

## Original research papers

# SPORT, PHYSICAL ACTIVITY AND (HARMFUL) ALCOHOL DRINKING IN UNIVERSITY STUDENTS DURING THE FIRST YEAR AFTER COVID-19 PANDEMIC: GENDER-STRATIFIED CROSS-SECTIONAL STUDY

JASNA LULIĆ DRENJAK<sup>1,3</sup>, EDIN UŽIČANIN<sup>2</sup>, NATAŠA ZENIĆ<sup>3</sup>

<sup>1</sup>University of Rijeka, Faculty of Health Studies, Croatia

<sup>2</sup>University of Tuzla, Faculty of Physical Education and Sport, Bosnia and Herzegovina

<sup>3</sup>University of Split, Faculty of Kinesiology, Croatia

Mailing address: Natasa Zenić, University of Split, Faculty of Kinesiology, 6 Teslina Street, 21000 Split, Croatia,  
e-mail: natasazenic@gmail.com

### Abstract

**Introduction.** COVID-19 pandemic increased consumption of alcohol (including harmful drinking – HD), and decreased physical activity levels (PAL) globally, but there is an evident lack of studies examining the problem in the post-pandemic period. This study aimed to evaluate gender-specific associations between sport participation and PAL (independent variables), and HD (dependent variable) among college/university students during the first post-pandemic year of the COVID-19 pandemic. **Material and Methods.** The participants were college/university students, aged 18 to 21 years (n = 788; 409 females) from Croatia and Bosnia and Herzegovina. They were tested on socio-demographic factors, HD (using the AUDIT scale), sport participation and PAL (using the IPAQ questionnaire). Analysis of variance, Chi square test, and t-test for independent samples were used to evaluate differences, while logistic regression with dichotomized criterion (HD vs. non-harmful drinking – NHD) was calculated to establish associations between independent and dependent variables. **Results.** T-test indicated significant differences between HD and NHD in PAL (t-test = 2.16, p = 0.02), but only in males. Also, logistic regression indicated a significant correlation between PAL and HD in males (OR: 1.41, 95%CI: 1.11-1.76), while no association was evidenced: (i) between sport participation and HD (in both males and females), and (ii) between PAL and HD (in females). **Conclusions.** Results indicated that an overall increase in PAL could be helpful in decreasing HD among college/university students; however, to evaluate it more specifically, prospective analyses are needed.

**Key words:** post-pandemic, students, physical activity, participation in sport, substance misuse

### Introduction

The COVID-19 pandemic, which was declared at the beginning of 2020, dramatically influenced all aspects of life all around the globe [1, 2]. The most important change in everyday life and habits happened because of the imposed measures of social distancing and lockdown [3, 4]. Numerous studies confirmed that such measures directly contributed to a decrease in physical activity levels (PAL), and increased the likelihood of misuse of different psychoactive substances (substance misuse – SUM), such as smoking and alcohol drinking [5, 6]. From the perspective of public health, this is important because of the two main reasons. First, proper PAL is known to be associated with better cardiovascular health, as one of the main determinants of health status, but also – overall quality of life [3]. Second, SUM is directly connected with numerous detrimental health and social consequences (delinquency, criminal, addiction) and is one of the most important social and public health concerns worldwide [7].

Alcohol is the second most common psychoactive substance used in the world today, and negative consequences of alcohol drinking are widely known [8]. In brief, alcohol consumption negatively affects brain function (by interfering with the brain's communication pathways, consequently changing mood, behavior, and coordination), (ii) heart function (causing

cardiomyopathy, arrhythmias, stroke and high blood pressure), (iii) liver function (causing fatty liver, alcoholic hepatitis, fibrosis, and cirrhosis), (iv) pancreases (causing pancreas to produce toxic substances that can eventually lead to pancreatitis, and (v) cancer (alcohol drinking can cause several types of cancer) [8]. Therefore, public health authorities and society as a whole are highly concerned about finding the ways to reduce the consumption of alcohol across all age groups [9].

Accordingly, special attention is paid to identification of the factors which could be positively or negatively associated with alcohol drinking [10, 11]. In such a way, it would be possible to identify the potentially vulnerable groups, but also to find eventual protective factors against alcohol drinking in specific population clusters (i.e. age groups, people of specific socioeconomic status, scholastic level). The youth and young adults are particularly important groups in such investigations. Namely, while alcohol drinking is addiction, preventing excessive alcohol drinking should be done at the age when alcohol drinking habits are actually “developed”, with special emphasis on the problem in the regions and countries where alcohol drinking is common, and figures of excessive drinking are high [7, 12].

