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Patterns of alcohol consumption and alcohol-related harm among European university students

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ABSTRACT

Background: To compare patterns of alcohol consumption and alcohol-related harm from a survey of university students sampled from universities in Denmark, England, Germany, Italy, Portugal and Switzerland.

Methods: A total of 2191 university students (70% female, 90% white ethnic group, age range 18-25) completed the survey. Participants completed measures of demographic variables (age, age of onset, ethnic group, sex) and the Alcohol Use Disorders Identification Test (AUDIT), which was the primary outcome.

Results: Sixty-three percent of the sample scored negative for harmful drinking on the AUDIT (<8), with 30% categorised as hazardous drinkers, 4% harmful drinkers and 3% with probable dependence. Analysis of variance, including demographic factors as covariates, identified a main effect of country on AUDIT scores $F(5, 2086) = 70.97$, $p < 0.001$, partial eta square = 0.15. AUDIT scores were highest in England ($M = 9.99$; $SD = 6.17$) and Denmark ($M = 9.52$; $SD = 4.86$) and lowest in Portugal ($M = 4.90$; $SD = 4.60$). Post hoc tests indicated large effect size differences between scores in Denmark and England and scores in all other countries ($0.79 < d < 0.94$; all p's < .001).

Conclusions: European university students in our sample mainly reported low risk patterns of alcohol consumption and alcohol-related harm. However, students from Northern European countries had significantly higher AUDIT scores compared to students from Central and Southern European countries. Research is needed to replicate the present study using nationally-representative samples to estimate the prevalence of alcohol use disorders among university students in different European countries.

Keywords: Alcohol; AUDIT; Hazardous drinkers; Europe; University students

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INTRODUCTION

Hazardous drinking is defined by the World Health Organisation (1) as: 'A pattern of substance use that increases the risk of harmful consequences for the user...' This pattern of substance use has been linked to an increased chance of being a victim of crime (2) and higher likelihood of needing emergency medical attention (3). Hazardous drinking is most prevalent among people aged 25 and under (4) and systematic reviews show this pattern of consumption is common among European university students (5,6).

One method to identify hazardous drinking in university students is to use screening tools such as the Alcohol Use Disorders Identification Test (AUDIT) (7,8) or the Cut-down, Annoyed, Guilty, Eye-opener (CAGE) tool(9). Using such tools, the scale of hazardous drinking in European university students can be illustrated. Based on AUDIT scores, 40% of English students recruited from seven English universities (10) were identified as hazardous drinkers, as were 40% of law students and 44% of medical students, recruited from a single English university (11). Data from a sample of Spanish university students (12) showed that 58% of men and 52% of women engaged in 'risky drinking' (defined as a score of 5 for women and a score of 6 for men on the AUDIT). Finally, in a sample of more than 2000 university students from the Republic of Ireland (13), 65% of men and 67% of women met the cut-off for hazardous drinking (defined as a score of 5 for women and a score of 6 for men on the first three AUDIT items, i.e, the AUDIT-C). Overall, there is consistent evidence that many European university students engage in hazardous patterns of alcohol consumption.

Nevertheless, much of the research into hazardous drinking among European university students has been conducted in countries such as the UK where population levels of hazardous alcohol consumption are higher than in other European countries (14). For example, within Wicki et al.'s systematic review (6), there are more data points from the UK than any other European country.

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Nationally representative school surveys such as the European School Survey of Alcohol and other Drugs (ESPAD) (15,16) show that the prevalence of hazardous drinking varies between European countries; adolescents from Northern European countries are more likely to report hazardous drinking than adolescents from Central or Southern European countries. Only two studies have compared rates of hazardous drinking among European university students. Stock et al. (17) reported higher rates of 'problem drinking' (defined as a score of 2-3 on the CAGE tool) in Germany, Lithuania and Poland and lower rates in Bulgaria, Denmark, Spain and Turkey. Dantzer, Wardle, Fuller, Pampalone and Steptoe (18) reported higher prevalence for 'heavy drinking' (defined as consuming 5/4 drinks for men/women on a single occasion) in Belgium, England, Iceland, Ireland the Netherlands, Poland and Slovakia and lower rates in Bulgaria, Germany, Greece, Italy, Portugal, Romania, Slovakia and Spain.

One explanation for these differences is the relative acceptability of hazardous drinking within different European countries. While research suggests that Italian adolescents hold negative views about public displays of drunkenness (19), English university students view being drunk as a way to increase self-confidence (20). Research by Aresi, Fattori, Pozzi and Moore (21) shows that Italian students studying abroad modified their alcohol consumption to fit in with dominant drinking norms. Overall, in countries where hazardous drinking is viewed as less acceptable, hazardous drinking among university students should be less prevalent than in countries where hazardous drinking is viewed as more acceptable.

