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## Strategies to cut down drinking, alcohol consumption, and usual drinking frequency: Evidence from a British online market research survey

Alessandro Sasso<sup>a,b,\*</sup>, Mónica Hernández-Alava<sup>b</sup>, John Holmes<sup>a</sup>, Matt Field<sup>c</sup>, Colin Angus<sup>a</sup>, Petra Meier<sup>d</sup>

<sup>a</sup> Sheffield Alcohol Research Group (SARG), School of Health and Related Research, University of Sheffield, UK

<sup>b</sup> Health Economics and Decision Science (HEDS), School of Health and Related Research, University of Sheffield, UK

<sup>c</sup> Department of Psychology, University of Sheffield, UK

<sup>d</sup> MRC/CSO Social and Public Health Sciences Unit, Institute of Health and Wellbeing, University of Glasgow, UK

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### ABSTRACT

**Background:** Relatively little is known about how risky drinkers attempt to moderate their drinking in the absence of specialist support. The broader literature has identified multiple potential strategies that people use to cope with temptation when trying to control health-risk behaviours. This study aims to identify types of alcohol moderation strategies used by British adults, and to explore how concurrent alcohol consumption differs across moderation strategies, focusing on the important role of usual drinking frequency.

**Methods:** We use a continuous repeat cross-sectional survey and one-week drinking diary collected by the market research company Kantar; these provide detailed information on alcohol consumption during a diary week and on how individuals try to moderate alcohol use for 49,204 British adults trying to reduce their drinking from 2013 to 2019. We use Latent Class Analysis (LCA) to identify predominant types of moderation strategies. With a three-step method, we also analyse the associations between adopting different moderation strategies, measures of frequency and intensity of drinking events, and usual drinking frequency.

**Results:** We found evidence of four alcohol moderation strategies: 29% of individuals use a pre-commitment-focused strategy (*having fewer drinking occasions*), two set of individuals adopt self-control strategies within drinking occasions (specifically 28% select *smaller drinks* and 5% have *fewer drinks*), while 38% adopt a *mixed* strategy that involves all three. Those using commitment tend to have a higher average consumption per drinking occasion but lower overall weekly consumption compared to those using self-control. Weekly alcohol consumption is particularly high among individuals who are usual everyday drinkers and use self-control to cut down drinking.

**Conclusion:** This analysis provides a useful platform for further work, using prospective or intervention designs, to test the relative effectiveness of different moderation strategies for alcohol consumers who want to reduce their alcohol consumption.

### 1. Introduction

The negative consequences of regular consumption of alcohol on health and wellbeing are well known (WHO, 2009). The U.K. Chief Medical Officers' guidance includes advice on both consumption volume and drinking frequency: they recommend that adults should drink no more than 14 units (equivalent to 112 g; 1 UK unit = 8 g) of alcohol per week and avoid heavy episodes, often defined in the UK as more than 6 units in a single occasion for women or 8 units for men (Department of

Health, 2016). Currently, 30% of men and 15% of women regularly drink in excess of these low-risk guidelines (ONS, 2019). Consumption of alcohol above this weekly guideline amount could be attributed to different combinations of frequency and intensity of drinking. For example, it may reflect daily or almost-daily consumption of low volumes of alcohol, or infrequent heavy episodic drinking (binge drinking). From a behavioural perspective, on the one hand, drinking frequency may play an important role in sustaining higher consumption levels, because it may be more difficult to reduce or moderate the consumption

\* Corresponding author. Sheffield Alcohol Research Group (SARG), School of Health and Related Research, University of Sheffield, UK.

E-mail address: [a.sasso@sheffield.ac.uk](mailto:a.sasso@sheffield.ac.uk) (A. Sasso).

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of alcohol when drinking is part of a daily (or almost daily) routine rather than a less frequent activity. On the other hand, the disproportionate health risks associated with less frequent but heavy “binge” drinking occasions are well documented (see e.g. Taylor et al., 2010; Rehm et al., 2017) and 27% of U.K. adults binge drink on their heaviest drinking day (ONS, 2019).

When people attempt to moderate an unhealthy behaviour such as excessive drinking, there are many different strategies they could use to help them to achieve this, and to deal with temptation (Bishop, 2018, p. 3). For example, they might substitute alcoholic for non-alcoholic beverages, aspire to abstain from alcohol on several days per week, attempt to reduce the number of drinks per day, or use smart phone apps (Katzir et al., 2021, p. 763). Gul and Pendorfer (2001) describe the behaviour of an individual dealing with temptation when trying to refrain from eating unhealthy food. When people have a desire to dine out, they may book a table in a restaurant before dinnertime where only healthy options are available on the menu. In this way, they will avoid the temptation of ordering an unhealthy meal when dinnertime comes; this is known as the *commitment* or *pre-commitment* strategy. Alternatively, a person could opt for a flexible strategy of finding a restaurant where both healthy and unhealthy options are available on the menu. In that case, at dinnertime he/she will need to use *self-control* to deal with the temptation of eating unhealthy. Some individuals might value *commitment* because it reduces temptation whereas others might value *self-control* strategies because this allows them to not restrict their food options, even though controlling the desire of eating unhealthy may become more difficult. The ‘commitment versus self-control’ conceptual framework has been used to explain individual unhealthy behaviours such as smoking and eating unhealthy and to study the financial trade-off between saving and consumption (Hersch, 2005; Ashraf et al., 2006; Sadoff and Samek, 2019). Furthermore, behaviour change interventions for excessive drinking can be mapped to this framework. For example, some interventions such as implementation intentions (e.g. Norman et al., 2019) are centred on commitment mechanisms, whereas others such as inhibitory control training (Jones et al., 2018) are more closely aligned with self-control.

