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Predictive utility of Protective Behavioral Strategies for Alcohol-related Outcomes in a Community Sample of Young Adults

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Abstract

Objective: Whilst previous studies have shown that Protective Behavioral Strategies (PBS) predict alcohol use and its related consequences in college students, it is not known whether a broader population of young adults also benefit from PBS use. We longitudinally examined the relationship between PBS use and alcohol-related outcomes in a community sample of young adults composed of college students and non-college individuals.

Method: Targeted sampling was used to access 339 young adults in the community (mean age=21.1 [*SD*=2.21], female=50.7%; college students=59.0%) who completed baseline and 2-month follow-up measures. Three types of PBS were examined: Manner of Drinking (MOD), Stopping/Limiting Drinking (SLD) and Serious Harm Reduction (SHR). Regression analyses were conducted to test the predictive utility of PBS use on alcohol-related consequences, frequency and quantity of alcohol used, and binge drinking.

Results: MOD strategies were the strongest predictors of decreased alcohol consumption and alcohol-related negative consequences. Baseline MOD scores were negatively associated with quantity of alcohol used, binge drinking, and alcohol-related consequences at follow-up. SHR was longitudinally related to a lower frequency of alcohol consumption, SLD was not associated with any outcome, whilst total PBS score was associated with all study outcomes.

Conclusions: Our findings could benefit health promotion by informing the design of preventive interventions for reducing alcohol use in the young adult community, along

with the attendant health-related negative consequences. These results may also be of value in extending the applicability of PBS findings to a broader alcohol-using population of young adults beyond those exclusively composed of college students.

Keywords: Protective behavioral strategies; alcohol; longitudinal; alcohol-related consequences; binge drinking.

Introduction

Alcohol is the most used substance worldwide and one of the main risk factors for disease, disability, and death (World Health Organization [WHO], 2014; 2018). Heavy drinking patterns and alcohol-related negative consequences are prevalent among young people (Patrick et al., 2020; WHO, 2018). Thus, in 2016, premature deaths attributable to alcohol among adults aged 20-39 were much higher (13.5%) than the estimated prevalence in the global population (7.2%) (WHO, 2018).

Protective behavioral strategies (PBS) are “specific cognitive-behavioral strategies that can be used by an individual to help reduce his or her alcohol use and the negative consequences resulting from such use" (Martens et al., 2007, p. 308). Three distinct types of PBS have been identified: strategies related to the Manner of Drinking (MOD), for example, avoid trying to keep up with or out-drink others; strategies for Stopping/Limiting Drinking (SLD), e.g., stop drinking at a predetermined time; and Serious Harm Reduction (SHR) strategies, e.g., only go out with people you know and trust (Treloar et al., 2015).

Several cross-sectional studies have consistently shown that the use of PBS is linked to a reduction in alcohol-related consequences and alcohol consumption (Pearson, 2013), although these findings differ according to the types of PBS used. Whilst MOD strategies show the strongest relationship with both negative consequences and alcohol use (Frank et al., 2012; Garcia et al., 2018; Cadigan et al., 2015; Martens et al., 2005; 2007; Pearson et al., 2012), no association has been found between SLD strategies and alcohol-related consequences (Cadigan et al., 2015; Frank et al., 2012; Martens et al., 2005; Pearson et al., 2012) and its relationship with alcohol use remains unclear (Cadigan et al., 2015; Frank et al., 2012; Garcia et al., 2018; Pearson et al.,

2012). SHR strategies have been consistently associated with alcohol-related consequences (Cadigan et al., 2015; Garcia et al., 2018; Pearson et al., 2012; Treloar et al., 2015), although most cross-sectional research studies have failed to find a relationship between these strategies and alcohol use (Cadigan et al., 2015; Frank et al., 2012; Garcia et al., 2018; Pearson et al., 2012).

