



Perceptions of the Risk and Social Acceptability of Driving Under the Influence of Cannabis

Megan A. Pollard¹ · Dalainey H. Drakes¹ · Nick Harris¹

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Abstract

Cannabis is the second most commonly used substance among Canadians for those 18 to 24 years old with the most prominent associated risk of driving under the influence. Cannabis consumption impairs executive functions necessary for driving and increases the likelihood of fatal motor vehicle crashes. The purpose of this study was to explore participant perceptions about the dangerousness and social acceptability of driving under the influence of cannabis (DUIC) compared to alcohol or while tired. Utilizing an experimental vignette design, participants ($N=453$) were randomly assigned to one of six vignettes that varied on the substance used by a 22-year-old (cannabis, alcohol, no substance) and driver sex (male, female). Participants responded to a series of questions about the dangerousness and social acceptability of the driving behaviors described. A series of ANOVAs revealed a significant main effect of substance use across all items and a main effect of sex on social acceptability. DUIC was perceived as less dangerous and more socially acceptable than driving under the influence of alcohol. Furthermore, impaired driving was viewed as more acceptable for females than males. Findings help provide further insights into public perceptions of DUIC and highlight the importance of public education on the risks of DUIC.

Keywords Cannabis · Road safety · Driving · Dangerousness · Social acceptability · Education

Cannabis is the second most frequently used substance in Canada (after alcohol), with the highest use among emerging adults aged 18 to 24 (Health Canada, 2017; Rotermann, 2019). The recent legalization of recreational cannabis in Canada has brought forth a strong push by the federal government to research cannabis-related risks in youth (Webster, 2018). One of the highest risk behaviors associated with cannabis use among young people is driving under the influence of cannabis (DUIC; Colonna, 2019; Robertson et al., 2017). Cannabis use affects essential motor and cognitive abilities involved in driving, including processing speed, motor control, and reaction time which significantly increases the risk of being involved in an automobile crash (Asbridge et al., 2012; Hartman & Huestis, 2013). Post-legalization data from the National Cannabis Survey (NCS) in 2021 indicate that 21%

✉ Nick Harris
nharris@mun.ca

¹ Department of Psychology, Memorial University of Newfoundland, St. John's, NL, Canada

of cannabis users has driven within 2 h of cannabis use, with the highest rates reported among young males aged 15 to 24 (Statistics Canada, 2021). Of further concern, NCS data indicates that 22% of respondents rode as passengers of someone who used cannabis less than 2 h prior, and this was most prevalent (50%) among those who reported cannabis use in the previous 12 months (Statistics Canada, 2021).

High rates of DUIC and the recent legalization of cannabis in Canada have led to growing public health concern over cannabis-impaired driving. Cannabis is present in upwards of 20% of fatal impaired driving crashes and is the second most common substance associated with automobile crashes behind alcohol (Beirness & Porath-Waller, 2019; Brubacher et al., 2020). Driving under the influence of alcohol (DUIA) has been considered a vital road safety concern for many years. For instance, the Traffic Injury Research Foundation (2019) found that nearly 81% of Canadians rated DUIA as a “severe problem” (Lyon et al., 2019) and DUIA was rated the most significant concern for 9 of the 14 years the survey was conducted (2005–2019) compared to all other societal issues (i.e., crime, economics, or climate change). While most Canadians (83%) also believe cannabis harms driving ability, survey-based data shows this is less likely the case among individuals who report cannabis use in the previous 12 months (78%; Statistics Canada, 2021) which is in line with previous research showing that cannabis consumers often perceive less potential for harm than non-consumers (Martinez-Vispo & Dias, 2020). Findings from past research have also highlighted that DUIC may be perceived to be of little harm especially among Canadian and American youth (Wadsworth & Hammond, 2019). The perception that DUIC is less risky or dangerous than DUIA has also been identified in emerging adults (Greene, 2018), adults (McDonald et al., 2021), and adult participants of a DUI program (Wickens et al., 2019). Perception of minimal risk associated with DUIC seems to stem from the belief that the level of dangerousness is dependent on individual factors (i.e., tolerance) and cannabis use factors (e.g., type of product; Cavazos-Rehg et al., 2018). Gender differences in perceptions of DUIC have also been found. For instance, male cannabis users with lower levels of education (McDonald et al., 2021) are more likely to believe that DUIC does not increase risk for car crashes and perceive DUIC as safer than DUIA (McDonald et al., 2021; Sterzer et al., 2022). According to the NCS, a small gender effect also exists such that female drivers are more likely to believe that using cannabis within an hour of driving increases the risk for car crashes and males are more likely to believe DUIC is not associated with increased risk of danger (Arnold & Tefft, 2016). Furthermore, attitudes regarding the dangerousness of DUIA and DUIC were lowest among those aged 20 to 24 with females expressing higher levels of concern about impaired driving than males across all age groups (Arnold & Tefft, 2016; Jonah, 2013).

