ALCOHOLISM CLINICAL & EXPERIMENTAL RESEARCH

Impact of Exchange Stay on Alcohol Consumption: Longitudinal Exploration in a Large Sample of European Students

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Background: Each year, more than 300,000 university students take part in European exchange programs. Besides their positive educational and cultural impacts, these programs are also reputed to immerse students in a high-risk festive context where excessive alcohol consumption is strongly present. There is thus a crucial need to evaluate the actual impact of those exchange stays on alcohol consumption.

Methods: Study abroad (n = 3,950) and local (n = 3,950) European students completed a 2-part longitudinal survey and reported their alcohol consumption before (T1) and during (T2) their exchange stay (or at the beginning of the academic year and 6 months later for local students, constituting the control group).

Results: During their exchange stay, individuals studying abroad showed more excessive and harmful alcohol consumption behaviors than local students, as measured by increased general alcohol consumption and binge drinking (BD) scores at T2. In particular, study abroad students under 20 years of age and performing their exchange stay in eastern Europe were the most exposed to excessive alcohol consumption and BD.

Conclusions: These results constitute the first large-scale longitudinal confirmation that exchange stays indeed constitute risky contexts in which students significantly increase their consumption and present stronger alcohol-related problems. In view of the rapid and deleterious effects of alcohol consumption in young people, it is essential to promote prevention campaigns targeting this population to limit public health consequences and possible evolution toward severe alcohol use disorders.

Key Words: Binge Drinking, Alcohol Consumption, European Young Students Sample, Exchange Program, Longitudinal Study.

STUDYING ABROAD HAS become increasingly popular among European students for the last decade. During the 2016/2017 academic year, more than 350,000 students took part in the Erasmus (EuRopean Action Scheme for the Mobility of University Students) program, the main exchange program in Europe. While the personal, cultural, and academic benefits of such exchange stays are obvious (e.g., foreign language learning, intercultural awareness development; Stone and Petrick, 2013), they might also be related to increased risky behaviors, particularly by encouraging alcohol and drugs consumption (Aresi et al., 2016a). Such stays, highly funded by the European Union, could thus have underestimated pernicious effects by increasing short-term (e.g., road accidents, unsafe sexual behaviors) and long-term (e.g., development of persistent alcohol or drug use) health risks. As excessive alcohol consumption rapidly leads to cognitive and cerebral consequences (Hermens et al., 2013; Maurage et al., 2013) and could be considered as a first step toward severe alcohol use disorders (Bonomo et al., 2004), exploring the effects of exchange programs on alcohol consumption is a key public health concern. However, while it has been suggested, in the United States (Marcantonio et al., 2018; Pedersen et al., 2010, 2014) and Italy (Aresi et al., 2016b; Mitchell et al., 2016), that alcohol consumption indeed increases during exchange stays, these studies were based on very limited samples (100 to 350 students). Moreover, they did not use any matched control group, hampering to disentangle the specific evolution of alcohol consumption during exchange stay from the one naturally observed in local students (i.e., not studying abroad) along the academic year.

In order to overcome these limits, the alcohol consumption of a large sample of European students has been evaluated before and during their exchange stay, and compared with the consumption of a group of local students matched on gender and age, but also on their baseline drinking level. Importantly, this comparison allowed clarification of the specific impact of exchange stay on drinking behaviors. In addition to measuring the general level of alcohol consumption dangerousness (through the Alcohol Use

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Disorder Identification Test [AUDIT]; Babor et al., 2001), we were particularly interested to characterize the binge drinking (BD) habits (through the computation of the BD score, specifically quantifying excessive alcohol consumption over short periods of time; Townshend and Duka, 2005). Moreover, as age-related differences have been reported regarding harmful alcohol consumption and BD prevalence (e.g., Patrick et al., 2017), the possible effect of age on the consumption of study abroad students was assessed. Finally, the variability of alcohol consumption habits according to the location of home and host universities across European regions was also explored.

MATERIALS AND METHODS

Participants and Procedure

A large longitudinal online survey explored global alcohol consumption and BD habits among students from European universities. The survey was disseminated through mailing lists and social networks (e.g., via national and international students associations) to reach a maximum of European study abroad and local students. They completed a baseline survey (T1) at the beginning of the academic year (i.e., before or at the start of their exchange stay for study abroad students) and were individually recontacted for the follow-up survey (T2), either just at the end of their exchange stay (for study abroad students) or 6 months after T1 (for local students). The first part of the questionnaire was available between mid-August and mid-November 2016. Inclusion criteria were being aged between 18 and 35 years, and studying in a European country (both for home and host universities). Complete teetotalers (both at T1 and T2) were excluded from the sample. All participants gave online consent before starting the survey, their anonymity was guaranteed, and they were included in an incentive lottery as a compensation for participating. The study protocol was approved by the ethical committee of the Université catholique de Louvain and conducted in accordance with the Declaration of Helsinki, as revised in 2008. This study is part of a larger research program exploring drinking habits in European students, which has led to previous publication (Dormal et al., 2018).

