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**Heightened impulsivity: associated with family history of alcohol misuse, and a
consequence of alcohol intake**

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Supplemental Information

TABLES (S1-S3); FIGURES (S1-S3)

METHODS

ADDITIONAL RESULTS

REFERENCES

TABLE S1. Group characteristics (age, vocabulary, alcohol use, smoking) and trait measurements (self-reported impulsivity ratings) at baseline for the family history groups

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	FH-	FH+	FH
<i>N</i>	40 (18m, 22f)	24 (12m, 12f)	
Age °	21.82 ± 3.20	22.25 ± 3.32	n.s.
Smokers (%)	20	16.7	n.s.
Cigarette per day (N) °	1.07 ± 2.55 (8)	0.79 ± 0.87 (4)	n.s.
Vocabulary Scale °	9.18 ± 1.78	9.13 ± 2.23	n.s.
<i>Barratt Impulsivity Scale</i>			
Total Score	63.10 ± 10.01	63.5 ± 8.77	n.s.
Attentional subscale ¥	16.77 ± 3.77	17.04 ± 3.82	n.s.
Motor subscale	23.25 ± 4.53	23.12 ± 4.05	n.s.
Non-planning subscale	20.08 ± 4.69	23.33 ± 4.19	n.s.
<i>Alcohol Use Questionnaire</i>			
Units of alcohol per week §	19.68 ± 9.58	21.00 ± 12.06	n.s.
Binge score §	27.84 ± 21.59	25.00 ± 14.44	n.s.
Alcohol Use score §	47.28 ± 27.62	46.00 ± 21.33	n.s.
AUDIT ¥	9.88 ± 4.55	10.08 ± 4.37	n.s.
Alcohol Age onset °	15.8 ± 1.76	15.13 ± 1.87	n.s.
Guilty after drinking % (Never / occasionally / sometimes / nearly always)	84.60 / 10.30 / 5.10 / 0	52.20 / 0 / 43.50 / 4.30	$U(62)=310.0$, $p=.010$, $r=.33$
Drink to get high (Y) %	5.1	21.7	$U(62)=374.0$, $p=.048$, $r=.25$
Drink without breaks (Y) %	23.1	43.5	n.s.
<i>Drug Use Questionnaire</i> (% , N) °			
No drug use / Occasional cannabis / Regular cannabis	57.5 (23) / 25.0 (10) / 17.50 (7)	37.50 (9) / 29.20 (7) / 33.30 (8)	n.s.
BDI §	5.35 ± 5.34	6.13 ± 5.19	n.s.

Abbreviations: ° non-parametric. ¥ SQRT transformed; § log transformed.

Values are expressed as mean ± SD, unless otherwise stated.

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39 **TABLE S2. Additional impulsivity measures for family history and alcohol groups, controlling for BIS-total**

<i>'BIS-Total' as Covariant</i>	FH	Alcohol	FH*Alcohol
<i>Sx5CSRTT</i>			
Premature responses total	n.s.	$F(1, 58) = 3.197, p = .079, \eta^2 = .055$	n.s.
Premature responses fITI	n.s.	$F(1, 58) = 3.496, p = .067, \eta^2 = .061$	n.s.
Premature responses vITI	n.s.	n.s.	n.s.
Premature responses dual_fITI	n.s.	n.s.	n.s.
Premature responses dual_vITI	$F(1, 58) = 4.259, p = .044, \eta^2 = .068$	n.s.	n.s.
Omitted trials fITI	n.s.	n.s.	n.s.
Omitted trials vITI	n.s.	$F(1, 58) = 3.737, p = .058, \eta^2 = .061$	$F(1, 58) = 3.694, p = .06, \eta^2 = .061$
Omitted trials dual_fITI	n.s.	$F(1, 58) = 4.080, p = .048, \eta^2 = .067$	n.s.
Omitted trials dual_vITI	n.s.	$F(1, 58) = 4.146, p = .047, \eta^2 = .070$	n.s.
<i>SSRT</i>			
SSRTi	n.s.	$F(1, 59) = 13.861, p = .001, \eta^2 = .194$	n.s.
Go Accuracy	n.s.	$F(1, 59) = 4.670, p = .035, \eta^2 = .072$	$F(1, 59) = 5.905, p = .018, \eta^2 = .091$
Go RT	n.s.	n.s.	n.s.
<i>IST</i>			
Boxes opened (fixed-win)	$F(1, 63) = 6.773, p = .012, \eta^2 = .100$	n.s.	n.s.
Errors (fixed-win)	$F(1, 63) = 5.540, p = .022, \eta^2 = .080$	n.s.	
k value	$F(1, 61) = 3.271, p = .076, \eta^2 = .051$	n.s.	
Delayed choices (TCIP)	n.s.	n.s.	n.s.
TET	n.s.	n.s.	n.s.