Sport and PAL are directly connected, and it is well known that people who are engaged in sports have higher PAL [13]. Moreover, studies confirmed associations between PAL and sport, and numerous health-related behaviors. For example, while

examining 11,631 high-school students, US authors concluded that low PAL was associated with higher rates of cigarette smoking, marijuana use, lower consumption of fruits and vegetables, and greater screen time (watching television) [14]. Supportively, male sport participants reported more fruit and vegetable consumption, and were less likely to report SUM, while female athletes consumed more vegetables, and reported less sexual intercourse than non-athletic females [15]. However, associations between sport and alcohol are not clear. In short, while it is generally considered that sport participation and higher PAL should be observed as protective factors against alcohol use, studies frequently did not evidence associations between alcohol drinking and sport/PAL, while some authors even confirmed higher likelihood for earlier initiation, and more harmful alcohol drinking in athletic samples [10, 12, 16].

It is clear that COVID-19 pandemic and imposed measures of social distancing negatively influenced health behaviors in various age groups, including (i) a decrease in PAL (mainly due to lockdown and prohibition of organized sport participation), and (ii) an increase in alcohol consumption [5, 6]. Also, there is an evident interest in studying possible associations between PAL and sport participation, and alcohol drinking in order to evidence sport and PAL as factors of possible influence on alcohol consumption. However, there is an evident lack of studies which examined the association between sport and PAL, and alcohol consumption (i) immediately after the COVID-19 pandemic (knowing the previously specified negative effects of lockdown), and (ii) in college/university students (knowing the fact that they are older than 18 and therefore may purchase alcohol legally, while this period of life is highly stressful and often accompanied with high alcohol consumption) [17, 18].

Consequently, the aim of this study was to evaluate gender-specific associations that may exist between sport participation and PAL (independent variables), and alcohol consumption (dependent variable) among college/university students during the first post-pandemic year of the COVID-19 pandemic. Based on results of previous studies we hypothesized that higher alcohol consumption would be associated with (i) sport participation, and (ii) higher PAL in college/university students.

## Material and Methods

### Participants

In this study, the sample of participants included college/university students aged 18 to 21 ( $n = 788$ ; 409 females). All of them were full-time students from Universities in Croatia and Bosnia and Herzegovina. Multi-stage sampling was performed to select the subjects from three Universities, where investigators were engaged as teachers. Faculties as main organizational units of the Universities were divided into “large” and “small” according to the number of students. In the next phase, 50% of the faculties in each group were randomly selected. In order to cover all academic years, one year was tested in each of the selected faculties. The tested students in each academic year were randomly selected, meaning that we had no specific requirements with regard to the educational program we intend to observe in our sample. After informing participants about potential risks and benefits, investigators visited each faculty and tested the participants by a semi-structured questionnaire, which was disseminated over a digital platform. Participation in the investigation was voluntary, and participants were informed that they could refuse to participate, and to leave the part or full questionnaire unanswered. No identification was collected from participants, and approval of Ethical Board of Faculty of Kine-

siology, Split, Croatia was obtained prior to the investigation. Prior to the study, the necessary sample size was calculated, and the required sample size was 702 (calculated on the basis of the harmful drinking prevalence reported previously for somewhat younger participants (please see later for details on variables), confidence level of 95% and error margin of  $p < 0.05$ ).

### Variables

Apart from gender (male, female, intersex), and age (in years), in this study we observed academic year of the study, PAL, participation in sports, and consumption of alcohol. All variables were collected by previously used questionnaires which were found to be reliable and valid for testing in local languages in the region, and specific details on metrics of the questionnaires are available elsewhere [7, 10, 19].

Participation in sports was evidenced using the scale that consisted of the following answers: “never participated in sport”, “yes, but quit”, “yes, currently participating”. For statistical purposes, results were later grouped into “not participating” (first two responses) and “participating in sports”.

A short version of the International Physical Activity Questionnaire (IPAQ) was used to evidence PAL [20, 21]. Although different types of questionnaires of PAL exist, we decided to use IPAQ mostly because this measurement tool was intended to evidence the so-called “health-related physical activity”. Also, the here applied IPAQ short version has been used in many studies globally, while its reliability and validity is repeatedly confirmed, even in local languages [22, 23]. In brief, IPAQ assesses physical activity undertaken during leisure time, yard activities, work-related activity, and transport. IPAQ contains questions about walking, moderate-intensity activities and vigorous-intensity activities, and sitting (sedentary time), with regard to frequency and duration of each observed activity itself. In this study, we observed PAL as energy expenditure in METs.

The Alcohol Use Disorders Identification Test (AUDIT) was used to evaluate alcohol consumption [24]. This measurement tool consists of 10 testing items with scores ranging from 0 to 4, which results in theoretical range of 0 to 40. Apart from raw score, the results were additionally divided into “harmful drinking” (HD; scores of 11 or above) and “non-harmful drinking” (NHD; scores below 11), as suggested previously, in order to allow meaningful comparison with previous studies done in the region [10, 12], and to allow calculations of the associations with regard to the dichotomized criterion variable.

### Statistics

Kolmogorov Smirnov test was used to evaluate the normality of the distributions for all variables, and means and standard deviations were calculated for age, AUDIT raw score and IPAQ. Meanwhile, frequencies and percentages were calculated for remaining variables.

