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Article

# Influence of Alcohol Consumption, Personality and Attention Deficit Hyperactivity Disorder on Traffic Offenders

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**ABSTRACT**

**Background:** Despite the authorities' efforts to promote responsible driving, traffic accidents are a notable cause of death in many countries. Scientific research shows that variables such as alcohol abuse and personality dimensions can contribute to explaining this social phenomenon and the rising number of traffic offences. The present study aims to explore how alcohol abuse, personality disorders and Attention Deficit Hyperactivity Disorder (ADHD) are associated with risky driving behaviour. **Method:** the sample included 300 subjects: the study group (199 convicted of traffic offences) and the control group (101 subjects from the general driving population). The tools used were the International Personality Disorder Scale, the Alcohol Use Disorders Identification Test and the Adult ADHD Self-Report Scale (ASRS). **Results:** a higher incidence of signs of paranoid, antisocial, impulsive, borderline and anxious personality traits was detected for the study group, as well as a higher prevalence of alcohol abuse. **Conclusions:** this research offers indications for the design of effective preventive and reinsertion interventions. It also highlights the importance of considering psychological dimensions to ensure road safety.

## Influencia del Consumo de Alcohol, la Personalidad y el Trastorno de Déficit de Atención e Hiperactividad en Delincuentes viales

***Palabras clave:***
Delincuencia vial
Prevención
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Trastorno por déficit de atención e hiperactividad

**RESUMEN**

**Antecedentes:** Los accidentes de tráfico son una causa de muerte en muchos países, pese a los esfuerzos por promover una conducción responsable. La investigación sobre el problema muestra que variables como el abuso de alcohol y dimensiones de personalidad, contribuyen a explicar este fenómeno social y el aumento de la delincuencia vial. El propósito de este estudio es explorar cómo el abuso de alcohol, los trastornos de la personalidad y el Trastorno por Déficit de Atención e Hiperactividad (TDHA) se asocian a conductas de riesgo al volante. **Método:** Participaron 300 sujetos: un grupo de estudio (199 personas condenadas por delitos viales) y otro control (101 sujetos extraídos de la población general de conductores). Los instrumentos utilizados fueron el examen internacional de trastornos de la personalidad (IPDE), el cuestionario de identificación de trastornos por consumo de alcohol (AUDIT) y el cuestionario autoinformado de cribado del TDAH. **Resultados:** el grupo estudio presentó mayor incidencia de indicios de trastornos de personalidad paranoide, disocial, impulsivo, límite y ansioso; así como mayor prevalencia de abuso de alcohol. **Conclusiones:** El estudio ofrece claves para construir intervenciones preventivas y de reinserción eficaces, enfatizando la relevancia de dimensiones psicológicas para garantizar la seguridad en las vías públicas.

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Road traffic accidents are one of the main causes of death for the population aged 5-29. Not only do they pose a serious public health problem despite progress being made (World Health Organization [WHO], 2018), but they also entail very high social costs (Wijnen & Stipdonk, 2016).

Around 22,800 people died in road traffic accidents in EU Member States in 2019 (European Commission, 2020). About 25% of these deaths could have been avoided, since alcohol was the main reason for these accidents in 2018 (Le Lièvre et al., 2019) and in 2016 (Calinescu & Adminaite, 2018).

Spain registered 104,080 accidents involving people in 2019, in which 1,755 died and 8,613 required hospitalization. In terms of risk behaviours, alcohol consumption appeared as the second most common concurrent factor (in 24% of the aforementioned fatal accidents) after distractions (Directorate-General for Traffic, 2020). Moreover, the total number of accidents involving people increased slightly in 2019, rising by 1,781 compared to 2018. This indicates that the behaviour of drivers is still risky. According to Spanish citizens, these accidents are also one of the most important social problems, after cancer and terrorism (Alonso et al., 2019).

The Spanish National Institute of Toxicology and Forensic Sciences (2020) indicates that the toxicological analyses performed with *post-mortem* samples to determine the alcohol, drugs of abuse and psychodrugs used by drivers who died in 2019 revealed that 45.50% of them obtained positive results. This tendency has grown in recent years. In 61.80% of these cases, alcohol was detected either on its own or in combination with other substances and, of these, 81.50% had blood alcohol levels of > 1.2 g/L (the threshold for prosecution).

