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## ORIGINAL ARTICLE

### Alcohol consumption and depressive symptoms as predictive factors of risk behaviors in urban transport drivers

*Consumo de alcohol y síntomas depresivos como factores predictores de conductas de riesgo en conductores de transporte urbano*

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#### ABSTRACT

**Background:** In Peru, there are alarming statistics regarding traffic accidents caused by drivers under the influence of alcohol and emotional problems. **Objective:** This study aimed to identify whether alcohol consumption and depressive symptoms are predictors of the perception of risky behaviors in drivers. **Method:** The methodology followed a quantitative approach with a predictive scope, non-experimental design, and cross-sectional study. A non-probabilistic sample of 310 drivers aged 18 to 54 years was used, of whom 95% were male. The study utilized the Alcohol Use Disorders Identification Test (AUDIT), the Patient Health Questionnaire-9 (PHQ-9), and the Aversion to Risk Taking Scale to assess the participants. **Results:** Four out of 10 drivers exhibited depressive symptoms, and 7 out of 10 presented alcohol consumption issues. Regarding linear regression, an increase in alcohol consumption and depressive symptoms predicted 48.3% of the variance in the perception of risky driving behaviors. **Conclusion:** It is concluded that increased depressive symptoms and alcohol consumption are predictors of a decreased perception of risky driving behaviors. Future studies could implement interventions aimed at reducing risky behaviors by addressing depression and alcohol dependency in drivers.

**Keywords:** depressive symptoms; alcohol consumption; risk behavior; transportation; drivers.

#### RESUMEN

**Introducción:** En el Perú existen cifras alarmantes de accidentes de tránsito provocados por conductores en estado de ebriedad y problemas emocionales. **Objetivo:** Este estudio se propuso identificar si el consumo de alcohol y los síntomas de depresión son factores predictores de la percepción de conductas riesgosas en conductores. **Método:** La metodología corresponde a un enfoque cuantitativo, alcance predictivo, diseño no experimental y corte transversal; se realizó en una muestra no probabilística de 310 conductores entre 18 y 54 años, donde el 95% fueron varones. Se evaluó con el Cuestionario Identificación de Trastornos Relacionados con el Uso del Alcohol, Cuestionario de Salud del

Paciente-9 y el Cuestionario Aversion to Risk Taking Scale. **Resultados:** Encontramos que 4 de cada 10 conductores presentaron síntomas depresivos y 7 de cada 10 problemas de consumo de alcohol. Referente a la regresión lineal el incremento de consumo de alcohol y los síntomas de depresión predicen un 48.3% de la varianza de la percepción de conductas riesgosas al conducir. **Conclusión:** El incremento de los síntomas de depresión y consumo de alcohol son predictores de la disminución de la percepción de las conductas de riesgo al conducir. Estudios posteriores podrían implementar intervenciones para disminuir conductas riesgosas a partir del tratamiento de la depresión y dependencia al consumo de alcohol en conductores de autos.

**Palabras claves:** síntomas depresivos; consumo de alcohol; conducta de riesgo; transporte; conductores.

## INTRODUCTION

World reports indicate that annually, 1.19 million people die in traffic accidents, and one person is killed every two minutes (United Nations, 2022). Therefore, traffic accidents have been considered a public health problem (Pan American Health Organization, 2023). Aspects that increase the risk of having traffic accidents are alcohol consumption and psychological factors, such as depression or aggressiveness (Borja et al., 2023). In Peru, there is a constant increase in traffic accidents; in 2022, more than 100,000 accidents were reported (Superintendencia de Transporte Terrestre de Personas Carga y Mercancías, 2024), and more than 13% of these accidents are due to driver recklessness (Observatorio Nacional de Seguridad Vial, 2024); in 2024, in the first four months in Lima, 140 cases of traffic accidents were reported due to driver recklessness, mainly due to drunkenness (Rojas, 2024). Likewise, the regions with the most traffic accidents were La Libertad with 53 accidents, and Puno with 26 accidents (Observatorio Nacional de Seguridad Vial, 2024). In the department of Puno, a daily increase in traffic accidents has been reported, with 120 accidents reported, 77 injured, and 29 deaths, making it the region with the second highest number of deaths due to drunk driving (Defensoría de accidentes de tránsito, 2023).