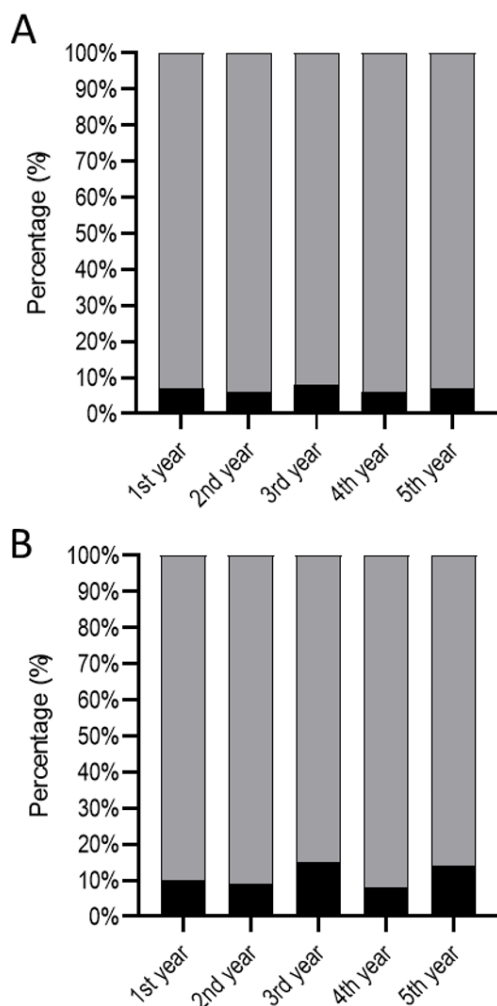
Differences between groups in categorical variables were calculated by Chi square. Analysis of variance (ANOVA) with a consecutive post-hoc test was used to establish the differences among academic years in parametric variables. The T-test for dependent samples was calculated to establish the differences between HD and NHD. Finally, logistic regression with sport participation and PAL as independent variables was calculated to evidence the association between independent variables (age, academic years, sport participation, and PAL) and binarized outcome (HD (coded as 1) vs. NHD (coded as 2)), with Odds Ratio (OR), and 95% Confidence Interval (CI) reported. Analyses of the differences and associations were stratified for gender.

Statistica v. 13.5 (Tibco Inc. Palo Alto, California, USA) was used for all analyses, and the p-level of 0.05 was applied.

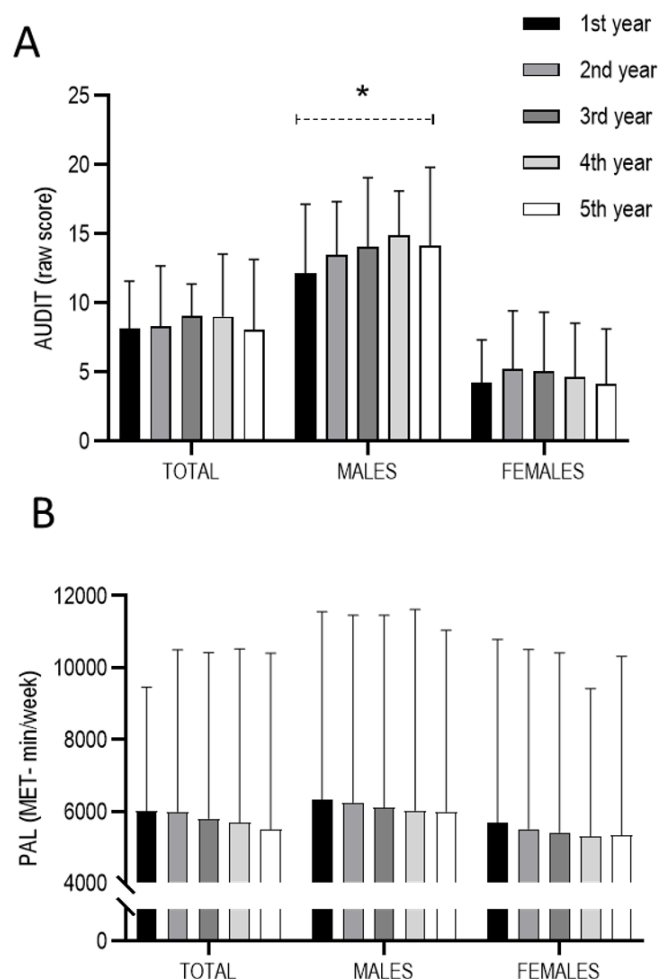
## Results

Figure 1 presents AUDIT scores (1A), and PAL (1B) across age groups (academic years) in the total sample, and separately for males and females. As evidenced, AUDIT score slightly increases from the 1st (total:  $8.11 \pm 3.44$ ; males:  $12.11 \pm 5.01$ ; females:  $4.2 \pm 3.1$ ) to the 5th year (total:  $8.01 \pm 5.11$ ; males:  $14.11 \pm 5.67$ ; females:  $4.1 \pm 4.01$ ) of college/university education, but significant differences are evidenced only for males (significant post-hoc differences at  $p < 0.05$  between the 1st and the 4th academic year). Meanwhile, PAL slightly decreases from the 1st (total:  $6011 \pm 3444$ ; males:  $6321 \pm 5231$ ; females:  $5677 \pm 5111$ ) to the 5th academic year (total:  $5500 \pm 4903$ ; males:  $5991 \pm 5054$ ; females:  $5333 \pm 4980$ ), but with no significant ANOVA difference.