Apart from the increase in road accident deaths in recent years, convictions for road safety crimes totalled 80,480 in 2019 (General State Prosecutor's Office, 2020) in addition to 24,001 community work sentences. Of these sentences, 60% involved driving while under the influence of alcohol or other drugs, which are the offences described in Article 379.2 (Spanish Organic Law 15/2007) and the most relevant typology of those considered (Alonso et al., 2015). It is worth reflecting on these in relation to the political-criminal measures taken in recent years.

In the EU directive On Driving Licences (Directive 2006/126/EC) one of the proposals for Member States was to set a number of minimum requirements for issuing driving licenses. For instance, drivers must "take account of all the factors affecting driving behaviour (alcohol, fatigue, poor eyesight, etc.) so as to retain full use of the faculties needed to drive safely" (p. 46). In Spain, the Spanish Royal Decree of 8 May (RD 818/2009), on the General Drivers Regulation, put into practice Directive 2006/126/EC which establishes the psycho-physical capability tests to verify that no disease or disorder is present that may render drivers incapable of driving, such as personality disorders (PDs), Attention Deficit Hyperactivity Disorder (ADHD), or disorders related to substance addiction. Article 36 therefore stipulates that drivers may have their driving licence revoked if the psycho-physical capacity required for safe driving has disappeared or worsened.

Since road accidents or road crimes are not concerned with the awareness or lack thereof of regulations, but rather the behaviour of drivers, personality may be an influential variable (Martí-Belda et al., 2019). Personality is understood as a "persisting pattern of the way one's environment is perceived, related and devised, and is manifested in different personal and social contexts" (De Miguel & Pelechano, 2000, p. 26). Personality is, therefore, considered an important variable for analysing and understanding the stability, perseverance, and recidivism of criminals' antisocial behaviour, due to the wide range of interindividual variety that exists in such conduct (Gallardo & Andrés, 2009). Moreover, political and sociodemographic conditions may contribute to rates of recidivism (Chen & Jou, 2018).

In terms of road traffic, driving is yet another daily task that takes place in a shared social context (Nordfjaen & Simsekoğlu, 2014). Within this context, personality traits are extremely relevant when studying drivers' behaviour and its relation to accidents or dangerous conduct (Constantinou et al., 2011; Haerani et al., 2014; Jonah et al., 2001; Martí-Belda et al., 2019; Tortosa & Montoro, 2002).

In behavioural terms, it is also necessary to study the existence of PDs, which occur when personality traits are inflexible/non-adaptive in the subject's culture and remain stable over time, harming or causing discontent to the person and his/her environment (Alavi et al., 2017). The American Psychiatric Association's DSM-5 (APA, 2013) indicates that the "general pattern of scorn and violating others' rights" (p. 659) is a determining characteristic of antisocial PDs. Some characteristics of different PDs are associated with other actions that can be considered a threat against safe driving, particularly those expressing antisocial conduct or those that pose a safety risk for people (Alonso et al., 2007; Räisänen et al., 2019; Ramos-Quiroga et al., 2013). This is also set out by Spanish Royal Decree RD 818/2009, where moderate or severe cases of dissocial personality disorder or other disturbers are not admitted, as they are normally accompanied by aggressive behaviour or serious violations of the regulations, negatively affecting road safety.

Cavaiola et al. (2003) found higher scores for traffic offenders in behaviours related to psychotic deviation for antisocial behaviours (Gallardo & Andrés, 2009), and higher levels for physical aggression and antisocial practices (Shechory et al., 2011). Hilterman et al. (2012) observed a closer relationship between general psychological problems and those related to alcohol in a group of people convicted of road crimes and serving time in prison, compared to subjects convicted of other crimes. Another study performed with individuals convicted of traffic crimes highlighted high levels of impulsiveness (Bıçaksız & Özkan, 2016), aggressiveness, and neuroticism (Slavinskienė et al., 2015).

Another disorder related to risky or antisocial driving is ADHD, often underestimated and untreated in adults (Eensoo et al., 2015). It is defined by having attention deficit problems, lacking organisation, and hyperactivity-impulsiveness that may persist until adulthood, which consequently results in deteriorated social, academic, and occupational skills (Simon et al., 2009). Different studies relate ADHD to antisocial and other behavioural disorders (Kaye et al., 2014; Klein et al., 2012; López et al., 2005), to an increase in the probability of committing criminal acts (Pérez et al., 2015; Retz et al., 2021), and to higher probability of divorce, unemployment, legal problems, or traffic accidents (Chang et al., 2017; Curry et al., 2017; García et al., 2019; Harpin, 2005; Valero et al., 2017). Drivers with ADHD are more likely to perform dangerous manoeuvres behind the wheel (Dekkers et

al. (2016), to drive without a licence or under the influence of substances, and to commit other traffic violations. These drivers are more prone to suffer accidents compared to the general population (Vaa, 2013). All these behaviours are motivated by impulsiveness and attention deficit (Andreu et al., 2015). ADHD is also associated with disorders caused by taking substances (Kaye et al., 2014; Luderer et al., 2021), making it difficult to concentrate or causing mistakes, which can have serious social and personal impacts (Cabasés & Quintero, 2005; Jiménez-Arriero et al., 2005; Ramos-Quiroga et al., 2006; Valero et al., 2017).

