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Hangover resistance in a Canadian University student population

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ABSTRACT

Background: Resistance to alcohol hangover may be a risk factor for alcohol use disorder. Previous research to establish the prevalence of hangover resistance in a drinking population has either not used comparable intoxication levels or has considered hangover resistance over a limited time frame. The purpose of this study was to examine the prevalence of *lifetime* hangover negative (LHN) drinkers across comparable eBAC values ranging from 0 to 500 mg/dl.

Methods: Students at an eastern Canadian university were surveyed about their heaviest drinking episode in the past month and indicated whether they had ever experienced a hangover in their lifetime (LHN) and, if they had, the hangover severity they experienced the next day. eBACs were calculated and the percentage of LHN drinkers was computed at each 10 mg/dl eBAC increment from 0 to 500 mg/dl.

Results: Most LHN drinkers (58% female, 71% male) had an eBAC on their heaviest drinking occasion below 80 mg/dl. Above eBACs of 80 mg/dl, 5.8% of female and 5.1% of male drinkers were lifetime hangover negative.

Conclusions: The results suggest that only a small percentage of heavy drinkers lay claim to being lifetime hangover negative.

1. Introduction

Alcohol hangovers are the unpleasant symptoms experienced the day after alcohol consumption. These symptoms, such as headache, sleepiness, and concentration problems can last up to 20 h after drinking (Verster et al., 2010). The presence and severity of hangover symptoms differ however, both between and within drinkers (Penning, McKinney, & Verster, 2012). Furthermore, a number of drinkers report not experiencing hangovers (Howland, Rohsenow, Allensworth-Davies, et al., 2008; Howland, Rohsenow & Edwards, 2008).

Little research has been conducted to estimate the prevalence of drinkers who do not experience a hangover. The latter is important however, since it has been suggested that hangover resistant drinkers may be at increased risk of continuing harmful drinking behavior because they do not experience the day after punishment (Piasecki, Robertson, & Epler, 2010; Rohsenow et al., 2012). Cameron and French (2015) have also reported that lower perceptions of hangover severity the morning after drinking are associated with stronger beliefs that one is safe to drive; by extension, those drinkers who do not experience hangover symptoms may perceive themselves as safe to drive when they are not. Despite these beliefs, which are also reported by professional drivers (Verster, van der Maarel, McKinney, Olivier & de Haan, 2014), research has shown that driving is significantly impaired during alcohol hangover (Verster, Bervoets, et al., 2014).

Howland, Rohsenow and Edwards (2008) reviewed the little research that has provided data about hangover resistance and found that "despite variations in study design, populations, and time referents, there was striking consistency in the proportion of exposed populations who report not experiencing hangover" (p. 43). In summarizing data from survey and experimental studies, Howland, Rohsenow and Edwards reported that, on average, 23% of drinkers appear to be hangover resistant.

There are, however, several limitations in the studies reviewed by Howland, Rohsenow and Edwards (2008). First, in experimental studies, generally a pre-set dosage of alcohol was consumed, within a set short period of time, to achieve a desired peak blood alcohol concentration (BAC). Given ethical constraints, this peak BAC was generally around 100–120 mg/dl (e.g., Chapman, 1970; Howland, Rohsenow, Allensworth-Davies, et al., 2008), which is lower than observed in real life drinking sessions (Hesse & Tutenges, 2010; Jones, 2010; Verster, de Klerk, Bervoets, & Kruisselbrink, 2013). Second, it is unclear what is meant by the term 'hangover resistance' from studies in which the time frame under consideration is limited. There is a difference between having experienced a hangover in one's lifetime (lifetime hangover positive; LHP) but not experiencing one following a particular drinking

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episode or within a limited time period (e.g. 1, 2, 5 years) and never having experienced a hangover across a lifetime of drinking (lifetime hangover negative; LHN). These two types of hangover resistance were not differentiated in the studies reviewed by Howland, Rohsenow and Edwards (2008) but are important, as the absence of negative after-effects of alcohol may differentially affect the frequency and volume of future alcohol consumption in LHN and LHP drinkers (Huntley et al., 2015), which could, hypothetically, differentially alter the risk for future alcohol use disorders.

Separating LHN from LHP drinkers can be easily achieved by asking participants whether or not they have ever experienced a hangover in their lifetime. However, in estimating the prevalence of lifetime hangover resistance, this simple binary is insufficient as it does not take level of intoxication into account. For example, using a large Dutch survey, Verster et al. (2013) constructed a frequency distribution of the number of past-year hangover resistant drinkers relative to the total number of drinkers at each 10 mg/dl (mg%) estimated BAC (eBAC) value ranging from 0 to 500 mg%. In addition, they computed a cumulative frequency distribution of the proportion of past-year hangover resistant drinkers above and below each 10 mg% eBAC increment to examine how past-year hangover resistant drinkers were distributed across the eBAC spectrum. In total, 32.1% of the drinkers in their study reported not experiencing a hangover in the past year, however more than half of them were distributed at eBAC levels below 80 mg%, the threshold used in a number of countries to determine impaired driving. For drinkers whose eBAC met or exceeded 200 mg%, only 8.1% reported not experiencing a hangover in the past year—substantially lower than the 23% reported by Howland, Rohsenow and Edwards (2008).