While DUIA and DUIC have both been recognized as major public health concerns, DUIA has been more consistently addressed, and DUIC has only more recently become a prominent concern. For example, there has been a long history of public awareness efforts and campaigns targeting DUIA; however, similar initiatives for DUIC have not been developed to the same extent and are less widespread (Capler et al., 2017; Watson et al., 2019). To date, the primary method for understanding public perceptions of DUIC has been data from survey-based research where respondents have been asked questions about their attitudes toward DUIC (e.g., “do people your age think driving after marijuana use is more or less dangerous than driving after alcohol use?”; Danton et al., 2003; Greene, 2018) and their engagement in DUIC and related behaviors (e.g., “In the past 3 months, have you been a passenger in a motor vehicle driven by someone who had used cannabis in the previous two hours?”; Statistics Canada, 2019). More traditional survey-based questions such as these have been instrumental in understanding how DUIC is perceived in general

and relative to DUIA—a behavior that is considered dangerous and unacceptable (Jonah, 2013; Lyon et al., 2019). However, alternative research methods intended to help better understand attitudes toward DUIC and to help inform efforts to educate the public on the risks associated with DUIC are important (Government of Canada, 2018).

The current study sought to expand on past survey-based research exploring public perceptions of DUIC by introducing an experimental vignette method to the literature that measures public opinions about a realistic impaired driving scenario. Vignettes are commonly used in social science research to examine attitudes, perceptions, beliefs, and norms (Evans et al., 2015; Gould, 1996). For example, vignettes have been used to assess attitudes toward mental illness (e.g., Angermeyer and Dietrich, 2006; Winters & Harris, 2019), substance use (Harris-Lane et al., 2020; McGinty et al., 2015), and dangerous driving (Farrow, 1987). There are a number of benefits to using vignettes in attitudinal-focused research. First, vignettes can be created and modified to directly assess the variables of interest to the researcher. Second, vignettes allow the researcher to provide real-world context and detail about the behavior of interest rather than asking generic questions about DUI (in this case). Third, vignettes allow for depersonalization, which enables respondents to analyze the scenario from a variety of perspectives rather than responding based on their own circumstances (Schoenberg & Ravdal, 2000). Finally, the use of vignettes can help reduce respondents' social desirability bias by having them respond to the behavior of a character rather than their own actions (Pescosolido et al., 2010).

To the authors' knowledge, this is the first study to utilize an experimental vignette design to measure the perceived dangerousness and social acceptability of DUIC. The current study aimed to assess the perceived dangerousness and social acceptability of the driving behavior of a young adult vignette character. The study's primary aim was to examine public opinions about the risk and social acceptability of DUIC, DUIA, or driving while tired (i.e., driving while tired was used as an additional comparison group as fatigue can contribute to non-substance induced impairment that can increase the risk of motor vehicle crashes, Lal & Craig, 2001). As DUIA has been the focus of awareness campaigns for decades, the public is well-informed about the dangers of DUIA and is widely considered a threat to safety. As such, the goal was to use these opinions as a baseline to compare opinions about DUIC. Of additional interest was to determine how attitudes about impaired driving differ depending on the sex of the driver (male or female). The secondary purpose of the study was to determine if participants' self-reported cannabis use frequency was related to their attitudes about DUIC. To address these areas, the following research questions and hypotheses were devised:

1. Using an experimental vignette design, how do participants' beliefs about the danger and social acceptability of a young adult engaging in DUIC compare to DUIA? As it has been well established in the survey-based literature that DUIC is often perceived as less dangerous and more socially acceptable than DUIA, it was hypothesized that participants would perceive it as less dangerous and more socially acceptable for the vignette character to DUIC than DUIA.
2. How do participants' attitudes about the perceived dangers and social acceptability of impaired driving vary based on the sex of the young adult? Although research suggests sex differences exist for impaired driving behaviors (e.g., young males DUIC more frequently) and attitudes (e.g., females perceive DUIC as more dangerous), research to date does not allow for a formal prediction to be drawn. As a result, sex differences were examined on an exploratory basis.

3. How do participants' attitudes about the perceived risk and social acceptability of DUI vary depending on their reported frequency of cannabis use? It was hypothesized that participants who reported using cannabis more frequently would perceive DUI as less dangerous and more socially acceptable.

