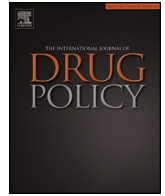




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## Short report

## AUDIT-C score and its association with risky behaviours among professional drivers

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## Introduction

High rates of alcohol use are related to an increased risk of engaging in dangerous behaviours. This is true for both vulnerable groups and for the general population (Beirness & Davis, 2007; Hamilton, Sinha, & Potenza, 2012; Le Marchand, Evans, Page, Davidson, & Hahn, 2013). One of the most frequent risky behaviours is driving after drinking alcohol (Beirness & Davis, 2007) as alcohol affects aspects of driving performance and has disinhibiting effects, which are a factor in dangerous driving behaviour (Fillmore, Blackburn, & Harrison, 2008).

Alcohol misuse is highly correlated to risk of accidents leading to injury, especially among professional drivers (PDs). The higher the consumption level, the higher is the probability of being engaged in dangerous behaviours. In order to establish and quantify the risk of driving under the effect of alcohol and of driving dangerously, we used a well-known measurement of alcohol consumption (the Alcohol Use Disorders Test-Consumption, AUDIT-C). This is a scaled (0–12 points) marker of alcohol consumption, as well as of the risk of alcohol use disorders and other complications of drinking (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). This questionnaire was designed to detect hazardous alcohol use without differentiating between consumption during leisure and work time. In this study we wanted to explore whether the AUDIT-C might also be used as an indicator of the risk of alcohol consumption at work – an important risk factor for accidents among drivers, even if the driver is not an alcohol misuser. If we think that risky behaviours can be generalized across contexts, the AUDIT-C could be helpful in detecting a dangerous driver (independent of alcohol consumption). Previously, for example, the AUDIT-C questionnaire has been used effectively to recognize an increased risk of unsafe sexual

and injecting behaviours among people who inject drugs (Le Marchand et al., 2013).

The need to screen for alcohol consumption among PDs is undisputed. However, how to apply screening policy is neither easy nor unambiguous. In Italy for example, accident prevention and safety at work for employees are the responsibility of occupational health services and particularly of the occupational health physician (OHP). Italian law establishes that the Blood Alcohol Concentration (BAC) of PDs during work hours must be zero, and that PDs with problems of alcohol dependence must be suspended from work and seek treatment. Regulatory guidelines, including the type of examinations and screening performed on workers, vary depending on region. In Piedmont, in northern Italy, a regional law imposes routine screening of PDs for alcohol use and misuse, using the AUDIT-C questionnaire in association with a blood screening test for some common markers for alcohol misuse (e.g., the carbohydrate-deficient transferrin in serum, CDT). In relation to the AUDIT-C, a cut-off score  $\geq 5$  points has been set by regional law to identify, among this category of workers, those who need more accurate alcohol screening and brief intervention. Nevertheless, the optimal AUDIT-C threshold for unhealthy alcohol use is still unclear. For example, in the US, a cut-off score  $\geq 4$  points for men and  $\geq 3$  points for women has been set (Delaney et al., 2014). Other studies have suggested higher sensitivities with a cut-off score  $\geq 5$  points (Calabria et al., 2014; Vitesnikova, Dinh, Leonard, Boufous, & Conigrave, 2014).

To the best of our knowledge, the association between alcohol consumption and the risk of drinking alcoholic beverages during working hours or breaks and with some common risky driving behaviour (RDB), such as hand-held cell phone use, text messaging, PC use, reading, TV watching among PDs, has not been investigated. Our goal was to determine whether high scores on the AUDIT-C questionnaire were associated with alcohol consumption in the workplace (ACW) and with RDB, and to set the best cut-off score for this category of workers. We controlled the analyses for some variables (educational level, age, driver

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category, driver length of service and travel on international routes), which have previously been found to be independently associated with ACW and/or AUDIT score (Hermansson, Helander, Brandt, Huss, & Rönnerberg, 2010; Rosso, Perotto, Feola, & Caramella, 2014).

## Methods

### Sampling and procedure

From 1st October 2012 to 31st December 2014, PDs were recruited on a voluntary basis from driving schools and associations across six towns in the province of Cuneo (an area of the Piedmont region in northern Italy), during various courses that were mandatory for the profession (mainly periodic driver qualification card training, but also specific training courses for safety). The main purpose of these courses is to set and maintain high safety and driving standards among PDs (drivers of trucks and/or buses). A convenience sample was recruited by course teachers (we collected data from approximately 30 courses, with a mean number of 20 participants). These courses had no final test and were unrelated to the routine inspections carried out by OHP or by inspectors (health officers, police officers, etc.). Participants were asked to complete a structured 15-min long, anonymous and self-administered questionnaire. The response rate was 93.3% (blank questionnaires were counted as refusals). The study was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

### Questionnaire items

Participants were asked to fill in a questionnaire which included, demographics, anthropometry and medical data. The specific questions were: (1) have you ever drunk alcohol during work or during lunch at work? (a) Never, (b) rarely, (c) often, (d) regularly while I am having lunch. (2) Have you ever used a cell phone (without headphone or speakerphone) and/or PC and/or watched TV and/or read some lines while driving, during the preceding year? Possible answers for the questions were: (a) never, (b) a few times (about once a month), (c) often (about once a week), (d) regularly (see also Appendix A).