Figure 2 presents distribution of sport participation across academic years. Generally, less than 8% of all university/college students are involved in some form of competitive sports (Fig. 2A). The percentage is somewhat higher in males (9% to 15% involved) (Fig. 2B), than in females (0.3% to 4% involved in competitive sports) (Fig. 2C). Chi square calculation did not reveal any difference among sport participation across different academic years of students (Chi square: 1.12, 2.43, and 1.89; all  $p > 0.05$ , for total, males, and females, respectively).



**Figure 2.** Participation in sport across academic years for the total sample (A), in males (B) and in females (C)



\* – denotes significant differences at  $p < 0.05$ .

**Figure 1.** Alcohol Use Disorder Test (AUDIT) scores (A), and physical activity levels – PAL (B) across academic years with significance of the differences

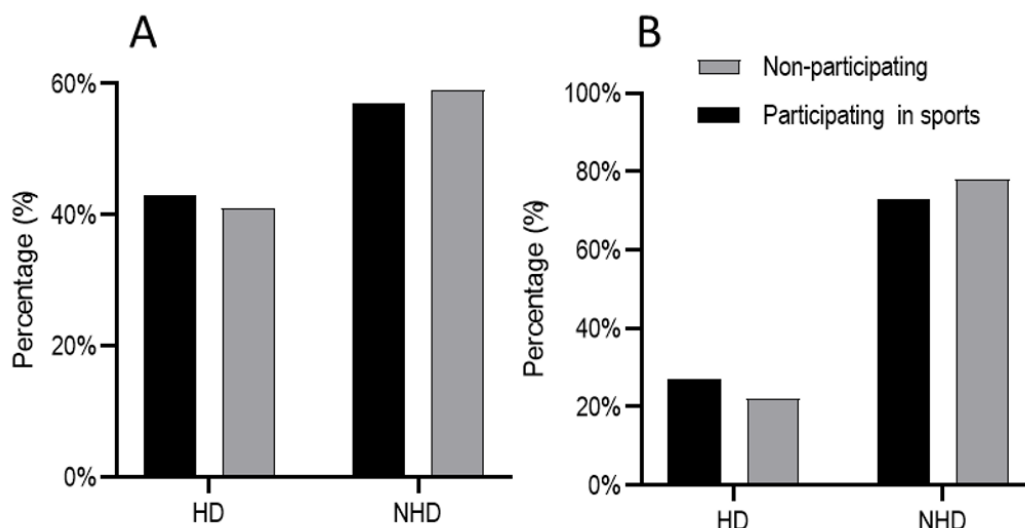
Due to evident differences in sport participation and alcohol consumption between males and females (please see previous results), further analyses were done only gender-stratified and not for the total sample (note that intersex was reported only in few cases per academic year, and therefore was not included in further analyses). Also, in further analyses, subsamples were not observed according to their academic years, since previous analyses did not evidence strong differences between academic years.

Figure 3 presents distribution of the male (A) and female participants (B) according to HD and sport participation. In short, HD is distributed evenly across two observed categories with regard to the occurrence of HD (43% of the male sport participants practice HD, vs. 41.5% non-participants who practice HD). In females, somewhat higher percentage of those who practice HD were actively involved in sports than it was the case

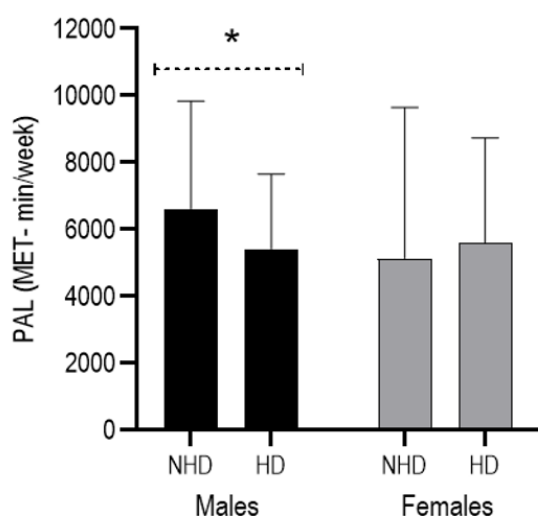
among those who do not practice competitive sports (28% vs. 22%, respectively), but Chi square calculation did not reach statistical significance either in males or in females (Chi square: 0.8 and 2.1;  $p > 0.05$  for males and females, respectively).