Measures

The online survey was implemented in Qualtrics software (Qualtrics, LLC, Provo, OR) and available in 4 languages (English, French, Spanish, and Italian). The baseline survey comprised 2 parts, respectively assessing sociodemographic variables (age, gender, country of origin, country and duration of exchange stay) and alcohol consumption habits. Alcohol consumption was assessed by the AUDIT (Babor et al., 2001), a 10-item questionnaire measuring the general intensity and harmfulness of alcohol consumption, with a total score ranging from 0 to 40. Then, 3 specific items were proposed to compute a BD score (Townshend and Duka, 2005), widely used in the literature to specifically evaluate BD behaviors among young people, namely consumption speed (number of alcohol units consumed per hour), frequency of drunkenness episodes (drunkenness being defined as having experienced motor, language, or memory dysfunctions following excessive alcohol consumption), and percentage of drunkenness episodes compared to the total number of drinking episodes, by applying the following formula: [(4 × consumption speed) + drunkenness frequency + (0.2 × drunkenness percentage)]. Higher score indicates stronger BD habits. When answering alcohol-related questions, participants had to consider the last 6 months and a standard drink definition (i.e., 10 g of ethanol) was used for all measures. Similar alcohol-related questions were submitted to the participants in the T2 follow-up survey, except that study abroad students had to specifically consider the exchange period to evaluate this T2 consumption.

Statistical Analyses

First, group selection and descriptive analyses of the sociodemographic and alcohol consumption variables were reported for the study abroad and local groups. Direct group comparisons using independent *t*-tests were conducted to check group pairing. Then, to evaluate the impact of the exchange stay on alcohol consumption, analyses of variance (ANOVAs) were computed with group (study abroad vs. local) as between-subjects factor and time (T1 vs. T2) as within-subjects factor, separately for AUDIT and BD scores. Finally, complementary ANOVAs were carried out on the study abroad group to explore the age effect (with time [T1 vs. T2] and age category [18 to 19, 20 to 22, 23 to 25 vs. >25 years old] as within-subjects factors) and geographical distribution of home/host universities (with time [T1 vs. T2] and European region [eastern, northern, southern vs. western] as within-subjects factors), separately for AUDIT and BD scores.

RESULTS

Groups Selection and Matching

A total of 26,010 answers were collected at T1, and 9,483 (4,181 study abroad students and 5,302 local students) at T2 (retention rate: 36.5%). After exclusion of complete teetotalers (n = 687, 7.2% of the whole sample), the study abroad group was composed of 3,950 students: 96.1% were Erasmus credit mobility students, 1.6% were degree mobility students (i.e., students pursuing a full bachelor or master degree in a foreign country), and 3.3% took part in another exchange program during the present academic year. These students, from 38 European countries, were grouped in 4 geographical regions (according to EuroVoc classification; see Table S1) regarding their home (eastern [n = 743], northern [n = 223], southern [n = 1,758], and western [n = 1,226]) and host[1] (eastern [n = 869], northern [n = 823], southern [n = 1,240], and western [n = 911]) universities. In order to constitute the comparison group, a subsample of European local students, matched for age, gender, and T1 alcohol consumption, was selected (n = 3,950). The geographical distribution across European regions for the home university of local students was highly similar (see Table S1): eastern (n = 1,068), northern (n = 241), southern (n = 1,924), and western (n = 717).

No difference was found between groups for age, $t(7{,}898) = 1.36$, $p = 0.174$, gender, $\chi^2(1) = 3.146$, $p = 0.076$, AUDIT, $t(7{,}898) = 0.480$, $p = 0.631$, and BD, $t(7{,}898) = 0.191$, $p = 0.848$, scores at T1, thus confirming our excellent group pairings (see Table 1).

[1]A total of 107 data are missing for this category.

