**Abstract**

*Background:*Alcohol use is a considerable public health concern, leading to negative health and adverse social consequences. Despite widespread knowledge and acceptance of these consequences many individuals continue to drink excessively. Lack of regret for these consequences may partially explain this. *Objectives:* To examine the prevalence of regrettable experiences and their role in future intentions to drink. *Methods:* In two studies (Study 1: cross-sectional; Study 2: longitudinal) participants reported on 18 regrettable experiences; from common regrets (e.g. hangover), to risky behaviours (e.g. drug taking), and serious regrets (e.g. driving under the influence), over a two-week period. *Results:* Prevalence of regrettable experiences was high (e.g. 79.0% of individuals in study 1 and 66.9% of individuals in study 2 experienced a hangover). Prevalence was greater for common regrets compared to risky behaviours and serious regrets. In study one, alcohol consumed over the previous fortnight predicted the number of different regrettable experiences over the same period. In study two, units consumed on a day-to-day basis predicted the number of regrets on that same basis. Neither study demonstrated evidence for the predictive utility of regrets for intentions to consume alcohol in the future. *Conclusions:* These findings suggest high prevalence of regrettable experiences, that are predicted by increased alcohol consumption. However, there was little evidence that increased number of experiences predicted future drinking intentions. Regrettable experiences are prevalent following consumption, however a focus on these regrets to deter future alcohol consumption may not be an effective psychological intervention.

**Key words: Alcohol; Hangover; Intentions; Regret; Risky Behaviours**

**Introduction**

Approximately 21% of the UK population (28% of males, 14% of females) consume alcohol at levels which increase their risk of experiencing alcohol-related harms (National Health Service Statistics, 2019). Consuming alcohol at this level has been linked to many short-term (e.g. hangovers, lost productivity) and long-term (e.g. development of noncommunicable diseases) negative health consequences (Coomber, Mayshak, Curtis, & Miller, 2017; Nolen-Hoeksema, 2004). There are also a range of well-known negative emotional and social consequences of alcohol consumption (e.g. social ostracism, financial issues). Despite these consequences, because many people continue to consume alcohol in excess, and it is important to identify the psychological factors which might contribute to this.

A lack of regret in response to the short-term negative experiences following alcohol consumption may be a candidate mechanism for future excessive consumption. Regret can be defined as the extent to which individuals’ experience/realize/imagine that their current situation might be improved, if a different course of action was taken (Brewer, DeFrank, & Gilkey, 2016). Expectancy value theory predicts that the likelihood and severity of anticipated regrets (e.g. ‘*In the next week, I would feel regret if I drank two bottles of wine single session*’), play a key role in health-risk behaviours (Brewer et al., 2016; Nicolai, Moshagen, & Demmel, 2018). Empirical data supports this suggestion. Stoddard et al (2012) noted a robust negative association between anticipated regret of alcohol, and other drug use, on previous 30-day alcohol use. Anticipated regret has also been shown to predict intentions to consume alcohol or binge drink in the future (Ajzen & Sheikh, 2013; Cooke, Sniehotta, & Schuz, 2006; Barratt & Cooke, 2018). Whilst, there is often a predictive gap between intentions and actual behaviour (Armitage, Norman, Alganem, & Conner, 2015; Baumann et al., 2015; Mullan, Wong, Allom, & Pack, 2011), researchers have suggested that a focus on regret may be a fruitful avenue for future behavioural interventions in order to increase knowledge of safer drinking guidelines and social norms (Davies, Law, Hennelly, & Winstock, 2017).

Few studies have examined the role of *experienced* regrets following drinking episodes. Dunne and Katz (2015) examined the incidence of low-risk regrettable social behaviours, such as saying something embarrassing or acting out of character, experienced within the previous three months. The prevalence of these regrettable behaviours was 66.1%, and there was a significant positive relationship between level of alcohol consumption and the engagement in these behaviours. Orchowski et al (2012) found that 25% of students reported alcohol-related regretted sex (with numbers greater in females than males). Oswalt and colleagues (2005) reported that that one of the most cited reasons for regretted sexual behaviours was the influence of alcohol on decision making (31.7%). In Australia, 15% of 16-17 year olds reported having sex and later regretting it due to alcohol (Bonomo et al., 2001).