The few longitudinal studies that have analyzed the relationships between PBS and alcohol use/consequences have found partially mixed results. Most concluded that the use of MOD strategies predicts lower alcohol consumption (Grazioli et al., 2015a; Napper et al., 2014; Pearson et al., 2013) and fewer negative alcohol-related consequences (Grazioli et al., 2015a; Linden et al., 2018; Napper et al., 2014), although two research studies found no support for these longitudinal relationships (Grazioli et al., 2015b; Martens et al., 2011). In contrast, most studies analyzing the predictive utility of SLD strategies have shown that these strategies do not predict levels of alcohol consumption or alcohol-related consequences (Grazioli et al., 2015a; Linden et al., 2018; Martens et al, 2011; Napper et al., 2014), although two studies found evidence for the predictive value of SLD strategies with regard to alcohol use (Pearson et al., 2013) and consequences (Grazioli et al., 2015b). Overall, longitudinal research findings have consistently shown the absence of a relationship between SHR strategies and alcohol use (Grazioli et al., 2015a; 2015b; Martens et al., 2011; Napper et al., 2014; Pearson, 2013), although some studies (e.g. Treloar et al., 2015) found SHR to be longitudinally associated with binge drinking. Although cross-sectional studies have consistently found a relationship between SHR strategies and alcohol-related consequences, the findings from longitudinal research studies are mixed (Grazioli et al., 2015a; 2015b; Linden et al., 2018; Martens et al., 2011; Napper et al., 2014; Treloar et al., 2015).

These mixed findings on the relationships between SHR and alcohol use/consequences may be explained, at least in part, by the properties of the SHR subscale. Many of the previous research studies, employed the PBSS-15 (Martens et al., 2005) instead of the PBSS-20 (Treloar et al., 2015), which provided evidence of improved content validity of the SHR subscale by adding five items to the previous three items of the SHR subscale of the PBSS-15.

The lack of longitudinal studies analyzing the predictive value of PBS, and the mixed findings reported to date, provide strong grounds for conducting further longitudinal research on this issue. Moreover, almost all research studies in this area — both cross-sectional and longitudinal— have been conducted exclusively with college students. For example, only two longitudinal studies (Dekker et al., 2018; Drane et al., 2019) included non-student participants, and both were carried out with the same sample of adult drinkers. It has, however, been shown that college students report more alcohol-related problems and higher levels of heavy drinking than their non-college counterparts (Muthén & Muthén, 2000; Quinn & Fromme, 2011; White et al., 2008). The fact that previous research on alcohol-PBS focused on college students limits the applicability of the findings to broader populations of young adults who consume alcohol.

To our knowledge, no studies have longitudinally examined the relationship between PBS, alcohol-related negative consequences, and alcohol use in a community-based sample of young adults (including college students and non-college individuals) who use alcohol. Thus, we aimed to longitudinally examine i) the relationships between PBS use and alcohol-related negative consequences in a community-based sample of young adults who use alcohol, and ii) the relationships between PBS use and alcohol

use in terms of frequency and quantity of alcohol used, and binge drinking. Our findings could potentially be of value in extending the applicability of PBS findings to a broader alcohol-using population of young adults beyond those exclusively composed of college students.

Methods

Participants and procedure

Targeted sampling procedure (Watters & Bernacki, 1989) was used to survey young adults aged 18-25, who were approached in a variety of community settings of the city of Huelva (Spain). To participate in the study, candidates were required to report using alcohol on two or more occasions during the past month (no specific quantity was required) and to agree to participate in a 2-month follow-up assessment. First, to identify the settings where our target population is expected to consume alcohol, we interviewed young adults, and drew up a list of settings across various districts of the city: areas with pubs/bars/nightclubs, parks, sports centers, and shopping centers. We also included information on the time at which the target population would be expected to attend each setting.

In a second phase, a psychologist experienced in psychosocial research recruited the participants by visiting the various community settings and districts according to the time schedule previously established. He approached people who apparently met the age criteria and those who agreed to participate received a follow-up telephone call to establish whether they met the alcohol use criteria. Posters with basic information about the study were also placed in the selected areas.

Targeted sampling often makes use of participants´ social networks to access new candidates (Vervaeke et al., 2007; Watters & Biernacki, 1989), that is, it uses

snowball sampling (Goodman, 1961). Moreover, this is an adaptive sampling method (Thompson & Collins, 2002) in which the construction of the sample "is an ongoing and interactive process in which data are constantly analyzed and used to adjust the recruitment and sampling techniques" (Watters & Biernacki, 1989, p. 421). Thus, participants could nominate other potential participants from his/her social network (to maximize the heterogeneity of the sample, a maximum of five nominations was set). Throughout the recruitment process, the analyses of the data on the participants' characteristics (sex, age, academic status, and alcohol use) guided the recruitment process with the aim of obtaining a sample with similar characteristics to the young Spanish population. The baseline sample (n=360) consisted of 174 (48.3%) participants directly recruited by the field researcher, 155 (43.1%) nominated by other participants, and 31 (8.6%) who had contacted the researcher after seeing a poster in the street. The percentage of males (49.4%) was similar to that of the Spanish population aged 18-25 years (51.2%, National Statistics Institute, 2019).