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41 Boxes highlighted in dark gray reveal significant effects from the original analysis (i.e., not taking BIS in to account) light gray areas revealing a
 42 tendency.

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46 **TABLE S3. Correlations between impulsivity measures**

	Premature responses fITI	Premature responses vITI	Premature responses fITIdual	Premature responses vITIdual	Premature responses Total	SSRT	IST boxes opened	IST errors	k value
Premature responses vITI	.666**								
Premature responses fITIdual	.396**	.396**							
Premature responses vITIdual	.337**	.434**	.427**						
Premature responses Total	.827**	.708**	.709**	.659**					
SSRT	.114	.019	.006	.188	.135				
IST boxes opened	.088	-.010	.156	.179	.170	-.052			
IST errors	.139	.083	-.178	-.108	.024	.274*	-.648**		
k value	.040	.044	-.056	-.098	-.092	-.116	-.126	.154	
TCIP Immediate Choices	.027	-.038	.044	.207	.149	.283*	.109	.133	-.008

** . Correlation is significant at the 0.01 level (2-tailed).

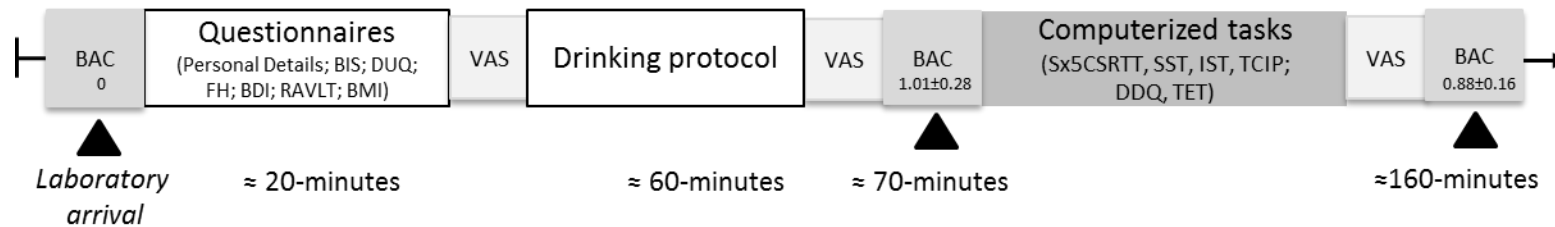
* . Correlation is significant at the 0.05 level (2-tailed).

47 Pearson's correlation coefficient r was used to determine relationships between impulsivity measures from the Sx-5CSRTT (Premature
48 responses during fITI, vITI, fITI-dual, vITI-dual sessions), SST (SSRT, stop signal reaction time), IST (number of boxes opened, and number of
51 errors) and Delay Discounting Questionnaire (k value). Sx-5CSRTT variables were positively related to one another, but not to any variable of
52 the other tasks, which is consistent with the multifaceted nature of the impulsivity construct. IST variables were also intercorrelated. SSRTi was
53 positively correlated with number of errors in the IST task and with percentage of immediate choices in the TCIP paradigm. No other
54 correlations appeared in the analysis (see table for r and p values).

