**University Lab Project – Paired Samples *t*-test & ANCOVA**

**Aim**

Existing research regarding risky decision-making has identified alcohol as a key influence. Yet, this research has typically focussed on alcohol use and intoxication, neglecting to investigate the after-effects of alcohol such as hangovers. Therefore, this study aims to investigate whether, and indeed how, hangovers influence risky decision-making. From the existing research, trait impulsivity would also be investigated as a covariate, due to its relationship with both alcohol and risky decision-making. Using a naturalistic within-subjects design, 28 participants completed a series of tasks including the Balloon Analogue Risk Task (BART) and the Barratt Impulsivity Scale-11 (BIS-11), both with a hangover and sober. Through a paired samples *t*-test, there were significantly higher levels of risky decision-making when participants had a hangover compared to when they were sober (*p* < .001, *d* = 0.77). Yet, an ANCOVA reported that there was no significant difference when trait impulsivity was controlled for (*p* = .079, ηp2 = 0.114). Taken together, it is likely hangovers lead to increased risky decision-making. This may impact interventions and ways of managing risky decision-making within the wider public environment, particularly in settings where alcohol use and intoxication are known to have an influence.

**Hypotheses**

**H1:** The hangover condition will display higher levels of RDM, as measured using the Balloon Analogue Risk Task compared to the non-hangover condition, as measured by the number of average pumps per trial.

**H2:** the hangover condition will display higher levels of RDM compared to the non-hangover condition, even after trait impulsivity has been controlled for, assessed using the BIS-11.

**Data Sources**

The final sample consisted of 28 participants recruited using opportunity and volunteer sampling methods. Data was collected using a survey designed in Qualtrics and an experimental task made in Gorilla. These were made in collaboration with 3 other students as part of a dissertation project.

**Data Analysis**

Data was analysed using IBM SPSS Statistics (version 30). Descriptive statistics were performed on participant and drinking information to illustrate sample characteristics and drinking behaviour. A repeated measures ANCOVA and a paired-samples *t*-test were performed to test the hypotheses. The data was tested to ensure the ANCOVA assumptions were met. Due to a sample size of *n* > 20 and insignificant results of the Shapiro-Wilk test of normality (*p*hangover = .117, *p*non-hangover = .998), it was determined there was not a significant departure from normality. No outliers were detected based on Cook’s distances and standardised residuals. All other assumptions were also met.

Exploratory analysis involved a paired-samples *t*-test determine whether there was a significant difference between mental effort needed (RSME) to complete the BART when hungover compared to when sober as well as a correlational analysis between hangover severity and RDM. All results were considered significant if *p* < 0.05.

**Results**

In the 30 days before taking part in the experiment, participants reported drinking an average of 4.07 (*SD* = 3.88) days per week, consuming an average of 7.50 (*SD* = 7.74) units when drinking in a day and participating in binge drinking an average of 4.82 (*SD* = 3.65) times. Total AUDIT scores revealed, on average, participants placed in the hazardous **A table with numbers and text

AI-generated content may be incorrect.**drinking category (*M* = 13.61, *SD* = 5.60).

As demonstrated in Table 4, participants consumed the recommended limit for regular alcohol consumption as well as exceeding the recommended limit for alcohol consumption in a single day with the National Health Service recommending males and females aged 18 or over to consume no more than 14 units of alcohol per week and to spread these 14 units over at least three days (National Health Service, 2024). Further, with the average eBAC given, most participants would likely be dazed and confused with increased nausea and requiring assistance to walk or even stand (University of Toledo, n.d.).

A repeated measures ANCOVA revealed, after all assumptions were met, that when TI is controlled for, hangover status had no significant effect on RDM, *F*(1, 26) = 3.33, *p* = .079, ηp2 = 0.114.

A paired-samples *t*-test was performed to investigate whether a significant difference in RDM between the hangover and sober conditions was present. Results showed that when participants were hungover, they gave significantly more pumps per balloon (*M* = 5.32, *SD* = 0.51) compared to when they were sober (*M* = 4.97, *SD* = 0.49, *t*(27) = 4.09, *p* < .001, *d* = 0.77), supporting the hypothesis that RDM would be significantly higher in the hangover condition compared to the non-hangover condition.

*Exploratory Analysis*

A further paired-samples *t*-test was performed to investigate whether there was a significant difference in mental effort during the BART between the hangover and non-hangover conditions. Results showed participants used significantly more mental effort when hungover (*M* = 30.29, *SD* = 28.67) to perform the BART than when they were sober (*M* = 17.75, *SD* = 22.29, *t*(27) = 2.48, *p* = .01, *d* = 0.47). Participants reported an average hangover severity on the one-item scale of 5.54 (*SD* = 1.84) and an average mean score on the mAHSS of 3.87 (*SD* = 1.72) out of 10. However, through bivariate correlational analysis, there was no correlation between hangover severity score and RDM.

**Conclusions**

This study aimed to investigate the influence of hangovers on RDM, hypothesising RDM would be greater during the hangover condition compared to the sober condition. This hypothesis was supported, revealing a large effect size (Cohen, 1988). This finding is consistent with the wider alcohol literature, supporting the notion of alcohol influencing RDM. Previous findings, such as those from Lane et al.’s (2004) and George et al.’s (2005) studies, demonstrated that alcohol increased the willingness of an individual to engage in RDM and thus risky behaviour – much like the present study. However, as discussed previously in relation to much of the existing alcohol literature, these findings are relative to the beginning end of the timeline of alcohol’s effect on RDM. Where this study can make notable contributions to the literature is at the end of the timeline of alcohol’s effect on RDM. This study’s findings provide evidence of alcohol’s influence on RDM towards the latter end of the timeline. In consideration of the literature discussed previously, it is evident alcohol has an influence on RDM throughout the course of the timeline, from administration and intoxication, to the after-effect of a hangover.

However, upon introducing TI as a covariate into the ANCOVA, hangover status had no significant effect on RDM. Therefore, the second hypothesis was not supported. This result suggests TI does not significantly influence the relationship between hangover status and RDM. However, this is not consistent with previous research investigating TI and its distinct relationships with RDM and alcohol. It is more likely this non-significant result was due to the study being significantly underpowered, rather than due to the absence of a relationship between alcohol hangover and RDM involving TI. An insufficient number of participants were recruited according to the a-priori power analysis, and the study experienced a participant attrition rate of 17%. This is not unexpected in hangover research, and steps were taken to limit attrition such as conducting the study online rather than in person (Scholey et al., 2019). However, the study did struggle to collect suitable quality data from the remaining 59 participants, with only 28 (47%) participants giving usable data. This likely explains why a significant effect was not found using an ANCOVA model, contradicting the suggestions of existing research.

Based on the non-significant result from the ANCOVA, exploratory analysis was carried out in the form of a paired-samples *t*-test, revealing a significant difference in mental effort during the BART between the two conditions. The increased mental effort needed during the hangover condition compared to the non-hangover condition could indicate the influence of hangovers on cognition.