Differences between groups based on HD practice in their PAL are presented in Figure 4. Evidently, males who are involved in HD had lower PAL than their NHD peers ( $t$ -test = 2.16,  $p = 0.02$ ). Meanwhile, no significant difference was found for females ( $t$ -test = 1.10,  $p = 0.35$ ).

Figure 5 presents results of logistic regression calculation for binarized criterion (NHD vs. HD) in males and females. In brief, PAL was found as the only significant predictor of HD/NHD practice in males, with higher likelihood of NHD in college/university students who reported higher PAL (OR: 1.41, 95%CI: 1.11-1.76).

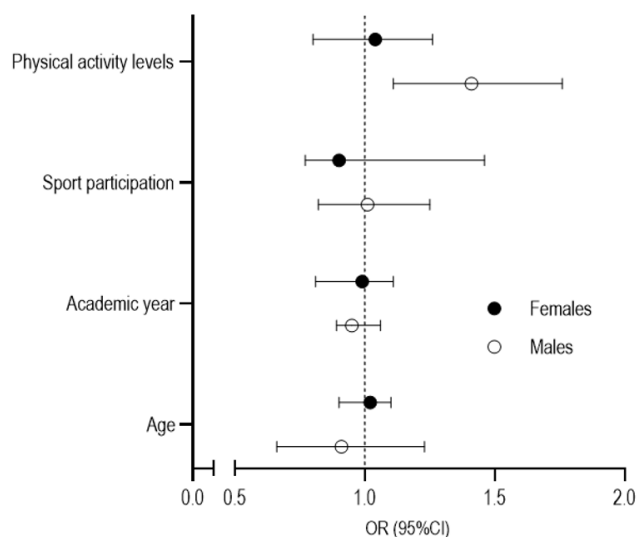


**Figure 3.** Distribution of participants involved in harmful drinking (HD), and those non-involved in harmful drinking practice (NHD) according to their sport participation in males (A) and females (B)



\* – denotes significant differences at  $p < 0.05$ .

**Figure 4.** Differences in physical activity levels (PAL) across groups of participants according to their harmful drinking (HD) or non-harmful drinking practice (NHD)



OR – Odds Ratio, CI – Confidence Interval.

**Figure 5.** Logistic regression results; association between independent variables and binarized outcome (harmful drinking vs. non-harmful drinking) for males and females

## Discussion

There are two most important findings with regard to study aims. First, PAL is significantly correlated to alcohol drinking among male students. Second, no association between sport and PAL, and alcohol drinking was found in females. Therefore, we cannot confirm our initial study hypothesis. Before discussing the main findings in greater detail, we will briefly overview the prevalence of alcohol drinking in the studied participants.

Although this is one of the first studies in the region where prevalence of drinking was examined in college/university students, we may compare the results with previous reports globally, and results obtained on somewhat younger participants in the region. In general, studies done so far, as well as European official reports on SUM (ESPAD), confirmed high numbers of drinking in the region of southeastern Europe (territory of former Yugoslavia), with 31-33% of older adolescents who practice HD [10, 12]. As it is evident from our data, HD is evidenced in 35% participants (41% males and 22% females). Therefore, it seems that numbers of those who reported HD in our sample are not much higher than numbers previously reported for somewhat younger participants from the region [10, 12]. Considering that this study was done in the first year after COVID-19 pandemic, and that we studied somewhat older population, one can argue that this was not expected (i.e. young adults should drink more than adolescents, while COVID-19 pandemic increased drinking rates globally). The possible explanation is briefly discussed in the following text.

As already said, previous reports on drinking prevalence in this region observed older adolescents who were high school students at that moment [10, 12]. Although their drinking behaviors are (only) 5-6% lower than those reported herein for college/university students in the first year after the pandemic, it must be emphasized that only a minority of all adolescents who attend high school later continue to college/university. Specifically, it is approximated that only up to 15% high-school students in the region advance with their education at college/university [25]. This is important to note since previous studies clearly confirmed that “college plans” of high school students are regularly found to be associated to lower SUM, including alcohol drinking [26]. Second, previous studies confirmed relatively consistent correlations between higher scholastic achievement in high school and lower SUM [16]. Since possible enrollment to college/university is significantly influenced by better scholastic achievement in high-school, this additionally explains our results.

PAL is found to be the factor of influence on HD, with lower likelihood of HD in those male students who had higher PAL. While sport participation was not evidenced as the factor associated to HD, it is clear that in this study, PAL and sport participation should be considered as relatively independent covariates of HD. The explanations are not as simple, but from the authors' perspective – logical. However, before discussing it further it is important to note that previous studies were inconsistent with regard to associations which may exist between participation in sports and alcohol drinking [11, 16, 27].

For example, one study evidenced individual sport participation as a protective factor against alcohol drinking among adolescent boys, but no association between sport and alcohol was evidenced in girls [10]. Furthermore, in two-year prospective study authors did not evidence any influence of sport/PAL on harmful drinking in 16-18-year-old adolescents [16]. In US samples, high-school sport participation was positively associated with alcohol use [28], which was similar to findings in

another study where sport participation was evidenced as a risk factor for drinking alcohol in high school [29]. Meanwhile, other studies evidenced some forms of sport participation as being protective against alcohol drinking [11, 27].