 More recently, Davies and Joshi (2018) developed a 21-item list to capture experiences caused by alcohol consumption that might cause anticipated regret. They asked participants to indicate whether they had encountered each experience in the previous 12 months whilst consuming alcohol. These regretted experiences loaded onto one of three factors; common regrets (e.g. Hangover), risky behaviour regrets (e.g. Taking Drugs) or serious regrets (e.g. Verbal Aggression). They observed that high risk drinkers (individuals with Alcohol Use Disorder Identification Test (Babor et al., 2001) scores > 7) had lower levels of overall regrets than low risk drinkers. They also demonstrated that heavier drinking was characterised by lower levels of anticipated regret, and more numerous regrettable experiences. One potential limitation of Davies and Joshi’s approach was the recall of the previous 12 months, as lengthy retrospective recall might lead to biased or unreliable estimates (Hoeppner, Stout, Jackson, & Barnett, 2010), particularly for negative experiences (Miron-Shatz, Stone, & Kahneman, 2009; Sato & Kawahara, 2011), and in substance users (Robinson, Sobell, Sobell, & Leo, 2014).

The aim of the current study was to elaborate on and develop the findings reported by Davies and Joshi (2018). First, we examined the prevalence of *experienced*, rather than anticipated, regrets over both a short retrospective recall period (2-week period: study 1), as well as on a day-by-day basis (study 2). Second, we tested whether regrettable experiences act as disincentives to consume alcohol in the future (intentions to drink). In both studies, a measure of self-control was included due to its strong predictive relationship with alcohol use (Gerich, 2013; Lindgren, Neighbors, Westgate, & Salemink, 2014; Pearson, Kite, & Henson, 2013), and to explore any predictive relationships with experienced regret and future intentions (Muraven, Collins, Shiffman, & Paty, 2005). **For example, theoretical predictions and meta-analytic evidence suggest imagined (intended) behaviours may be more greatly influenced by self-control compared to actual behaviours (de Ridder et al, 2012, Hagger, 2013). Given our outcome was intentions to drink alcohol in future it was important to take self-control into account.**

**Study 1:**

 In our first study, we hypothesised that quantity of alcohol consumed would predict the quantity of different regrettable experiences (hypothesis 1); and the quantity / strength of regrettable experiences would predict future plans to drink (hypothesis 2). We conducted an online questionnaire-based study (data are available here – [https://osf.io/7y6kr/]).

**Methods**

***Participants***

An *a-priori* power calculation demonstrated 146 participants would be required to detect a small-to-medium R2 increase (F2 = .10) in the number of regrettable experiences (common, risky behaviour, serious) whilst adjusting for age, gender, self-control and previous alcohol consumption, with 90% power and alpha = .05.Given limited research in the area we chose a small-to-medium effect size as was is likely to be of theoretical interest. We reached our recruitment target within our time-frame and therefore were able to oversample in order to improve our statistical power. Four-hundred and nine participants attempted the online survey, with 305 providing data on all questionnaires (the majority of participants dropped out following consent or after providing demographic information). Of these individuals, nine participants failed an attention check and six participants did not report alcohol consumption in the previous two weeks, so their data was not included in our final analyses. Our final analysis sample was 290 individuals (209 / 72.1 % female; 80 / 27.6 % male; 1 / 0.3% prefer not to disclose) with a mean age of 24.36 ± 10.78 (range: 18 - 69)[[1]](#footnote-1). Inclusion criteria were age 18 + and consumption of alcohol on at least one occasion per week (e.g. a social drinker), with no current or previous diagnosis of substance use disorder. Participants were recruited using opportunity sampling, with advertisements placed online and around the host university campus, with students receiving course credit for their participation. All participants provided informed consent and the study was approved by the local research ethics committee at the host university.

***Materials***

The Alcohol Use Disorders Identification Task (AUDIT:(Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) )

 The AUDIT is a 10 item questionnaire to screen for hazardous/harmful alcohol consumption. Questions range from quantity and frequency of consumption *(‘How many drinks containing alcohol do you have on a typical day when you are drinking?’*) to measures of harm caused by alcohol consumption *(‘Have you or someone else been injured as a result of your drinking?’*). It is scored from 0 - 40, with scores 8 - 15 indicative of hazardous alcohol consumption 16 - 19 indicative of harmful drinking and 20+ indicative of dependent drinking (Saunders et al., 1993). The AUDIT has demonstrated excellent psychometric properties, including internal reliability estimates ranging from α .75 - .94 (Allen, Litten, Fertig, & Babor, 1997) and excellent test re-test reliability in the general population (Selin, 2003). In this sample the internal consistency estimate was acceptable (McDonald's ω = .782).