Method

Participants

Respondents ($N=453$) between the ages of 18 and 65 ($M=35.5$, $SD=13.1$) were recruited. Participants reported having completed on average 16.6 years of education, the majority of participants self-identified as female (75.5%), and the sample was ethnically homogenous identifying predominantly as Caucasian (92%). Cannabis consumption more than once in their lifetime was reported by 65.4% of the sample with 46% of participants who consumed cannabis in the last 12 months reporting an average frequency of less than once per month ($M=0.7$, $SD=1.3$). DUI more than once in their lifetime was reported by 15.7% of respondents and 41.9% recalled being a passenger with a cannabis-impaired driver on more than one occasion. Higher levels of alcohol consumption were indicated with 97% of our sample reporting they had consumed alcohol more than once in their lifetime. The majority of respondents (93%) who consumed alcohol did so within the past 12 months with average consumption of 1 to 3 times per month ($M=2.3$, $SD=1.2$). DWI more than once in their lifetime was reported by 21.3% of the sample, and the frequency of being a passenger with an alcohol-impaired driver more than once was reported by 35% of participants. All demographics and the frequency of substance use related behaviors are reported in Table 1.

Procedure

The online survey was created and accessed by participants using the online survey platform *Qualtrics* between August 2018 and October 2018. Recruitment of participants occurred through social media platforms by sharing the recruitment poster in community groups, undergraduate and graduate discussion boards, and university affiliated pages (i.e., *Facebook*) and word-of-mouth (i.e., posters displayed in public spaces, Listservs, online newsletters). Recruitment posters shared electronically or printed included a brief invitation to participate in an online survey exploring DUI, ethics approval, contact information for additional questions, and the opportunity for entry into a prize draw. Once participants clicked the hyperlink to the survey, they were presented with an informed consent form. Those who agreed to participate were randomly assigned to one of six vignettes created by the current authors to elicit participants' reactions to a social scenario where a 22-year-old character named Barry (male) or Betty (female) drove a vehicle after the consumption of cannabis, alcohol, or while tired (see Appendix 1). Next, participants were asked to complete a series of questions to assess demographic information, perceived dangerousness and social acceptability of the vignette character's behaviors, and personal cannabis and

Table 1 Summary of sample characteristics and related substance use behaviors

Demographics	Mean (<i>SD</i>) / % of sample
Age	35.5 (13.1)
Education	16.6 (3.5)
Sex	
Female	75.5%
Male	24.5%
Ethnicity	
Caucasian	92.0%
Indigenous	1.3%
Hispanic or Latino	0.7%
Middle Eastern	0.7%
Asian	0.4%
Others	1.3%
Preferred not to report	3.5%
Cannabis consumption	
More than once in their lifetime	65.4%
Ingested only once	9.9%
Never tried cannabis	24.7%
Average monthly cannabis consumption	0.7 (1.3)
Frequency of DUIC	
More than once in their lifetime	15.7%
DUIC only once	6.9%
Never tried DUIC	77.3%
Frequency of being a passenger with DUIC driver	
Passenger more than once in their lifetime	41.9%
Passenger only once	11.6%
Never a passenger of DUIC driver	46.5%
Frequency of alcohol consumption	
More than once in their lifetime	97%
Ingested only once	1.9%
Never tried cannabis	1.2%
Average monthly alcohol consumption	2.3 (1.2)
Frequency of DUIA	
More than once in their lifetime	21.3%
DUIA only once	10.4%
Never tried DUIA	68.3%
Frequency of being a passenger with DUIA driver	
Passenger more than once in their lifetime	35%
Passenger only once	16.7%
Never a passenger of DUIA driver	48.4%

alcohol use experiences. Completion of the survey took approximately 10 min with the option to discontinue at any time by voluntarily exiting the survey. Participants were thanked, provided a separate link to enter a draw for one of five \$50 gift cards, and debriefed about the study.

Measures

Demographic Information Participants completed questions on demographic information related to age, education, sex, and ethnocultural variables.