Table 1. Sample's Characteristics on Demographic and Alcohol Consumption Measures at T1 and T2

	Study abroad group (n = 3,950)		Local group (n = 3,950)	
Measures	T1	T2	T1	T2
Demographic measures				
Age [mean (SD)]	21.8 (1.8)^{ns}	/	22.4 (2.5)^{ns}	/
Gender ratio (female/male, in %)	72/28^{ns}	/	74/26^{ns}	/
Alcohol consumption measures at T1 [mean (SD)]				
Alcohol Use Disorder Identification Test score	8.15 (5.03)^{ns}	8.63 (5.30)*	8.20 (4.57)^{ns}	7.15 (4.48)*
Binge drinking score	15.37 (14.36)^{ns}	15.80 (14.50)*	15.31 (12.49)^{ns}	12.29 (10.03)*

Difference between study abroad and local groups: ns = Nonsignificant.
*$p < 0.001$.

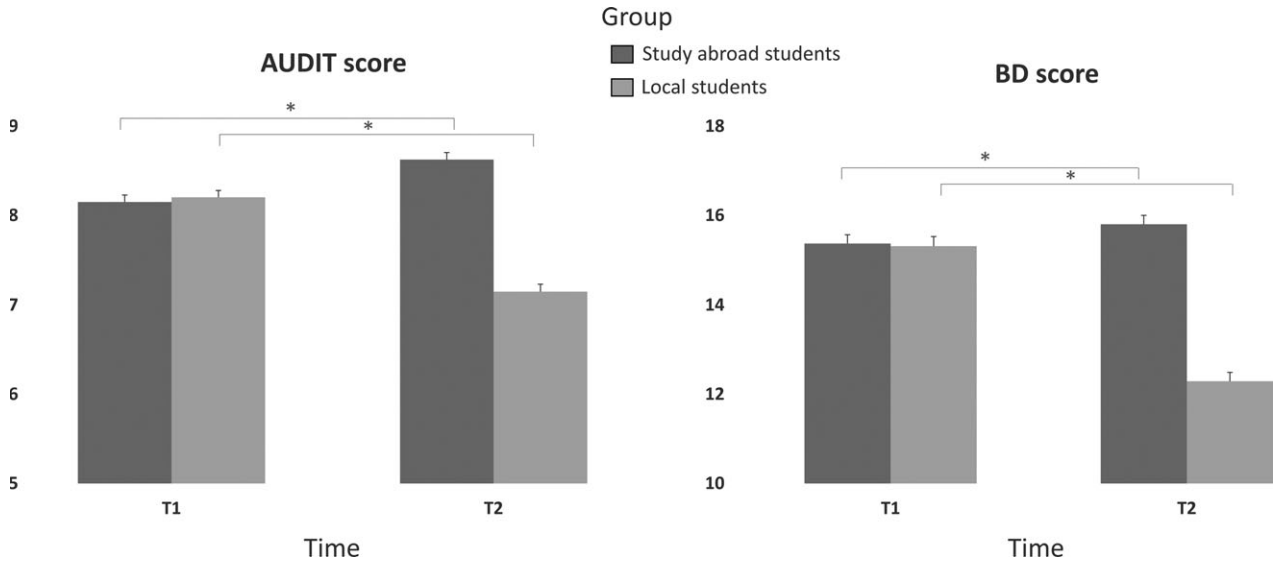

Fig. 1. Mean AUDIT (**left**) and BD (**right**) scores (±SE) as a function of group (study abroad vs. local) and time (T1 vs. T2). Asterisks indicate significant differences between T1 and T2. AUDIT, Alcohol Use Disorder Identification Test; BD, binge drinking.

Alcohol Consumption Comparisons

For both AUDIT and BD scores, ANOVAs revealed main effects of time, AUDIT: $F(1, 7{,}898) = 40.656$, $p < 0.001$, $\eta^2 = 0.005$; BD: $F(1, 7{,}898) = 84.871$, $p < 0.001$, $\eta^2 = 0.011$, and group, AUDIT: $F(1, 7{,}898) = 51.214$, $p < 0.001$, $\eta^2 = 0.006$; BD: $F(1, 7{,}898) = 48.590$, $p < 0.001$, $\eta^2 = 0.006$. Scores were globally larger at T1 (AUDIT: 8.18 ± 4.81; BD: 15.34 ± 13.45) than T2 (AUDIT: 7.89 ± 4.96; BD: 14.05 ± 12.59), and study abroad (AUDIT: 8.39 ± 5.17; BD: 15.59 ± 14.43) showed larger scores than local (AUDIT: 7.68 ± 4.52; BD: 13.80 ± 11.26). Importantly, significant time × group interactions were observed, AUDIT: $F(1, 7{,}898) = 285.789$, $p < 0.001$, $\eta^2 = 0.035$; BD: $F(1, 7898) = 151.451$, $p < 0.001$, $\eta^2 = 0.019$. While the mean scores decreased for local students between T1 and T2, mean AUDIT difference: −1.05 ± 3.86, $t(3{,}949) = 17.140$, $p < 0.001$; mean BD difference: −3.02 ± 11.15, $t(3{,}949) = 17.020$, $p < 0.001$, a significant increase was observed for both AUDIT, mean difference: 0.48 ± 4.17, $t(3{,}949) = 7.173$, $p < 0.001$, and BD, mean difference: 0.43 ± 13.67, $t(3{,}949) = 1.997$, $p = 0.046$, scores for the study abroad students (see Table 1 and Fig. 1).[2]