Few studies have investigated the extent to which excessive drinkers who want to moderate their drinking favour commitment or self-control strategies, or compared the relative effectiveness of commitment versus self-control in terms of their influence on alcohol consumption. One exception is studies that examined the impact of single commitment interventions or intrinsic commitment on consumption (Babor et al., 2003). Particularly relevant is Schilbach (2019) which studied the effect of using cash transfers to incentivize sobriety among 229 cycle-rickshaw drivers in India. In this three-arm experiment, a subgroup of individuals was offered the possibility to choose between financial incentives for sobriety versus an unconditional payment. One third of this group chose financial incentives over the unconditional payment even if the unconditional payment was higher than the maximum possible amount that subjects could earn with the sobriety incentives. According to the author, this finding provides evidence of a pre-commitment mechanism: among people who have a desire for sobriety, they may try making future drinking more costly in order to reduce temptation. Interestingly, Schilbach (2019) did not find a significant effect of sobriety incentives on the overall daily alcohol consumption of these individuals, suggesting the potential ineffectiveness of this commitment device, despite its appeal to individuals. Witvorapong and Watanapongvanich (2020) evaluated the effect of a public alcohol-prevention social marketing campaign in Thailand aiming to incentivize temporary alcohol abstinence. In this campaign, drinkers were able to publicly pledge temporary abstinence from alcohol and this acted as a pre-commitment device, because failure to follow through would cause social embarrassment. To investigate the effect of pre-commitment on alcohol consumption, they collected primary data for 453 drinkers and found that the decision to pre-commit increased the probabilities of temporary alcohol abstinence and reduction in alcohol consumption.

In the present study, we use data from a large, cross-sectional survey in order to explore the use of moderation strategies for alcohol consumption, among British adults. In particular, the aims of this study are the following. First, we attempt to identify moderation strategies that reflect how individuals deal with temptation. Second, we investigate whether preferred moderation strategies are associated with usual drinking frequency, after accounting for important factors such as socio-demographic characteristics, and personal preference towards types of alcoholic beverages (Beard et al., 2017). Third, we investigate whether concurrent alcohol consumption differs according to individuals’ preferred moderation strategies, focusing on three measures of alcohol consumption (total quantity of alcohol consumed in the last week, reported weekly frequency, and average quantity consumed per drinking event). Finally, we extend the analysis to capture differences in concurrent alcohol consumption between the off-trade (e.g. private homes) and the on-trade sector (e.g. pubs and restaurants) as well as by the moderation strategy adopted. This is important from a policy perspective, because drinking behaviours as well as the effect of incentives to reduce alcohol consumption are expected to differ by trade sector (see e.g. Robinson et al., 2014).

## 2. Methods

We used data from Alcovision, a continuous cross-sectional survey conducted by the market research company Kantar. It provides detailed information on alcohol consumption for a large sample of adults (18 years old and over) living in Great Britain. The survey uses a retrospective diary design to gather data on the drinking occasions of respondents over the seven-day period preceding the survey. Quota sampling is used to draw a representative sample of adults living in Great Britain and participating in Kantar’s online managed access panels, with quotas based on age, gender, region, and social grade. Survey invitations are timed to ensure that every day and month of the year is covered by the fieldwork.

We use data from 177,893 individuals collected between 2013 and 2019. To identify regular drinkers who are trying to moderate their alcohol consumption, we excluded 68,482 individuals whose usual drinking frequency is once a month or less, and a further 60,207 individuals who were not attempting to moderate their alcohol consumption. This leaves an analytical sample of 49,204 individuals who report attempting to cut down drinking. A comparison between those reporting that they are attempting to cut down and those who are not, in Table 1, show that there are not large differences in individual socio-demographic characteristics. The latter group has a slightly lower proportion of men, is slightly older, and they drink less frequently, on average.

### 2.1. Variables of interest

The dataset contains a wealth of information on personal characteristics and alcohol consumption. The variables used are grouped according to their role in the statistical analysis and described below in detail.

#### 2.1.1. Moderation techniques

These variables provide information that allow us to identify the different moderation strategies employed by individuals, using Latent Class Analysis (LCA). Specifically, respondents are asked the following question: ‘Are you trying to moderate the amount of alcohol you drink these days?’ Those who are trying to moderate are then asked: ‘how are you trying to moderate your alcohol consumption?’. Respondents can select one or more of the following responses: ‘drinking on fewer occasions’; ‘having fewer drinks on occasions when you do have a drink’; ‘having smaller serving sizes’; ‘choosing drinks with a lower alcohol content’; ‘drinking soft drinks’; ‘drinking other non-alcoholic drinks such as alcohol-free beer and wine’. We refer to these variables as moderation *techniques*, whereas moderation

strategies are the combinations of techniques identified with LCA.

### 2.1.2. Usual drinking frequency and other predictors of moderation strategies

Usual drinking frequency is captured with the survey question “Over the year as a whole, how often do you drink any alcoholic drink of any kind?” Respondents are given several response options which we used as a set of binary variables: ‘once-twice per week’ (the reference category), ‘three-five times per week’, ‘six-seven times per week’. Drinking frequencies equal to or lower than once per month are not included as those individuals are not included in this sample. Note that usual drinking frequency is also a proxy for usual quantity of alcohol consumption, which is not asked in the survey.