Perceived Dangerousness and Social Acceptability Due to no pre-existing measure to assess the dependent variables perceived risk and social acceptability of a vignette character's driving behavior (i.e., DUIC, DUIA, or driving fatigued), a series of 6 single-item measures were developed for the current study to both directly and indirectly (i.e., likelihood of engaging in behaviors that support or challenge DUIC, for example, stopping a driver from DUIC, etc.) assess DUI-related attitudes. Table 2 includes each item with its corresponding 4- or 5-point Likert scale. All items were developed based on past research exploring attitudes toward DUI including items on perceived dangerousness and social acceptability (items 1 and 2; Aston et al., 2016;

Table 2 Perceived dangerousness and social acceptability of the vignette characters' behaviors measure items

Dependent variable	Item	Likert scale
Perceived dangerousness	Based on this scenario, to what extent do you think Barry/Betty driving himself home is dangerous?	0 = Not at all dangerous 1 = A little dangerous 2 = Moderately dangerous 3 = Very dangerous 4 = Extremely dangerous
Social acceptability	Based on this scenario, to what do you think Barry/Betty driving himself home is socially acceptable?	0 = Not at all socially acceptable 1 = A little socially acceptable 2 = Moderately socially acceptable 3 = Very socially acceptable 4 = Extremely socially acceptable
Harm to self	Based on this scenario, how much do you think Barry risks harming himself physical by using cannabis (alcohol or no substance) and driving?	0 = No risk 1 = Minor risk 2 = Moderate risk 3 = Severe risk
Harm to others	How much do you think Barry risks harming others physically by using cannabis (alcohol or no substance) and driving?	0 = No risk 1 = Minor risk 2 = Moderate risk 3 = Severe risk
Stop driver from DUI	If you were at the party Barry and saw him getting in his car to drive home, how likely would you be to try and stop him?	0 = Not likely at all 1 = Somewhat likely 2 = Moderately likely 3 = Very likely
Accept ride from driver DUI	If you needed a ride home, how likely would you be to get a ride with Barry?	0 = Not likely at all 1 = Somewhat likely 2 = Moderately likely 3 = Very likely

Arterberry et al., 2013), risk of physical harm to self or others (items 3 and 4; Johnston et al., 2018), likelihood of intervening in a DUI (item 5; Buckley et al., 2016), and accepting a ride from someone DUI (item 6; Aston et al., 2016; McCarthy et al., 2007).

Alcohol and Cannabis Use A series of questions from the *Canadian Cannabis Survey* (Health Canada, 2017) and *Canadian Community Health Survey – Mental Health* (Statistics Canada, 2013) were utilized to measure participants' cannabis use, alcohol consumption, and self-reported DUI behaviors.

Statistical Analysis

Statistical analyses were undertaken using *IBM SPSS Statistics Software* (version 25). Survey data was analyzed using descriptive statistics to characterize sample demographics, cannabis and alcohol use frequency, and self-reported DUI behaviors. Primary analyses involved a series of 2 (sex) × 3 (substance use) between-subjects factorial ANOVAs in examining the effect of the independent variables sex (male or female) and substance consumption (cannabis, alcohol, or no substance use/tired) on the dependent variables assessing the perceived dangerousness and social acceptability of the described vignette character's behaviors. Among participants assigned to one of two vignettes depicting cannabis consumption, *Pearson's r* correlation coefficients were calculated to examine the relationship between self-reported cannabis use frequency and attitudes toward the vignette character DUIC.

Results

Analyses of Frequency of Missing Data

Four hundred and eighty-three participants clicked on the survey link; however, 30 participants completed less than 20% of the survey questions and their data were removed from the analyses. It is likely that these participants began the survey but chose to forfeit their participation. The remaining 453 participants who were included were missing <3.6% of data points on average. If a participant failed to respond to an item, they were not included in any analyses involving that item.

Correlational Analyses

Significant correlations were found between the frequency of cannabis consumption in the past year and all six dependent variable items assessing perceived dangerousness and social acceptability of the vignette character's DUIC behavior ($\alpha=0.01$; see Table 3).

Preliminary Analyses

One-way ANOVAs and chi-square analyses were conducted to examine between group differences on demographic and substance use variables revealing no significant differences between the six vignette groups (see Appendix 2).

Table 3 Correlations between the frequency of cannabis use in the past 12 months and the dependent variables

	Perceived dangerousness	Social acceptability	Harm to self	Harm to others	Stop driver from DUI	Accept ride from driver DUI
Frequency of Cannabis use (past 12 months)	−0.432	0.219	−0.400	−0.401	−0.355	0.487

All correlations reached significance at the level of 0.01

Primary Analyses

A series of six 2 (sex: male or female) × 3 (substance use: cannabis, alcohol, tired) univariate ANOVAs were conducted to assess the perceived dangerousness and social acceptability of DUI. The dependent variables for the analyses were measured using the six items constructed to assess perceptions of dangerousness and social acceptability (see Table 2 for dependent variables). Levene's test of equality of variances was significant for all six dependent variables with an alpha level of 0.01 applied to correct multiple analyses and heterogeneity of variances.