Timeline Follow-back (TLFB: (Sobell & Sobell, 1992))

 The two-week retrospective recall TLFB was used to provide estimates of alcohol consumption for the two weeks immediately preceding the experiment. Participants were provided with a guide to UK alcohol units (1 unit = 8g pure alcohol) and were asked to fill in the number of units consumed on a day-by-day basis. They were also asked to predict how many units they planned to consume in the week following the experiment using the same strategy. The TLFB has demonstrated excellent test retest reliability for alcohol consumption (M. B. Sobell, Sobell, & Klajner, 1986), and has shown to be accurate particularly at shorter timescales (Hoeppner et al., 2010).

Brief Self-Control Scale (BSC: (Tangney, Baumeister, & Boone, 2004))

 The BSC is a 13-item Likert scale measuring trait self-control (e.g. *‘I have trouble concentrating’*) with participants providing an assessment from 0 - Strongly Disagree to 7 - Strongly agree. The BSC has demonstrable internal reliability (α’s ~ .80: (Tangney et al., 2004)) and test re-rest reliability (Brevers, Foucart, Verbanck, & Turel, 2017). In this sample the internal consistency estimate was below acceptable (McDonald's ω = .538).

Regrettable Experiences (Davies & Joshi, 2018)

 Regrettable experiences were measured using Davies and Joshi’s (2018) drinking experiences questionnaire. The original questionnaire has 21-items in which participants are asked to indicate to what extent they would regret experiences happening to them either during or after a period of heavy drinking. Following factor analysis, the items loaded onto Common Regrets (Vomited, Feeling Vulnerable, Hungover, Mood Changes, Memory Loss, Feeling Embarrassed, Separated From Friends, Missing Classes, Spending Money, Wasting Time), Risky Behaviour Regrets (Unprotected Sex, Sexually Provocative, Taking Drugs, Smoking) and Serious Regrets (Verbal Aggression, Physical Aggression, Acquiring an Injury, Driving over the limit, Sexually Transmitted Infection, Pregnancy, Missing Work).

We adapted the original questionnaire in a number of ways. We collapsed ‘missed lectures’ and ‘missed work’ into a single item ‘missed lectures or work’ as Davies and Joshi demonstrated that a separate item for missed work did not adequately load onto one of the factors for items experienced in the previous 12 months. We also removed items ‘Caught STI’ and ‘Pregnancy’ as we were interested in regrettable experiences during the previous two weeks, and the identification of these items may well occur later than two weeks after the event. Thus, our participants were asked to complete a 19-item version of the original questionnaire. Participants were provided with each item and asked *‘In the previous two weeks have you experienced [item] as a result of your alcohol consumption, and if so to what extent did it make you regret your consumption’* (1 = no regret to 10 = completely regret). **If participants did not experience the item they could leave the question blank or score the item 0**. Participants were also informed that if they experienced the item more than once, to base their recall on the more severe of the experiences. Finally, participants were asked *‘Overall how much did you regret consuming alcohol in the previous two weeks?’* from 0 = Not at all to 100 = Completely.

***Procedure***

Participants clicked a link to the study entitled (‘*Perceived consequences of alcohol use’*) which took them to the secure server hosting the questionnaire (Qualtrics) and provided informed consent. Following this they were asked to complete some demographic information (age, gender and current occupation [options: student, part-time work, full-time work, unemployed]). They then completed the TLFB, AUDIT, BSC and regrettable experiences questionnaire. They were then debriefed and provided with course credit where appropriate. The questionnaire took approximately 10 minutes to complete. Data was collected from October 2018 to February 2019.

***Analysis strategy***

For each individual, the number of regrettable experiences over the two week period prior to the study was calculated separately for common, risky behaviour and serious regrets, as well as the total number of regrets experienced (Total = N Common + N Serious + N Risky). Drinking regret score for each type of regret was calculated by taking the maximum regret score across the individual items falling within the experience type (e.g. for risky behaviour this would have been the greatest score reported on the items Unprotected Sex, Sexually Provocative, Taking Drugs or Smoking). We conducted a confirmatory factor analyses on regrettable experiences as binary data (1 = experienced, 0 = did not experience) using the ‘lavaan’ package in R, with Diagonally Least Squares estimation (for binary data). Module fit was assessed using Comparative Fit Index (CFI: > 0.95 indicative of good fit); Tucker-Lewis Index (TLI: > 0.96 indicative of good fit), Root Mean Square Error of Approximation (RMSEA: < .06 indicative of good fit) and Standardized Root Mean Square Residual (SRMR: < 0.08 indicative of good fit).