Alcohol consumption seriously alters drivers' capacity to drive safely and increases the risk of having an accident (Alonso et al., 2015; Alonso et al., 2017; Begg et al., 2017; Del Río et al., 2002; Moskowitz & Fiorentino, 2000). It is also more common in drivers whose licence has been revoked (Valero et al., 2017). Almost 20% of drivers attending medical examination centres to re-apply for a driving licence suffer disorders caused by substance use (Gómez-Talegón et al., 2008). Many drivers previously convicted of drink driving tend to be persistent offenders (Monrás et al., 2011; Schell et al., 2006), and alcohol consumption is the best predictor (Gugliotta, 2018; Nelson et al., 2019). Herraiz (2009) and Herraiz et al. (2011) highlighted that 50% of jailed traffic offenders have a drinking problem (Hilterman et al., 2012) and exhibit ethyl alcohol dependence symptoms (Faílde-Garrido et al., 2016; McCutcheon et al., 2009; Valero, et al., 2017). Traffic offenders (*vs.* a control group) drink statistically more alcohol (González-Iglesias & Gómez-Fraguela, 2010). Quite frequently convicted individuals suffer from alcoholism, but only a few are diagnosed, and even those who drive under the influence of alcohol are more likely to relapse and display antisocial behaviour (Freeman et al., 2011; Jornet-Gibert et al., 2013; Keating et al., 2019; Nelson et al., 2015).

Del Río et al. (2001) worked on a study with 8,043 drivers who went to health centres for medical and psychological check-ups to re-apply for their driving licences. These authors observed how 60.30% of them drink alcohol on a regular basis, 7.30% present a problematic alcohol use pattern, and 2% meet alcohol abuse/dependence criteria. Their study revealed that of all those with alcohol consumption problems, 23.20% had been involved in traffic accidents and 18.70% had a record of such offences. Nonetheless, the tests performed with 72.20% of these drivers revealed that they were eligible to drive. These conclusions are not in agreement with the regulations for being granted a driving licence.

The research carried out by Gómez-Talegón et al. (2008) included a sample of 5,234 drivers who went to medical-psychological health centres, of whom 3.30% had mental or substance-related disorders, 18.70% used substances, and 11.70% had impulse-control disorder. Of all these drivers, 39.80% were assessed as "eligible" (most with impulse-control disorder), 53.20% as "eligible, but with restrictions" and 7% as "not eligible". In this last group, 25% suffered a drug abuse or dependence disorder, and 14.30% had dementia. The research carried out by De las Cuevas and Sanz (2009) focused on the effect of mental disorders and psycho-pharmacological treatments on cognitive function and psychomotor skills in driving. It included a sample of patients with mental disease, treated as outpatients, who have a driving licence and drive regularly. Only 20% of them passed the driving licence tests, and only 10% informed health centres that their driving capacity may be worsening to a certain extent. Of all the subjects, 56.70% did not pass the decision-making test for a mean reaction time, and 22% had a tendency to break the rules. Trujillo et al. (2007) evidenced increased severity of antisocial conduct when antisocial disorder and ADHD occur together, resulting in a more than 50% probability of suffering a behavioural disorder related to rule-breaking (Andreu et al., 2015; Soutullo & Díez, 2007). McDonald and Davey (1996) reviewed studies about the relationship between psychiatric disorders and traffic accidents. They reported that the combination of an antisocial PD and alcoholism increases the vulnerability to accidents. A study performed with drivers with no road crime records, and others convicted for driving under the influence of alcohol, observed that the latter were considerably more likely to adopt antisocial behaviours (Jornet-Gibert et al., 2013).

Lapham et al. (2001) concluded that the road offenders who drive under the influence of alcohol need to be evaluated and treated not only for their potential problems related to risky abuse, but also for the psychiatric disorders that frequently come with alcohol abuse, including, among others, an antisocial personality.