When considering the age of study abroad students, a significant time × age category interaction was observed for both AUDIT, $F(1, 3946) = 3.450$, $p = 0.016$, $\eta^2 = 0.003$, and BD, $F(3, 3{,}946) = 3.591$, $p = 0.013$, $\eta^2 = 0.003$, scores. The significant increase in AUDIT score between T1 and T2 was observed for all age categories; mean difference for 18 to 19: 0.95 ± 4.48, $t(239) = 3.286$, $p = 0.001$; mean difference for 20 to 22: 0.53 ± 4.21, $t(2{,}528) = 6.375$, $p < 0.001$; mean difference for 23 to 25: 0.34 ± 4.01, $t(1{,}032) = 2.725$, $p = 0.007$, except for older participants, mean difference for > 25: −0.34 ± 3.91, $t(147) = 1.052$, $p = 0.294$; Fig. 2. Concerning BD score, a significant increase between T1 and T2 was only observed for the 18 to 19 year old age category,

[2]Note that while males (AUDIT: 9.49 ± 5.39; BD: 17.54 ± 14.66) showed globally higher AUDIT and BD scores than females (AUDIT: 7.49 ± 4.56; BD: 13.62 ± 12.18), similar results and conclusions are found when analyses are carried out on each gender separately.

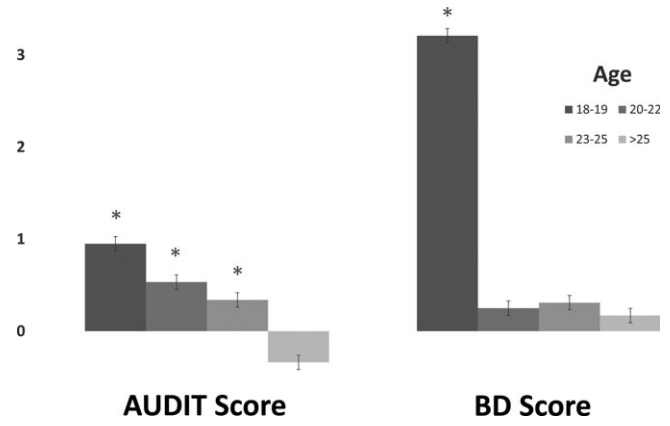

Fig. 2. Mean T2 – T1 difference for the AUDIT (**left**) and BD (**right**) scores (±SE) as a function of age category (18 to 19, 20 to 22, 23 to 25, >25 years old) for the study abroad students. Asterisks indicate significant differences between T1 and T2. AUDIT, Alcohol Use Disorder Identification Test; BD, binge drinking.

mean difference for 18 to 19: 3.21 ± 14.90, $t(239) = 3.343$, $p = 0.001$, while no difference was observed for the other age categories (all p-values > 0.3; Fig. 2).

Finally, regarding the geographical distribution of home universities, for both AUDIT and BD scores, ANOVAs revealed a significant time × European region interaction, AUDIT: $F(3, 3{,}946) = 6.207$, $p < 0.001$, $\eta^2 = 0.005$; BD: $F(3{,}3946) = 5.414$, $p = 0.001$, $\eta^2 = 0.004$. While comparisons of AUDIT score across regions revealed a significant increase between T1 and T2 in the eastern, mean difference: 0.58 ± 4.37, $t(742) = 3.602$, $p < 0.001$, and southern, mean difference: 0.73 ± 4.29, $t(1{,}757) = 7.100$, $p < 0.001$, regions, only the study abroad students from the southern region increased their BD score, mean difference: 1.34 ± 13.83, $t(1{,}757) = 4.075$, $p < 0.001$. Similarly, significant time × European region interaction was observed when the geographical distribution of host universities was considered for both AUDIT, $F(3, 3{,}839) = 15.106$, $p < 0.001$, $\eta^2 = 0.012$, and BD, $F(3, 3{,}839) = 7.414$, $p < 0.001$, $\eta^2 = 0.006$, scores. A significant increase in AUDIT score between T1 and T2 was observed for the students performing their exchange stay in eastern, mean difference: 1.26 ± 4.75, $t(868) = 7.813$, $p < 0.001$, southern, mean difference: 0.40 ± 4.15, $t(1239) = 3.419$, $p = 0.001$, and western, mean difference: 0.33 ± 3.85, $t(910) = 2.578$, $p = 0.010$, regions. For the BD score, a significant difference was observed only for the students performing their exchange stay in the Eastern region, mean difference: 2.11 ± 15.43, $t(868) = 4.032$, $p < 0.001$.