In line with existing literature, we control for age, gender, socio-economic status, household composition, and region because drinking behaviours differ by these socio-demographic and geographic characteristics (e.g. Stockdale et al., 2007; Richter et al., 2013; Twigg and Moon, 2013). Socio-economic status is based on the four-class occupation-based classification developed by the National Readership Survey: DE (the lowest socio-economic group), C1, C2, and AB (the highest). Regarding household composition, we include variables capturing the presence of a cohabiting partner, the number of dependent children, and the number of adults living in the house (excluding the respondent).

Alcohol-specific attitudes are captured via the individual’s openness to try new alcoholic drinks and openness to try low-alcohol drinks. These variables are measured using a Likert scale ranging from zero (Strongly Disagree) to five (Strongly Agree), with questions assessing agreement with the following statements: “I love to try new and different alcoholic drinks”; “I am happy to consider low or no alcohol drinks”. The variables are included in the model as continuous. Four additional variables capturing individuals’ preferences for quality and price when buying alcohol both on-trade and off-trade are also included, in line with the literature (Gruenewald et al., 2006; Meng et al., 2014). All these variables are measured using a Likert scale going from zero (Strongly Disagree) to five (Strongly Agree) and are included in the model as continuous variables. The survey questions capturing attention to quality and price are: “it’s worth paying extra for quality when it comes to buying drinks in restaurants, pubs, bars or clubs”; “it’s worth paying extra for quality when it comes to buying alcoholic drinks to have at home”; “I usually consider the price of drinks when I’m in restaurants, pubs, bars or clubs”; and “I usually consider the price of drinks when I’m buying alcoholic drinks to have at home”. Finally, we include two sets of dummy variables capturing the month and year of interview, because alcohol consumption and attempts to reduce alcohol intake may vary by season and over time (Twigg and Moon, 2013; de Vocht et al., 2016).

### 2.1.3. Alcohol consumption variables

The following variables are included to assess if the moderation strategies are associated with different alcohol consumption patterns.

## 2.2. Primary outcomes

Kantar Alcovision provides information on the number of the drinks consumed in each drinking occasion, and their alcoholic strength. Using this detailed information, we can calculate: 1) total units of alcohol per week (1 unit = 8gr of alcohol); 2) number of drinking days per week; 3) total units of alcohol per occasion. These variables capture three different aspects of alcohol consumption, namely, quantity, frequency, and intensity of drinking, respectively.

## 2.3. Secondary outcomes

Alcovision collects information on whether each drink is consumed in the on-trade (e.g. restaurants or pubs) or in the off-trade (e.g. in private homes). We are therefore able to compute the total number of weekly alcohol units and alcohol units per occasion for the on-trade and

off-trade sectors separately. We do not report number of drinking days by trade sector because the numbers are too small for robust analysis. We investigate the results by type of trade sector because moderation strategies may affect consumption differently in the on-trade versus off-trade.

The original distributions of weekly-level and occasion-level consumption are shown in Figure A2 in Appendix. Note that in Kantar Alcovision, respondents are also asked to report occasions containing solely non-alcoholic drinks in the on-trade, whereas for the off-trade sector only drinking occasions with at least one alcoholic drink are reported. This is because it is difficult to define non-alcoholic drinking occasions when these happen outside commercial premises. We included on-trade occasions with zero units consumed in our analysis but excluding them does not affect the conclusions as they only represent about 3% of all occasions.

## 3. Statistical analysis

The statistical method used is in line with the aims of the paper: to characterise the latent classes of strategies that respondents use to cut down drinking (first aim); to investigate the relationship between these strategies and usual drinking frequency, after accounting for other respondent socio-demographic characteristics (second aim); to investigate whether usual alcohol consumption varies across the moderation strategies (third aim).

Fig. 1 presents a path diagram of the statistical model to be used based on LCA (Wang and Wang, 2012). It is assumed that individuals adopt different moderation strategies. This discrete set of  $k$  (latent) moderation strategies cannot be directly observed but we can use the variables that relate to moderation techniques (fewer occasions, fewer drinks, smaller serving sizes, low alcohol strength, soft drinks, other alcohol-free drinks) to identify them, under the assumption that the patterns of correlation between the observed variables are solely due to the latent moderation strategies.

The model describing the relationships between respondent characteristics and the categorical latent variable is a multinomial logit; those describing the relationship between the latent strategies and each alcohol consumption variable are linear regression models. We allow for correlation between alcohol consumption variables.

We adopt the three-step model estimation method for LCA described by Asparouhov and Muthén (2014), where auxiliary variables (here personal characteristics and total alcohol consumption) are introduced in the model after estimating the latent classes independently and using appropriate correction methods to take into account the stepwise procedure. In principle, the model could have been estimated jointly using maximum likelihood but there are well known drawbacks in doing this where characterisation of the latent classes may differ substantially between analyses that use different sets of auxiliary variables (Vermunt, 2010).

The three steps are as follows. Step 1 is standard LCA described in the dashed box of Fig. 1. In Step 2, each individual is assigned to one of the latent strategies identified in the previous step. This is done by calculating the predicted posterior probability of the individual belonging to each of the latent moderation strategies based on the moderation techniques that they endorsed, and then assigning the individual to the moderation strategy with the highest probability. Since the highest probability is unlikely to be equal to one, this step also introduces misclassification error that is then corrected for in the following step. In Step 3, we estimate the relationship between the moderation strategies (c) and the auxiliary variables, after taking into account the misclassification error introduced in Step 2 (for details, see Asparouhov and Muthén, 2014).