All these data suggest the need to conduct research with a view to modifying current medical examination protocols and tests to increase road safety and to minimise driving under non-optimal conditions, particularly under the effect of psychotropic substances that could alter attention and other processes, as suggested by scholars such as Ayinde et al. (2019). Many arguments prove that it is necessary to build crime policies in relation to drinking, driving and antisocial personality, in order to improve already-existing programmes and to create new evidence-based therapies.

By taking psycho-physical capabilities for driving safely into account, the present study therefore aims to explore those variables related to normative demands in sentenced road traffic offenders (such as harmful alcohol consumption, PDs and attention and impulse-related disorders), and to compare their scores with a control group from the general driving population with no road crime record.

It could be hypothesised that a significant number of road offenders will present signs of harmful alcohol consumption (Faílde-Garrido et al., 2016; González-Iglesias and Gómez-Fraguela, 2010), personality disorders (Kieling et al., 2011; Shechory et al., 2011), and ADHD (Ramos-Quiroga et al., 2006; Valdizán and Izaguerri-Gracia, 2009).

## Method

### Participants

The sample was made up of 300 participants divided into two groups: a study group with 199 road traffic offenders sentenced to perform community work related to the type of crime (the TASEVAL resocialisation workshop), and a control group made up of 101 subjects with no road crime record who were randomly selected from the general driving population. The inclusion criteria for both groups were being at least 18 years old, while the study group had to attend the aforementioned workshop for the first time, and the control group members had to have a driving licence, with full driving points (according to the Spanish driving point systems),

and have no road crime record. The participants' age ranged from 19 to 76 years of age ($M$ = 38.47; $SD$ = 11.53 years). Of the whole sample, 78% were male ($n$ = 234) and 22% were female ($n$ = 66). The sociodemographic characteristics of the sample, divided by groups, can be found in Table 1.

**Table 1.**
Sociodemographic data of the participants by groups (N = 300).

| Sociodemographic | Traffic offenders (n = 199) | Non-offender drivers (n = 101) | Total sample (N = 300) |
|---|---|---|---|
| **Age (years): *M (SD)*** | 36.84 (11.33) | 41.69 (11.29) | 38.47 (11.53) |
| **Gender: *n* (%)** | | | |
| Men | 174 (87.40) | 60 (59.40) | 234 (78.00) |
| Women | 25 (12.60) | 41 (40.60) | 66 (22.00) |
| **Civil status *n* (%)** | | | |
| Single | 127 (63.80) | 38 (37.60) | 165 (55.00) |
| With couple | 72 (36.20) | 63 (62.40) | 135 (45.00) |
| **Children (yes) *n* (%)** | 99 (49.70) | 60 (59.40) | 159 (53.00) |
| **Education level *n* (%)** | | | |
| Primary education / without studies | 35 (17.60) | 7 (6.90) | 42 (14.00) |
| Secondary education | 64 (32.20) | 8 (7.90) | 72 (24.00) |
| High school/T&D | 57 (28.60) | 41 (40.60) | 98 (32.70) |
| University Studies | 43 (21.60) | 45 (44.60) | 88 (29.30) |
| **Employment *n* (%)** | | | |
| Student | 12 (6.00) | 6 (5.90) | 18 (6.00) |
| Unemployed | 67 (33.70) | 12 (11.90) | 79 (26.30) |
| Active worker | 108 (54.30) | 78 (77.20) | 186 (62.00) |
| Retired or pensioner | 12 (6.00) | 5 (5.00) | 17 (5.70) |

## Instruments

International Personality Disorder Examination (IPDE) (Loranger et al., 1997) was used to track subjects who are quite likely to present PDs according to the International Disease Classification (IDC-10; WHO, 1992). The version used (De Miguel & Pelechano, 2000) explores nine PDs (paranoid, schizoid, antisocial, impulsive, borderline, histrionic, anankastic, anxious, dependent) and contains 59 items with dichotomic responses (true/false) that describe behaviour in the past five years. If the subject meets three scale criteria or more (categorial or clinical approach), it suggests that some PDs might be present and the need to later hold an interview to ensure proper diagnosis, if necessary (De Miguel & Pelechano, 2000). This questionnaire's concordance is almost perfect (*Kappa*= .87) (Landis & Koch, 1977).