To examine whether alcohol consumption predicted regretted behaviours we conducted negative binomial regressions, allowing us to adjust the standard errors of the regression coefficients for overdispersion. We conducted separate models for overall number of regretted experiences over the two weeks and then separately for common, risky and serious regrets. To assess model fit, we used the Likelihood Ratio Chi-Square statistic. To examine influence of influential cases in our models we removed any data points with Cook’s Distance > 1. We conducted sensitivity analysis with age included and omitted from models, due to the large number of missing data points. Models below are presented include age. Finally, we did not include AUDIT in the models as this had a strong positive correlation with units consumed (r = .50, p < .001), which would likely contribute to biased estimates through multicollinearity.

**Results**

**Descriptive statistics**

Participants consumed approximately 35.70 units (± 32.71: range 2 to 197.1) in the fourteen days prior to the experiment[[2]](#footnote-2). On average our sample were drinking more than UK Government Guidelines for lower risk drinking (i.e. below 14 units). In line with this, the average AUDIT score was 10.86 ± 5.44, indicative of a hazardous drinking sample. Males consumed significantly more alcohol than females (47.32 ± 39.71 / 31.37 ± 27.92: Welch’s t (110.2) = 3.29, p = .001, d = .465), but did not have significantly higher AUDIT scores (males = 11.15 ± 5.66, females = 10.79 ± 5.34; Welch’s t (136.1) = 0.49, p = .628, d = .07). There were no significant gender differences in self-control (Welch’s t (144.75) = 0.575, p = .566, d = .08) or age (Welch’s t (130.02) = 0.068, p = .946, d = .01). The majority of participants were students (N = 188 / 64.8%), followed by individuals in full-time work (N = 82 / 28.3%), part time work (N = 16 / 5.5%) or unemployed (N = 4 / 1.4%).

**Confirmatory Factor Analysis (Figure 1)**

 We examined whether experienced regrets conformed to the same factors reported in Davies and Joshi (2018). Items were free to load onto their respective factors. The three-factor model was a good fit to the data (TLI = 0.99; CFI = 0.99; RMSEA = .04 (95% CI .03 - .05); SRMR = .06). Internal consistency for each of the subscales was excellent (Common ω = .96; Serious ω = .95; Risky Behaviours ω = .95) There were strong associations between each latent variable of regret type. As we confirmed the factor structure we were confident in separating regrettable experiences in the subsequent analyses.

Figure 1: Confirmatory Factor Analysis of experienced regrets across three types: common regrets, serious regrets and risky behaviours.



\*p<.01

**Frequency and magnitude of regrettable behaviours**

Frequency of each regretted experience is shown in table 1. The most common experience was hangover (79% of participants experienced this) and the least common was driving under the influence (10.3%).

In an exploratory analysis, we conducted a repeated measures ANCOVA (3 experience type: common, serious, risky behaviours; covariate = alcohol consumption) to examine whether drinking regret differed based on experience type. The main effect was significant (F(1.91, 214.19) = 30.21, p < .001, np2 = .212) , experienced regret was higher for common experiences (7.89, se = .212) compared to serious (4.99, se = .301; p < .001) and risky behaviours (5.04, se = .278; p < .001). There was no significant difference between serious and risky behaviours (p = 1.00).

[table 1 here]

**Does alcohol consumption predict regrettable behaviours? (Table 2)**

 A negative binomial regression was performed, with total number of different regretted items as the dependent variable. Predictor variables included units consumed over previous two weeks, age, gender, and self-control. In all models, age was a significant predictor of regrets experienced, with lower ages associated with a smaller number of regretted behaviours. Units consumed was a positive predictor of total regrets, serious regrets and risky behaviours, but not common regrets. Self-control and gender were not significantly associated with any type of regrets.

[table 2 here]

**Do regrettable behaviours predict future consumption intentions?**

A hierarchical linear regression was conducted with future consumption intentions (i.e., plans to drink in the future) as the dependent variable. To adjust for their effects we included age, gender, self-control and previous alcohol consumption at step 1. At step two, we included number of common regrets, serious regrets and risky behaviours. The overall model was significant (F(7, 212) = 38.10, p < .001) and predicted 54.3% of data (adjusted R2 = .543). Variance Inflation Factors were < 2.14, suggesting limited evidence of multicollinearity. Previous consumption was the only significant predictor of future consumption intentions (B = .346 (SE = .024), 95% CI .297 - .394; t = 14.09, p < .001; see supplementary table 1). Running the model with total regretted experiences did not significantly change the pattern of results.