Finally, we propose an extension of the above model to partly tackle the unavailability of longitudinal data. Given the lack of information on participants’ usual alcohol consumption (i.e. consumption of alcohol before they attempted to moderate their drinking), we are not able to

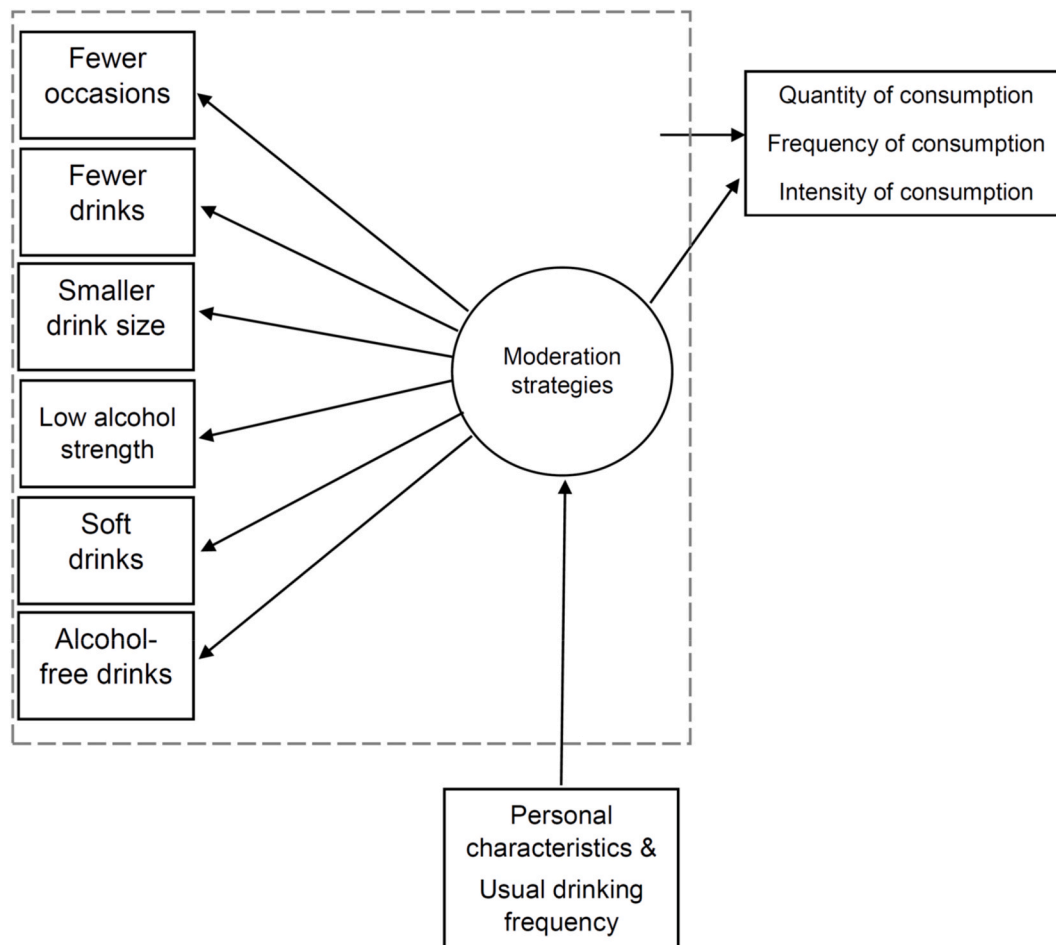


Fig. 1. Empirical model.

evaluate or contrast the effectiveness of the different strategies for this purpose. Nevertheless, Alcovision provides information on the respondents' usual drinking frequency recorded on a yearly basis (six-seven times per week, three-five times per week, once-twice per week, once per month, etc.), which is likely to be correlated with the respondents' usual consumption. Hence, we can at least exploit this information to capture how differences in the relationship between the moderation strategies and the alcohol consumption recorded in the one-week diary are explained by differences in the usual drinking frequency. To do this, we estimate an additional model as presented in Figure A1 in Appendix. This is equivalent to the model presented in Fig. 1 but it allows the usual drinking frequency to also have a direct effect on alcohol consumption separate from its indirect effect through the moderation strategy adopted; and it includes an interaction term to allow this direct effect to differ across moderation strategies.

In this study, all analyses are undertaken using sampling weights. Weights are computed using a raking procedure to match the marginal distributions of observed characteristics (such as social grade, region, and age within gender) with the UK Census. The weighting procedure is described in detail elsewhere (see e.g. Stevely et al., 2021). The presented analyses are not pre-registered.

### 3.1. Robustness analysis

As a robustness analysis, we estimate additional models including an additional direct effect (arrow) from personal characteristics to alcohol consumption. The findings are robust to this model variation (see Table A1 in the attached online Appendix). For example, the coefficients capturing effect of drinking frequency on alcohol consumption are

similar to those obtained in the model without controlling for socio-demographic characteristics, reported in Table 4. Finally, we investigate whether there are gender differences in the relationships between the latent classes and the auxiliary variables included in the model by estimating separate models for men and women. The results are reported in the attached Tables A2 and A3 of the online Appendix.

## 4. Results

Table 1 presents summary statistics for the main variables of interest for the sample of individuals attempting to moderate alcohol consumption. Over 50% of the sample consume alcohol at least three times per week on a usual basis. Regarding the moderation techniques adopted, trying to reduce the number of drinking occasions per week is the most common technique (reported by 60% of the sample), 42% report trying to reduce the number of drinks per week, 23% report trying to replace alcohol with soft drinks, and 17% use smaller serving sizes. The least common techniques are using low alcohol or other alcohol-free drinks ( $\leq 10\%$ ). Table 2 presents summary statistics for the alcohol consumption variables. Individuals attempting to cut down alcohol report a higher quantity of alcohol consumption (25 units per week) compared to those not attempting to moderate alcohol (22 units per week).