Although Verster et al. (2013) were able to show how hangover resistant drinkers were distributed across the continuum of eBAC values, hangover resistance over a 12 month period is not equivalent to hangover resistance over a lifetime of drinking (LHN). Therefore, the purpose of the present study was to examine the frequency distribution and cumulative frequency of LHN drinkers across a continuum of eBAC values ranging from 0 to 500 mg% in a population of university drinkers. Based on Verster et al. we hypothesized that half or more of the LHN drinkers would be distributed at eBAC levels below 80 mg%. Furthermore, as it is conceivable that a proportion of the past-year hangover resistant drinkers in the frequency distribution created by Verster et al. may have experienced a hangover at some point in their lifetime, it was hypothesized that the cumulative frequency of LHN drinkers above 80 and 200 mg% in the present study would be lower than that reported by Verster et al. These aims were achieved through the use of survey data collected from students at an eastern Canadian university.

2. Materials and methods

2.1. Subjects & procedure

As part of an ongoing larger project examining monthly patterns of alcohol consumption and alcohol related harms in university students, full-time students at Acadia University (an eastern Canadian university) were invited by email to anonymously complete an online drinking survey about their experiences involving alcohol. The Acadia University Research Ethics Board provided ethical approval for the project. During each three month long academic term, the full-time student population was divided into three groups stratified on the basis of sex, year of study, and degree program. A day following the end of each month within an academic term, one of these groups was sent an email inviting them to complete an anonymous drinking survey online so that, by the end of the third month of each academic term, each full-time student had received an invitation to complete the survey. The email provided students with a hyperlink to the survey URL. Students provided informed consent by clicking on the URL hyperlink, which took them to the survey website. Twenty-four hours following the invitation email students received a reminder email, and 24 h following the reminder email students received a third email thanking those who had completed the survey and reminding students to complete the survey for a final time. The survey was closed at the end of the day following the final reminder. Students who completed the survey had the option to enter into a draw for one of two $50 gift certificates by clicking on a URL hyperlink that directed them to a separate website.

2.2. Survey

The survey asked students about their experiences involving alcohol during the previous month, including details about their typical pattern of drinking (frequency, quantity & duration) and their highest volume drinking episode (quantity, duration & hangover severity). Data for the heaviest rather than a typical drinking episode was chosen as the unit of analysis in the present study because we wanted to know the highest BAC after which LHN drinkers report not experiencing a hangover, as claims of lifetime hangover resistance gain credibility at higher levels of intoxication. Regarding students' heaviest drinking episode, they were asked, “In the past month, what is the largest number of drinks you recall consuming?” and “On that day, over how many hours did you drink?” Students were then asked to rate their hangover severity the next day on a single item hangover question (Rohsenow et al., 2007) that asked, “How would you rate your hangover the next day?” Seven response options were provided: I have never experienced a hangover, 0 (Absent), 1 (Mild), 2, 3 (Moderate), 4, and 5 (Severe); students selecting ‘I have never experienced a hangover’ were labelled LHN whereas students selecting ‘0 (Absent)’ and students with a hangover severity rating greater than zero were labelled LHP.

Demographic questions pertinent to the present research included students' sex, age, height and weight. Information about height and weight was obtained to compute estimated blood alcohol concentration (eBAC). eBAC (in mg/dl, or mg%) was computed separately for males and females using the formulas provided by Seidl, Jensen and Alt (2000, p. 74). For males, eBAC was obtained by the formula: $1000 * ((\#\text{drinks} * 13.6 \text{ g alcohol}) / (\text{weight in kg} * (0.31608 - (0.004821 * \text{weight in kg}) + (0.004632 * \text{height in cm})) / 10 - (\#\text{hours} * 0.017))$; for females, eBAC was obtained with the formula: $1000 * ((\#\text{drinks} * 13.6 \text{ g alcohol}) / (\text{weight in kg} * (0.31223 - (0.006446 * \text{weight in kg}) + (0.004466 * \text{height in cm})) / 10 - (\#\text{hours} * 0.017))$. In each formula, the number of drinks was multiplied by 13.6 as this value corresponds to the volume of alcohol (in grams) contained in a standard drink in Canada. An elimination rate of 0.017 g% per hour was selected as it represents the midpoint in Jones' (2010) suggested range of elimination rates of alcohol from blood. Each formula was multiplied by 1000 to convert BAC values from g/dl to mg/dl. eBAC values represent blood alcohol concentrations for the time point at which students reported their drinking episode had ended. Thus, an eBAC of zero means that a drinking episode was sufficiently long for the alcohol a student had consumed to be metabolized. For inclusion in the analyses, students were required to have provided data about their heaviest drinking episode (quantity, duration & hangover severity), sex, height and weight as well as background information, including their age and their typical drinking pattern (frequency, quantity & duration). Missing data resulted in case wise deletion.

2.3. Statistical analysis

Data collected over six academic terms from September 2013 to March 2016 were combined to produce a dataset with the greatest number of observations of LHN drinkers. Computed eBAC values from 0 to 300 mg% were organized into 10 mg% increments by combining values within a range of −5 and +4.9 mg% around each increment (e.g., an eBAC of 80 mg% included computed eBACs within the range of 75 to 84.9 mg%). eBAC values from 300 to 500 mg% were organized into 50 mg% increments due to the increasing scarcity of data points beyond 300 mg%. A frequency distribution was created by dividing the