**Study 1 Discussion**

Findings from Study 1 suggest that experienced regrets are reported more frequently over a shorter drinking period than has been shown in previous studies (Davies & Joshi, 2018) with common regrets having the greatest frequency, as befitting their title. Interestingly, the amount of alcohol consumed did not predict the frequency of common regrets experienced, but greater alcohol consumption did predict frequencies of risky behaviour, and serious, regrets. Finally, the frequency of regrettable experiences did not predict future intentions to drink (unlike previous research examining anticipated regret (Barratt & Cooke, 2018; Cooke et al, 2007). In Study 2, we aimed to replicate these findings on a day-to-day basis, using an Ecological Momentary Assessment. Given the focus on retrospective recall of both alcohol consumption and regretful experiences, ecological momentary assessment designs may serve to reduce any biases but also allow for daily-level predictions (Shiffman, 2009; Shiffman, Stone, & Hufford, 2008).

**Study 2:**

 In an ecological momentary assessment study, we set out to examine whether day-to-day fluctuations in alcohol consumption predict regrettable experiences. We hypothesised that increased daily alcohol consumption would predict increased number of regrettable experiences. Data from this study is available here - [https://osf.io/7y6kr/].

**Methods**

***Participants***

Seventy-four participants took part in the study, however two participants reported no alcohol consumption prior to the study so were removed from our main analyses. The sample comprised 44 female and 28 male participants and was aged 26.03 ± 11.85. Inclusion criteria and the recruitment strategy were the same as study 1. However, given the intensive nature of EMA designs participants were also entered into a prize draw for £50 in high street vouchers for completion of the EMA sessions. We aimed to recruit at least 50 participants (level 2 units) to this study to ensure unbiased standard errors for multilevel modelling procedures (Maas & Hox, 2005). All participants provided informed consent and the study was approved by the local research ethics committee.

***Materials***

Participants completed a 2 week TLFB, AUDIT (McDonald's ω = .870) and BSC (McDonald's ω = .650) as in study 1

**EMA assessments**

 Each morning participants were asked to click a link on their phone to provide information about their alcohol consumption and regret. Upon clicking the link, they were presented with the UK unit of alcohol guide from the TLFB and asked *‘How many units of alcohol did you consume yesterday?’* and also *‘How many units of alcohol do you plan to consume today?’* (see (Jones, Tiplady, Houben, Nederkoorn, & Field, 2018). If participants reported consuming alcohol on the previous day they were then asked to report if they experienced any of the 18 items from the regrettable experiences questionnaire (from study 1). If participants did not report consuming alcohol they were given a list of 18 popular UK TV shows (e.g. Top Gear, The Simpsons) and asked ‘*Which of these TV shows have you watched in the past 24 hours?*’. This was to ensure that the length of the EMA sessions were similar irrespective of whether alcohol was reported or not, to decrease the likelihood of participants not reporting use to expedite the sessions (as seen in some ecological momentary assessment studies, e.g. Freedman et al 2006).

***Procedure***

Participants attended the Human Psychopharmacology laboratories at [removed for review] and provided informed consent. They then completed the two week TLFB, AUDIT and BSC. Following this the experimenter provided a familiarisation session on the EMA protocol, and informed participants to complete the protocol as soon as possible after they woke. However, we allowed data to be provided at any point during the day to ensure maximum data yield. After participants left the laboratory they were sent the link to the EMA assessments via email, and were asked to complete this for 14 days.

**Analysis strategy**

To examine whether alcohol consumption predicted number of regrettable experiences on a day-to-day basis we conducted multi-level negative binomial regressions in STATA, using the ‘menbreg’ command. We fitted a two level structure of days > participants. To examine whether the two level structure was a good fit of the data we used the change in Log-likelihood statistics and associated p-value for this change (p < .05 indicative of an improved model fit over the single level model). We repeated the models separately for common, risky behaviour, and, serious regrets. We also examined whether regrettable experiences predicted planned consumption (quantity) on the following day however the models were a poor fit to the data, as there were few occasions in which planned consumption was reported after drinking the previous day (N = 88 / 11.3% total).

**Results**

***EMA compliance.***

Participants complied with 80.7% (N = 755 out of 936) daily assessments (in line with recommended rates from substance use studies (Jones et el, 2019). We did not include day 14 in compliance, which was not analysed (as participants did not provide the subsequent days alcohol consumption). Compliance was higher in the first seven days (84.7%) compared to the final six (75.9%). Compliance did not correlate with: alcohol consumption (r = .44, p = .092); age (r = -.135, p = .259); AUDIT scores (r = .039, p = .748), gender (r = .032, p = .787) or Self-Control scores (r = .112, p = .309).