Alcohol Use Disorders Identification Test (AUDIT) (WHO, 2001). This consists of 10 Likert-type items, with an ordinal response option that assesses alcohol consumption and conduct problems arising from alcohol abuse or dependence (Rubio et al., 1998). Its purpose is to evaluate an at-risk drinker by distinguishing three different levels: alcohol intake, potential dependence on alcohol, and experience of alcohol-related harm. For problematic alcohol consumption, different cut-off points were used for each gender, namely a minimum of 6 points for females and 8 points for males (Pérula de Torres et al., 2005). Therefore, based on these scores, it could be considered that a subject is a high-risk drinker or engages in problematic alcohol use (Pérula de Torres et al., 2005). In this study, the internal consistency, measured by Cronbach's alpha, was $\alpha$ = .84. Other studies obtained similar scores ($\alpha$ = .82) (Ballester et al., 2021).

Adult ADHD Self-Report Scale Version 1.1 (WHO, 2003). The screening version by the WHO and Kessler et al. (2005) comprises six items with five Likert-type response options that aim to detect suggestive signs of ADHD. The reference criterion is based on obtaining a score of more than 12 points (Kessler et al., 2007). The first four items assess attention deficit symptoms and the last two explore hyperactivity symptoms. A categorial approach was followed in order to identify subjects with signs of ADHD by calculating the sum of the total score and taking a cut-off point of 12. Specific attention and hyperactivity factors were calculated, too. The reliability of the complete test was adequate in the present study ($\alpha$ = .68), measured by Cronbach's Alpha. When the internal consistency for its two factors were independently calculated, it was observed that attention obtained an $\alpha$ = .74 and hyperactivity an $\alpha$ = .60. These results are very similar to those obtained previously by other authors (Kessler et al., 2007), who found a general reliability of $\alpha$ = .72. According to its bifactorial solution, an $\alpha$ = .82 was found for attention and an $\alpha$ = .52 for hyperactivity (Daigre et al., 2009).

## Procedure

After applying for the corresponding authorisation from the Subdepartment of Institutional Relations and Territorial Coordination of the General Secretariat for Penitentiary Institutions to conduct this research work and to obtain its approval, the TASEVAL workshop was chosen (beginning within a period of three months in Valencia, Alicante and Castellón as part of the Valencian Community's Services for Managing Offences and Alternative Penal Measures). Questionnaires were handed out while the workshop was held. For the control group, the subjects who went to health centres to request or re-apply for a driving licence were selected. Before data collection, it was ensured that the participants met the criteria for ethical information, confidentiality, and data processing rules. Informed consents were obtained, duly completed and signed by the participants.

## Data analysis

The independent variables were gender, age, ADHD, problems with alcohol consumption, and PDs.

Descriptive analyses were performed using frequencies for the categorical variables, and the frequencies homogeneity test (chi-squared) in the bivariate analysis to study inter-group differences. The dependent variable was dichotomic and distinguished between traffic offenders and drivers with no record. Median and standard deviations were calculated for quantitative variables, comparing groups making use of t-test. Size effect was calculated with Cohen's d.

To describe the traffic offenders' psychological profile, a binomial logistic regression was carried out, and a decision tree was derived using the CHAID method (Chi-squared Automatic Interaction Detector). CHAID is a hierarchical and divisive descending classification method, which aims to find group cases that may present similar and different characteristics with respect to other groups. In this investigation, it was intended to study

the segments that, using the Chi-Squared statistic, had a specific criterion which contrasted the possible differences between the segments formed through the interaction of the chosen independent variables (Escobar, 1998).

For the binomial logistic regression, all the predictor variables were introduced into the model as dummy variables (except for age, taken as a quantitative variable). All of them were nominal and dichotomic (the possibility of suffering a disorder or not). The conditions to apply this model were studied by analysing the normality of residues and the presence of the influential values that led to their overestimation by Cook's distance, to find that four subjects resulted in model overfit. Hence, in the end they were not included as participants, and the analyses continued with a final sample of 296 subjects. The forward Wald method was used for the selection of variables in the logistic regression model. The model was executed with 80 % of the 296 subjects (training sample with $n$ = 237), of whom 36.16% did not commit offences ($n$ = 86) and 63.83% were traffic offenders ($n$ = 151). External validity was tested (test sample with $n$ = 59) by the model's predictive capacity over the remaining 20.00%. The CHAID model was built with an 80% training sample, and its external validity was tested over the remaining 20%.

Statistical analyses were carried out using version 24.0 of the Statistical Package for Social Sciences (IBM SPSS). For this investigation, an .05 alpha level was used.