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62 FIGURE S1

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66 **Fig. S1.** Experimental timeline. Abbreviations: BAC, breath alcohol concentration (Mean±SD); BIS, Barrat Impulsiveness Scale; DUQ, Drug
 67 Use Questionnaire; FH, Family history assessment; BDI, Beck Depression Inventory; RAVLT, Rey Auditory Verbal Learning Test; BMI,
 68 Body Mass Index (body weight and height measurement); VAS, Alcohol Visual Analogue Scale; Sx-5CSRTT, Sussex-Five Choice Serial
 69 Reaction Time Task; SST, Stop Signal Reaction Time task; IST, Information Sampling Task; TCIP, Two Choice Impulsivity Paradigm; DDQ,
 70 Delay Discounting Questionnaire; TET, Time Estimation Task.

FIGURE S2

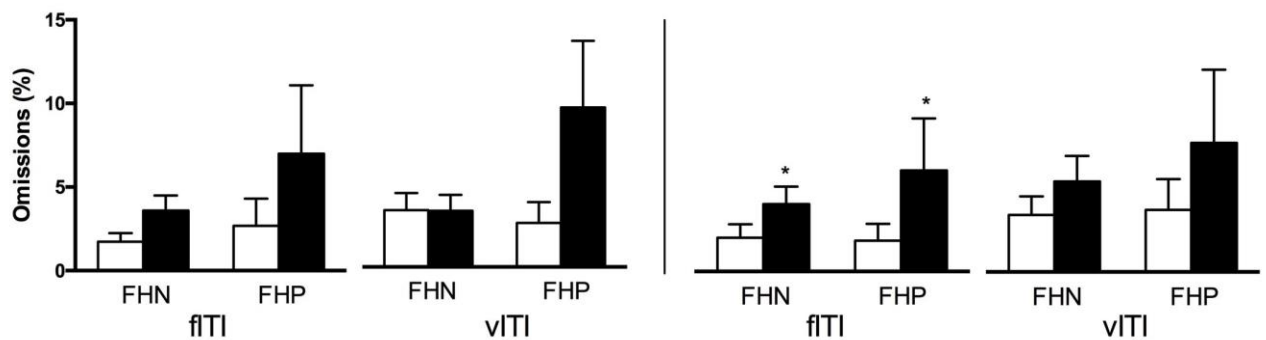


Fig. S2. Five-Choice Serial reaction time task performance (percentage of omitted trials during the simple task [left panels] and in combination with the dual task [right panels]; mean \pm SEM) by family history status (FH) and alcohol condition. FHP showed similar attentional performance in comparison to FHN subjects, but FHP subjects were marginally more affected by the acute effects of alcohol under a vITI-dual task condition ($p = .057$), reflected by a higher proportion of trials omitted. Alcohol increased omissions in all conditions (tendency on fITI, $p = .095$; vITI, $p = .042$; fITI dual, $p = .019$; vITI dual, $p = .030$).

FIGURE S3

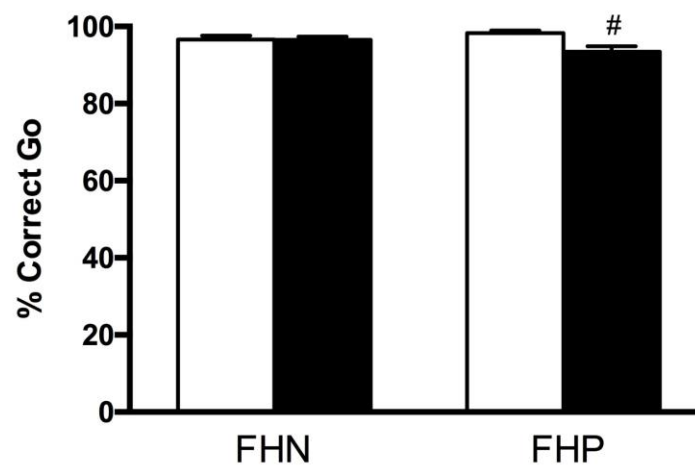


Fig. S3. Alcohol decreased Go accuracy ($p = .017$) on the Stop Signal Reaction Time Task, particularly in FHP subjects ($p = .018$). # $p < .05$ alcohol vs. placebo (same FH group).