Participants provided informed consent and completed self-administered paper-and-pencil questionnaires in a room of the University of Huelva After completion, they provided contact information for follow-up and received a 15-euro Amazon voucher as compensation for their participation.

Most participants (n=339, 94.2%) completed a 2-month follow-up assessment. To request participation at 2-months follow-up, a mixed method procedure was followed (Dillman et al., 2014), which has been shown to be useful for gaining high response rates and avoiding non-response biases in survey-based research (Dillman et al., 2014; de Leeuw, 2005; 2018). First, the participants received a pre-notification via WhatsApp seven days before the exact date that they were supposed to complete the

follow-up questionnaire. They were informed that in 2-3 days they would receive a telephone call asking for participation and to schedule an appointment.

For those participants who failed to respond, two follow-up contacts were made (via WhatsApp and telephone call). Eighteen participants refused to complete the follow-up questionnaire and three did not respond to any contact; therefore, the final sample in this study comprised 339 participants (94.2%). Participants and non-participants did not differ significantly in terms of mean age (*Mann-Whitney U*=3397.5; z=-.353, *p*=.724), sex (χ^2=0.077, *p*=.782), frequency of PBS use (*Mann-Whitney U*=3399.0; *z*=-.347, *p*=.729), alcohol-related negative consequences (*Mann-Whitney U*=3077.5; *z*=-.653, *p*=.514), and quantity of alcohol consumed during a typical week in the last month (*Mann-Whitney U*=3139.0; *z*=-.909, *p*=.363). For follow-up assessment, a similar procedure was followed, and participants were also compensated with a 15-euro Amazon voucher.

The protocol for this research study was approved by the Regional Committee for Bioethics Research of Andalusia (Regional Ministry of Health, Andalusia, Spain).

Instruments

The questionnaire was first piloted with 127 young adults with the same characteristics as those of the target population, who were discarded from the analytic sample of the study. The final version included:

Sociodemographic characteristics (baseline): Age, sex, country of birth, highest level of education, main source of income, model of cohabitation and college status (studying at university or not)

Alcohol use measures: At baseline we collected data on the frequency of alcohol use in the past year. Both baseline and follow-up questionnaires included items designed to measure the number of days of alcohol use and binge drinking in the past two months, with the latter defined as "consuming ≥5drinks (in men) or ≥4drinks (in women) within a two-hour interval" (Courtney & Polich, 2009).

Quantity of alcohol consumed in a typical week during the past month. Both the baseline and follow-up questionnaires included a modified version of the Daily Drinking Questionnaire (DDQ; Collins et al., 1985), which gathers information about the use of six types of alcoholic beverages (accompanied by their images) as established by the Spanish Observatory of Drugs and Addictions (Observatorio Español de las Drogas y las Adicciones [OEDA], 2019). The number for each type of beverage was then converted into Standard Drink Units (SDUs), which in Spain is equivalent to 10 grams of pure alcohol (Rodríguez-Martos et al., 1999).

Protective Behavioral Strategies. PBS use in the past two months was measured at baseline and follow-up using the Protective Behavioral Strategies Scale (PBSS-20, Treloar et al., 2015), the most widely used and well-validated scale for measuring PBS (Pearson, 2013; Prince et al., 2013). We used the Spanish version (S-PBSS-20) adapted by Sánchez-García et al. (2020) which consists of 20 items (using a Likert-type response format ranging from 1-never, to 5-always) distributed across three dimensions: stopping/limiting drinking (SLD-7 items), manner of drinking (MOD-5 items) and serious harm reduction (SHR-8 items). The S-PBSS-20 (Sánchez-García, 2020) supported the internal structure and a second-order factor (total score) of the PBSS (Treloar et al., 2015), showed adequate internal consistency, thus providing evidence of validity based on its relationship with alcohol use and alcohol-related consequences.

In agreement with the adapted Spanish version of Sánchez-García et al. (2020), internal consistency was estimated using ordinal Cronbach's alpha. In our study, ordinal Cronbach's alpha values at baseline and follow-up were: MOD=.70, .72; SLD=.61, .72; SHR=.70, .77 and total PBSS=.81, .84.

Alcohol-related negative consequences. At baseline and follow-up, we administered the Young Adult Alcohol Consequences Questionnaire (YAACQ, Read et al., 2006), in its Spanish version (Pilatti et al., 2016), to assess alcohol-related consequences during the past two months. The YAACQ consists of 48 items that evaluate eight types of alcohol-related consequences. As recommended by the authors of the original scale (Read et al., 2006) tetrachoric correlations were used to estimate internal consistency. Cronbach´s Alpha values were 0.95 (baseline) and 0.96 (follow-up).