The present study seeks to answer the following research questions: (1) Is hazardous drinking the most prevalent pattern among European university students? and (2) Is hazardous drinking more prevalent in Northern European university students compared with Central and Southern European university students?

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METHOD

Design & Setting

Data are from the CALIBRATE study, a longitudinal survey study examining predictors of alcohol consumption among university students aged 18-24 (22). Further information about the study can be found on the Open Science Framework at https://osf.io/xc8au. GPower 3.1 was used to calculate power for the study. As the primary aim of the study was to detect a medium effect size (i.e., $f^2 = 0.15$) for a model predicting alcohol consumption, with 80% power and alpha set to 0.05, we aimed to recruit a minimum sample of 203 students, per university, at baseline and follow-up. The current paper employs a cross-sectional design and uses data collected from universities in six countries: Denmark (University of Copenhagen), England (Aston University, University of Sussex), Germany (Freie Universität Berlin), Italy (University of Turin), Portugal (University of Porto, Polytechnic Institute of Porto) and Switzerland (University of Zurich). Data were collected between 31st October and 19th December 2014.

Recruitment and Incentives

In all settings except the University of Copenhagen, some participants were recruited in response to emails advertising the study; this was the only method used to recruit participants in Porto, Sussex and Zurich. In Copenhagen institutional rules prevented us from sending an email to students, so, a CALIBRATE project Facebook page was used to recruit participants. Facebook pages were also used in Aston, Berlin, and Torino. Twitter was used to advertise the study to Aston University students. Participants were offered either course credit or entry into a lottery prize draw in recompense for their participation.

Participants

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University students aged 18-25, who had consumed alcohol in the last 12 months, were eligible to participate in the study. Overall, 2191 participants (females = 1541; males = 643; other (please specify) = 7[1]) completed the survey up to and including the AUDIT questionnaire. The majority of participants were female (70%) and described themselves as white (90%). Mean age was 21.11 (SD = 2.04) and mean age of onset of alcohol use was 15.65 (SD = 1.94). See Table 1 for full details. Across countries there were differences in all demographic variables. In Portugal, 35% of participants were male while in Germany 24% of participants were male $\chi2(10)$ = 22.29, p = .01. In Portugal, 99.6% of participants described themselves as White, in contrast, 71% of the English sample described themselves as White $\chi2(25)$ = 375.55, p < .001. The English sample had the youngest average age (M = 19.61) while the Danish sample had the oldest average age (M = 21.98) $F(5,2188)$ = 96.82, p <.001. Age of onset was lowest in Denmark (M = 14.80) and highest in Portugal (M = 16.26) $F(5, 2104)$ = 25.03, p < .001. As a result of these differences between samples, sex, ethnic group, age and age of onset were controlled for in all analyses.

<div align="center">INSERT TABLE 1 HERE</div>

<u>Measures</u>

Demographic variables were measured as follows. Participants reported their age and age of onset (i.e., 'How old were you when you first started drinking alcohol, not including small sips of tastes? _____ years old') as a number. Sex was a closed-choice question with female, male or other (please specify) as options. Ethnicity was reported by asking participants to indicate the group that best represented them from this list: Asian/Asian British; Black/Black

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[1] Due to the small number of participants who reported other as their response to the question about sex, it was decided to exclude these participants from the main analysis.

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British; Middle/Near Eastern; Mixed Ethnic Group; White/White British; Other (please specify). Labels were adapted as appropriate for each country.

All participants completed the AUDIT, a widely used 10-item screening tool developed by the World Health Organisation to screen for the presence of alcohol use disorders. AUDIT score was the primary outcome in this paper. The AUDIT has has been shown to be reliable and valid (7,8,23) and shown sensitivity and specificity between 80 and 95%, with an area under the ROC curve of between 0.8 and 0.9 in most studies (24). AUDIT score is used to categorise individuals into one of four categories based on the following cut-offs: Low risk (0-7); Hazardous drinking (8-15); Harmful drinking (16-19); Probable dependence (20-40). The standard cut-off for a postive screen is 8+. The AUDIT has been used with university populations in previous research (10–13). Validated versions of the AUDIT exist in several languages. In the current study we used the Danish version in Denmark, the English version in England, the German version in Germany, the Italian version in Italy, and the Portuguese version in Portugal. In Denmark, participants could also complete measures in English. In Switzerland participants could complete measures in German or Italian.