On the other hand, in the Peruvian context, 20% of the adult population suffers from a mental disorder; among the most common are depression and alcohol dependence (Ombudsman's Office, 2022). These actions endanger public transportation. Since its influence on mental health can impact driving ability (Valdés, 2021). In a recent ranking of countries that drink the most alcohol in Latin America, Peru is in third place, after Argentina and Brazil (El Comercio, 2024). Also, a 2022 report indicated that approximately 70% of adults in Peru consume alcohol moderately or heavily in urban areas of Peru, with males (68.8%) being the highest consumers (Instituto Nacional de Estadística e Informática, 2022). The consumption of alcoholic beverages, even in minimal amounts, increases the probability of being involved in road incidents, as it affects the perceptual capacity to drive safely, such as visual acuity, reaction times, and the ability to make informed decisions (PAHO, 2021). Alcohol is a psycho-depressant because even in small doses, it "suppresses" the central nervous system, alters consciousness, and slows cognitive and physiological abilities such as breathing or heart rate; it can also cause traffic accidents or even death (Ahumada-Cortéz, 2017). In addition, excessive alcohol consumption can act as a trigger or aggravating element of depression and generate risk behaviors (García-Perales et al., 2023).

Likewise, the problem of depression is a global challenge since at least 5% suffer from this disorder, and symptoms such as poor

concentration, thoughts of death or suicide, and hopelessness about the future could have fatal consequences in those who suffer from it (World Health Organization [WHO], 2023), in the Peruvian context, 280 917 cases of depression were treated in 2023 (Ministry of Health, 2024). Among the risk factors for depression were marital status, gender, living in the highlands or jungle, and consuming alcoholic beverages (Zeñas-Trujillo & Vera-Ponce, 2024). Therefore, when a driver has depressive symptoms, it can cause excessive alcohol consumption, affecting their thinking behavior and causing many times road incidents due to speed and distraction of the driver of vehicles (Comisión Nacional de Seguridad de Tránsito [CONASET], 2018). Likewise, when more alcohol is consumed, visual impairment is noticed, especially in the form of double vision; consequently, it impairs drivers, causing accidents on public roads causing injuries or even fatalities (Alessandrini, 2022).

Risky driving behaviors are voluntary or involuntary actions that can lead to fatal consequences (Corona & Peralta, 2011). Some risky behaviors reported by 36% of drivers are running red lights, and approximately 3 out of 10 drivers admit to drinking alcohol while driving (García-Domingo, et al., 2020); others reported speeding (Machin & Sankey, 2006). Such is the case of some studies, such as the one conducted in Bogotá, Colombia, in urban public transport drivers with 165 drivers, in which they stated that there is a significant relationship between the use of alcohol and tobacco in risky behaviors (Calvache-Dorado et al., 2022), in Mexico a study was conducted in drivers of heavy cargo transport, where a statistically significant correlation was observed between fatigue and alcohol consumption among drivers (García-Perales et al., 2023). Likewise, in Medellín, drivers who operate public transport vehicles in urban environments consume alcohol in most cases, with the possibility of risky and harmful consumption and causing accidents on public roads (Molina, et al., 2011). On the other hand, in Chile, drivers who drive public transport indicate that alcohol consumption was aimed at reducing stress caused by work worries, which cause accidents (Arias-Meléndez et al., 2022). Likewise, in Chile, it has been observed that cargo and urban transport drivers have a significant relationship with alcohol consumption and road incidents due to the various activities of the companies they perform as part of their social life, which cause accidents at work (Silva et al., 2014).