In explaining the correlation between higher PAL and lower HD, we must emphasize that PAL of the studied participants is less likely to be a result of active participation in competitive sport, simply because only a small proportion of college/university students are even engaged in such type of sports. Namely, college/university level education in the region rarely gives the possibility for regular involvement in competitive sport, and full-time students in the studied countries are only sporadically members of some competitive sport-team, no matter what type of sport [30]. This problem is recognized even by governmental bodies that intensively try to find the way to stimulate college/university level education for competitive athletes [30].

Our results clearly support previous discussion, since <8% of participants are current competitive athletes. Therefore, it is clear that (i) a small proportion of our participants are involved in competitive sport, and (ii) PAL of our participants is more a result of some recreational activity (i.e. exercising in fitness centers, and/or participation in other individual/group recreational programs). As a result, simply statistically (e.g. mathematically) it would be unexpected that the discrepancy of distribution across categories of sport participation (e.g. 90% vs. 10%) could result in some identifiable trend of association between sport participation and HD in the studied students.

What aggravates the problem is the fact that among current athletes, alcohol drinking is not rare. Indeed, studies regularly confirmed high prevalence of alcohol drinking among competitive athletes [19]. In our region, this is additionally accentuated by the fact that alcohol drinking is very common in public gatherings, while such “social circumstances” are an indispensable part of post-sport events. Even more, some specific sport cultures are characteristic of excessive alcohol drinking, and rates of alcohol drinking in some sport societies sometimes even overcome alcohol consumption in non-sporting communities and events [19]. Together with previous statistical/mathematical explanations, this explains the fact that sport participation is not correlated to alcohol drinking in our participants.

Contrary to sport participation, PAL was found as a protective factor against HD in males. However, this study cannot clearly interpret the causality of the relationship due to its cross-sectional nature. Namely, while it is possible that PAL reduces HD simply socio-psychologically (i.e. if you are physically active you avoid situations when alcohol is excessively consumed), it is also possible that those male students who practice HD are not physically active due to socio-cultural and psychological barriers [12]. However, since the authors of the study are deeply involved in college/university education in the region, we may offer one specific explanation of the found correlation.

As specified previously, PAL of the studied participants is actually a result of “overall lifestyle” rather than a consequence of participation in competitive sport. The background of higher PAL should be therefore found in other factors, such as active transport (i.e. walking and cycling), outdoor activities (i.e. mountaineering, hiking), exercising in fitness centers and/or participation in other recreational activities. Such physically demanding activities increase overall PAL and are all known as “activities of healthy lifestyle” [31]. In the most common words, “healthy lifestyle” is characterized by interest of general health. Persons who adopt such lifestyle are certainly less oriented toward HD as well. However, it does not mean that those people do not consume alcohol at all, especially if we consider that we

studied countries where specific “Mediterranean type of drinking” is common (i.e. alcohol, mostly wine, is consumed regularly with meals, while intoxication is not socially accepted) [32].

At the end of the discussion, we will briefly discuss the lack of correlation between sport and PAL, and HD in female students. As evident from our results, PAL of the female participants was low. This is at least partially a result of negligible participation in competitive sports (girls quit sports mostly by the age of 16) [33]. Also, during college/university education, in the studied countries there are no mandatory physical education classes (which significantly contributes to PAL in the previous age, over high-school education). Alarming low PAL in female students in the region is not a novel fact. For example, recent studies in Croatia and Bosnia and Herzegovina which studied changes in PAL among adolescents as a result of COVID-19 pandemic reported practically negligible decrease in PAL in high-school girls as a result of lockdown, which clearly points to low PAL among females initially (in the pre-pandemic period) [2]. Putting it all together, it is not surprising that such low PAL and the general lack of physical activity could not even be correlated to HD.

This study is not without limitations, and the most important one comes from the cross-sectional nature of the investigation. Therefore, and as specified previously, causality cannot be interpreted. Second, with regard to plausibility of the results, a possible tendency toward “socially acceptable answers” is also expectable. However, this is less likely to happen, simply because the study was strictly anonymous, and participants were older than 18. Finally, we observed students from only one region with specific templates of alcohol drinking (so-called Mediterranean style of drinking), and results are generalizable only to similar samples of participants. Meanwhile, this is one of the first studies which examined the association between PAL and sport, and alcohol drinking in college/university students in the post-pandemic period (first year after COVID-19 pandemic), which is probably the most important strength of the study because (i) this age group is particularly endangered in SUM because of the stress imposed on them, and (ii) a decrease in PAL, and an increase in SUM patterns during the pandemic period.

### Conclusions

The lack of correlation between sport participation and PAL, and alcohol drinking in females is probably a consequence of alarmingly low participation in sport and physical activities among females involved in college/university education in the studied countries. It altogether results in low PAL of female students, which should be observed as one of the most important findings of this study, irrespective of the main objectives of the investigation.