A significant main effect of substance use was found in all six ANOVAs as summarized in Table 4. DUIA was perceived as the most dangerous and least socially acceptable as compared to DUI or driving while tired (see Tables 5 and 6 for group means and effect sizes for substance use comparisons across all constructs). Furthermore, respondents associated more significant harm to themselves and others when engaged in DUIA than DUI or driving while tired. Lastly, respondents were more likely to stop DUIA and least likely to accept a ride from an alcohol-impaired driver than to those DUI or driving while tired. Only results from one of the six ANOVAs demonstrated a main effect of sex. Respondents perceived DUI as more socially acceptable for the female (Betty) than the male (Barry) vignette. Interaction effects between substance use and sex were non-significant across all ANOVAs for each dependent variable.

Discussion

The purpose of this study was to examine adult perceptions about the dangerousness and social acceptability of DUI compared to DUIA and driving while tired. Additional aims of the study included determining how respondents' perceptions of impaired driving varied depending on the sex of the driver and how frequency of cannabis consumption was related to attitudes about DUI. Results revealed a main effect of substance use on all measures of perceived dangerousness and social acceptability. Specifically, participants perceived DUIA as more dangerous and less socially acceptable than DUI or driving tired and DUI was perceived as more dangerous and less socially acceptable than driving tired. A main effect of sex was also found for ratings of social acceptability. This finding supports the notion that individuals perceived driving impaired as more socially acceptable for a female driver than a male driver. Finally, significant inverse relationships were found between past-year cannabis use and four dependent variables

Table 4 ANOVA of dependent variables based on substance use and sex of the vignette character

Predictor	Sum of squares	<i>df</i>	Mean square	<i>F</i>	<i>p</i>	Partial η^2
Perceived dangerousness						
Substance use ^b	161.848	2	80.924	82.560	<0.001	0.270
Sex	0.700	1	0.700	0.714	0.399	0.002
Substance use × sex	2.560	2	1.280	1.306	0.272	0.006
Social acceptability						
Substance use ^b	259.998	2	129.999	66.834	<0.001	0.230
Sex ^a	13.765	1	13.765	7.077	0.008	0.016
Substance use × sex	4.782	2	2.391	1.229	0.293	0.005
Harm to self						
Substance use ^b	79.532	2	39.766	64.569	<0.001	0.224
Sex	0.419	1	0.419	0.680	0.410	0.002
Substance use × sex	0.053	2	0.026	0.043	0.958	<0.001
Harm to others						
Substance use ^b	86.579	2	43.290	68.678	<0.001	0.235
Sex	0.263	1	0.263	0.416	0.519	0.001
Substance use × sex	0.123	2	0.123	0.195	0.822	0.001
Stop driver from DUI						
Substance use ^b	203.722	2	101.861	101.618	<0.001	0.313
Sex	2.426	1	2.426	2.242	0.120	0.005
Substance use × sex	2.157	2	1.079	1.076	0.342	0.005
Accept ride from driver DUI						
Substance use ^b	162.802	2	81.401	99.650	<0.001	0.308
Sex	0.390	1	0.390	0.478	0.490	0.001
Substance use × sex	0.188	2	0.094	0.115	0.891	0.001

ANOVA = analysis of variance, DUIC = driving under the influence of cannabis, ^a*p* < 0.01, ^b*p* < 0.001

(i.e., variables that indicated DUIC was dangerous). In comparison, significant positive relationships were found for the remaining two dependent variables (i.e., variables that indicated DUIC are socially acceptable). To the best of our knowledge, this study is the first to implement an experimental vignette design to examine the perceived dangerousness and social acceptability of DUIC.

Table 5 Mean scores for the dependent variables as a function of the substance consumed by the vignette character

	Perceived dangerousness M (SD)	Social acceptability M (SD)	Harm to self M (SD)	Harm to others M (SD)	Stop driver from DUI M (SD)	Accept ride from driver DUI M (SD)
Cannabis	3.2 (1.1)	2.5 (1.4)	2.9 (0.8)	3.0 (0.9)	2.8 (1.1)	1.7 (0.9)
Alcohol	3.8 (1.0)	2.1 (1.4)	3.4 (0.7)	3.4 (0.7)	3.4 (0.8)	1.2 (0.6)
Tired	2.3 (0.9)	3.9 (1.3)	2.3 (0.8)	2.3 (0.9)	1.7 (1.0)	2.7 (1.1)

For social acceptability, higher scores indicate the behavior is perceived as more socially acceptable

