.65%)	292 (16.54%)	200 (11.33%)	132 (7.48%)
19. Les autres voulaient que je les conduise quelque part d'autre	1176 (66.63%)	296 (16.77%)	209 (11.84%)	84 (4.76%)
20. Vous avez une urgence et vous devez vous rendre là-bas rapidement	1161 (65.78%)	343 (19.43%)	168 (9.52%)	93 (5.27%)
21. Vous avez consommé moins que les autres qui pouvaient conduire	1157 (65.55%)	272 (15.41%)	232 (13.14%)	104 (5.89%)
22. Il n'y a pas beaucoup de gens sur la route à ce moment de la journée ou de la nuit	1135 (64.31%)	298 (16.88%)	241 (13.65%)	91 (5.16%)
23. Vous voulez prendre un risque	1376 (77.96%)	219 (12.41%)	110 (6.23%)	60 (3.40%)
24. Vous ne pensez pas que conduire serait dangereux	903 (51.16%)	289 (16.37%)	294 (16.66%)	279 (15.81%)

Annexe 4

Moyennes (brutes) des six sous-échelles

Sous-échelles/facteurs	Moyenne	Écart-type
Transport alternatif	1.831	.832
Faible risque de conséquences négatives	1.793	.815
Faible impact des effets du cannabis sur les habiletés de conduite	1.625	.734
Recherche de sensation	1.615	.758
Être le chauffeur désigné	1.417	.707
Pression des pairs	1.438	.638

Note : il est possible que les moyennes soient tirées vers le bas en raison des individus qui n'ont jamais conduit après consommé du cannabis et qui ont répondu « Jamais » à tous les motifs. Les moyennes pourraient être plus élevées avec un échantillon composé exclusivement d'individus ayant conduit après avoir consommé du cannabis.