### 4.1. Identification of latent classes of moderation strategies

We estimated LCA models with two to six latent classes and selected the four-class model based on the interpretability of the latent classes as well as model fit statistics (AIC, BIC and Adjusted BIC). Table 3 presents

**Table 1**  
Summary statistics of variables of interest by moderation group.

Sample	Moderating		Non-moderating	
	Mean	SD	Mean	SD
Age	46.50	16.21	47.86	17.11
Adults in the household	1.44	0.85	1.45	0.86
Children in the household	0.45	0.80	0.40	0.77
Love trying new alcoholic drinks	3.19	1.19	3.11	1.20
Open to try low alcoholic drinks	3.04	1.28	2.71	1.29
Value quality when buying on-trade alcohol	3.21	1.07	3.12	1.08
Value quality when buying off-trade alcohol	3.44	1.03	3.35	1.06
Sensitiveness to price when buying on-trade alcohol	3.64	1.07	3.44	1.12
Sensitiveness to price when buying off-trade alcohol	3.84	0.96	3.67	1.03
Variable	%		%	
Female	45.4		41.6	
Socio-economic class (AB)	26.5		25.8	
Socio-economic class (C1)	31.7		30.3	
Socio-economic class (C2)	21.8		23.5	
Socio-economic class (DE)	19.9		20.3	
Cohabiting partner	64.0		63.1	
Drinking frequency (1–2 times/week)	48.7		55.0	
Drinking frequency (3–5 times/week)	37.1		30.0	
Drinking frequency (6–7 times/week)	14.2		15.0	
Scotland	8.1		8.2	
North East	5.3		5.4	
North West	10.9		10.5	
Yorkshire and The Humber	9.5		9.9	
East Midlands	7.9		8.3	
East England	6.0		6.9	
South East	18.1		18.5	
Wales	4.8		4.8	
West Midlands	8.4		8.6	
South West	9.1		9.0	
London	11.9		9.9	
Moderation techniques				
Fewer occasions	60.5			
Fewer drinks	41.8			
Smaller serving sizes	16.7			
Low alcohol strength	9.7			
Using soft drinks	22.9			
Other alcohol-free drinks	5.6			
Observations	49,204		60,201	

Note. These samples include individuals whose usual drinking frequency is at least once a week.

**Table 2**  
Summary statistics of alcohol consumption variables, by moderation group.

Sample	Moderating		Non-moderating	
	Mean	SD	Mean	SD
Number of drinking days per week	2.65	1.86	2.58	1.93
Number of weekly units	25.02	27.20	22.14	27.35
Number of on-trade weekly units	7.25	13.20	6.93	13.59
Number of off-trade weekly units	17.77	22.20	15.21	21.86
Number of units per occasion	6.77	7.59	6.40	7.17
Number of on-trade units per occasion	1.96	5.21	2.00	5.10
Number of off-trade units per occasion	4.81	7.02	4.40	6.55

Note. These samples include individuals whose usual drinking frequency is at least once a week.

the results for the four-class model. The prevalence indicates the predicted proportion of individuals in each class while the conditional probabilities indicate the probability of selecting a particular moderation technique (e.g. reducing the size of drinks) conditional on being in a specific class.

The four latent classes (or moderation strategies) have prevalence of 27.7%, 4.8%, 29.5%, and 38%, respectively (Table 3). The labels of these latent classes provide an intuitive description of the respective moderation strategies. For example, we label the first class as ‘fewer

**Table 3**  
Latent class Analysis of moderation types. Prevalence and conditional probabilities.

Latent class label	Fewer drinks	Smaller sizes	Fewer occasions	Mixed strategy
Prevalence	27.7%	4.8%	29.5%	38.0%
Fewer occasions	0.41	0.00	1.00	0.53
Fewer drinks	1.00	0.00	0.27	0.41
Smaller drinks’ size	0.12	1.00	0.04	0.23
Low alcohol drinks	0.01	0.03	0.00	0.24
Soft drinks	0.00	0.00	0.01	0.57
Other non-alcoholic	0.00	0.00	0.00	0.14

Note. The proportion for the latent classes are based on the posterior probabilities.

drinks’ because reducing the number of drinks is the main moderation technique used by individuals in that class and has a much higher probability ( $p = 1$ ) compared to the other latent classes ( $p \leq 0.41$ ). Similarly, the second and third latent class are labelled as ‘smaller size’ and ‘fewer occasions’ reflecting a relatively high probability in these moderation variables. The fourth latent class is labelled as ‘mixed’ strategy as there is no single dominant technique and has a relatively high probability of choosing any technique (fewer occasions,  $p = 0.53$ ; fewer drinks,  $p = 0.41$ ; smaller drink size,  $p = 0.23$ ; low alcohol drinks,  $p = 0.24$ ; soft drinks,  $p = 0.57$ ; non-alcohol beer-wine,  $p = 0.14$ ). This latent strategy is also the only one to include a substantive probability of using soft drinks and other low/non-alcoholic drinks to moderate alcohol consumption. Finally, it is interesting to note that a large proportion of individuals (62%) use a moderation strategy that is mainly based on one moderation technique while 38% use a mixed strategy. Among the moderation types that are mainly using one moderation mode, 35.5% are strategies based on *self-control* (‘fewer drinks’ and ‘smaller size’), whereas 29.5% (‘fewer occasions’) are *commitment* strategies.