College/university period is highly stressful, and increased alcohol consumption is a frequent consequence of such psychological burden put on students. While sport participation is not found as being significantly associated with HD in male students, it seems that an overall increase in PAL could be helpful in decreasing HD among them. Knowing the positive effects of increased PAL on overall health status, the fact that results confirmed theoretically positive influence of higher PAL on a decrease in HD deserves special attention. However, in explaining the evidently complex associations, and cause-effect relationships between study variables, further prospective analyses are warranted.

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### References

1. Romero-Ramos, N., Ó. Romero-Ramos, and A.J.G. Suarez (2021). Purpose in life during COVID-19 confinement: effect of physical activity and meditation. *Polish Journal of Sport and Tourism* 28(2), 25-31. DOI: 10.2478/pjst-2021-0011
2. Sekulic D., Blazevic M., Gilic B., Kvesic I., Zenic N. (2020). Prospective analysis of levels and correlates of physical activity during COVID-19 pandemic and imposed rules of social distancing; gender specific study among adolescents from Southern Croatia. *Sustainability* 12(10), 4072. DOI: 10.3390/su12104072
3. Zenic N., Taiar R., Gilic B., Blazevic M., Maric D., Pojskic H., Sekulic D. (2020). Levels and changes of physical activity in adolescents during the COVID-19 pandemic: contextualizing urban vs. rural living environment. *Applied Sciences* 10(11): 3997. DOI: 10.3390/app10113997
4. Klonova A., Brustio P., Grants J., Rudi D., Chiari C., Schena F. (2022). Physical activities at distance: Feasibility and acceptability of online remote exercise intervention in older adults. *Polish Journal of Sport and Tourism* 29(3), 23-28. DOI: 10.2478/pjst-2022-0017
5. Schmidt R.A., Genois R., Jin J., Vigo D., Rehm J., Rush B. (2021). The early impact of COVID-19 on the incidence, prevalence, and severity of alcohol use and other drugs: A systematic review. *Drug and Alcohol Dependence* 228, 109065. DOI: 10.1016/j.drugalcdep.2021.109065
6. Clemente-Suárez V.J., Beltrán-Velasco A.I., Ramos-Campo D.J., Mielgo-Ayuso J., Nikolaidis P.A., Belando N., Tornero-Aguilera J.F. (2022). Physical activity and COVID-19. The basis for an efficient intervention in times of COVID-19 pandemic. *Physiology & Behavior* 244, 113667. DOI: 10.1016/j.physbeh.2021.113667
7. Zenic N., Terzic A., Rodek J., Spasic M., Sekulic D. (2015). Gender-Specific Analyses of the Prevalence and Factors Associated with Substance Use and Misuse among Bosnian Adolescents. *International Journal of Environmental Research and Public Health* 12(6), 6626-40. DOI: 10.3390/ijerph120606626
8. White A.M. (2020). Gender differences in the epidemiology of alcohol use and related harms in the United States. *Alcohol Research: Current Reviews* 40(2), 01. DOI: 10.35946/arcr.v40.2.01
9. Loy J.K., Seitz N.N., Bye E.K., Raitasalo K., Soellner R., Törönen J., Kraus L. (2021). Trends in alcohol consumption among adolescents in Europe: Do changes occur in concert? *Drug and Alcohol Dependence* 228, 109020. DOI: 10.1016/j.drugalcdep.2021.109020
10. Cerkez, I., Culjak Z., Zenic N., Sekulic D., Kondric M. (2015). Harmful alcohol drinking among adolescents: the influence of sport participation, religiosity, and parental factors. *Journal of Child & Adolescent Substance Abuse* 24(2), 94-101. DOI: 10.1080/1067828x.2013.764372
11. Denault A.S., Poulin F. (2018). A detailed examination of the longitudinal associations between individual and team