Ethics

Ethical approval for the study was granted in different ways in different countries. Ethical approval was received from the School of Life and Health Sciences Ethics Committees at Aston University (England), Freie Universität Berlin (Germany) and Zurich University (Switzerland). Ethical approval from Aston was deemed sufficient for data collection to take place at the University of Copenhagen and the University of Sussex. According to Italian and Portuguese scientific legislation no ethical review was necessary

Procedure

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All aspects of the study were conducted online using Survey Monkey software package. Data collection took place using a self-administered questionnaire hosted on a secure server. Each country had its own version of the questionnaire. Potential participants clicked on the website for the study in their country. The first page of each website contained information about the project, the anonymity of the survey findings, and a short outline of what the survey entailed. The second page of study websites contained statements to indicate informed consent. Participants had to click on each statement to indicate consent. Participants were then asked to generate a personal identification code, which was used to separate their data from other participants while maintaining their confidentiality. The third page of survey websites asked participants to indicate their age, sex and ethnic group. Finally, participants completed the AUDIT items and age of onset before completing the remainder of the survey. At the end of the study all participants read a debrief form describing the study and asking them to enter their email address if they wished to receive course credit, gift vouchers or be entered into a lottery prize draw, as appropriate (see above).

Analysis Plan

To address the first research question, frequency data were used to indicate the percentages of university students in each of the four AUDIT categories: Low risk; Hazardous drinking; Harmful drinking; Probable dependence. To answer the second research question, linear regression was used to test a model that predicts AUDIT scores using age, age of onset, country of study, ethnic group and gender. Analyses were conducted in JASP version 0.8.5.1 and SPSS version 24.

RESULTS

Is hazardous drinking the most prevalent pattern among European university students?

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The median AUDIT score was 6.00 (M = 6.90, SD = 5.42, Range = 1-31). Sixty-three percent of our sample were categorised as low risk drinkers, 30% as hazardous drinkers, 4% as harmful drinkers and 3% as probable dependence drinkers. This means most of our sample did not screen positive on the AUDIT.

<u>Is hazardous drinking more prevalent in Northern European university students compared with Central and Southern European university students?</u>

Figure 1 displays the percentage of university students in each country for each AUDIT category. In Denmark and England, hazardous drinking was the most common category (50% and 44%, respectively). Low risk drinking was also common in these countries (38% and 40%, respectively). In Germany, Italy, Portugal and Switzerland low risk is the most common category, ranging from 72% to 79%. In Denmark and England 8% and 7% of participants, respectively, reported harmful drinking. In all other countries, less than 4% of participants were categorised as harmful drinkers. Finally, in England 9% of participants reported probable dependence. This compares with rates ranging from 1-4% in all other countries.

INSERT FIGURE 1 HERE

Linear regression was used to test a model predicting AUDIT score including the following variables: age; age of onset; country of study; ethnic group; gender. Age and age of onset were measured continuously, country of study was converted into a set of dummy variables (i.e., England vs. all other countries), ethnic group was dichotomised (with White as the reference category) gender was measured dichotomously (female = 0; male = 1). The model accounted for approximately 24% of the variance in AUDIT score $F(9,2086)$ = 71.91, p < .001. There were significant effects for England (B = 4.91, SE = 0.35, p <.001), Denmark (B = 3.49, SE = 0.36, p <.001), gender (B = 1.88, SE = 0.23, p <.001), age of onset (B = -0.63, SE = 0.06, p <.001), and age (B = 0.15, SE = 0.06, p = .01). Higher AUDIT scores were

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associated with being (1) an English student, (2) a Danish student, (3) male, (4) younger age of onset and (5) older age. Table 3 summarises the results of this analysis.

INSERT TABLE 2 HERE

INSERT TABLE 3 HERE

DISCUSSION

Most students in our sample did not report hazardous drinking based on their AUDIT score. However, AUDIT scores did vary significantly between university students sampled from different countries; participants recruited from Denmark and England reported large effect size differences in AUDIT score compared to participants recruited from other countries. AUDIT score was also predicted by age, gender, and age of onsent.

While almost a third of participants reported hazardous drinking, this prevalence is lower than previously found in studies that have used the AUDIT (5,10–13). Results are similar to those reported by Stock et al. (17), with the majority of their sample reporting low risk while 24% of males and 13% of females scored 2 or 3 (indicating problem drinking) on the CAGE screening tool. Like the current study, Stock et al. (17) also noted differences in CAGE score due to country of study. In contrast to the present study, they found the highest rates of problem drinking in Germany and the lowest rates in Denmark, although it should be noted that Stock et al. recruited more male participants than the current study, and men tend to have higher AUDIT scores.