***Descriptive Statistics***

 Participants consumed 44.87 (± 29.51, range: 4 – 137) units on average in the fortnight prior to the experiment and had a mean AUDIT score of 11.28 ± 4.71. As such they drank more alcohol than those in study 1. There were no significant gender differences in units consumed (males = 51.63 ± 28.85, females = 40.58 ± 29.44; Welch’s t (58.51) = 1.57, p = .121, d = .379) or AUDIT scores (males = 11.04 ± 4.00, females = 11.43 ± 5.15; Welch’s t(67.06) = 0.365, p = .716, d = .086). During the EMA assessment period participants reported consuming 40.67 ± 23.46 units on average (over 13 days).

***Frequency and magnitude of regrettable behaviours (Table 3)***

Overall, prevalence of reporting regrettable behaviours was lower than study 1. However, the most common (e.g., hangovers, spending money) were similar across both samples.

 [table 3 here]

**Multilevel model predicting regretted behaviour (Table 4)**

 In all instances, a 2 level model (days > participants) was more appropriate than a single level model. Within each model alcohol consumed was positively associated with number of regretted experiences on a day-to-day basis. For risky behaviours, age was a negative predictor. There were no significant associations with gender or self-control.

[table 4 here]

**Study 2 Discussion**

In general, the pattern of regretted experiences was similar to that of study 1, however the reported prevalence was lower. On a day-to-day basis the amount of alcohol consumed predicted the number of different regretted experiences that followed, in line with the cross-sectional data from Study 1. Unlike study 1, age was only a significant negative predictor for risky behaviours.

**General Discussion**

 The aim of these studies was to examine the prevalence of regrettable experiences following alcohol consumption, reported by individuals, over a relatively short period of time compared to previous research (Davies & Joshi, 2018). Prevalence rates for common regrettable experiences were high across both studies. We also tested whether alcohol consumption predicted the likelihood of these experiences, and the role these experiences played in future intentions to consume alcohol. In general, greater alcohol consumption was associated with greater number of regrettable experiences.

This was the first study to report the prevalence of a wide range of regrettable experiences as a result of alcohol consumption, over a relatively short-period (two weeks). We demonstrated behaviours such as hangovers, mood change and spending money across were prevalent in both studies; therefore, these behaviours lived up to the term ‘common’ regrets, coined for them by Joshi and Davies. These rates are similar to the low-risk regrettable social behaviours reported by Dunne and Katz (2015) in US college students, but also rates of individual behaviours reported in the broader literature (e.g. hangovers (Griffin, Freeman, Adams, & Smith, 2018; Farlie et al, 2016); blackouts (Hingson, Zha, Simons-Morton, & White, 2016; Merrill, Boyle, Jackson, & Carey, 2019; Farlie et al, 2016), drink driving (Morrison, Begg, & Langley, 2002)). The prevalence of each behaviour was generally lower in Study 2 compared to Study 1. This may be due to EMA methods leading to more reliable data capture (Shiffman, 2009), or reactivity to measurement (Rowan et al., 2007). Finally, in study 1 age was a significant negative predictor of all types of experiences and total experiences, whereas in study 2, age was only a negative predictor of risky behaviours. These findings are partially in line with research which suggests younger people take greater risks following alcohol consumption and in general, and have lower levels of risk perception (Cherpitel, 1993; Hampson et al, 2001).

Interestingly, in Study 1, we observed that levels of drinking regret were greater for common experiences than serious or risky behaviours. This is possibly due to the common regrets occurring more recently than serious or risky behaviours (e.g., individuals may still be experiencing a mood change when reporting their responses), and thus are more readily accessible in memory. However, this contradicts evidence to suggest some common behaviours - such as hangovers, getting into trouble with the authorities - can be positively appraised in certain social circumstances (e.g. seen as a ‘badge of honour’ or ‘to confer social status’ (Davies, et al 2017; Griffin et al., 2018; Patrick & Maggs, 2011). Alternatively, as risky behaviours likely occurred in the past they may be seen as a *sunk cost*, which would be irrational to regret (Zeelenberg, 1999) particularly, if more severe consequences were avoided (e.g., driving under the influence, but not getting caught). As such, future research should examine the social (e.g., peer network) and individual differences (e.g. risk perception) which might moderate experienced regret following alcohol consumption. Similarly, the amount of previous negative experiences should be measured, as this influence the perceived likelihood and appraisal of future negative consequences (Logan et al, 2012).