Also, a study conducted with automobile drivers (e.g., 431 Peruvians and 501 Dominicans) found that alcohol use significantly increased drivers' risk of traffic accidents (Cherpitel et al., 2021). Similarly, a study conducted in Lima found a relationship between personality trait extraversion and burnout syndrome in public transport drivers; the personal accomplishment di-

mension showed associations with the number of children, monthly salary income, and alcohol consumption. In addition, a prominent correlation was found with the level of secondary education (58%) and with a job tenure of 10 years or more with 46% (Santa et al., 2019). This study seeks to identify the elements related to alcohol consumption and symptoms of depression as risk behaviors to develop tactics to prevent and promote mental health and methodologically valuable for this specific context, as it allows to expand the data and compare them with other similar studies about road safety and traffic psychology. Therefore, the study aimed to determine whether alcohol consumption and symptoms of depression are predictors of the perception of risky behaviors in urban transport drivers in Juliaca, Peru.

## METHODS

### Design and context

The study is a cross-sectional study (Ato et al., 2013) developed in drivers of urban service cars in the city of Juliaca, department of Puno, Peru.

### Participants

A sample of  $n = 310$  participants participated using non-probabilistic convenience sampling since the selection of participants was by convenience considering some inclusion criteria, such as being driving an urban transport car during the application of the survey, being over 18 years of age, being male or female, Peruvian nationality, and giving informed consent. On the other hand, we excluded those who accompanied the driver as a collector or support, those who partially answered the survey, and those who presented some permanent or temporary condition that prevented them from answering the questions coherently.

### Instruments

The variables used were alcohol consumption (AUDIT) symptoms of depression (PHQ-9) as predictors of the perception of risky behaviors (ARTS) in urban transport drivers in the city of Juliaca.

Alcohol Use Disorders Identification Questionnaire (AUDIT): It was developed by the World Health Organization (WHO) to be used as a screening tool for alcohol consumption, the effects that are present are: Aggressiveness, irrational behavior, arguments, depression, social and occupational problems (Babor et al., 2001), The questionnaire consists of 3 dimensions (risk consumption, symptoms of dependence and harmful alcohol consumption), 10 items, which was validated in Peru by Anel Cecilia Colán Herrera and Fernando Joel Rosario Quiroz in the year 2022, evaluated through a Likert scale from 0 to 4, and validated by expert judges, obtaining an Aiken V of 0.80, the reliability analysis in the Comparative Fit Index (CFI) is 0.99 and the Tucker-Lewis Index (TLI) is 0.98, the approximation error (RMSEA) is 0.06, the standardized root mean square residual (SRMR) is 0.03, NFI: 0.99, adjusted goodness-of-fit index (AGFI) is 0.98, Cronbach's Alpha internal consistency is 0.86 and McDonald's  $\omega$ : 0.875 (Colán & Rosario, 2022).

La Patient Health Questionnaire (PHQ-9): This depression assessment scale is based on DSM-IV diagnostic criteria based

on occurrences in the last two weeks. It originally had a unidimensional structure and consisted of 9 items with Likert-type response options where Not at all = 0 and almost every day = 3; from the responses, a score between 0 and 27 points can be obtained. The Peruvian version (Villarreal-Zegarra et al., 2023) presented a cut-off point for presence of depressive symptoms  $\geq 7$  points, also presented strong evidence of structural validity ( $\chi^2=251.9$ ;  $df=27$ ;  $CFI=0.974$ ;  $TLI=0.965$ ;  $SRMR=0.051$ ;  $RMSEA=0.079$ ) as well as optimal reliability ( $\alpha=0.89$ ;  $\omega=0.86$ ).

Questionario Aversión to Risk Taking Scale (ARTS): Originally developed in Australia and the United Kingdom by Dorn and Machin in 2004, it was initially constructed with eight items to measure the perception of risky behaviors such as being overconfident and not respecting traffic regulations, running red lights, driving while talking on the cell phone, among others. Subsequently, an adaptation was developed in Argentina, characterized by being unidimensional and with categorical Likert-type responses from 1 to 5, in Argentine drivers has shown adequate adjustments ( $CFI = 0.98$ ,  $TLI = 0.97$ ,  $RMSEA = 0.065$ ,  $WRMR = 0.64$ ) as well as strong evidence of reliability through ordinal alpha = 0.77 (Trógolo et al., 2019). Therefore, the instrument was validated by five judges among police officers and expert psychologists to apply the instrument to the Peruvian context, resulting as valid, in terms of reliability, it has presented adequate levels since Cronbach's coefficient is ( $\alpha = 0.70$ ) placing it as very reliable.