Hazardous patterns of alcohol consumption are more common in Northern European countries as compared to Central and Southern European countries (15,16). Data from the current study show the same patterns with 50% of Danish students and 44% of English categorised as 'hazardous drinkers' as opposed to 24% and 23% in Switzerland and Germany and 20% and 17% in Italy and Portugal. These results are consistent with the idea that

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patterns of alcohol consumption and alcohol-related harm reported by university students reflect broader cultural norms.

It is worth noting that it is difficult to compare results from the current study with results from previous studies due to variation in definitions of hazardous drinking used; some studies used definitions based on number of drinks (18) while other studies using tools like the AUDIT (10,11) or the CAGE (17). When defining hazardous drinking using screening tools, there is a need to consider the cut-offs values that are used to classify hazardous consumption. Some researchers argue that using a lower cut-off for AUDIT score (5 or 6) produces better sensitivity and specificity. We decided to use AUDIT scores below 8 as a cut-off because this cut-off is frequently reported in past papers (10,11). However, had we elected to define hazardous drinking in line with other cut-offs then interpretation of our results may have changed. A key recommendation from this study is the need to reach consensus on cut-offs for alcohol screening tools to allow for comparisons between studies.

Perhaps the most concerning results come from England where 9% of participants were categorised as 'probably alcohol dependent' and a further 7% categorised as 'harmful drinkers'. These results match those reported by Heather et al. (10) who found that 10% of their sample were 'probably alcohol dependent' and 11% 'harmful drinkers'. These results contrast with responses from other countries, where levels of harmful and dependent drinking were lower than 5%. Longitudinal data from Spain (25) shows that students who drank hazardously prior to attending university maintained this pattern at age 27, suggesting an underlying issue with alcohol consumption that is potentially masked while attending university due to the higher prevalence of hazardous drinking among university students. A similar, although more extreme, pattern may be evident in those English participants scoring at the cut-off for probable dependence, with these individuals likely having a alcohol use

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disorder prior to attending university. Future studies are urgently needed to explore the beliefs and behaviour of English university students who score so highly on the AUDIT.

The current study has a number of strengths. First, we collected data from multiple countries using a standardised measure allowing us to directly compare results across countries. Second, our total sample size of 2191 compares favourably with other studies based on smaller samples. Finally, the countries sampled in this study cover a range of different drinking patterns, from countries where infrequent, hazardous, drinking patterns are common to where drinking patterns are frequent, but low risk (26).

In addition, the current study has a number of limitations. First, we were unable to recruit similar sample sizes in all countries, with samples ranging from 275 in Italy to 471 in Portugal. Second, the samples were recruited from a single university in most countries, so, results may not generalise to other universities within the same country; data from Heather et al. (10) found regional differences in AUDIT scores. Third, our study oversampled women and white participants. Finally, no samples were recruited from Eastern Europe. A recent study suggests that Eastern European adolescents tend to drink more than Southern European adolescents but less than Northern and Central European adolescents (27).

In conclusion, the current study shows that the majority of university students, recruited from six different European countries did not report hazardous drinking. Results also show that Danish and English university students were more likely to report hazardous patterns of alcohol consumption compared with university students recruited from Germany, Italy, Portugal and Switzerland. Nationally-representative surveys of European university are now needed to confirm prevalence rates of alcohol consumption and to inform the design of interventions to reduce the burden of alcohol-related harm among young people.

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Conflict of interest: ERAB are funded by The Brewers of Europe. ERAB had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Keypoints:

- European university students mainly scored AUDIT negative, suggesting low risk patterns of alcohol consumption and alcohol-related harm.

- Students from Denmark and England had significantly higher AUDIT scores, on average, relative to students from Germany, Italy, Portugal and Switzerland, suggesting cultural differences in patterns of alcohol consumption and alcohol-related harm.

- Public health policies to reduce harmful alcohol consumption need to be tailored to the cultural context of the target audience.