METHODS

Recruitment and Procedure – *Additional details*

Participant's inclusion/exclusion criteria - *Restrictions during the study*

Participants were healthy, not currently suffering from a mental or neurological illness or alcohol or substance abuse disorder as documented via a medical questionnaire. Psychiatric diagnoses (including those relating to alcohol or substance use disorders) were not formally assessed as part of the study; information concerning those was obtained via a medical questionnaire and an additional interview. Participants had to be able to abstain from smoking during testing and not taking medication (excluding the contraceptive pill). In addition, the Alcohol Use Disorder Identification Test (AUDIT) was used to evaluate heavy drinking and/or signs of alcohol abuse or dependence. Prior to the experiment, participants had been instructed to abstain from the use of illicit recreational drugs (≥ 5 days) or alcohol (≥ 12 h), and were asked to eat a low-fat breakfast/lunch (excluding drinking coffee or tea) on the day of testing. Although the age range criterion for inclusion was wide (18-35), only 9.3% of the participants were over 25 (Years: 27 (N=1), 29 (N=1), 30 (N=2), 33 (N=2)). All participants provided written informed consent to take part in the study, which was approved by the University of Sussex ethics committee.

Binge drinking scores

The “binge drinking score” [derived from items from the AUQ questionnaire] used here focuses on patterns of drinking rather than quantities and includes drunkenness, which may be a better predictor of alcohol dependency problems. Indeed, we have shown that, unlike the measurement “drinks in a row,” the “binge drinking score” was unrelated to weekly alcohol consumption (Townshend and Duka, 2002).

To calculate the binge drinking score (Townshend and Duka, 2002), we collected the information given in items 10, 11 and 12 of the Alcohol Use Questionnaire (Mehrabian et al., 1978), which provides information of: average of drinks consumed per hour (item 10); number of times being drunk in the previous 6 months (item 11); percentage of times getting drunk while drinking (item 12). The binge score is then calculated by using the following equation: $[4 \times (\text{item 10}) + \text{Item 11} + 0.2 \times (\text{Item 12})]$.

We have previously used 'binge drinking' scores to classify 'binge drinkers' and 'non-binge drinkers'; cutoff scores were derived from a database of 245 AUQ questionnaires, completed by volunteers. Participants close to the upper 33% were grouped as 'binge drinkers' and close to the low 33% as 'non-binge drinkers'. Participants were classified as 'binge drinkers' if they scored > 32 , and 'non binge drinkers' if they scored < 16 . In our study, mean 'binge drinking' scores were of 26.78 (SD=19.14).

Alcohol and placebo administration. Participants in this group received a 0.8g/kg dose of ethanol [90% v/v alcohol], diluted with tonic water to make up a drink of 500 ml [giving rise to BAC=0.8-0.9mg/DL]. The drink was mixed with Angostura aromatic bitters to mask the taste of alcohol. The alcohol was provided in 10 portions (50 ml each) administered by the experimenter every 3 minutes over a 30-minute period (total amount equivalent to 5 units; i.e. equivalent to approximately 2.5 pints of lager or 5 glasses of wine). The placebo group received 500ml of tonic water and Angostura, on the same schedule as the experimental group. The experimenter was blind to the treatment. At the end of the experiment, participants were asked if they thought they had received alcohol or placebo. 89.1 % of the subjects correctly identified the beverage they received, 10.9% participants misjudged their condition (7 out of 64, belonging to: FHN_Placebo: N=3, FHN_Alcohol: N=2; FHP_Placebo: N=2; FHP_Alcohol: N=0)). The number of aware/unaware participants was not significantly

different between the alcohol or placebo groups ($\chi^2(1)=1.66$, $p=0.197$) or between the FHN or FHP groups ($\chi^2(1)=2.67$, $p=0.605$).

Questionnaires – Additional information

Personal Details Questionnaire (PDQ): The PDQ is brief questionnaire asking for age, date of birth, smoking status, alcohol use and current medication.

Beck Depression Inventory II (BDI-II; Beck et al., 1996): The BDI is a 21-item multiple choice checklist measuring severity of depression.

Alcohol Use Questionnaire (AUQ; Townshend and Duka, 2002): The AUQ gives a measure of total alcohol units per week and a binge score. To assess alcohol drinking patterns, a “binge drinking” score (Townshend and Duka, 2002b), was calculated based on the speed of drinking (number of drinks per hour), the number of episodes of alcohol intoxication in the past 6 months, and the percentage of alcohol intoxications out of the total number of times of going out drinking. An overall score for weekly alcohol-unit consumption was also estimated.