DISCUSSION

Since 1987, more than 3 million students have been involved in European exchange programs, mostly the Erasmus program. This experience provides students with an opportunity to study in a different country, increasing their understanding and openness to other cultures, as well as improving their language skills and broadening their social bonds. Given the growing number of study abroad students, the evaluation of their health and well-being is a critical public health concern. The main aim of this study was to explore the influence of the exchange stay on alcohol consumption and particularly on BD, an alcohol consumption pattern widely prevalent among young people and known to induce deleterious cognitive and brain consequences (Hermens et al., 2013; Maurage et al., 2013).

A large sample of students participating in European exchange programs (n = 3,950) and matched local students (n = 3,950) were compared regarding their alcohol consumption, revealing significant larger AUDIT and BD scores for study abroad students during their stay compared to their baseline level, while local group consumption actually decreased. In other terms, while local students reduce their alcohol consumption during the course of the academic year (a classical effect related to the progressive increase in academic constraints; Gentile et al., 2012), study abroad students show increased consumption as well as more negative health consequences, and more frequent BD behaviors. These results extend preliminary observations (e.g., Aresi et al., 2016b; Pedersen et al., 2010) to a large European sample. Importantly, for the first time, the direct comparison with a group of local students matched for baseline alcohol consumption level ensured that the consumption increase is not due to a selection bias: In our sample, study abroad students did not show a specific predisposition to higher alcohol use compared to local students.

Complementary analyses revealed that this increase in AUDIT score during exchange stay is observed whatever the age of study abroad students, except for the oldest ones (i.e., >25 years old). These results are in line with alcohol consumption habits among classical student population in most countries, with a peak observed in late adolescence or early adulthood (around the age of 18 to 25), while a decrease is reported after 25/26 years of age (Kuntsche et al., 2004; Patrick et al., 2017). However, regarding BD habits, only students aged from 18 to 19 years reported a significant increase in BD score, showing that this age group is particularly at risk regarding excessive alcohol consumption when performing exchange stays. Finally, the comparison of AUDIT and BD scores across European regions revealed that study abroad students from southern European countries were those who had the most massively increased their alcohol consumption and BD frequency. While the general increase in alcohol consumption and the experience of negative health consequences were commonly observed in almost all regions (except in the northern region), students who performed their exchange stay in eastern region specifically showed a large increase in BD habits. Altogether, these findings suggest that the region of origin of study abroad students, as well as the destination they have chosen for their exchange stay, influence their experience with alcohol; eastern European countries seem to be particularly confronted with the danger of excessive alcohol consumption among students. However, as a quite broad classification of regions

was used, differences between countries within regions might have been masked by our analyses. Further studies exploring differences in drinking patterns across countries, and using more demographically representative European samples, are needed to elaborate on these preliminary findings. Besides the variability across countries, it should also be noted that the variability across universities (e.g., private, state-supported, parochial), as well as the specific prevention campaigns or interventional policies regarding alcohol consumption developed by these universities, were not considered in this study. However, these factors could clearly influence the level of alcohol consumption among study abroad students and should therefore be taken into account in future studies.

Our results are thus the first controlled test–retest evidence that exchange stays specifically promote an escalation of alcohol consumption, and that exchange programs are thus generating high-risk contexts where students are confronted with reinforced environmental and peer influences on drinking decisions (Pedersen et al., 2009). In view of these results, the development of specific prevention programs, targeting study abroad population and implemented before or during exchange stays (Pedersen et al., 2017), should be encouraged by European authorities to protect health and well-being of study abroad students. In order to efficiently implement such prevention campaigns, future studies should determine the specific drinking motivations shown by study abroad students and should include follow-up evaluations of alcohol consumption to assess whether exchange stays have only transitory or rather long-term consequences on alcohol use pattern.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. List of countries and number of students per European region as a function of home (for local and study abroad groups) and host universities (for study abroad group) according to the EuroVoc geographical classification.