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Table 1. Sample characteristics and descriptive statistics for total sample and sub-samples

Country	N	Sex (%)			Ethnicity %						Age[a] (SD)	Age of Onset (SD; *Range*)
		F	M	O	White	Mixed	Middle/ Eastern	Asian	Black	Other		
Denmark	351	238 (68)	112 (32)	1	96	3.4	0.3	0.3	0	0	21.98 (1.69)	14.80 (1.24; 12-21)
England	424	308 (73)	115 (27)	1	70.7	6.1	0.2	18.9	3.1	0.9	19.61 (1.55)	15.55 (2.14;11-22)
Germany	292	220 (75)	69 (25)	3	91	4.2	1.7	2.1	1.0	0	21.54 (2.18)	15.53 (1.78; 8-22)
Italy	275	202 (73)	73 (27)	0	89.1	5.8	2.9	0.4	0	1.8	21.89 (1.82)	15.96 (2.19; 11-23)
Portugal	471	306 (65)	165 (35)	0	99.6	0	0	0.2	0.2	0	20.67 (1.86)	16.26 (2.03; 10-21)
Switzerland	378	267 (71)	109 (29)	2	92.6	2.6	0.5	3.2	0	1.1	21.66 (1.98)	15.72 (1.73; 11-22)
Total	2191	1541 (70)	643 (30)	7	89.7	3.5	0.7	4.7	0.8	0.6	21.11 (2.04)	15.65 (1.94; 8-23)

Note. F = female; M = male; O = Other (please specify)

[a] Age range was 18-25 in each country apart from Italy where it was 19-25.

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Table 2. AUDIT scores in each country

Country	AUDIT Score (Median)	AUDIT Score (Mean (SD))	Lower CI	Upper CI
Denmark	9.00	9.52[a] (6.17)	8.99	10.03
England	9.00	9.99[a] (6.17)	9.50	10.45
Germany	4.00	5.44[b] (4.17)	4.88	6.02
Italy	4.00	5.55[b] (4.53)	4.95	6.13
Portugal	3.00	4.90[b] (4.60)	4.45	5.36
Switzerland	4.00	5.62[b] (4.55)	5.12	6.13
Total	6.00	6.90 (5.43)		

Note. Values in rows that have different superscripts differ by $p < .001$; Lower CI = lower confidence interval, Upper CI = Upper confidence interval. 95% CIs were used.

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Table 3. Linear regression predicting AUDIT score in $N = 2095$ students

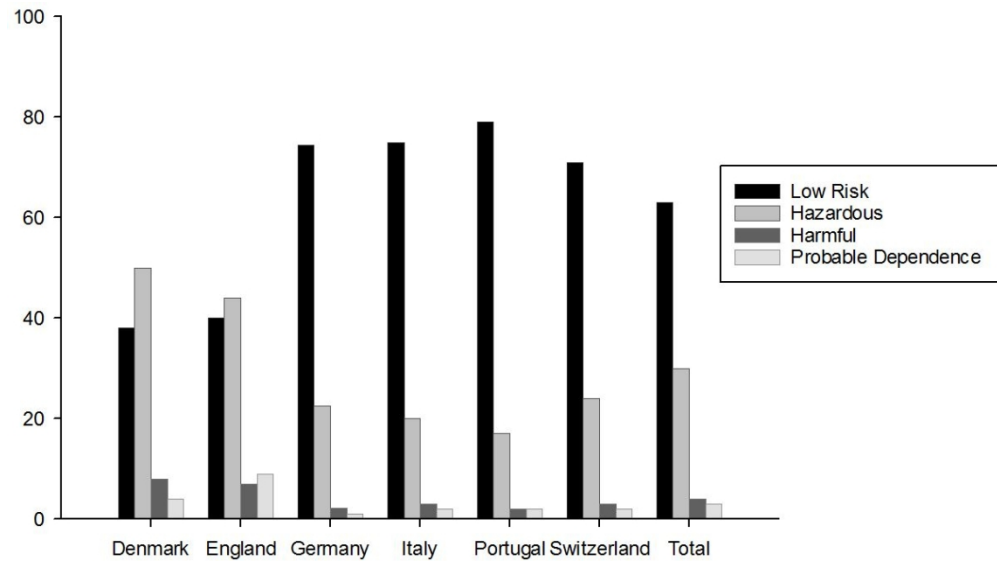| Variable	B	SE	β	p	Lower CI	Upper CI
Age	0.15	0.06	.06	.01	0.04	0.26
Age of Onset	-0.63	0.06	-.22	<.001	-0.74	-0.52
England = 1	4.91	0.35	.36	<.001	4.23	5.59
Denmark = 1	3.49	0.36	.24	<.001	2.79	4.20
Switzerland = 1	0.21	0.34	.02	.53	-0.46	0.89
Germany = 1	0.17	0.38	.01	.66	-0.57	0.90
Italy = 1	0.19	0.38	.01	.61	-0.54	0.93
Ethnic Group (white = 1)	0.34	0.37	.02	.36	-0.38	1.05
Gender (male = 1)	1.88	0.23	.16	<.001	1.43	2.33
R^2	0.24					
F	71.91			<.001		

Note. 95% CIs were used.

Figure 1. Frequency of AUDIT categories reported in each study country