## Results

### Differences in presenting signs of PD, alcohol consumption and ADHD

Traffic offenders had higher scores than non-offenders in the general score on the Adult ADHD Self-Report Scale ($p$ = .027) and in hyperactivity ($p$ < .001), but not on the attention subscale. The effect size was small for ADHD, with total score ($d$ = 0.27), and medium for hyperactivity ($d$ = 0.51) (Table 2). On the other hand, the analysis revealed differences in frequencies between traffic offenders and non-offenders in presenting signs of PD, ADHD, and problematic alcohol use (Table 3).

A significant Chi-squared value appeared for the following: PDs, ordered according to level of significance: a) antisocial ($\chi^2$ = 63.68; $p$ < .001), impulsive ($\chi^2$ = 16.37; $p$ < .001) and borderline ($\chi^2$ = 13.48; $p$ < .001); b) paranoid ($\chi^2$ = 11.02; $p$ = .001) and anxious ($\chi^2$ = 9.07; $p$ = .003). The results revealed that traffic offenders showed a higher frequency for the five PDs, where antisocial, impulsive, and borderline stood out. For ADHD, the statistics showed no statistically-significant differences between the groups, with 11% of traffic offenders presenting signs of ADHD. Statistically-significant differences appeared for problematic alcohol use ($\chi^2$ = 46.72; $p$ < .001). Therefore, 55.80% of traffic offenders may have problematic alcohol consumption, far ahead of the figure for drivers with no traffic offences (13.90%) ($p$ < .001).

**Table 2.**
Mean, standard deviation and statistical comparsion for independent measures (specific factors of ADHD test).

| ADHD | Traffic offenders (n=199) | | Non-offender drivers (n=101) | | | | |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *t* | *p- value* | *d* |
| **General Score** | 7.98 | 3.72 | 6.99 | 3.56 | **2.22*** | .027 | 0.27 |
| **Attention-Deficit** | 4.12 | 2.71 | 4.01 | 2.91 | .30 | .767 | 0.04 |
| **Hyperactivity** | 3.87 | 1.90 | 2.97 | 1.64 | **4.23***** | .000 | 0.51 |

Note: M: Mean; SD: Standard Deviation; t: t-test; d: Cohen's d.
* = p < .05; ** = p < .01; *** = p < .001

**Table 3.**
Distribution of the frequencies and χ2 of the variables of personality disorders, ADHD and problematic alcohol consumption.

| Variable | Traffic offenders (n=199) | | Non-offender drivers (n=101) | | χ2 | *p*-value | *Phi* |
|---|---|---|---|---|---|---|---|
| | *n* | *%* | *n* | *%* | | | |
| Paranoid disorder | 151 | 75.90 | 57 | 56.40 | 11.02** | .001 | .20 |
| Schizoid disorder | 179 | 89.90 | 91 | 90.10 | .00 | 1.000 | .00 |
| Antisocial disorder | 145 | 72.90 | 24 | 23.80 | 63.68*** | .000 | .47 |
| Impulsive disorder | 58 | 29.10 | 8 | 7.90 | 16.37*** | .000 | .24 |
| Borderline disorder | 56 | 28.10 | 9 | 8.90 | 13.48*** | .000 | .22 |
| Histrionic disorder | 59 | 29.60 | 19 | 18.80 | 1.96 | .060 | .12 |
| Anancastic disorder | 147 | 73.90 | 66 | 65.30 | 1.97 | .161 | .09 |
| Anxious disorder | 107 | 53.80 | 35 | 34.70 | 9.07** | .003 | .18 |
| Dependent disorder | 59 | 29.60 | 20 | 19.80 | 2.86 | .091 | .11 |
| Without personality disorder | 17 | 8.50 | 15 | 14.90 | 2.18 | .140 | .10 |
| ADHD | 22 | 11.10 | 5 | 5.00 | 2.35 | .125 | .10 |
| Problematic alcohol consumption | 111 | 55.80 | 14 | 13.90 | 46.72*** | .000 | .40 |

Note: χ2: Chi-squared Yates continuity correction. Phi: Phi Coefficient
* = p < .05; ** = p < .01; *** = p < .001.

### Binomial regression logistics

As a result of applying the forward Wald method to select variables, the extracted model was formed by the predictor variables of gender, alcohol use-related problems, and borderline/antisocial PDs. Table 4 includes the model that resulted from Wald's test to select variables. The last column shows the Beta exponent, which enables the interpretation of the odds ratio (OR). It can be concluded that alcohol use-related problems increased the probability of being convicted for traffic offences, with 9.5 traffic offenders in such circumstances for each driver with no such background. The presence of antisocial disorder increased the probability of being convicted for traffic offenders, with 7.6 offenders with signs of this disorder for each driver with no such background. The presence of borderline disorder increased the probability of being convicted for traffic offences, with 3.4 offenders with signs of this disorder for each driver with no such background. Lastly, there were 5.3 male traffic offenders for each female.