#### 4.2. Usual drinking frequency and other variables associated with moderation strategies

The second aim is to investigate whether the respondent’s usual drinking frequency is associated with the moderation strategies, after controlling for individual socio-demographic characteristics and personal preference towards beverage type. Table 4 presents the average marginal effects for the Multinomial Logit Model linking the probability of adopting a particular moderation strategy and the set of individual characteristics listed above. We also present the results by gender and these do not differ significantly from those obtained for the overall sample (see Table A2 of the online Appendix). Results show that the probability of adopting each moderation strategy differs by the frequency of “usual” drinking. As compared to individuals who usually drink less than three times per week, those who usually drink every day are 9.7pp (percentage points) more likely to report the ‘fewer drinks’ strategy, 5.1pp more likely to use the ‘smaller sizes’ strategy, and 5.9pp more likely to use a ‘mixed’ strategy. The probability of being in these three classes increases monotonically with the frequency of usual drinking. In contrast, individuals who usually drink only once or twice per week are 20.7pp less likely to report a strategy based on ‘fewer occasions’.

There are age differences in the probability of adopting different moderation strategies. Moderation attempts based on ‘fewer drinks’ are more likely among older generations with, for example, individuals between 51 and 60 years old being 10.7pp more likely to be in this class as compared to those younger than 26. In contrast, using a ‘mixed’ strategy is less common in older age groups. For example, individuals

older than 60 are 12.6pp less likely to report using a mixed strategy as compared to drinkers younger than 26. The probabilities of using a strategy based on ‘fewer occasions’ and ‘smaller sizes’ do not vary considerably across the age groups. Finally, variables describing different individual attitudes towards alcohol (namely openness to new types of alcoholic drinks, openness to new types of alcoholic drinks, sensitivity to price and preference for quality and preference for quality) are also related to different moderation strategies but their marginal effects are small in size.

4.3. Moderation strategies and concurrent alcohol consumption

The next step is to investigate whether concurrent alcohol consumption patterns differ according to individuals’ preferred moderation strategies. Table 5 reports the predicted mean values for weekly units of alcohol, number of drinking days per week, and units of alcohol per occasion, by moderation strategy. Table 6 presents the results of the above models conditional on the usual drinking frequency. Table 7 present the results by trade sector. In all the tables, we also report alcohol consumption for individuals that are not trying to reduce their drinking, for comparison.

Primary outcome: relationship between different moderation strategies and concurrent alcohol consumption.

Using a self-control strategy - either *smaller serving sizes or fewer drinks* - is associated with a higher weekly consumption (27.3 units) compared to the strategy based on ‘fewer occasions’ (24.6 units). In contrast, the ‘fewer occasions’ strategy is associated with higher occasion-level consumption (7.3 units) compared to 6.4 and 6.5 units reported by individuals using ‘fewer drinks’ and ‘smaller drink sizes’, respectively. Using a ‘mixed strategy’ is associated with the lowest weekly consumption (23.4 units) and the lowest intensity of consumption (5.9 units per occasion) amongst all the moderation strategies. In addition, self-control strategies are associated with a higher number of drinking days in the diary week (3.1 days) than those using either pre-commitment (2.3 days) or a mixed strategy (2.5 days).

We observed some interactions between usual drinking frequency and the moderation strategy adopted (see Table 6). Within the subgroup of individuals who usually drink once-twice per week, using ‘smaller sizes’ is associated with a higher weekly consumption (21.7 units), compared to using ‘fewer drinks’ (17.3 units), ‘fewer occasions’ (18.7 units), and ‘mixed’ (16.0 units) as moderation strategies. In contrast, among individuals usually drinking six-seven times per week, using the ‘smaller sizes’ strategy is associated with lower weekly consumption (32.8 units) compared to using ‘fewer drinks’, ‘fewer occasions’ or ‘mixed strategy’ (45.6, 40.7, and 38.2 weekly units, respectively).

Secondary outcome: moderation strategies and relationships to consumption in different trade sectors.

Most of the variation in the weekly alcohol consumption across moderation strategies comes from off-trade consumption (see Table 7). The reported weekly off-trade consumption is 20 units for individuals using self-control strategies, 17.4 units for those using fewer occasions, and 16.2 units for those using a mixed strategy. In contrast, on-trade consumption is between 7.2 and 7.4 for all the moderation strategies. Similar differences between on-trade and off-trade alcohol consumption appear when focusing on occasion-level consumption.

5. Discussion

People who are trying to moderate unhealthy behaviours can adopt multiple different strategies to facilitate this and to cope with temptation. We investigated how individuals deal with temptation when trying to moderate alcohol consumption, using a large observational U.K. dataset containing unique information on the moderation techniques they use. We found evidence of four main strategies. Two options are based on a moderation technique that can be described as self-control strategies and is applied within drinking occasions (*reducing the*