Drug Use Questionnaire (see Townshend and Duka, 2005): This questionnaire asks for duration of use, time since last use, and how often used for the main drug categories. Participants are given a score in which 0 = no drug use; 1 = occasional use of cannabis; 2 = regular use of cannabis (at least once a week); 3 = use of more than one type of illegal drug.

Family Tree Questionnaire (FTQ, Mann et al. 1985): The FTQ is a self-reported questionnaire assessing family history of alcohol problems. Participants need to score first- (parents, siblings) and second- (grandparents, uncles, aunts) degree relatives, using a family tree diagram: 1 = abstainer, or never drank: ‘a person who never consumed alcoholic

beverages'; 2 = social drinker: 'a person who drinks moderately and is not known to have (or have had) an alcohol problem'; 3 = possible problem drinker: 'a person who you believe or were told might have/had an alcohol problem, but whom you are not certain actually had an alcohol problem'; 4 = definite problem drinker: 'only who either is known to have received treatment for an alcohol problem (including being a regular member of Alcoholics Anonymous), or who has experienced several alcohol-related consequences'; 5 = 'do not know/remember'. Participants were classified as Family History Positive for Alcoholism, if they reported having one or more first-degree relative scoring 3 or 4; and as Family History Negative, if they reported having all first degree relatives scoring 1 or 2.

Structured Interview Questionnaire: To further evaluate patterns of drinking and number of relatives with alcohol problems, participants answered to the following questions (Duka et al. 2002, interview adapted for social drinkers):

1) At what age did you start drinking heavily?; **2)** When you started drinking regularly did you drink only at weekends? Or on most days of the week?; **3)** Do you feel guilt or worry about being dependent on alcohol? Nearly always; Often; Sometimes; Occasionally; Never; **4)** When drinking, do you abstain for some days and then binge? Yes / No; **5)** Did you ever plan your drinking and taking time off from drinking in order to get a "high" from alcohol when you next drank? Yes / No; **6)** When drinking, do you drink whenever you have the opportunity, seldom taking a break? Yes / No; **7)** When drinking, do you often become aggressive and have fights? Yes / No; **8)** Have you ever had an accident because you were under the influence of alcohol? Yes / No; **9)** Have you ever driven while drunk? Yes / No. **10)** Do you have anyone in your close family who was alcoholic? Yes / No. If yes, what relation are they to you?; **11)** What do you think makes you want to drink most? Below are some suggestions or you can add your own (if necessary, number in order of importance, starting

at 1 for the most important): seeing a drink; going to the place where you find the drink; meeting the people that you usually drink with; expecting a good feeling from the drink; feeling anxious or worried; feeling depressed; other (please specify). Although item #10 examines the number of relatives with alcohol problems, this measure was not considered to classify participants as family history positive or negative for alcoholism. Instead, the Family Tree Questionnaire, which provides a more detailed description of alcohol misuse, was used to classify the participants.

Barratt Impulsivity Scale, Version 11 (BIS-11; Patton et al., 1995): The BIS-11 is a 30-item checklist measuring impulsivity. The questionnaire gives a total impulsivity score, and three sub-scores: attentional, motor and non-planning impulsiveness.

Alcohol visual analogue scales (VAS; Duka et al., 1998): The alcohol VAS is a set of 90mm visual analogue scales. Participants score how much a mood state (contented, lightheaded and relaxed) applies to them at that moment.

The Rey Auditory Verbal Learning Test (RAVLT, Rey, A. (1941): Participants completed the RAVLT to give an estimate measure of short-term capacity. A list of 30 words is read to the participant with one word read every 2 seconds; the participant is asked to say back as many words as he/she can remember following a 2-minutes delay.

Cognitive tasks – Additional information

The human Sussex Five-Choice Serial Reaction Time Task

Participants were comfortably seated in front of a touch screen. Viewing distance was approximately 30 cm with a vertical visual angle of -30° and a horizontal visual angle of 0°. The task consisted of five moving blue circles (stimulus) represented in a “circular” motion

in a tactile screen. Below the stimuli and at the bottom of the screen was located a “home” button.