We also demonstrated that greater alcohol consumption had a positive association with the occurrence of reported regrettable experiences, with the exception of common regrets in Study 1. These findings replicate research by Davis and Joshi (2018) who reported high risk drinkers where more likely to report regrettable experiences. However, increases in the number of potentially regrettable experiences did not predict intentions to drink alcohol in future in Study 1, and we were unable to assess this in Study 2. This does not support previous research which suggests *anticipated* regret of alcohol use predicts future intentions to drink (Cooke et al., 2007): c.f. (Patrick & Maggs, 2011)) There are limited reports of the effects of *experienced* regrets or behaviours on intentions to drink or actual alcohol consumption. Epler et al (2014) demonstrated that hangover was associated with delayed time to next drink (median 6 hours), however this effect did not survive adjustment for multiple drinking related variables. In a sample of university students, Marino and Fromme (2018) demonstrated that memory loss predicted intentions to reduce alcohol consumption one year later, however this motivation did not translate into drinking reductions. Finally, Farlie et al., (2016) demonstrated that overall evaluations of the drinking experience did not predict next-day drinking. **It is possible that participants in our studies may have underestimated their intentions to consume alcohol in future due to demand characteristics (McCambridge et al, 2012), particularly given they had been recently been asked to report negative drinking consequences, which may obscure any relationship.** We can also speculate that decreased sensitivity to future consequences and punishment might explain why experienced regrets and behaviours do not reliably predict future intentions (Bø, Billieux, & Landrø, 2016; Cantrell, Finn, Rickert, & Lucas, 2008), **but it is critical that future studies measure *actual* behaviour following regrettable experiences.** The lack of predictive relationship may suggests interventions targeting experienced regrets will have limited efficacy in heavier drinking populations (Davies et al., 2017).

There are numerous limitations to this research and opportunities for future research. First, it is difficult to completely separate the behaviours we assessed as many have been shown to co-occur in the literature. For example, hangovers are associated with mood changes (Mc Kinney & Coyle, 2005; van Schrojenstein Lantman, Mackus, van de Loo, & Verster, 2017) and increased likelihood of missing appointments. Similarly, memory loss and physical aggression may increase the likelihood of injury following alcohol consumption (Hingson et al., 2016). As such, the experience of one potentially regrettable behaviour may have a cascade effect on others. Secondly, heavy drinking episodes are associated with memory loss / black-outs (see (Merrill et al., 2019), and reported in both Studies 1 and 2). This memory loss might reduce retrospective recall for both alcohol consumption and experienced behaviours, but also compliance for EMA assessments (Naughton et al., 2016; Zamroziewicz et al., 2017)). **In relation to this, we measured alcohol use (and intentions) and negative experiences using self-report which can lead to biases (Midanik, 1988; Del Boca & Darkes, 2009). Future research should attempt to clarify these findings using objective measures, such as biochemical verification for alcohol use (e.g. Field et al, 2020).** Finally, we focused only on the negative experiences following alcohol consumption, and consideration of the positive experiences (e.g. increasing sociability, maintaining a reputation) alongside these might improve our understanding of how experiences might interact to shape future behaviour (Patrick & Maggs, 2011; Logan et al, 2012).

In conclusion, across two studies using cross-sectional and intensive longitudinal methodologies, we demonstrated that alcohol use predicts experiencing regrettable consequences. Common experiences were regretted with greater intensity, but experienced regret did not predict intentions to drink alcohol in the future.

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**Table 1: Number of participants experiencing each type of regret over a two week period, split by type of regret.**

**Common Risky behaviours Serious**

Hungover (229 / 79.0%) Unprotected sex (48 / 16.6%) Missed class/work (106 / 36.6%)

Vomiting (112 / 38.6%) Sexually provocative (68 / 23.4%) Verbal aggression (95 / 32.8%)

Feeling vulnerable (125 / 43.1%) Taking drugs (65 / 22.4%) Injury (64 / 21.1%)

Mood change (148 / 51.0%) Smoking (104 / 35.9%) Physical aggression (36 / 12.4%)

Memory loss (138 47.6%) Driving under influence (30 / 10.3%)

Embarrassed (152 / 52.4%)

Separated from Friends (89 / 30.7%)

Spending money (203 / 70.0%)

Wasting time (134 / 46.2%)