Consumption of other drugs: We collected information on the number of days of use during the past two months (baseline and follow-up) for the six substances most widely used by young adults in Europe and Spain (EMCDDA, 2019; OEDA, 2017): cannabis, cocaine, ecstasy (MDMA), amphetamines, LSD, and magic mushrooms. To obtain evidence of validity, we included a fictitious drug (Nadropax), which has been used in previous research (Fernández-Calderón et al., 2017). None of the participants reported use of Nadropax, either at baseline or at follow-up.

Data analysis

To examine the relationships between all study variables, Pearson's correlation coefficients were calculated. We also conducted bivariate analyses (U Mann-Whitney test and chi Square test) to examine the differences in the study variables according to the college status of the participants. Since multiple comparisons in these analyses could

increase the probability of Type I error, we conducted a Bonferroni correction to reduce this (.05/21=.0024).

Four regression models were applied to test the predictive utility of PBS for alcohol-related consequences (YAACQ total score at follow-up) and alcohol use (three follow-up outcomes: frequency of alcohol use, binge drinking, and typical quantity of alcohol consumed). We used the Kolmogorov-Smirnov test to analyze the normal distribution of the outcome variables. Since they were non-normally distributed (frequency of alcohol use, z=3.501, p<.001; frequency of binge drinking, z=4.224, p<.001; quantity of alcohol used, z=2.499, p<.001; YAACQ, z=1.664, p=.008), we applied negative binomial regressions for count data. The relative appropriateness of negative binomial regression models in comparison with other count regression models was checked using the COUNTFIT procedure (Long & Freese, 2014).

Previous research has shown that being female and older are factors strongly associated with PBS use (Demartini et al., 2013; Jongenelis et al., 2016; Pearson, 2013). It has been suggested that PBS use is also more effective in women in terms of protecting against alcohol-related consequences (Clarke et al., 2016), and also that college students differ from non-college individuals in terms of their alcohol use and related consequences (Muthén & Muthén, 2000; Quinn & Fromme, 2011) Therefore, in all five regression models, sex, age, and college status were included as covariates.

Although no previous studies analyzing the relationship between PBS use and alcohol-related negative consequences have controlled for the impact of using other substances, many drugs have the potential to produce similar effects to those caused by alcohol use as measured by the YAACQ (e.g. not eating properly, feeling depressed/sad, and social problems). Thus, in the model with YAACQ score as the

outcome, we also controlled for the number of days of use during the past two months for cannabis, cocaine, and ecstasy at follow-up (no other substance was reported). Considering that the use of other substances could also influence the frequency and quantity alcohol use, including binge drinking, their effects were also controlled in the regression models with these outcomes.

Finally, since the frequency and quantity of alcohol use, and binge drinking may influence alcohol-related consequences, these three variables were also included in the model with YAACQ score as the outcome. Using follow-up measures as covariates allowed us to control for these effects during the same time-frame (past two months) in which the outcome variables were measured.

Several previous studies (e.g. Grazioli et al., 2019) have tested the association and predictive utility of the total PBSS score in relation to alcohol-related consequences and alcohol use measures. In this study, for comparability purposes, and to test the predictive utility of the total PBSS score for the five examined outcomes, we repeated the regression models, removing PBS subscale scores and including the total PBSS score.

Given that 44.5% of the participants in our analytic sample were recruited through snowball sampling, some participants could belong to the same social network, which could lead to non-independence of their data. To address this issue and determine whether multilevel regression models were required, we first estimated the intraclass correlation coefficients (ICC; Leckie et al., 2019) for the four outcome variables (frequency of alcohol use=.23; frequency of binge drinking=.07; quantity of alcohol used =.06; and YAACQ outcome=.00). Then, considering that the average cluster size in our sample was 1.8 (for those participants not recruited through snowball sampling, a

cluster size of one was considered), we estimated the design effects (frequency of alcohol use=1.18; frequency of binge drinking=1.06; quantity of alcohol used=1.05; and YAACQ outcome=1.00). Finally, we compared the results of the negative binomial multilevel regression models with those obtained from the corresponding negative binomial models, and no differences in the pattern of results was found. Therefore, single-level negative binomial regression models were considered more parsimonious and preferable.