Table 6 Effect size (Cohen's *d*) and significance of the main effect of substance use as a function of the dependent variables

	Cannabis vs. alcohol		Cannabis vs. tired		Alcohol vs. tired	
	<i>Cohen's d</i>	<i>p</i>	<i>Cohen's d</i>	<i>p</i>	<i>Cohen's d</i>	<i>p</i>
Perceived dangerousness	0.6	<0.001	0.9	<0.001	1.6	<0.001
Social acceptability	0.3	<0.006	1.0	<0.001	1.3	<0.001
Harm to self	0.6	<0.001	0.7	<0.001	1.5	<0.001
Harm to others	0.6	<0.001	0.8	<0.001	1.5	<0.001
Stop driver from DUI	0.6	<0.001	1.0	<0.001	1.8	<0.001
Accept ride from driver DUIC	0.6	<0.001	1.0	<0.001	1.7	<0.001

For the first research question, results confirmed our hypothesis that respondents perceived DUIC to be more dangerous than driving while tired but less dangerous than DUIA. Findings revealed a similar pattern regarding the social acceptability of DUIC wherein participants perceived DUIC to be less socially acceptable than driving while tired but more acceptable than DUIA. These findings coincide with survey-based research showing that many people believe DUIC is safer than DUIA (Fischer et al., 2006; Swift et al., 2010) and that cannabis has minimal impact on driving ability (e.g., Arnold & Tefft, 2016; Capler et al., 2017; Watson et al., 2019).

While it is promising that participants acknowledged to some degree the risk associated with DUIC, as evidenced by participants perceiving DUIC to be more dangerous and less acceptable than driving while tired, it remains somewhat concerning that DUIC is perceived as much safer and more acceptable than DUIA.

There are a number of plausible reasons for this finding. First, there remains much debate about the relative risks associated with DUIC (Wyatt & Novotna, 2021). It has been argued that DUIC may not have a negative effect on automobile-related harms (Hostiuc et al., 2018) and that the estimated risk for DUIC-related crashes has been overestimated with greater harms linked to DUIA than DUIC (White & Burns, 2021). This is in line with DUIC seemingly having become normalized in society with the perception that little danger is posed to oneself and a low likelihood of being in a car crash (Wickens et al., 2019). DUIC has also been perceived as convenient and viewed as a safe alternative to driving under the influence of other substances (Colonna et al., 2021). What is more, there remains scientific uncertainty about the association between cannabis consumption and level of impairment. For instance, findings have highlighted that impairment of driving ability may be dependent upon the potency of delta-9-tetrahydrocannabinol (THC), mode of consumption (i.e., oral vs. inhaled), and frequency of cannabis consumption (i.e., less impairment for regular consumers than occasional users; McCartney et al., 2021). Although meta-analyses have concluded DUIC is associated with greater risk for car crashes (Woo et al., 2020), level of impairment has been found to be dependent on the dose of THC consumed (Lenné et al., 2010; Sevigny, 2021) and strains of cannabis that promote stimulation may less negatively impact driving ability than strains associated with feeling high (Burt et al., 2021). Given the ongoing debate and uncertainties surrounding real DUIC risks (especially relative to DUIA), along with the range of factors that may influence actual level of

cannabis impairment, it seems likely that many participants did in fact believe DUIC to be less risky than DUIA.

Second, some participants may have believed that DUIC is less dangerous than DUIA because individuals impaired by cannabis may be able to compensate for their impairment. For example, research suggests that cannabis users tend to overestimate their degree of impairment and may attempt to compensate for the effects of cannabis on driving ability as illustrated by decreased driving speed, fewer passes or lane change attempts, and increased following distance (Alvarez et al., 2021; Sewell et al., 2009). In contrast, individuals who DUIA underestimate their level of impairment and engage in dangerous driving behaviors including driving at high speeds, more frequent attempts to overtake other vehicles, and driving closer to vehicles (Sewell et al., 2009; Smiley, 1999). Given that those who DUIC may appear to drive safer than people who DUIA, participants in the current study, most notably those participants who reported cannabis use, may believe that these compensatory behaviors are sufficient to mitigate the risk associated with DUIC. However, while compensatory driving behavior may decrease the likelihood of lane swerving or other tasks that require conscious control, it is unlikely to compensate for impairments in motor control, visual attention, and automatic driving behaviors (e.g., response time; Ramaekers et al., 2009, 2011; Sewell et al., 2009). Therefore, the perception that compensatory behaviors while DUIC would eliminate risk may be based on incorrect or incomplete evidence.