- sports and alcohol use. *Addictive Behaviors* 78, 15-21. DOI: 10.1016/j.addbeh.2017.10.019
12. Devčić S., Sekulić D., Ban D., Kutlesa Z., Rodek J., Sajber D. (2018). Evidencing protective and risk factors for harmful alcohol drinking in adolescence: A prospective analysis of sport-participation and scholastic-achievement in older adolescents from Croatia. *International Journal of Environmental Research and Public Health* 15(5), 986. DOI: 10.3390/ijerph15050986
  13. Trudeau F., Shephard R.J. (2008). Physical education, school physical activity, school sports and academic performance. *International Journal of Behavioral Nutrition and Physical Activity* 5(1), 1-12. DOI: 10.1186/1479-5868-5-10
  14. Pate R.R., Heath G.W., Dowda M., Trost S.G. (1996). Associations between physical activity and other health behaviors in a representative sample of US adolescents. *American Journal of Public Health* 86(11), 1577-1581. DOI: 10.2105/ajph.86.11.1577
  15. Pate R.R., Trost S.G., Levin S., Dowda M. (2000). Sports participation and health-related behaviors among US youth. *Archives of Pediatrics and Adolescent Medicine* 154(9), 904-911. DOI: 10.1001/archpedi.154.9.904
  16. Zenić N., Terzić A., Ostojic L., Sisic N., Saavedra J.M., Kristjánssdóttir H. et al. (2019). Educational and sport factors as predictors of harmful alcohol drinking in adolescence: A prospective study in Bosnia and Herzegovina. *International Journal of Public Health* 64(2), 185-194. DOI: 10.1007/s00038-018-1168-5
  17. Ramón-Arbués E., Gea-Caballero V., Granada-López J.M., Juárez-Vela R., Pellicer-García B., Antón-Solanas I. (2020). The prevalence of depression, anxiety and stress and their associated factors in college students. *International Journal of Environmental Research and Public Health* 17(19), 7001. DOI: 10.3390/ijerph17197001
  18. Watson T.L., Jordan H.R., Madson M.B. (2020). Perfectionism and alcohol use outcomes in college students: The moderating role of alcohol protective behavioral strategies. *Addiction Research and Theory* 28(5), 379-386. DOI: 10.1080/16066359.2019.1663832
  19. Sekulić D., Bjelanović L., Pehar M., Pelivan K., Zenić N. (2014). Substance use and misuse and potential doping behaviour in rugby union players. *Research in Sports and Medicine* 22(3), 226-39. DOI: 10.1080/15438627.2014.915839
  20. Hagstromer M., Oja P., Sjostrom M. (2006). The International Physical Activity Questionnaire (IPAQ): A study of concurrent and construct validity. *Public Health Nutrition* 9(6), 755-62. DOI: 10.1079/phn2005898
  21. Fogelholm M., Malmberg J., Suni J., Santtila M., Kyröläinen H., Mäntyselä M., Oja P. (2006). International Physical Activity Questionnaire: Validity against fitness. *Medicine and Science in Sports and Exercise* 38(4), 753-60. DOI: 10.1249/01.mss.0000194075.16960.20
  22. Martinović D., Tokić D., Martinović L., Kumrić M., Vilović M. et al. (2021). Adherence to the Mediterranean diet and its association with the level of physical activity in fitness center users: Croatian-based study. *Nutrients* 13(11), 4038. DOI: 10.3390/nut13114038
  23. Ćosić Mulahasanović I., Nozinović Mujanović A., Mujanović E., Atiković A. (2018). Level of physical activity of the students at the university of Tuzla according to IPAQ. *Central European Journal of Sport Sciences and Medicine* 21(1), 23-30. DOI: 10.18276/cej.2018.1-03
  24. Williams N. (2014). The AUDIT questionnaire. *Occupational Medicine* 64(4), 308-308. DOI: 10.1093/occmed/kqu011
  25. Baketa, N., Kovačić M. (2019). The educators' perspective – the image of a generation on the shift from secondary to higher education. In Z.R. Dedić, B. Jokić (eds), *What after high school?: wishes, plans and attitudes of Croatian high school students* (pp. 123-134), Zagreb: Agency for Science and Higher Education. [in Croatian]
  26. Kvesić I. (2018). *Prospective analysis of the connection between playing sports and the consumption of cigarettes, alcohol and drugs in adolescents*. Zagreb: University of Zagreb.
  27. Elder C., Leaver-Dunn D., Wang M.Q., Nagy S., Green, L. (2000). Organized group activity as a protective factor against adolescent substance use. *American Journal of Health Behavior* 24(2), 108-113. DOI: 10.5993/AJHB.24.2.3
  28. Dawkins M.P., Williams M.M., Guilbault M. (2006). Participation in school sports: Risk or protective factor for drug use among black and white students? *The Journal of Negro Education* 75(1), 25-33.
  29. Eccles J.S., Barber B.L. (1999). Student council, volunteering, basketball, or marching band: What kind of extracurricular involvement matters? *Journal of Adolescent Research* 14(1), 10-43. DOI: 10.1177/0743558499141
  30. Caput-Joginica R., Jazbec A. (2012). Athletes' opinion of a dual career in Croatian secondary schools. *Odgovorno-obrazovne Teme* 4(2), 57-76.
  31. Loefer M., Walach H. (2012). The combined effects of healthy lifestyle behaviors on all cause mortality: a systematic review and meta-analysis. *Preventive Medicine* 55(3), 163-170. DOI: 10.1016/j.ypmed.2012.06.017
  32. Sekulić D., Ostojic M., Ostojic Z., Hajdarevic B., Ostojic L. (2012). Substance abuse prevalence and its relation to scholastic achievement and sport factors: An analysis among adolescents of the Herzegovina-Neretva Canton in Bosnia and Herzegovina. *BMC Public Health* 12, 274. DOI: 10.1186/1471-2458-12-274
  33. Pedišić Ž., Bennie J., Jurakić D., Bauman A.E. (2014). Levels and correlates of domain-specific physical activity in university students: Cross-sectional findings from Croatia. *Kinesiology* 46(1), 12-22.

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