Results

Descriptive data and bivariate analyses

Approximately half of the participants (n=172, 50.7%) were female (Table 1), and their mean age was 21.1 years (*SD*=2.21). Eight participants (2.4%) were postgraduate students and 56.6% (n=192) were undergraduate students. More than half (n=199, 58.7%) reported using alcohol between 1-3 days per week during the past year, and the mean number of binge drinking days during the past two months at baseline was 5.8 (*SD*=8.0). More than a third of the participants reported using cannabis at baseline (n=128, 37.8%) and follow-up (n=116, 34.2%). SHR strategies were used more frequently than SLD and MOD strategies, both at follow-up and baseline.

*****TABLE 1 ABOUT HERE*****

Correlations between the study variables are displayed in Table 2. In comparison to baseline SHR and SLD, baseline MOD scores showed the highest negative correlations with follow-up YAACQ scores, binge drinking and typical quantity used.

According to college status, non-statistically significant differences were found in the study variables included in Table 2 (n=22), except for sex (χ^2=5.405, *p*=.020),

frequency of alcohol use at baseline (*Mann-Whitney U*=11628.5; *z*=-2.564., *p*=.010) and follow-up (*Mann-Whitney U*=11927.5; *z*=-2.231, *p*=.026), and binge drinking frequency at baseline (*Mann-Whitney U*=11786.5; *z*=-2.403, *p*=.016). These differences were not significant after applying a Bonferroni correction for multiple comparisons.

*****TABLE 2 ABOUT HERE*****

Multiple regressions examining prospective relationships between PBSs, alcohol-related consequences, and alcohol use outcomes

Table 3 displays the negative binomial regression analyses. Higher baseline MOD scores were associated with fewer follow-up consequences. MOD scores at baseline were also negatively associated with mean number of binge drinking days and typical alcohol quantity used at follow-up. Higher SHR scores were longitudinally associated with lower frequency of alcohol consumption

The negative binomial regression models revealed that total PBSS score at baseline was negatively associated with all follow-up outcomes examined: YAACQ (*IRR*=.98, 95% *CI*=.98, .99, *p*=0.001), frequency (*IRR*=.98, 95% *CI*=.97, .99, *p*=<.001), quantity (*IRR*=.98, 95% *CI*=.97, .99, *p*=<.001) and binge drinking (*IRR*=.96, 95% *CI*=.95, .97, *p*=<.001).

*****TABLE 3 ABOUT HERE*****

Discussion

To our knowledge, this is the first study to longitudinally evaluate the predictive utility of PBS use for reducing alcohol use and its negative consequences in a community-based sample of young adults who use alcohol. Overall, our findings show that PBS use predicts fewer alcohol-related consequences and lower alcohol use at two-

month follow-up. However, these relationships differed according to the types of PBS and the outcome variables examined. Consistent with the results of previous cross-sectional and longitudinal studies (e.g., Frank et al., 2012; Napper et al., 2014), after accounting for sociodemographic characteristics and the use of SHR, SLD and other substances, the use of MOD strategies was the strongest predictor of decreased alcohol consumption and alcohol-related negative consequences.

In line with the findings of previous longitudinal studies, the use of SLD strategies did not predict fewer alcohol-related consequences (e.g., Linden et al., 2018; Napper et al., 2014). However, previous research has yielded mixed results regarding MOD and SHR strategies. Our results are consistent with some longitudinal studies supporting the predictive utility of MOD (Grazioli et al., 2015a; Linden et al., 2018) and with those showing that frequent use of SHR strategies is not longitudinally related to alcohol-related consequences (Grazioli et al., 2015a; 2015b). Contrary to our results, other studies did not find any predictive value of MOD (e.g. Grazioli et al., 2015b) for alcohol-related consequences, which could be explained, on the one hand, by the differing use of covariates between studies. On the other hand, these mixed findings could be explained by the different instruments typically used to measure alcohol consequences, the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) and the YAACQ. Two studies (Kite et al., 2013; Pearson et al., 2012) found that using MOD strategies in college students was associated with experiencing fewer alcohol consequences when these were assessed with the YAACQ, but not with the RAPI. In contrast, a relationship was found between SHR and RAPI but not YAACQ scores, which these authors explained in terms of the fact that the YAACQ was designed to evaluate a broader and less severe range of consequences (best avoided by MOD strategies) than the RAPI (best avoided by SHR strategies). Our results are in line with

these findings, since MOD strategies were the only strategies that predicted fewer alcohol-related consequences as assessed by the YAACQ, whilst SHR strategies did not show a relationship with YAACQ scores.