**Table 4.**
Results of the logistic regression model for the traffic offender probability.

| Variables | β | SE | Wald | gl | Sig. | Exp(β) |
|---|---|---|---|---|---|---|
| Gender (masculine) | 1.672 | .477 | 12.301 | 1 | .000 | 5.323 |
| Alcohol consumption disorder | 2.261 | .455 | 24.681 | 1 | .000 | 9.592 |
| Antisocial disorder | 2.040 | .380 | 28.778 | 1 | .000 | 7.688 |
| Borderline disorder | 1.228 | .600 | 4.182 | 1 | .041 | 3.414 |
| Constant | -2.580 | .488 | 28.017 | 1 | .000 | .076 |

The model's goodness of fit was tested using the Hosmer-Lemeshow test ($\chi^2 = 1.253$, $gl = 6$, $p = .974$). A good fit appeared with the observed values. The model's goodness was also explored by studying the percentage of correctly-classified cases in the training sample, which came to 82.60%. Finally, the model's predictive validity was found to be high, and correctly classified 84.70% of the remaining sample.

### Decision tree

The CHAID method, employed with the training sample of 239 cases, reported how antisocial PD and alcohol consumption problems established significant differences in the probability of classifying someone as a traffic offender. The tree diagram (Figure 1) presents segmentation, which means that the most discriminating variable in the classification of a driver as a traffic offender is antisocial disorder. A higher probability of classifying a subject as a traffic offender (with 92.60%) was reflected among those subjects with signs of antisocial disorder and alcohol use problems.

The CHAID model was able to correctly classify 72.80% of the whole training sample (n = 239) and classified 78.70% of the reserve sample (n = 61) when testing its predictive validity.

## Discussion

Different studies have analysed the relationship between risky conduct while driving and personality (Constantinou et al., 2011; Martí-Belda et al., 2019), antisocial conduct (Butcher et al., 2015; Gallardo & Andrés, 2009; Shechory et al., 2011) or alcohol abuse (Hilterman et al., 2012); which are predictor variables of its recidivism (Gugliotta, 2018; Herraiz et al., 2011; Monrás et al., 2011). A higher prevalence has been found for ethylic dependence in people convicted of road safety crimes (Faílde-Garrido et al., 2016; Valero, et al., 2017). In line with this, ADHD has been considered a neurodevelopmental disorder that is associated with antisocial (Simon, et al., 2009) and criminal (Pérez et al., 2015) behaviour, as has substance dependence (Andreu et al., 2015), because they can lead to these problems appearing in the life cycles of those suffering from them.