Third, DUIC detection is more difficult and less likely to result in criminal charges than DUIA (Ginsburg, 2019; Jonah, 2013). As a result, respondents in the current study may have rated DUIC as safer and more acceptable than DUIA as difficulties with detection methods suggest that drivers who DUIC are more likely to go undetected by police and less likely to face legal repercussions. Fourth, differences in the amount and distribution of awareness campaigns about DUIC compared to DUIA may help explain the current results. For example, awareness campaigns outlining the risks associated with DUIA exist in many forms, ranging from grass roots initiatives to large scale policy change, and have been widely distributed within the public for decades (Holder, 2000; Schermer et al., 2006). As such, it is likely that this messaging has permeated society and that these campaigns to some degree have impacted most members of the public. However, given the recency of cannabis legalization in Canada, DUIC awareness campaigns (Government of Canada, 2018) have not been extensively examined or refined like public health initiatives focused on DUIA but may benefit from emphasizing the associated risks with DUIC and highlighting the additive risks associated with DUI of cannabis coupled with alcohol (Pearlson et al., 2021). Fifth, the medicalization of cannabis may have impacted participant perceptions. Medicinal cannabis is often associated with higher cannabidiol (CBD) to THC ratios that do not negatively affect driving abilities to the same extent as products with higher levels of THC (Sevigny, 2021). As a result, it is plausible that participants viewed cannabis as a potentially therapeutic substance which may have impacted their perceptions of level of cannabis impairment and DUIC. Lastly, the overall finding that DUIC is considered more socially acceptable than DUIA aligns with past research on supportive cannabis use cultures where the substance is viewed to benefit society and individual consumers (Holm et al., 2014).

The second research question in this study explored whether perceptions of dangerousness and social acceptability varied based on the sex of the driver. While the results revealed a main effect of substance use across all dependent variables, a main effect of

sex was only found for social acceptability indicating that respondents considered it more socially acceptable for females to drive while impaired than males. One possible explanation for this may stem from research indicating that young females engage in less risky driving (Rhodes & Pivik, 2011) and are involved in fewer fatal crashes than male counterparts (Amarasingha & Dissanayake, 2014). As such, it is plausible that respondents believed it was more acceptable for the female vignette character to drive while impaired because she was less likely to engage in risky driving behaviors above the risk of DUI. This finding may also be explained by the fact that the current sample consisted mostly of female participants (75.5%) which may have contributed to a gender bias such that female participants were more likely to perceive female impaired driving as more acceptable than male impaired driving.

The final research question examined the relationships between participants' self-reported cannabis use frequency and their perceptions of dangerousness and social acceptability toward DUIC. Among participants assigned a vignette with a character who DUIC, results indicated significant inverse relationships between cannabis use frequency and variables measuring the perceived risk of DUIC. Respondents who used cannabis more frequently believed DUIC to be less dangerous and were less likely to stop someone from DUIC than those who consumed cannabis less frequently. Positive correlations were revealed between cannabis use frequency and variables measuring the social acceptability of DUIC and the likelihood of accepting a ride from a cannabis-impaired driver. These results align with our hypothesis and past survey-based research that has found a positive relationship between cannabis use and DUIC such that the more frequently individuals use cannabis, the less likely they are to consider DUIC as harmful (e.g., Bergeron et al., 2014; Fergusson et al., 2008; Statistics Canada, 2019).

This study has implications for improved public health and road safety as it highlights some of the discrepancies in how members of the public view the risks associated with DUIC compared to DUIA. These findings emphasize the need for more effective preventative measures such as educational campaigns about the dangers of DUIC especially since the rates of DUIC recidivism and fatal crashes do not decrease with an increase in the severity of punitive measures or law enforcement (Department of Justice, 2015; Public Safety Canada, 2021). Research suggests that campaigns designed using a theoretical framework, such as the protection motivation theory (PMT), effectively promote change to cognitions and health behaviors including drunk driving (Cismaru et al., 2009). Data suggests that higher self-efficacy, strong beliefs about the effectiveness of alternative behaviors, and lower perceived costs lead to high protection motivation levels (Floyd et al., 2000). PMT suggests that commonly used threat-based awareness campaigns are unlikely to promote awareness or effectively decrease the prevalence of DUIC. Instead, awareness efforts should aim to increase individuals' self-efficacy to refuse DUIC and choose alternative behaviors (Cismaru et al., 2009). Furthermore, given that youth and young adults are most vulnerable to cannabis-related harms, campaigns should make an active effort to appeal to this target demographic through the use of stimulating and non-traditional messaging (Capler et al., 2017). For example, creating interventions that focus on changing normative beliefs about DUIC through interactive platforms to share information between peers may be particularly effective (Cuijpers, 2002).