In line with the results of previous research (e.g., Napper et al., 2014), frequent use of MOD strategies predicted lower quantities of alcohol use. MOD strategies are related to the speed of alcohol consumption (Frank et al., 2012) which is coherent with the fact that, in our study, the MOD is also longitudinally associated with binge drinking, an indicator of fast drinking.

Contrary to our results, previous cross-sectional and longitudinal research studies (e.g., Napper et al., 2014) have consistently shown that frequent use of SHR strategies is not related to the frequency of alcohol use. This could be due to the fact that most of the previous longitudinal research employed the PBSS-15 (Martens et al., 2005) whilst we used the PBSS-20 (Treloar et al., 2015), which provided evidence of improved content validity of the SHR subscale.

Finally, previous cross-sectional and longitudinal research (e.g., Cadigan et al., 2015) has provided mixed results on the utility of SLD strategies for reducing alcohol intake. Our results do not support the utility of SLD in this community sample of young adults. However, it should be noted that the low estimated internal consistency for SLD in our study could have affected these findings. Moreover, some of the discrepant results regarding the utility of PBS found in this and previous research could be attributed to differences between the studies in terms of the inclusion of covariates.

The major strengths of this study include the use of a community-based sample of young adults not exclusively composed of college students, the longitudinal design, the low attrition rate (5.8%), and the fact that we controlled for the use of other

substances to analyze how PBS use predicts alcohol use and alcohol-related consequences. Nonetheless, some limitations must be considered. Given the correlation between our outcome variables, the differential pattern of relationships between PBS subscales and alcohol-related outcomes in our study should be interpreted with caution. Further, compared with the Spanish population aged 18-24 years, college students are overrepresented in our sample (32.1% vs. 59.0%) (Ministry of Science, Innovation and Universities, 2019). In order to test the utility of PBS in young adults, there is a need for further research that includes non-college and community-based samples. Studies testing the moderating role of college status in the relationship between PBS use and alcohol-related outcomes could also be useful for informing the design of preventive interventions in young adults.

We did not use a probabilistic sampling procedure, which limits the representativeness of our sample. Moreover, given the data collection procedure employed here, participants without a phone, and with limited availability of transportation and/or time may be underrepresented in our sample. Previous research has found no evidence for gender-based measurement invariance in the PBSS-15 (Treloar et al., 2014) and PBSS-20 (Treloar et al., 2015), whilst Sánchez-García et al. (2020) found Differential Item Functioning (DIF) for one SHR item in the Spanish PBSS-20 used in our study. Thus, the potential lack of invariance across gender should be considered in our findings. Finally, the frequency of PBS use shows high stability between baseline and follow-up, which could be related to the short time interval between both measures. Thus, it is not possible to determine whether changes in the frequency of PBS use between baseline and follow-up are associated with changes in the negative consequences experienced. Future research should analyze this possibility

by extending the follow-up interval (e.g., six months or one year) in order to increase the sensitivity needed to detect changes in the frequency of PBS use.

Our findings extend those of previous research showing that PBS may be useful in reducing alcohol use and negative consequences not only in college students but also in broader alcohol-using populations of young adults which also include non-college individuals. These results will be of value for informing the design of clinical and preventive interventions aimed at reducing alcohol use and the attendant negative consequences in the young adult community. In light of our results, MOD strategies should be central to these interventions.

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Table 1.

Sample characteristics: sociodemographic data, alcohol consumption, protective behavioral strategies, and alcohol-related consequences

Sociodemographic data	M(*SD*) or %	Alcohol and other drug use measures	M(*SD*) or %	Protective behavioral strategies and alcohol consequences	M(*SD*)
Age (*M, SD*)	21.1 (2.21)	**Past-year frequency of alcohol use at baseline**		**PBSS total score**	
Female	50.7%	less than once per month	5.9%	Baseline	64.4 (10.2)
Country of birth		1-3 times per month	29.2%	Follow-up	66.8 (11.0)
Spain	96.2%	one day per week	25.1%	**PBSS SHR**	
Other	3.8%	2-3 days per week	33.6%	Baseline	30.0 (4.7)
Highest level of education		4 or more days per week	6.2%	Follow-up	32.8 (5.1)
Secondary education or lower	15.3%	**Mean number of days of alcohol use in the past two months**		**PBSS SLD**	
Baccalaureate	51.6%	Baseline	15.8 (11.5)	Baseline	16.8 (4.3)
Occupational professional training	19.5%	Follow-up	12.4 (9.8)	Follow-up	17.6 (5.0)
College degree	7.7%	**Mean number of days of binge drinking in the past two months**		**PBSS MOD**	
Postgraduate degree	3.8%	Baseline	5.8 (8.0)	Baseline	15.5 (4.0)
Currently studying at	59.0%	Follow-up	4.0 (5.4)	Follow-up	16.4 (3.9)