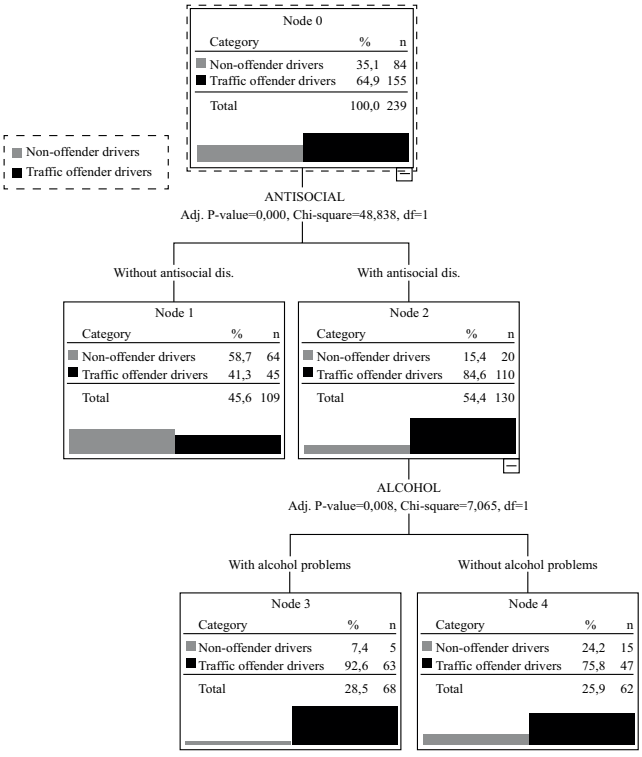


**Figure 1.**
Traffic offender decision tree.

The present study aims to determine which psychological variables, from among those studied, are risk factors that can potentially impact road crimes. These results conclude that the most relevant variables are antisocial disorder and alcohol use problems, as well as hyperactivity. This finding concurs with previous related evidence (Keating et al., 2019) and confirms the research hypothesis. Additionally, a higher prevalence of different PDs (evaluated from a categorial perspective) has been reported in the group of traffic offenders, especially those related to lack of inhibitory control (borderline, antisocial, impulsive) (Albert et al., 2019, Broche-Pérez et al., 2016). This cognitive problem is also common in ADHD (particularly in the hyperactive subtype) (Ramos-Galarza et al., 2019), and can act as a shared element in all these clinical problems (Miranda et al., 2014), which might explain its relation to road crimes.

This study shows that, from ADHD symptoms, hyperactivity seems to be the most relevant for understanding this association, while attention remains stable between the groups and would not contribute to it. Hyperactivity has common traits among some personality disorders, such as impulsivity, which may suggest dimensional features that should be considered in the future.

Other dimensions, such as neuroticism and aggressiveness, might also be a point of convergence for various disorders and traffic offences (Slavinskienė et al., 2015).

The temporal-situational stability attributable to the personality structure (De Miguel & Pelechano, 2000) can, in turn, explain that the disorders in this area are associated with a high traffic offence relapse rate (Warren-Kigenyi & Coleman, 2014). Their therapeutic approach could hence be very important as a preventive measure. This is also in line with Knecht et al., (2015), who conclude that the risk of criminal behaviour among individuals with ADHD increases when there is a psychiatric comorbidity - specifically, a conduct disorder and a substance use disorder; therefore, these findings show the need to approach more individualised and comprehensive interventions, combining medical and psychosocial measures.

Data concerning the high prevalence of alcohol abuse are described herein, and concur with the data that other authors have previously reported (Hilterman et al., 2012). This abuse affects more than half of the sample, and comes over as one of the factors with the greatest classification capacity among groups. This finding is in line with the literature, which suggests the marked presence of alcoholism in people charged with road crimes (Alonso et al., 2019), and is most important because of its association with high mortality (Le Lièvre et al., 2019). In the current study, the concurrence of alcohol abuse and antisocial personality involves a model that suitably discriminates among groups. This backs existing pieces of evidence for the separate role of both (Cavaiola, 2003; Shechory et al., 2011), and also for alcohol consumption disorders along with reckless driving as a predictor of recidivism (Padilla et al, 2018). All this opens up new lines of research around the potential importance of their synergy. As previously considered for PDs and neurodevelopment, the depressor effect of alcohol on different executive functions (e.g., inhibitory control) can increase the risk of careless behaviour, especially when the personality structure that implies certain vulnerability to performing impulsive actions comes into play. Some pieces of evidence also exist for careful driving styles and a high perception of risk lowering the probability of committing offences while driving. These variables are compromised in ethylic intoxication (Padilla et al, 2018), and empower the tendency to inhibit responsibilities in antisocial disorders (APA, 2013).

A lack of significant results when comparing subjects in the presence of the clinical expression of ADHD suggests the need to explore which ADHD symptoms might be closely related to road safety crimes, by distinguishing a dimensional level (and not essentially a categorical one) in this matter. Future studies should evaluate the effect of attention deficit and hyperactivity separately, and how both are related to other mental disorders and impact the risk of committing traffic offences. More research is necessary to determine if psychiatric comorbidity in first-time offenders can predict the recidivism of road safety crimes. If this were the case, designing new assessment protocols that could identify these risk factors would be fundamental for assigning all the resources needed to impact them and to promote greater road safety. For example, reviewing and modifying the protocols for obtaining and renewing driving licences at driver assessment centres, which ensure the psychophysical conditions of people who drive as required by regulations.

Road safety is a first-order social problem because the accidents that occur while driving are one of the main causes of death in many countries around the world. Contributing to knowledge about the psychological variables that lie at its foundations will lead to efficient and evidence-based strategies. This article goes into detail about certain PDs as risk factors, and also about alcohol abuse, by providing evidence for them both sharing a higher prevalence in those subjects who commit road safety crimes. In view of the high comorbidity in these mental health problems, studying how they all influence, either together or separately, the complex equation of conduct while driving, and determining which variables are common to them all with a higher predictive power, is important.

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