**Table 4**  
Marginal effects of the Multinomial logit model; outcome variable = moderation strategies.

	Moderation type			
	Fewer drinks	Reduced sizes	Fewer occasions	Mixed strategy
Drinking frequency (3–5 times/week)	0.009 (0.005)	0.006 (0.002)	-0.031 (0.005)	0.016 (0.004)
Drinking frequency (6–7 times/week)	0.097 (0.006)	0.051 (0.003)	-0.207 (0.008)	0.059 (0.007)
Female	-0.017 (0.004)	0.006 (0.002)	0.002 (0.004)	0.009 (0.004)
Age (26–30)	0.026 (0.009)	0.000 (0.004)	-0.012 (0.009)	-0.013 (0.008)
Age (31–40)	0.033 (0.007)	-0.015 (0.003)	0.016 (0.007)	-0.034 (0.007)
Age (41–50)	0.074 (0.007)	-0.027 (0.004)	0.020 (0.007)	-0.067 (0.007)
Age (51–60)	0.107 (0.008)	-0.031 (0.004)	0.022 (0.008)	-0.097 (0.008)
Age (61+)	0.128 (0.008)	-0.012 (0.004)	0.010 (0.008)	-0.126 (0.008)
Socio-economic class (AB)	-0.016 (0.006)	-0.012 (0.003)	0.005 (0.006)	0.023 (0.005)
Socio-economic class (C1)	-0.010 (0.006)	-0.017 (0.003)	0.015 (0.006)	0.013 (0.006)
Socio-economic class (C2)	0.005 (0.006)	-0.007 (0.003)	0.008 (0.006)	-0.006 (0.006)
Cohabiting partner	-0.002 (0.005)	0.008 (0.003)	-0.004 (0.005)	-0.002 (0.005)
Adults in the household	0.013 (0.003)	-0.003 (0.001)	0.003 (0.003)	-0.014 (0.002)
Children in the household	-0.011 (0.003)	0.003 (0.001)	-0.004 (0.003)	0.012 (0.003)
Love trying new alcoholic drinks	0.006 (0.002)	-0.001 (0.001)	0.007 (0.002)	-0.012 (0.002)
Open to try low alcoholic drinks	-0.049 (0.002)	0.003 (0.001)	-0.054 (0.002)	0.099 (0.002)
Value quality when buying on-trade alcohol	-0.001 (0.003)	0.003 (0.001)	-0.003 (0.003)	0.001 (0.003)
Value quality when buying off-trade alcohol	0.007 (0.003)	0.002 (0.001)	-0.001 (0.003)	-0.009 (0.003)
Sensitiveness to price when buying on-trade alcohol	-0.002 (0.002)	0.002 (0.001)	-0.005 (0.002)	0.005 (0.002)
Sensitiveness to price when buying off-trade alcohol	0.012 (0.003)	-0.009 (0.001)	0.005 (0.003)	-0.009 (0.003)

Note. Standard errors in parenthesis. The reference categories for the explanatory variables are: 1 – Age: 18–25 years old; 2 – Socio-economic Class: DE (the lowest socio-economic group); 3 – Usual drinking frequency: 1–2 times per week. Other covariates included in the model: region, month and year of interview. The region categories are: North-East; Yorkshire and The Humber; East Midlands; East England; South East (the reference category); South West; West Midlands; North West; Wales; Scotland; London.

*number of drinks* and *reducing the drinks’ size*); another can be described as a pre-commitment strategy of limiting the exposure to temptation (*reducing the number of drinking occasions per week*); and another is a *mixed strategy* that is a combination of moderation techniques, often making significant use of soft drinks to replace alcoholic drinks within an occasion.

We found that people with different moderation strategies report different alcohol consumption patterns. Most importantly, individuals using self-control strategies report a higher weekly quantity of alcohol compared to those using pre-commitment. On average, they drink at a

**Table 5**  
Predicted mean of alcohol consumption variables, by moderation strategy.

Outcome variables	Moderation type									
	Fewer drinks		Smaller sizes		Fewer occasions		Mixed strategy		Non-moderating	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Weekly-level consumption										
Number of weekly units	27.3	0.316	27.3	0.730	24.6	0.264	23.4	0.265	22.1	0.111
Number of drinking days	3.1	0.024	3.0	0.064	2.3	0.017	2.5	0.019	2.6	0.008
Occasion-level consumption										
Number of units per occasion	6.5	0.054	6.4	0.168	7.3	0.066	5.9	0.078	6.4	0.015

Note. Sample size: The analysis is based on 49,204 individuals trying to cut down drinking, reporting 183,728 drinking occasions. Individuals not trying to cut down drinking are 60,207 reporting 211,674 drinking occasions. When analysing occasion-level data, standard error are clustered to account for repeated observation within individuals.

**Table 6**  
Predicted mean of alcohol consumption conditional on usual drinking frequency.

Explanatory variables	Moderation type									
	Fewer drinks		Smaller sizes		Fewer occasions		Mixed		Non-moderating	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Outcome variable = weekly units										
Intercept	17.3	0.316	21.7	0.951	18.7	0.273	16.0	0.272	14.2	0.140
Freq. (3–5 times/week)	11.8	0.571	6.4	1.663	11.5	0.527	11.8	0.495	12.7	0.236
Freq. (6–7 times/week)	28.2	1.034	11.1	1.748	22.0	1.698	22.2	1.117	27.4	0.302
Outcome variable = drinking days										
Intercept	1.9	0.020	1.8	0.045	1.7	0.016	1.7	0.016	1.7	0.008
Freq. (3–5 times/week)	1.5	0.038	1.0	0.108	1.2	0.031	1.4	0.034	1.4	0.014
Freq. (6–7 times/week)	3.4	0.064	2.8	0.141	2.0	0.107	2.5	0.074	3.3	0.018
Outcome variable = units per occasion										
Intercept	6.6	0.099	7.5	0.267	7.4	0.084	6.1	0.124	6.4	0.037
Freq. (3–5 times/week)	−0.3	0.118	−0.8	0.341	−0.2	0.111	−0.4	0.132	0.0	0.057
Freq. (6–7 times/week)	0.1	0.162	−2.0	0.374	0.0	0.270	0.1	0.215	−0.1	0.076

Note. See Table 3. The intercept can be interpreted as the predicted mean for individuals drinking no more than twice per week.