The session started upon selection (tapping) and holding of the finger on the home button, thus initiating the first trial. After a fixed interval (ITI; 5s), the motion of the five visual stimuli was interrupted and one circle briefly changed its contour (designated here as “illuminated”) for 0.5s. The participant was then required to tap in the correct circle within a certain period of time and return to the home button. The releasing of the home button before the presentation of the illuminated stimulus was recorded as a premature response and punished with a 5s time out. Correct responses and number of omitted trials provided a measure of attention. Latency to make a correct response (correct latency), latency to return to the “home” button (re-start latency), and perseveration after correct detection were also recorded. Sessions consisted of a maximum of 50 trials or 10 minutes, whichever came first.

Participants were required to complete two variants of the task: fixed ITI (fITI) and variable ITI (vITI, with pseudorandom presentation of different inter-trial intervals varying from 2, 5, 10 to 15 seconds), designated here as “simple task”. Additionally, participants completed the fITI and vITI conditions with the inclusion of an auditory continuous discrimination task (designated here as “dual task”), which we have used previously to increase the attentional load in a study assessing cognitive processing and drug seeking (Hogarth et al., 2008). During the fITI, one participant (FHN-male-alcohol) was unable to complete the testing and did not finish the Sx-5CSRT or performed SST, DDQ, TCIP, TET. Data was lost (technical errors): fITI, N=2; vITI; N=1; fITIdual, N=1; vITI_dual, N=1.

The complete list of variables considered in the analysis of the 5-CSRTT were:

- Accuracy (percentage of correct responses): $\text{correct responses} / (\text{correct responses} + \text{incorrect responses}) \times 100$.
- Percentage of omissions (including responses only after stimulus presentation): $\text{omissions} / (\text{correct responses} + \text{incorrect responses} + \text{omissions}) \times 100$.
- Percentage of premature responding (including all responses): $\text{premature responses} / (\text{correct responses} + \text{incorrect responses} + \text{omissions} + \text{premature responses}) \times 100$.
- Correct latency: latency to tap into the correct circle after the onset of the stimulus (s).
- Re-start latency: latency to tap the home button following a response (s).
- Perseverative responses: total number of responses made into the circles after a correct detection.

Auditory continuous discrimination task (Hogarth et al., 2008). The dual task utilised a PC computer to record detection rates. Auditory stimuli were presented via headphones equipped with an adjusted volume control, and detection rates were recorded using an external keyboard. Participants were required to discriminate between low and high pitched tones and respond to the latter by pressing a space bar located in an external keyboard. This practice trial allowed the high tone task to be practiced in isolation. Otherwise, the auditory dual task was combined with the Sx-5CSRTT Fixed and vITI tests. Accuracy of detection and latency of responding were recorded and considered in the analysis. Data points exceeding >3 standard deviations from the group mean, were excluded for that variable (3 data points: high tones detection during the vITI session).

Stop Signal Task (SST) (Logan, 1994). The SST (CANTAB; Cambridge Cognition, Cambridge, UK; <http://www.camcog.com>) was used as a behavioural measure of response inhibition. The task consisted of five blocks of 64 trials. Subjects were instructed to respond as quickly as possible to the orientation of an arrow ('go' stimulus) with a left or right- button on a

press pad response box. On 25% of the trials, after the 'go' stimulus, an auditory stimulus ('Stop Signal') was presented at a variable delay (Stop Signal Delay, SSD; 100-200-400-500ms), during which participants were instructed to withhold responding. The initial Stop Signal was presented at 200ms, but was automatically increased or decreased by 50ms following a staircase procedure according to the subject's performance: increasing times of presentation by 50ms following successful stopping, decreasing presentation times following failure to stop by 50ms. After the subject successfully inhibited his or her responses during Stop trials in 50% of the occasions, the Stop Signal Reaction Time (SSRT; RT Go stimulus – RT successfully Stop Trials) was determined. The Go Accuracy (%), Go Reaction Time (mean; ms) and SSRTi were also calculated. SSRT was calculated using the integration method (SSRTi; see Verbruggen et al., 2013 for further details on SSRTi analysis, Caswell et al., 2013). Three participants were excluded from the analysis: two participants exceeded 1000ms (Go Reaction Time) and one showed 0% of stop accuracy.

