Original Article

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RISK PERCEPTION AND DRIVING A MOTOR VEHICLE UNDER THE INFLUENCE OF CANNABIS: A STUDY WITH COLLEGE STUDENTS OF A PRIVATE INSTITUTION

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ABSTRACT

Objective: to analyze the relationship between risk perception and behaviors related to driving a motor vehicle under the influence of cannabis.
Method: The research was carried out through a cross-sectional *survey*. 382 undergraduate students between the ages of 17 and 29 were interviewed at a private higher educational institution in the Federal District, Brazil. Descriptive and inferential statistics (cross tabulations and chi-square) were used to analyze the data.
Results: they indicate that more than 1/3 of the participants used cannabis in the past 12 months, and 36.4% reported problematic use. It was possible to establish a relationship between the behaviors of perception of risk and driving a motor vehicle under the influence of cannabis: 1) the perception of being sanctioned as a driver and driving a motor vehicle under the influence of cannabis ($\chi^2(1) = 3.96$, p=≤0); 2) to perceive damages as driver and driving a motor vehicle under the influence of cannabis ($\chi^2(1)=3.96$, p = ≤05); 3) perception of damages as passenger and driving a motor vehicle under the influence of cannabis ($\chi^2(1)=3.96$, p=≤5.0).
Conclusion: damages caused by cannabis are underestimated by university students, since they have a very low risk perception, especially when compared to alcohol. In Brazil, there is also a lack of regulation and sanctions with respect to driving a motor vehicle under the influence of cannabis, which may contribute to an important risk among this population.

DESCRIPTORS: Risk. Assumption of risks. Cannabis. Students. Driving under the influence. Illicit drugs.

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PERCEPÇÃO DE RISCO E CONDUÇÃO DE VEÍCULO AUTOMOTOR SOB O EFEITO DE MACONHA: UM ESTUDO COM UNIVERSITÁRIOS DE UMA INSTITUIÇÃO PARTICULAR

RESUMO

Objetivo: analisar a relação entre percepção de risco e comportamentos relacionados à condução de veículo automotor sob efeito de maconha.
Método: A pesquisa foi realizada por meio de um *survey* transversal. 382 estudantes de graduação entre 17 e 29 anos de idade foram entrevistados em uma instituição privada de ensino superior no Distrito Federal, Brasil. Foram realizadas estatísticas descritivas e inferenciais (tabulações cruzadas e qui-quadrado), utilizadas para a análise dos dados.
Resultados: indicam que mais de 1/3 dos participantes usaram maconha nos últimos 12 meses,36,4% relataram uso problemático. Foi possível estabelecer uma relação entre os comportamentos percepção de risco e condução de veículo automotor sob efeito de maconha: 1) a percepção de ser sancionado como motorista e condução de veículo automotor sob efeito de maconha ($\chi^2(1)=3,96$, p=≤,0); 2) perceber danos como motorista e condução de veículo automotor sob efeito de maconha ($\chi^2(1)=3,96$, p=≤05); 3) percepção de dano como passageiro e condução de veículo automotor sob efeito de maconha ($\chi^2(1)=,96$, p=≤5,0).
Conclusão: a maconha tem prejuízos subestimados pelos estudantes universitários, pois apresentam uma percepção de risco muito reduzida, especialmente quando comparada ao álcool. No Brasil, também há uma falta de regulamentação e sanções em relação à condução de veículo automotor sob efeito de maconha, o que pode contribuir para um risco importante entre essa população.

DESCRITORES: Risco. Assunção de riscos. Cannabis. Estudantes. Dirigir sob a influência. Drogas ilícitas.