### Procedures

With prior authorization from the respective authorities of the transportation companies in Juliaca, Puno, Peru. Two surveyors applied the survey to the drivers at these companies' bus stops or terminals. The survey was presented virtually using a printed form. The survey initially provided informed consent; only those who agreed to participate voluntarily could answer the questions. The questionnaires were administered at available times, in a personal manner, explaining the purpose of the research. In addition, anonymity and confidentiality of the responses were guaranteed, respecting ethical principles and using personal data exclusively for research purposes. The survey was applied between June and July 2024.

### Data Analysis

The data were analyzed statistically using the Statistical Package for Social Sciences SPSS version 26. Initially, descriptive analyses were performed for numerical variables, using measures of central tendency, dispersion, skewness, and kurtosis ( $g1$  and  $g2 < \pm 1.5$ ), while for categorical variables, absolute and relative frequencies were used.

Next, simple and multiple linear regression analyses were performed considering the normal distribution of the data, for which we considered risk perception while driving as the dependent variable. Standardized beta values and their respective 95% confidence intervals were estimated.

### Ethical aspects

Our study was approved by the Faculty of Health Sciences Ethics Committee of the Universidad Peruana Unión with Re-

port No 2024-CEB-FCS-Upeu-069. Likewise, it respected all the principles of research on human beings of the Declaration of Helsinki, such as the use of informed consent, confidential and anonymous handling of data, and respect for the dignity of the participants.

**RESULTS**

Participants reported an average age of 37 years (37.21 ± 10.233), an average of one child (1.70 ± 1.736), and an average of six years of driving experience (6.79 ± 4.387). Most 293 (94.5%) were male, 135 (43.6%) were cohabitants, 184 (59.4%) lived in urban areas, and 199 (64.2%) of the participants had high school (Table 1). We also found that 219 (70.6%) presented symptoms of alcohol use disorder, 145 (46.8%) depressive symptoms, and 166 (53.5%) presented high levels of risk perception when driving.

Likewise, it is observed that all the study variables present a normal distribution ( $g1 < \pm 1.5$ ). While alcohol consumption and its dimensions reported a minimum mean of (1.703 ± 1.098) in the risk consumption dimension and a maximum (7.445 ± 4.346) in the overall score, depressive symptoms presented an average score 8 (8.471 ± 6.481) which is above the cut-off point for presence of depressive symptoms (PHQ-9 > 7) and an average of 29 points close to a perception of high risk when driving (29.374 ± 6.420) (Table 2).

At the predictive level, we found that a one-unit increase in the dependence symptoms dimension decreases 1.44 units in the perception of risk when driving ( $\beta = -1.445$ ; 95% CI = -1.961 to -0.928;  $p = 0.000$ ), but in the adjusted model it was no longer significant ( $p = 0.114$ ). On the other hand, in an adjusted model, a one-unit increase in depressive symptoms will decrease the perception of risk when driving by 0.66 units ( $\beta = -0.662$ ; 95%CI

**Table 1.** Bio-socio-demographic characteristics of participants.

	M	SD
Age	37.21	10.23
Number of children	1.7	1.74
Years of experience as a driver	6.79	4.39
	N	%
Sex		
Male	293	94.5
Female	17	5.5
Education level		
Primary	7	2.2
Secondary	199	64.2
High School	104	33.6
Civil Status		
Single	94	30.3
Cohabitant	135	43.6
Married	59	19
Divorced	15	4.8
Widowed	7	2.3
Place of residence		
Urban	184	59.4
Rural	126	40.6
Alcohol consumption		
No symptoms	91	29.4
With symptoms	219	70.6
Depressive symptoms		
No symptoms	165	53.2
With symptoms	145	46.8
Perception of risk when driving		
Low and moderate risk	144	46.5
High risk	166	53.5

Note. M: Mean. SD: Standard Deviation.

= -0.750 to -0.575; p= 0.000). At the multiple linear regression level, the independent variables predicted 48.3% of the explained variance of risk perception while driving ( $R^2= 0.483$ ; p= 0.000) (Table 3).