Information Sampling Task (IST; Clark et al., 2006): On each trial, a matrix of 5x5 grey squares was presented on a computer screen. Participants were instructed to select a square to reveal one of two colours and decide which was in the majority by selecting one of two coloured boxes at the bottom of the screen. A feedback response "You have won/lost 100 points" was then presented on the screen. One practice trial was followed by ten experimental trials. Participants confronted two conditions: fixed-win (subjects do not lose points by opening boxes) and decreased-win (decreased number of points depending on the number of boxes opened). Dependent variable was the average number of boxes opened before making a decision, and number of errors (incorrect choices). The smaller the number of boxes opened, the higher the degree of impulsivity.

The Two choice impulsivity paradigm (Dougherty et al., 2005). The Two Choice Impulsivity Paradigm (TCIP) is a forced-choice, reward directed procedure, which assesses the participant's tendency to choose between a circle and a square presented on a computer screen. Choosing the circle allows the subject to retrieve a small immediate reward (5 points) after 5 seconds delay by again responding on the chosen symbol; choosing the square allows retrieval of a large reward (15 points) following 15 seconds delay. Subjects were presented with a total of 50 trials. The proportion of immediate choices selected and the maximum number of consecutive long-delayed choices scored were measured and served as an index of 'choice' impulsivity.

Delay-Discounting Questionnaire. The Delay-Discounting questionnaire (DDQ) was used to provide an index of the relative value for immediate vs delayed rewards and was programmed using E-Prime (Richards et al., 1999). Subjects were asked to choose between different amounts of money after a period of different delays using a two response buttons on an external keyboard. The questionnaire consisted of 189 questions, such as 'would you rather £x Now, or £1000 in y time?', presented on a computer screen. Whilst 27 monetary rewards could be received immediately (£1, £5, £10, £20, £40, £60, £80 £100, £150, £200, £250, £300, £350, £400, £450. £500, £550, £600, £650, £700, £750, £800, £850, £920, £960 £990 £1000), the second option (£1000) could be received after a certain delay (1 week, 2 weeks, 1 month, 6 months, 1 year, 5 years, 25 years). Each delay was presented in a block, with the monetary amount randomised across trials. The order of the delays was also randomised, as the sequence of delays has been shown to alter the participant's preferences (Stillwell and Tunney, 2012). The point at which each individual was indifferent between the smaller immediate reward and the \$1000 delayed reward (e.g. switch from delayed to immediate rewards to delayed rewards) was determined for each of the seven

different delays. Within each session, seven indifferent points for seven different delays were determined. The curves that result from the devaluation of reinforcer value (k) by delay were also measured using the hyperbolic function of Mazur (Mazur and Coe, 1987):

$$V_d = \frac{V}{(1+kd)}$$

where V_d is the present subjective value of a reward of amount V (£1000), d is the time (delay) until its receipt, and k is the parameter that governs the rate at which the subjective value decreases. The subjective value was calculated as the value at which participant switched from immediate, certain rewards to the delayed reward. Thus, seven subjective equivalent points (indifference points), one for each delay, were calculated. Comparison of goodness-of-fit (R^2), nonlinear regression, was used to fit the seven estimated indifference points from each participant to a hyperbolic function, according to the methodology established by Bickel et al. (1999). When the hyperbola is less than 1.0, discounting rate (for the same value of k) becomes less steep as the delay increases.

Time Estimation Task. Time perception was measured using a Time Estimation task (TET), programmed using E-prime and administered using a screen and an external keyboard. Subjects were instructed to press and hold a spacebar to indicate a 27 seconds interval. Releasing the spacebar indicated the amount of time that the subject considered to have elapsed. The subject's accuracy of performance was calculated.