PERCEPCIÓN DE RIESGO Y CONDUCCIÓN DE VEHÍCULO AUTOMOTOR BAJO LOS EFECTOS DE LA MARIHUANA: UN ESTUDIO CON UNIVERSITARIOS DE UNA INSTITUCIÓN PARTICULAR

RESUMEN

Objetivo: analizar la relación entre percepción de riesgo y conductas relacionadas a la conducción de vehículo automotor bajo los efectos de la marihuana.
Método: investigación realizada por medio de un *survey* transversal. Se entrevistaron a 382 estudiantes de grado entre 17 y 29 años de edad en una institución privada de enseñanza superior en el Distrito Federal, Brasil. Para analizar los datos, se realizaron estadísticas descriptivas e inferenciales (tabulaciones cruzadas y chi-cuadrado).
Resultados: indican que más de 1/3 de los participantes consumieron marihuana en los últimos 12 meses;36,4% relató uso problemático. Se pudo establecer una relación entre la conducta y la percepción de riesgo en el vehículo propulsado y conducido bajo los efectos de la marihuana: 1) la percepción de ser sancionado como conductor del vehículo y el efecto de conducción de la marihuana ($\chi^2(1) = 3,96$, p = ≤ ,0); 2) notar los daños como conductor del vehículo y conducir el vehículo bajo los efectos de la marihuana ($\chi^2(1) = 3,96$, p = ≤05); 3) la percepción del daño como pasajero y conducción de un vehículo automotor bajo los efectos de la marihuana ($\chi^2(1) = 96$, p = ≤5,0).
Conclusión: los estudiantes universitarios subestiman las pérdidas que genera la marihuana, dado que para ellos presenta una percepción de riesgo muy reducida, sobre todo cuando se la compara con el alcohol. En Brasil, también hay una falta de reglamentación y sanciones en relación a la conducción de vehículo automotor bajo efecto de la marihuana, lo que puede contribuir a un riesgo importante en esta población.

DESCRIPTORES: Riesgos. Toma de riesgos. Cannabis. Estudiantes. Conducir bajo influencia. Drogas ilícitas.

INTRODUCTION

Driving involves a series of abilities, such as cognitive and perceptive skills and psychomotor activities.[1–3] These abilities may be adversely affected by the use of psychoactive drugs. Psychoactive substances can decrease functions that are important for driving a motor vehicle, such as: alertness, attention, and processing speed, reaction time, and depth perception. Therefore, driving under the influence of psychoactive drugs is a factor that has been pointed out as an important risk for accidents involving motor vehicles, especially among young adults.[4]

Internationally, motor vehicle accidents are the leading cause of death among young adults aged 16-29.[5–7] Young adults also have the highest rates of drug use when compared to the overall population, which may represent a greater risk factor for the presence of risk behaviors, including driving a motor vehicle.[6]

The number of road deaths has increased in Brazil. Over the past 10 years, road deaths have been responsible for an average of 37 deaths per 100,000 and the average growth rate is 3.7% per year.[7–8]

The Brazilian Traffic Code establishes as a very serious violation driving under the influence of alcohol or any other substance that causes dependence. Penalties vary from license suspension, fines to the driver, and even detention. For alcohol, penalties may be imposed upon detection of: (a) 6 or more decigrams of alcohol per liter of blood, (b) 0.3 or more milligrams of alcohol per liter of alveolar air, or (c) signs showing impairment of psychomotor skills, pursuant to the law. It is noteworthy that, even though it is provided by law to supervise and penalize the use of cannabis and other illicit drugs while driving, the actions and penalties are almost exclusive to alcohol.[10]

In Brazil, the number of publications on the use of alcohol behind the wheel has grown in recent years, especially after the Brazilian drinking and driving law was tightened up and gradually became more intolerant and punitive for drivers who drink and drive. In any case, there are not many publications on the use of cannabis (and other illicit drugs) behind the wheel. In addition, few studies have explored how cannabis can affect skills related to driving a motor vehicle and lead to injury and mortality in traffic.[11]

Prevalence data show that cannabis is one of the most commonly used drugs in the southern hemisphere, ranking first among illicit drugs.[12] Prevalence data available for the period between 1994 and 2013 show that the population's current use of cannabis has increased (from 0.7% in 1994 to 8.3% in 2012[11]).