**DISCUSSION**

The general objective of this research was to determine whether alcohol consumption and depressive symptoms are predictors of the perception of risky behaviors, which resulted in alcohol consumption and depressive symptoms predicting 48.3% of the explained variance of the perception of risky behaviors. In this regard, similar results were found in which it was affirmed that alcohol consumption and depressive symptoms act as risk factors that lead to traffic accidents due to non-compliance with road safety regulations (Arias-Meléndez et al., 2021). Likewise, in Ecuador, a study on drivers shows that alcohol consumption psychological problems such as depression are factors that lead to inappropriate behaviors ending in traffic accidents because this combination of disorders prevents drivers from becoming aware of the risks to which they are exposed (Amancha, 2015). Another study found that drivers with emotional problems such as depression are less aware of the risks that may occur, such as exceeding the speed limit (Ponce, 2015).

On the other hand, it has been found that an increase in alcohol dependence symptoms decreases the perception of risk when driving by up to 1.44 units. Although this result loses statistical significance in an adjusted model, it presents an approximation to the problem of driving cars when there are symptoms of alcohol dependence, which is related to the predisposition to poor mental health and increased depressive symptoms (Jacob et al., 2021). Problematic alcohol consumption can produce alterations in people’s behavior, interfering with daily activities

such as work because they have difficulty concentrating (Tembo et al., 2017) and within this is the perception of risk since they affect risky behaviors such as speeding by driving with high levels of alcohol in the blood (Tirado, 2019). Those risky behaviors undoubtedly contribute to the rate of deaths due to traffic accidents that can be avoided with timely psychological attention to drivers, which at the moment is null in the Peruvian context. Likewise, we found that 70.6% (7 out of 10) of the drivers in the city of Juliaca presented symptoms of alcohol use disorder. Our result seems to be at least 3 times higher than results from other countries, such as in Colombia, Bogota where out of 165 drivers (27.3%), the incidence of alcohol consumption (Calvache-Dorado et al., 2022) and therefore drivers who consume alcohol cause affectation to their cognitive and psychophysical functions, thus, limiting the perception of risk when driving causing traffic accidents (Teófila Vicente Herrero et al., 2014); Alcohol causes physical, mental and social damage which predisposes to interpersonal conflicts, family and work accidents (port), in addition, in Peru 0.25 milligrams of alcohol per liter of blood is tolerated in urban transport drivers. However, research indicates that with a minimum of 0.1, drivers already have psychomotor alterations such as visual impairment, low reflexes, and difficulty moving around (Ministry of Health, 2011). Likewise, a study conducted on the geographical altitude of Peru ( $\leq 2,500$  masl) and high altitude ( $> 2,500$  masl) and alcohol dependence shows that 334 (45%) of the study population lived at low altitude of which 113 (15%) had alcohol dependence (Quiñones-Laveriano et al., 2016). This finding shows the need to regulate psychological intervention programs to reduce the consumption of alcoholic beverages by drivers working in cities with considerable altitude, such as those in the city of Juliaca, which could reduce the accident and death rate in the transpor-

**Table 2.** Descriptive analysis of variables

	M	SD	g1	g2
Risky consumption	1.70	1.10	0.37	0.61
Symptoms of dependence	1.80	1.33	0.65	1.46
Harmful alcohol consumption	3.94	2.81	0.19	-0.84
Overall alcohol consumption	7.45	4.35	-0.02	-0.52
Depressive symptoms	8.47	6.48	0.38	-1.30
Perception of risk when driving	29.37	6.42	-0.16	-1.04

Note: M=Mean, SD= Standard deviation, g1=asymmetry, g2=kurtosis.

**Table 3.** Simple and multiple linear regression for risk perception while driving

	Raw model			Fitted model		
	coefficient	IC 95%	p	coefficient	IC 95%	p
Depressive symptoms	-0.69	[-0.768 : -0.608]	0.00	-0.66	[-0.750 : -0.575]	0.00
Overall alcohol consumption	-0.16	[-0.324 : 0.005]	0.06	-	-	-
Risk drinking	-0.32	[-0.978 : 0.331]	0.33	-	-	-
Symptoms of dependence	-1.45	[-1.961 : -0.928]	0.00	-0.40	[-0.902 : 0.097]	0.11
Harmful alcohol consumption	-0.01	[-0.264 : 0.248]	0.95	-	-	-

Note: 95% CI: 95% confidence interval, dependent variable: risk perception when driving.



tation sector, which is a constant.