university					
Currently employed	32.7%	**Typical quantity of alcohol use in the last month (SDUs)**		**YAACQ score**	
Main source of income		Baseline	20.6 (18.2)	Baseline	13.2 (7.9)
Employment	25.1%	Follow-up	16.1 (14.2)	Follow-up	10.4 (7.5)
Family allowance	51.6%	**Cannabis use (%) and mean number of days (*SD*) of use in the past two months among users**			
Education grant	20.4	Baseline	37.8%, 17.4 (20.8)		
Other	3.0	Follow-up	34.2%, 18.9 (22.2)		
Model of cohabitation		**Cocaine use (%) and mean number of days (*SD*) of use in the past two months among users**			
Family of origin (parent/s and or sibling/s)	77.6%	Baseline	2.4%, 4.6 (6.3)		
		Follow-up	1.5%, 5.8 (8.1)		
Housemates	17.4%	**Ecstasy use (%) and mean number of days (*SD*) of use in the past two months among users**			
Other	5.0%	Baseline	3.5%, 3.7 (4.2)		
		Follow-up	2.4%, 1.6 (1.1)		

Note: SDU=Standard Drink Units; SHR=Serious Harm Reduction; SLD=Stopping /Limiting Drinking; MOD=Manner of Drinking; PBSS: Protective Behavioral Strategies Scale; YAACQ= Young Adult Alcohol Consequences Questionnaire.

Table 2.

Correlations between protective behavioral strategies, alcohol use outcomes, negative consequences, other substance use, and sociodemographic variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PBSS total-B	1																				
2. SHR-B	.82†	1																			
3. SLD-B	.75†	.39†	1																		
4. MOD-B	.77†	.47†	.38†	1																	
5. YAACQ total-B	-.39†	-.34†	-.19†	-.39†	1																
6. Alcohol use frequency-B	-.35†	-.34†	-.19†	-.29†	.45†	1															
7. Binge-drinking frequency-B	-.32†	-.23†	-.20†	-.33†	.47†	.60	1														
8. Alcohol use quantity-B	-.37†	-.32†	-.20†	-.37†	.48†	.57†	.57†	1													
9. PBSS total-FU	.75†	.59†	.59†	.57†	-.39†	-.38†	-.36†	-.40†	1												
10. SHR-FU	.61†	.69†	.35†	.36†	-.34†	-.35†	-.26†	-.36†	.79†	1											
11. SLD-FU	.54†	.30†	.65†	.34†	-.23†	-.21†	-.25†	-.19†	.79†	.37†	1										
12. MOD-FU	.58†	.36†	.35†	.69†	-.35†	-.29†	-.33†	-.38†	.76†	.43†	.43†	1									
13. YAACQ total-FU	-.35†	-.32†	-.16**	-.35†	.70†	.32†	.42†	.37†	-.44†	-.37†	-.28†	-.38†	1								
14. Alcohol use frequency-FU	-.32†	-.33†	-.18†	-.24†	.34†	.63†	.43†	.45†	-.40†	-.42†	-.20†	-.26†	.37†	1							
15. Binge drinking frequency-FU	-.36†	-.29†	-.22†	-.34†	.37†	.43†	.60†	.47†	-.46†	-.37†	-.29†	-.41†	.51†	.53†	1						
16. Alcohol use quantity-FU	-.34†	-.28†	-.18†	-.34†	.44†	.42†	.50†	.61†	-.46†	-.37†	-.29†	-.42†	.50†	.49†	.63†	1					
17. Cannabis use-FU	-.33†	-.39†	-.14**	-.24†	-.23†	-.18	-.11*	-.31†	-.35†	-.44†	-.12*	-.24†	-.16**	-.20†	-.20†	-.24†	1				
18-Cocaine use-FU	-.16**	-.16**	-.07	-.14*	.06	.12*	-.03	.07	-.09	-.13*	-.03	-.05	.06	.03	.00	.14**	.07	1			
19-Ecstasy use-FU	-.21†	-.20†	-.12*	-.16**	.21†	.19†	.18†	.21†	-.15**	-.17†	-.08	-.10	.09	.08	.17†	.22†	.14**	.08	1		
20-Gender (male=0)	.18†	.28†	.12*	.01	-.15**	-.08	-.02	-.11*	.18†	.30†	.07	.01	-.17†	-.10	-.10	-.09	-.16**	-.08	-.09	1	
21-Age	-.06	-.11*	-.08	.06	.07†	-.02	-.03	-.05	.00	-.10	.02	.12*	-.06	.07	.00	-.03	.03	.10	.08	-.03	1

*$p < .05$, **$p < .01$ †$p <$ Bonferroni adjusted p values for multiple comparisons ($p<0.0024$).