The Household Survey on the Use of Psychotropic Drugs in Brazil (LENADU) revealed that men had a higher use of cannabis, solvents, cocaine, hallucinogens, crack, merla, and steroids, while women had higher consumption of benzodiazepines, stimulants, appetite suppressants, and narcotics.[13] The use of cannabis in Brazil does not have the same dimension as alcohol, but it is of equal importance, as it can also adversely affect the driver's ability to drive a motor vehicle.

In Brazil, the use of illegal drugs, although small compared to the consumption of alcohol and tobacco, is alarming among specific populations such as university students. In 2010, a national survey with university students in the 27 capitals of Brazil[13] revealed that in the past year 26.1% had used cannabis (almost four times more than the general population) and 9.7% had used cocaine (almost three and a half times more than the general population). The study also revealed that 18% reported driving after consuming alcohol, and 30% reported having hitchhiking with a drunk driver.[13–15]

University students are a subgroup of the young population and also the group with the highest rates of illicit drug use.[16] In Brazil, it is estimated that, among this population, 13.8% used cannabis in the last year. Driving under the influence of drugs (DUI) is significantly associated with frequent use

of cannabis.[13–14] It is the most prevalent illicit drug among drivers involved in DUI.[17] Men are the ones who most report use of cannabis and driving a motor vehicle after using the drug.[11,18–19]

Regarding risk behaviors and perceptions, it is noted that people who use cannabis are more prone to the risk of hitchhiking in a vehicle driven by an intoxicated driver.[20] In addition, they may also be more likely to drive a vehicle under the influence of some psychotropic drug. This is also associated with an increase of at least twice in the risk of being a passenger in a vehicle driven by a driver under the influence of some psychoactive substance.[19]

With regard to the perception of the harmful effects of cannabis, many young adults state that smoking cannabis before driving does not affect their ability to operate a motor vehicle. People with lower levels of risk perception are more likely to drive under the influence of cannabis (DUIC). Similarly, recent evidence also shows that cannabis users do not consider their drug use or DUIC dangerous.[16,21]

Given this scenario, the objective of this study is to analyze the relationship between risk perception and behaviors related to driving a motor vehicle under the influence of cannabis.

METHOD

A quantitative study was carried out through a cross-sectional *survey*. Research participants were undergraduate students between the ages of 17 and 29, enrolled in face-to-face courses at a higher educational institution in the Federal District. The chosen institution had 10,000 students enrolled in regular and face-to-face courses at the Campus elected as the research field.

The size of the sample was estimated from an online sample calculator (*SurveyMonkey)* and was based on the total number of students enrolled in the courses of the elected Campus. The established sample was of 380 students and was selected in three stages. First, a random sample of two courses or their equivalent (institutes, departments, colleges) were drawn. At this stage, the Psychology and Pedagogy courses were drawn. In the second stage, classes were randomly selected from each of the selected courses. The random number method was used for random selection in the first and second phases. During the third and last phase of the sampling process, a non-probabilistic sample of students was recruited from the classrooms or amphitheaters of the selected classes. Therefore, only those who attended the class on the day of application of the questionnaire were included. The second and third sampling phases (class selection and student recruitment) were repeated until the desired sample size was reached.

To participate in the study, students should be enrolled in a face-to-face undergraduate course and be between the ages of 17 and 29. In addition, participants signed the Free and Informed Consent before answering the questionnaire.

The instrument used in this study was a self-administered questionnaire composed of six sections and 59 items. To evaluate the dependent variable, behaviors related to DUIC, the items were adapted from the *Ontario Student Health and Drug Use Survey* (OSHDUS). These items asked how often students had driven a motor vehicle or had been passengers in a car driven by someone under the influence of alcohol and/or cannabis during the past year. Possible answers included “Never”, “Once”, “2 times”, “3 times”, and “8 times or more”.