**Table 7**  
Predicted mean of alcohol consumption variables, by moderation strategy and trade sector.

Outcome variables	Moderation type									
	fewer drinks		smaller sizes		fewer occasions		mixed strategy		non-moderating	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Weekly-level consumption										
Off-trade weekly units	19.8	0.599	20.0	0.270	17.4	0.217	16.2	0.209	15.2	0.089
On-trade weekly units	7.3	0.141	7.4	0.350	7.2	0.127	7.2	0.131	6.9	0.055
Occasion-level consumption										
Off-trade weekly units	4.8	0.056	4.7	0.127	5.2	0.064	4.1	0.063	4.3	0.014
On-trade weekly units	1.7	0.031	1.7	0.088	2.2	0.032	1.8	0.034	2.0	0.011

Note. See Table 3. The results by trade sector and usual drinking frequency are reported in the online Appendix (Table A4).

lower intensity but instead tend to have a greater number of number of drinking occasions per week, so overall consumption is still substantial. Among all the moderation strategies, those using a mixed strategy have the lowest total weekly consumption and the lowest intensity of in-event consumption. Furthermore, the difference in weekly alcohol consumption across moderation strategies is associated with by differences in off-trade (home) rather than on-trade consumption.

We have also shown that the “usual” drinking frequency is related to both the probability of adopting a specific moderation strategy and the quantity of alcohol consumed. For example, usual everyday drinkers are relatively more likely to adopt strategies based on self-control and less likely to use pre-commitment. Weekly alcohol consumption is particularly high for usual everyday drinkers who adopt a self-control strategy based on reducing the number of drinks per week without reducing the number of drinking occasions.

Our findings are in line with recent literature suggesting that individuals may use different ways to deal with or avoid temptation.

Interestingly, we found that a sizeable proportion of drinkers (38%) adopt moderation strategies based on a wide range of moderation techniques. Most existing studies have focused on analysing the effect of single commitment devices on alcohol consumption, using controlled experiments. In real life, individuals may adopt and combine different moderation techniques simultaneously or over time. For example, they might generally try to avoid drinking occasions but opt for non-alcoholic beverages in situations when this is not possible or desirable (such as business meals). Future research should explore drinkers’ experiences of using the distinct moderation techniques described here. This might involve qualitative methods (cf. Bartram et al., 2017), or quantitative methods such as mapping of self-enactable techniques (SATs) to these moderation strategies, and prospectively investigating associations between use of relevant SATs and changes to alcohol consumption (Knittle et al., 2020).



### 5.1. Limitations

Although we found evidence of different drinking patterns across the moderation strategies, it is not possible to establish whether these associations are causal. Moreover, there are several potential ways in which usual drinking frequency may play a role in the relationship between the moderation strategies and concurrent alcohol consumption. The current, cross-sectional data makes it impossible to distinguish these accounts; the use of longitudinal data might help future research to understand the relative benefits of different strategies for different types of drinkers, in order to inform public health guidance. Regardless, our study suggests that adopting a strategy based on both reducing drinking in-event consumption and lowering the weekly drinking frequency should be recommended. This is consistent with the current U.K. drinking guidelines recommending regular abstinent days along with limiting the volume consumed per occasion.

### 5.2. Policy-relevant implications

Our findings may have other policy-relevant implications. For example, we have shown that age, usual drinking frequency, and individual openness to try new alcoholic drinks are important predictors of the moderation strategy used. Targeting specific population groups may help policy makers to design public health policies more effectively.

Finally, we acknowledge some potential weaknesses in this study due to data limitations. First, the use of quota sampling has potential drawbacks in terms of sample representativeness. However, in this study we are primarily interested in relationships within the data that have reasonable generalisability to the British population rather than generating accurate prevalence estimates for the population and, therefore, the exact representativeness of the sample population is not a major concern. In addition, non-random sampling methods such as quota sampling permit collection of large datasets at a relatively low cost. Second, we do not have information regarding potentially important constructs such as dependence severity and motivation to change, which may be important predictors of moderation strategies. As discussed, the unavailability of longitudinal data makes it difficult to evaluate the real effectiveness of moderation strategies. Future research may want to focus on designing longitudinal surveys and elicit more accurate information on moderation strategies and alcohol consumption over time. Lastly, although this data contains unique information on the ways to cut down drinking, there might be other commitment or self-control strategies that are not captured in the existing survey. Future surveys exploring additional response options would be needed to be able to identify additional moderation strategies.

## 6. Conclusions

Alcohol consumers in Great Britain who are attempting to moderate their drinking employ one of four latent classes of strategies to help them to do this, one of which involves commitment (fewer drinking occasions), two involve self-control (smaller or fewer drinks within occasions), and a mixed strategy that involves all three. Adoption of a commitment or mixed strategy is associated with reduced total alcohol consumption during the survey week, although the commitment strategy is associated with heavier drinking on drinking days. We also demonstrate how individual differences in typical drinking behaviour are associated with the types of strategies that people employ, and with the association between strategy use and drinking behaviour during the survey week. These associations provide a useful platform for further work, using prospective or intervention designs, to test the relative effectiveness of different moderation strategies for alcohol consumers who want to reduce their alcohol consumption.

## Declaration of competing interest

None.

## Data availability

The authors do not have permission to share data.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2022.115280>.

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