Note: B=Baseline; FU=Follow-up; SDU=Standard Drink Units; SHR=Serious Harm Reduction; SLD=Stopping /Limiting Drinking; MOD=Manner of Drinking; PBSS: Protective Behavioral Strategies Scale; YAACQ= Young Adult Alcohol Consequences Questionnaire.

Table 3.

Negative binomial regressions predicting alcohol outcomes from protective behavioral strategies.

Predictor	*B*	*SE*	*IRR*	95% *CI* for *IRR*	*p*
YAACQ total at follow-up					
College status (college students = 1)	.23	.08	1.02	.87, 1.20	.775
Sex (female = 1)	-.20	.07	.82	.71, .95	.008
Age	-.02	.02	.98	.95, 1.02	.307
Cannabis use frequency at Follow-up	-.00	.00	.99	.99, 1.00	.350
Cocaine use frequency at Follow-up	-.01	.02	.99	.96, 1.02	.657
Ecstasy use frequency at Follow-up	-.11	.08	.92	.76, 1.05	.181
Alcohol use frequency at Follow-up	.01	.00	1.01	.99, 1.01	.166
Binge drinking frequency at FU	.02	.01	1.02	1.01, 1.04	.002
Alcohol quantity at Follow-up	.01	.001	1.01	1.01, 1.02	.001
SHR at baseline	-.01	.01	.99	.97, 1.01	.320
SLD at baseline	.00	.01	1.00	.99, 1.02	.683
MOD at baseline	-.04	.01	.96	.94, 0.99	.002
Frequency of alcohol use at follow-up					
College status (college students = 1)	-.33	.08	.72	.62, .84	<.001
Sex	-.07	.08	.93	.80, 1.08	.368
Age	.02	.02	1.02	.98, 1.06	.260
Cannabis use frequency at Follow-up	.01	.00	1.01	1.00, 1.01	.027
Cocaine use frequency at Follow-up	-.01	.01	.99	.97, 1.01	.194
Ecstasy use frequency at Follow-up	-.01	.06	.99	.87, 1.12	.841
SHR at baseline	-.03	.01	.97	.95, .99	.003
SLD at baseline	-.01	.01	.99	.97, 1.01	.341
MOD at baseline	-.02	.01	.98	.96, 1.01	.172
Frequency of binge drinking at follow-up					
College status (college students = 1)	-.25	.14	.77	.59, 1.01	.062
Sex	-.34	.14	.71	.54, .94	.015

Age	-.02	.03	.98	.93, 1.04	.486
Cannabis use frequency at Follow-up	.01	.00	1.01	.99, 1.01	.158
Cocaine use frequency at Follow-up	-.06	.02	.94	.91, .97	<.001
Ecstasy use frequency at Follow-up	.09	.09	1.10	.93, 1.30	.274
SHR at baseline	-.02	.02	.98	.94, 1.02	.271
SLD at baseline	-.01	.02	.99	.95, 1.02	.459
MOD at baseline	-.09	.02	.91	.88, .95	<.001
Alcohol quantity at follow-up					
College status (college students = 1)	-.05	.09	.95	.80, 1.14	.597
Sex	-.10	.09	.90	.75, 1.08	.269
Age	-.01	.02	.99	.95, 1.03	.528
Cannabis use frequency at Follow-up	.01	.00	1.01	1.00, 1.01	.003
Cocaine use frequency at Follow-up	.02	.01	1.02	1.00, 1.05	.056
Ecstasy use frequency at Follow-up	.20	.14	1.23	.93, 1.62	.148
SHR at baseline	.00	.01	1.00	.97, 1.02	.820
SLD at baseline	.00	.01	1.00	.97, 1.02	.817
MOD at baseline	-.06	.01	.94	.92, .97	<.001

Note: IRR=Incidence Rate Ratio; B=Baseline; FU=Follow-up; SDU=Standard Drink Unit; SHR=Serious Harm Reduction; SLD=Stopping /Limiting Drinking; MOD=Manner of Drinking; PBSS: Protective Behavioral Strategies Scale; YAACQ= Young Adult Alcohol Consequences Questionnaire.