To evaluate the main independent variable, risk perception associated with driving a motor vehicle under the influence of cannabis, the items were developed in the form of statements that can be divided into the following categories: risk of damage, risk of detection, and risk of sanctions. These statements relate to possible events associated with driving a motor vehicle under the influence of cannabis, for example: “the police in your city will detect someone who is driving under the influence of cannabis”. Each item required participants to rate their perceptions related to the probability of an

event using a Likert scale, ranging from Very Unlikely to Very Likely. Given the nature of the assertions, a higher probability corresponds to a higher level of perceived risk.

To estimate the use of cannabis, the items were adapted from previous OAS/CICAD surveys conducted throughout the Americas. These items used dichotomous "Yes/No" response options to evaluate use of cannabis in the last year and month. General items on drug use were followed by items from the *Cannabis Abuse Screening Test* (CAST). This scale operationalized the variables type of cannabis use. The questionnaire also included items to collect demographic information such as: age, sex, and whether the participants drive and own a driver's license.

An electronic database was created using the *Statistical Package for the Social Sciences* (SPSS) version 21. Next data were cleaned to identify and resolve inconsistencies, missing data, and incorrect entries. Data was analyzed using descriptive and inferential statistics. Descriptive statistics were used to determine the characteristics of the sample with respect to the key variables (e.g., age, sex, prevalence of use, type of use). Inferential statistics were used to test the several research hypotheses. First, chi-square analyzes and cross-reference tables were used to assess the relationship between risk perception and DUIC-related behaviors. Second, chi-square and cross-reference tables were used to investigate the relationship between DUIC by members of the students' social network and perception of risk and behaviors related to DUIC.

RESULTS

The total number of students interviewed was 382. The age group that concentrated the most students was 17 to 21 years old, with only 0.8% (n=3) being 17 years old. The average age was 23 years (*SD*=3) and almost 2/3 of the interviewees (62.6%, n=239) reported driving a motor vehicle. Regarding sex, almost 3/4 of the sample was composed of women.

Table 1 – General information about the sample, Brasília, Brazil, 2016

Variable	%	n
Age		
17-21	45.0	172
22-25	36.4	139
26-29	18.6	71
Gender		
Men	22.8	87
Women	77.2	295
Use of Cannabis in the last 12 months		
Yes	10.6	40
No	89.4	338
Problematic use of Cannabis among users	36.4	12

Based on Table 1, it is possible to verify that a little more than 10% declared the use of cannabis in the same period. Regarding the problematic use, it was identified that 36.4% of the interviewees face this problem.

Driving a motor vehicle, use of cannabis, and perception of risk

The perception of risk is an important factor for the occurrence of risk behaviors, in this case, for driving a motor vehicle under the influence of cannabis. Table 2 presents the interviewees' risk perception regarding detection (How likely is the police in your city to spot a driver who is driving under the influence of cannabis?), sanction (How likely is a driver in your city to receive a sanction (for example, being arrested, imprisoned, fined, warned) for driving under the influence of cannabis? and damages (How likely is a driver who has used cannabis to be involved in a motor vehicle accident?):

Table 2 – Driving a motor vehicle under the influence of psychoactive substance, perception of risk, Brasília, Brazil, 2016

	Perception of risk			
	Likely		Unlikely	
	%	n	%	n
Alcohol				
Detection	82.3	303	17.7	65
Sanction	81.2	301	18.2	67
Damages	97.0	355	3.0	11
Marijuana				
Detection	40.8	150	59.2	218
Sanction	39.7	146	60.3	222
Damages	67.7	247	32.3	118
Alcohol and Cannabis				
Detection	74.6	273	25.4	93
Sanction	75.7	277	24.3	89
Damages	89.6	327	10.4	38

By looking at Table 2, it is possible to verify that the interviewees' greater perception of risk (regarding detection, sanction, and/or damages) is more significant with respect to alcohol. It is noteworthy that almost all interviewees perceive damages associated with alcohol consumption. The perception of risk with respect to cannabis is quite reduced in comparison to alcohol, being approximately 50% smaller for the perception of risk in relation to detection and sanction. The perception of damage is also reduced, about 1/3 lower in relation with alcohol. About 3/5 of the interviewees consider it unlikely that driving under the influence of cannabis would result in detection of and/or sanction against the driver.