**Table 2: Negative Binomial regression models examining predictors of number of regrettable experiences.**

**Model 1 (All Regrets)**

**Odds Ratio 95% CI Wald Chi-Square**

Age .962 .948 - .977 26.06, p < .001

Gender .920 .665 – 1.273 0.255, p = .613

Self-control .987 .961 – 1.013 0.943, p = .331

Units cons. 1.005 1.000 - 1.011 4.423, p = .035

*Model fit (4) = 32.37, p < .001*

 **Model 2 (Common Regrets)**

Age .962 .947 - .977 23.32, p < .001

Gender .941 .673 – 1.316 0.127, p = .722

Self-control .981 .954 – 1.008 1.937, p = .164

Units cons. 1.003 .998 – 1.009 1.647, p = .199

*Model fit (4) = 27.12, p < .001*

 **Model 3 (Serious Regrets)**

Age .966 .944 - .988 9.335, p = .002

Gender .852 .558 – 1.301 0.552, p = .457

Self-control .990 .958 – 1.024 0.328, p = .567

Units cons. 1.009 1.003 – 1.015 7.834, p = .005

*Model fit (4) = 22.38, p < .001*

**Model 4 (Risky Behaviours)**

Age .952 .926 - .979 11.68, p = .001

Gender .951 .613 – 1.474 0.051, p = .821

Self-control 1.009 .974 – 1.046 0.264, p = .607

Units cons. 1.010 1.003 – 1.016 9.304, p = .002

*Model fit (4) = 22.38, p < .001*

**Table 3: Number of participants reporting regrettable behaviour over the two week EMA assessment period.**

**Common Risky behaviours Serious**

Hungover (48 / 66.7%) Unprotected sex (5 / 6.9%) Missed class/work (10 / 13.9%)

Vomiting (15 / 20.8%) Sexually provocative (5 / 6.9%) Verbal aggression (6 / 8.3%)

Feeling vulnerable (14 / 19.4%) Taking drugs (9 / 12.5%) Injury (6 / 8.3%)

Mood change (20 / 27.8%) Smoking (33 / 45.8%) Physical aggression (3 / 4.2%)

Memory loss (13 / 18.1%) Driving under influence (1 / 1.4%)

Embarrassed (12 / 16.7%)

Separated from Friends (5 / 6.9%)

Spending money (43 / 59.7%)

Wasting time (23 / 31.9%)

**Table 4: Multilevel negative binomial regression predicting day-to-day regrettable experiences.**

**Model 1 (All Regrets)**

**Odds Ratio 95% CI Z, p**

Age .985 .964 – 1.00 1.41, p = .158

Gender 1.005 .642 – 1.575 0.03, p = .980

Self-control .964 .923 – 1.006 1.66, p = .097

Units cons. 1.234 1.199 - 1.269 14.36, p < .001

*Model fit (4) = 218.11, p < .001*

 **Model 2 (Common Regrets)**

Age .992 .972 - 1.012 0.74, p = .462

Gender 1.010 .651 – 1.566 0.05, p = .963

Self-control .976 .935 – 1.019 1.08, p = .281

Units cons. 1.224 1.186 – 1.263 12.68, p < .001

*Model fit (4) = 169.84, p < .001*

 **Model 3 (Serious Regrets)**

Age .983 .926 – 1.043 0.56, p = .579

Gender .938 .286 – 3.076 0.11, p = .916

Self-control .915 .821 – 1.020 1.59, p = .111

Units cons. 1.163 1.084 – 1.249 4.19, p < .001

*Model fit (4) = 19.59, p < .001*

**Model 4 (Risky Behaviours)**

Age .897 .821 - .979 2.43, p = .015

Gender 1.08 .494 – 2.359 0.19, p = .847

Self-control .959 .895 – 1.027 1.18, p = .237

Units cons. 1.125 1.072 – 1.181 4.81, p < .001

*Model fit (4) = 33.36, p < .001*

**Supplementary Table: Predicting intentions to drink in future from regrettable experiences**

 **Coefficient 95% CI**

***Step 1***

Gender -.907 -3.999 – 2.185

Age -.011 -.157- .136

Self-Control .003 -.247 - .253

Previous Cons. .346 .297 - .394\*\*

***Step 2***

Common Regrets .215 -.511 - .941

Serious Regrets .144 -1.251 – 1.539

Risky Behaviours .284 -1.290 – 1.859

***\*\**** P<.01

1. 66 participants did not provide their age. [↑](#footnote-ref-1)
2. One participant reported consuming 100 units in one day which we coded as an unfeasible response, given the rest of their consumption. Therefore, we recoded this value to their next largest value. Similarly, two participants predicted consuming 100 units on one or more days and we coded these to the next highest values. [↑](#footnote-ref-2)