On the other hand, we found that 46.8% (4 out of 10) of the drivers in the city of Juliaca presented depressive symptoms. It is known that those who suffer from depressive symptoms experience sadness, irritability, loss of interest in activities, sleep disturbances, and lack of energy that cause problems in family and work (World Health Organization, 2023). This finding shows a need for mental health care for car drivers in the Peruvian context, which could reduce traffic accidents.

Likewise, we found that a one-unit increase in depressive symptoms decreases 0.66 units in the perception of risk when driving. This finding is like that found in an investigation in Australia, where a sample of 60 drivers was used. Our results reveal a significant relationship between risk behaviors and depression that were linked to traffic accidents (Chalmers et al., 2021). Likewise, in El Salvador, an investigation of psychosocial risk variables in drivers was conducted, where depression is highlighted as a risk factor that affects traffic accidents. It should be noted that psychosocial occupational risk factors can impact physical and mental health (Gutiérrez Quintanilla & Lobos Rivera, 2017). Undoubtedly, addressing depression problems in drivers could be an efficient mechanism to reduce traffic accidents.

#### Public health implications

Our findings can be scientific support for government authorities such as the Minister of Transportation of Telecommunications and the Minister of Health to promote policies to promote mental health by assessing the symptoms of depression and alcohol dependence in drivers to reduce the risk and avoid traffic fatalities and heavy economic losses due to these risky behaviors.

#### Limitations and strengths

It is necessary to state some limitations and strengths of this study. The strength of the present study is that it is the first study in high Andean areas about traffic psychology involving the variables of depressive symptoms and alcohol consumption as predictors of risky driving behaviors, which have not been explored so far in all of Peru. Likewise, one limitation of the study was the sample size, which, being non-probabilistic, limits the generalization of the results; however, this does not detract from the value of our results, although subsequent studies could use probabilistic sampling. On the other hand, since this is a self-reporting study, it is possible that some participants may not have been honest with their answers; to this end, at the beginning of the application, all participants were made aware of the need for honesty in answering the survey; on the other hand, we used instruments with evidence of structural validity and reliability to measure subjective variables. Also, the data collection was carried out only on drivers of public service buses and cabs; the results would be different if motorcycle cab drivers were included.

#### Conclusions

It is concluded that 4 out of 10 car drivers in the city of Juliaca suffer from depressive symptoms, and 7 out of 10 present alcohol consumption problems. Likewise, the increase in depressive

symptoms and alcohol dependence symptoms decrease the perception of risk when driving. Further studies could implement interventions to decrease depressive symptoms and alcohol dependence. Also, decision-makers could implement public policies to make mental health screening of drivers mandatory to reduce traffic accidents.

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#### AUTHORS' CONTRIBUTION

Maribel Lizbeth Yana-Yana: Conception, design of the study, application of instruments, statistical analysis, review and drafting of documents.

Nicol Yaquelin Cruz Vargas: Conception, design of the study, application of instruments, review and drafting of documents.

Kristel Raquel Hilasaca-Mamani: Advice, critical review of all components of the study and the article.

Julio Cjuno: Advice, statistical analysis, critical review of all components of the study and the article.

Lucy Puño-Quispe: Advice, critical review of all components of the study and the article.

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#### CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest in the collection of data, analysis of information, or writing of the manuscript.

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#### REVIEW PROCESS

This study has been reviewed by external peers in double-blind mode. The editor in charge was Anthony Copez-Lonzoy. The review process is included as supplementary material 1.

#### DATA AVAILABILITY STATEMENT

The authors attach the database as supplementary material 2.

#### STATEMENT ON THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE

We used DeepL to translate specific sections of the manuscript and Grammarly to improve the wording of certain sections. The final version of the manuscript was reviewed and approved by all authors.

#### DISCLAIMER

The authors are responsible for all statements made in this article.

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