Driving a motor vehicle, use of alcohol and cannabis, and related behaviors

The risk behaviors associated with driving a motor vehicle under the influence of alcohol and/or cannabis and those associated with the act of hitchhiking with some driver under the influence of these drugs are important data in order to assess the investigated group's degree of risk, as well as which of the drugs, regarding those surveyed, pose a greater risk to both the driver and the passenger. Table 3 shows the risk behaviors regarding DUI related to the driver (In the last 12 months, how many times have you driven a motor vehicle 2 hours after consuming alcohol (at least two doses) and/or

using cannabis?) and the passenger (In the last 12 months, how many times have you hitchhiked to someone who had consumed alcohol and/or used cannabis?):

Table 3 – Risk behaviors associated with driving a motor vehicle under the influence of alcohol and/or cannabis, Brasilia, Brazil, 2016

	Involved in DUI * – Behaviors			
	Yes		No	
	%	n	%	n
DUI of Alcohol				
Driver	30.7	69	69.3	156
Passenger	67.2	244	32.8	119
DUI of Cannabis				
Driver	29.4	10	70.6	24
Passenger	11.7	40	88.3	302
DUI of Alcohol & Cannabis				
Driver	30.4	7	69.6	16
Passenger	9.1	31	90.9	310

*DUI: Driving Under the Influence of substances.

Alcohol, among the drugs and arrangements surveyed, is the drug that poses the greater risk to drivers and passengers. 1/3 of those interviewed said that they had already driven a motor vehicle within two hours after consuming 2 or more doses of alcohol. There is also a significant risk for passengers, 2/3 of them said they had already hitchhiked with someone who had consumed alcohol.

Risk Perception X Risk Behaviors associated with driving a motor vehicle under the influence of psychoactive substances

The results presented below are intended to evaluate the relationship between risk perception and behaviors related to driving a motor vehicle under the influence of cannabis or both cannabis and alcohol. Through the *cross table* and chi-square analysis, the significant relationships were:

The relationship between risk perception and risk behavior is expressed in only three arrangements. The first one refers to the relationship between the perception of being sanctioned, as a driver, and driving a motor vehicle under the influence of cannabis ($\chi^2(1)= 3.96$, p=≤.05). The second one is between perception of damages, as a driver, and driving motor vehicles under the influence of cannabis ($\chi 2(1)=3.96$, p=≤.05). The third one refers to perception of damages, as a passenger, and driving a motor vehicle under the influence of cannabis ($\chi^2(1)=3.96$, p=≤.05). Thus, it is possible to say that there is a relationship between risk perception and behaviors related to driving a motor vehicle under the influence of cannabis.

There is a relationship between risk perception and social network behaviors associated with DUIC only in one arrangement: social network members driving under the influence of cannabis and perception of damages associated with DUI ($\chi^2(1)=3.90$, p=≤.05). Thus, it is possible to say that DUIAC, by members of the social network of these students, is associated with risk perceptions and behaviors related to DUIC.

It was also possible to note a relationship between DUIC passengers who have a social network involved in vehicle driving situations under the influence of cannabis and risk perception (only sanction

and damages) ($\chi^2(1)=35.22– 6.86$, p=≤.001). Finally, there was also a significant relationship among DUIC passengers who have a social network involved in situation of driving under the influence of alcohol and cannabis (at the same time) and risk perception (detection, sanction, and damages) ($\chi^2(1)=18.53$-21.01, p=≤.001).

DISCUSSION

The most prevalent age group in this study was similar to that found in the I National Survey on the Use of Alcohol, Tobacco and Other Drugs among University Students of the 27 Brazilian Capitals – with 1.8% of undergraduates being 18 years of age and 58% between 18 and 24 years old.[13,22] Regarding sex, a significant predominance of women is due to the fact that the courses selected in the first phase of the sampling process were Psychology and Pedagogy, courses mostly composed of women. Regarding use of cannabis in the last 12 months, the results of this study also resemble that of LENADU (13.8% used cannabis/hashish/skunk in the last year).[13–14]

The vast majority of the interviewees found it unlikely that the cannabis users would be detained and/or punished. This is possibly due to the lack of regulation and inputs for monitoring the use of illicit drugs behind the wheel, especially cannabis. In Brazil, almost all regulations, technology, and monitoring are only for detection of alcohol.