### Measures

#### Main predictor variable and potential confounding variables

We estimated alcohol consumption using the Alcohol Use Disorders Identification Test Consumption (AUDIT-C), which is a revised and shorter version of AUDIT (a gold standard test, developed by WHO, consisting of 10 alcohol identification questions) (Saunders et al., 1993). The AUDIT-C assesses the frequency and quantity of alcohol consumption, and the frequency of heavy drinking (six or more drinks on 1 day). Total scores range from 0 to 12. As with the 10-item AUDIT, higher scores indicate more problematic alcohol use. We used this variable both as a continuous and a dichotomous variable (setting two different cut-offs:  $\geq 4$  and  $\geq 5$ ). We examined several variables as potential confounders: educational level (we split this variable into elementary or middle school versus high school or university degree), age and driver length of service (considered as continuous variables), driver category (bus or truck), travel on international routes and occasional consumption of meals at restaurants, which we previously found to be independently associated with ACW (Rosso et al., 2014).

#### Outcome variables

We examined two risky behaviours (yes/no): driving professionally after drinking (ACW, yes = often or regularly/no = never or

rarely) and driving while engaged in other activities: hand-held cell phone use, text messaging, PC use, reading and/or TV watching (risky driving behaviour, aggregate dichotomous variable, yes = frequently or daily/no = never or rarely).

### Statistical analysis

Data were analysed using STATA software (version 11.0 STATA Corporation, College Station, TX, USA). Spearman's rank correlation test was used to measure the strength and direction of association between age and AUDIT-C score. Univariate analyses (Chi squares) assessed associations between potential predictor or confounding variables, and outcome variables. Factors with  $p < 0.20$  in the univariate analysis were incorporated into a backward logistic regression analysis; the criterion for remaining in the model was a likelihood ratio associated with  $p \leq 0.05$ . We adjusted the odds ratios for potential confounders. Sensitivities for each relevant score were calculated, and receiver operator characteristic (ROC) curve analysis was used to determine test accuracy. The area under the ROC curve (AUC) was used to assess the overall fit of the models. Results were considered significant if  $p \leq 0.05$ . Odds ratios (OR) are reported with 95% confidence intervals (CI).

## Results

Of 404 PDs who received the questionnaire, 377 (93.3%) completed it. The list of participants in courses to whom the questionnaires were administered revealed that more than 99% were male. Thus, in order to ensure anonymity, gender was not required in the questionnaire. Participants were truck drivers (70.7%), bus drivers, and drivers of both types of vehicle (2.3%). Their mean age was 43.3 years, and their mean length of service was 18.5 years. Of the participants, 88.3% reported that their main routes were regional or national and 11.7% reported driving on international routes. The education level was: 2.2% elementary school, 62.5% middle school, 33.6% high school, 1.7% university degree. ACW was admitted by 23.6% of participants: 5% rarely, 9.8% frequently and 8.8% daily. The majority of participants (81.8%) reported at least one of the above mentioned RDBs (28.7% rarely, 25.5% frequently and 27.6% daily). The results of the different questions are shown below.

The mean age of those who admitted ACW was lower than those who did not (42.5 years versus 46.3 years,  $p = 0.003$ ). The association between age and RDB responses reached borderline statistical significance (mean age of those who responded never was 46.1 years; rarely 43 years; frequently 42.6 years; daily 42.4;  $0.05 < p < 0.10$ ). We detected an inverse effect of age on AUDIT-C overall total score ( $\rho = -0.19$ ,  $p < 0.001$ ). Collinearity between age and length of service was detected ( $\rho = 0.73$ ,  $p < 0.001$ ), therefore length of service was removed from the final multivariate models.

Table 1 shows the results of the logistic regression models (univariate and multivariate) for ACW and RDB outcomes. AUDIT-C was analysed as a continuous variable. For every unit increment in the AUDIT-C score, there was a 45% higher risk of ACW (adjusted odds ratios [AOR] 1.45, 95% CI 1.24–1.68) and a 15% incremented risk of RDB (AOR 1.15, 95% CI 1.01–1.31). The effect of educational level on ACW was explained by the different age between the two groups (low vs high educational level mean age 44.9 and 39.9 years respectively,  $p < 0.001$ ). In univariate analyses, the variable smoke attitude was correlated with RDB, and this effect was not confirmed in the multivariate regression model. This is because PDs who declared smoking had a higher number of hours spent driving per day (7.3 vs 6.4 h/day,  $p = 0.005$ ). Truck drivers declared more time spent driving compared with bus drivers

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