RESULTS

Sx-5CSRTT – Additional Measurements

The effects of FH and alcohol dose on omitted trials ('percentage of omissions', a measure of attentional performance) and latencies of performance were explored using a two-way

ANOVA (FH and alcohol condition as the fixed factors); the behavioural measures of 'perseverative responses' were analysed by Mann-Whitney *U* tests.

During fITI or vITI sessions, when the task was performed under single task conditions, no FH differences were found ($F_s < 0.691$, $p_s > .05$). During the vITI version, alcohol significantly increased levels of omissions relative to subjects in the placebo condition ($F(1,58) = 4.316$, $p = .042$, $\eta^2 = .069$; Fig. S2).

During the fITI-dual task session, again, omitted trials were higher following alcohol ingestion ($F(1,58) = 5.830$, $p = .019$, $\eta^2 = .095$; Fig. S2). When participants performed the vITI session under dual task conditions, alcohol-induced impairments on attentional performance were also detected; subjects in the alcohol condition showed more omissions ($F(1,58) = 4.944$, $p = .030$, $\eta^2 = .082$; Fig. S2), and this effect had a tendency to be exaggerated in FHP subjects (FH x alcohol interaction: $F(1,58) = 3.768$, $p = .057$, $\eta^2 = .061$).

Latency to make a correct detection, latency to return to the "home" button ('re-start latency') and perseverative responses were additional variables considered into the analysis.

Under simple task conditions, compared with placebo, alcohol increased the time to make a correct response ([Placebo, $M = 1.05$, $SEM = 0.044$; Alcohol, $M = 1.19$, $SEM = 0.045$]; $F(1, 59) = 4.725$, $p = .034$, $\eta^2 = .073$) and to return to the home button after making a response ([Placebo, $M = 0.79$, $SEM = 0.075$; Alcohol, $M = 1.11$, $SEM = 0.077$]; $F(1, 59) = 8.692$, $p = .005$, $\eta^2 = .132$), and increased the number of perseverative responses ([Placebo, $M = 2.26$, $SEM = 0.52$; Alcohol, $M = 7.906$, $SEM = 2.48$]; $U(63) = 338.0$, $p = .028$, $r = .28$), when performing in a fITI session. Increasing the task difficulty in a vITI session abolished the differences in latencies of correct performance, but alcohol again decreased the speed to collect the points ('re-start latency': [Placebo, $M = 0.69$, $SEM = 0.048$; Alcohol, $M = 0.845$, $SEM = 0.050$]; $F(1, 59) = 4.759$, $p = .033$, $\eta^2 = .077$). When a dual task was introduced, acute alcohol also

induced higher correct and 're-start' latencies ([Placebo, $M= 1.05$, $SEM= 0.032$; Alcohol, $M= 1.16$, $SEM= 0.033$]; $F(1, 59)= 5.559$, $p= .022$, $\eta^2= .082$); [Placebo, $M= 0.623$, $SEM= 0.071$; Alcohol, $M= 0.843$, $SEM= 0.072$]; $F(1, 59)= 4.740$, $p= .034$, $\eta^2= .077$, respectively) both during a fITI and a vITI session ([Placebo, $M= 1.138$, $SEM= 0.037$; Alcohol, $M= 1.229$, $SEM= 0.038$]; $F(1, 59)= 6.983$, $p= .011$, $\eta^2= .109$); [Placebo, $M= 0.634$, $SEM= 0.039$; Alcohol, $M= 0.758$, $SEM= 0.040$]; $F(1, 59)= 5.002$, $p= .029$, $\eta^2= .083$, respectively). In a vITI-dual session, an effect of FH also appeared in the analysis, FHP subjects showing higher number of perseverative responses than FHN (FHP, $M= 6.833$, $SEM= 3.383$; FHN, $M= 1.237$, $SEM= 0.273$; $U(62)= 310.50$, $p= .028$, $r= .28$).

SSRT – Additional Measurements

Alcohol decreased Go accuracy ($F(1,59)= 6.060$, $p= .017$, $\eta^2= .092$; Fig. S3); alcohol-induced deficits in Go accuracy were more pronounced in FHP (FH x alcohol interaction: $F(1,59)= 5.890$, $p= .018$, $\eta^2= .090$).

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