The 'problematic use' in this study was 4.6 higher than that reported by LENADU (7.8% use cannabis at a moderate risk).[13] This is a significant discrepancy, but it is not possible to establish the determinants for these variations. However, it is important to emphasize that the idiosyncrasies of the participants of this research (only two courses surveyed, most of women, and a private teaching institution) may have played an important role in these results.

Compared to LENADU's results (18% reported driving after consuming 4 doses of alcoholic beverage),[13] it is possible to note that the use rate among people participating in this research is higher, almost double. The same happens with those who, in LENADU, claim to have hitchhiked with an alcoholic driver (27%); in comparison, participants in this study also have a higher rate of use, more than double.

Regarding cannabis and the combined use of cannabis and alcohol, it is possible to note that, in both cases, the risk as a driver is much higher (more than double) than as a passenger. If we compare the percentages of those who consumed alcohol before driving and those who consumed alcohol and cannabis at the same time, before driving, it is possible to see that there is no significant difference. However, when analyzing those who were passengers of these drivers, the variation is very large: 7 times higher for those who hitchhiked with a driver who consumed only alcohol.

With respect to the objective of the research, it was possible to find the relationship between risk perception and risk behaviors in only three arrangements: 1) relationship between the perception of being sanctioned as a driver and driving under the influence of cannabis; 2) relationship between perception of damages as a driver and driving under the influence of cannabis; and 3) relationship between perception of damages as a passenger and driving under the influence of cannabis. With respect to the social network, it was possible to verify only the relationship between the situation in which social network members drive under the influence of cannabis and perception of damages associated with DIU.

The limitations of this study are based on three aspects: a) field of research – data was collected in a private higher educational institution. It is reasonable to assume that there may be significant differences with respect to public higher educational institutions and even other private institutions; b) limitations on access to information – data was collected in only two courses from only one Campus in only one private college. Other Campuses, other courses, and other private institutions could have showed results with significant differences for the results found; c) sample idiosyncrasies: 2/3 of the

sample were composed of women, this is a clear bias of the results of this research. In addition, the last phase of the sampling process was not probabilistic.

CONCLUSION

The results on the prevalence of the use of cannabis indicated that just over 1/3 of the interviewees had used cannabis in the past 12 months. It was found that these findings were relatively smaller, in terms of use rate, when compared to other studies with this same type of population, in a national context. Regarding the problematic use, it was found that almost 1/3 of those interviewed had a problematic use of cannabis. These results are at least one time higher than those found in national studies with this same population.

The results showed that the highest risk perception of the interviewees is related to cannabis and even the combined use of alcohol and cannabis. The perception of risk regarding cannabis was significantly reduced when compared to alcohol, about 50% lower for perception of risk with respect to detection and sanction. The perception of damages was also reduced, about 1/3 lower when compared to alcohol.

Nevertheless, the results of this investigation are important to help the better understanding and formulation of new research hypotheses about the practice of driving a motor vehicle under the influence of psychotropic substances among university students. Especially with regard to cannabis, which has a double problem: 1) its harms are underestimated by university students, since they have a very low perception of damage, especially when compared to that presented with respect to alcohol; 2) the gaps in regulations, technology, and monitoring for detection and sanctions of the practice of driving under the influence of cannabis. Thus, it is believed that this paper has the potential to contribute to public and even institutional policies (within educational institutions) for prevention, awareness, regulation, and monitoring of practices related to driving motor vehicles under the influence of alcohol and/or cannabis.

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NOTES

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Discussion of the results: Mendes JAA, Mann R, Khenti A.
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There is no conflict of interest.

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