There are some important limitations to this study as well as opportunities for further research. The majority of our sample was female (75.5%) and Caucasian (92%), limiting the generalizability of our findings. Furthermore, the average age of our sample was 35.5 years, meaning our results may not represent the opinions of younger adults who are at the highest risk for DUI. Future research could utilize a similar vignette design but specifically target youth and young adults to examine public attitudes about DUI of substances in this age group. This vignette design could also be used to examine attitudes toward other behaviors found to be associated with negative driving outcomes such as driving while texting (Caird et al., 2014).

Conclusion

Utilizing an experimental vignette design novel to this area of study, the current research provides further evidence that the public perceives DUI as safer and more acceptable than DUIA. These findings support the further development of DUI awareness initiatives that provide detailed information about judging levels of cannabis-related impairment, guidelines for driving after consumption, and safe alternatives to DUI. Research concurrently examining the efficacy of these initiatives, especially among high-risk populations such as youth and frequent cannabis users, is imperative to ensure that initiatives lead to positive attitude and behavior change associated with DUI. Furthermore, further research exploring common misconceptions about DUI and factors that influence individuals' decisions to DUI will continue to help inform targeted awareness efforts.

Appendix 1 Examples of Experimental Vignettes

Participants will be presented with one of the following vignettes (or similar based on randomly assigned condition) followed by questions related to the activity in the vignette:

1. A description of a Caucasian male follows: Barry is a 22-year-old male attending a birthday party for his friend. He and his friends regularly get together on the weekends and use cannabis (also known as weed, marijuana, etc.). Barry can't stay out late that night, but he does use some cannabis before he has to leave. He starts to feel the effects of the cannabis and stops. Shortly after he leaves to drive himself home.
2. A description of a Caucasian female follows: Betty is a 22-year-old female attending a birthday party for her friend. She and her friends regularly get together on the weekends and drink alcohol. Betty can't stay out late that night, but she drinks some alcohol before she leaves. She starts to feel the effects of the alcohol and stops. Shortly after she leaves to drive herself home.

Appendix 2 Summary of Preliminary Analyses Examining Group Differences

Tables 7, 8

Table 7 Summary of ANOVAs of group differences on demographic variables and substance use

Variable	Sum of squares	<i>df</i>	Mean square	<i>F</i>	Sig
Age					
Between groups	1344.902	5	268.980	1.59	0.162
Within groups	66,212.347	391	169.341		
Total	67,557.249	396			
Education (years)					
Between groups	98.203	5	19.641	1.638	0.149
Within groups	4484.984	374	11.992		
Total	4583.187	379			
Cannabis use (12 months)					
Between groups	3.376	5	0.675	0.382	0.861
Within groups	753.010	426	1.768		
Total	756.387	431			
Alcohol use (12 months)					
Between groups	12.382	5	2.476	1.600	-.159
Within groups	657.762	425	1.548		
Total	670.144	430			

Table 8 Chi-square analysis of group differences between vignettes, sex, and ethnicity

	χ^2	<i>df</i>	Asymp. Sig
Vignette assigned	12.947	5	0.024
Sex	711.128	3	0.000
Ethnicity	1951.783	5	0.00

Author Contribution Megan A. Pollard contributed to conception, design, acquisition, analysis, data interpretation, drafted the manuscript, critically revised the manuscript, and agreed to be accountable for all aspects of the work ensuring integrity and accuracy. Dalainey H. Drakes made significant contributions to drafting the manuscript and agreed to be accountable for all aspects of the work ensuring integrity and accuracy. Nick Harris contributed to conception, design, acquisition, data analysis, and interpretation, critically revised the manuscript, and agreed to be accountable for all aspects of work ensuring integrity and accuracy.

Data Availability Data and materials for this study have not been made publicly available. The design and analysis plans were not pre-registered.

Code Availability No custom code was utilized. All statistical analyses were undertaken using *IBM SPSS Statistics Software* (version 25).

Declarations

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of Interdisciplinary Committee on Ethics in Human Research at Memorial University of Newfoundland (ICEHR #20190587-SC).

Consent to Participate All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study. Informed consent was obtained from all individual participants included in the study.

Consent for Publication Megan Pollard submitted an earlier version of this manuscript in partial fulfillment of the Doctorate in Clinical Psychology at Memorial University of Newfoundland; however, this is an original manuscript that has not been submitted elsewhere or previously published.

Conflict of Interest The authors declare no competing interests.

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