Effects of alcohol on self-control: a psychophysiological approach

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INTRODUCTION

RESULTS

1. Behavior: Did Alcohol Increase Typical Flanker Interference Effects?

- Participants responded more quickly, \(F(1,89) = 37.45, p < .01\), and more accurately, \(F(1,89) = 410.54, p < .01\), on compatible than on incompatible trials (see Figure 1).
- There was no interaction with beverage group for reaction time.

2. There was a significant beverage group interaction for error rates such that placebo group participants made significantly fewer errors (\(M = 0.90\) on compatible trials compared to errors (\(M = 1.14\) on compatible trials) and the control group (\(M = 1.13\)), which did not differ from each other, \(F(1,90) = 4.36, p < .05\) (see Figure 2).
- In contrast, follow-up analyses of errors on incompatibility trials showed no significant linear or quadratic effects (\(F < 0.05, p > .07\)).

3. Did Alcohol Impair Post-error Adjustment?

- The analysis showed a significant Beverage group x Previous trial interaction, \(F(2, 85) = 3.62, p < .05\) (see Figure 3).
- Ps in the alcohol and control groups showed no evidence of post-error adjustment (i.e., smaller interference effects on post-error vs. post-control trials), whereas, participants in the placebo group showed significant post-error adjustment, seen as a smaller compatibility effect on post-error trials (\(M = 41\) ms) than on post-trials (\(M = 57.7\) ms), \(F(1, 85) = 4.87, p < .05\).

4. ERN Amplitude: Was the ERN Reduced by Alcohol?

- Beverage group significantly affected ERN amplitude (see Figure 4), \(F(2, 85) = 7.41, p < .001\) (see also Bartholow et al., 2009; Rüdigerinkhof et al., 2002).
- There was no significant interaction effect between the beverage group and the Compatibility effect on the ERN (see Figure 5).

5. NSW Amplitude: Was the NSW Affected by Alcohol?

- Results showed a significant main effect of Compatibility, \(F(1, 90) = 50.24, p < .01\) such that NSW amplitudes were greater (more negative) for incompatible (\(M = -2.4\)\(\mu\)V) than compatible (\(M = -1.8\)\(\mu\)V) trials (see Figure 6).
- This effect was not moderated by beverage group.

6. Risk Score and the Compatibility Effect.

- The hypothesis for the relationship between flanker task behavioral performance (compatibility effects in accuracy) and risk score, including potential interactions with beverage group, was tested using separate linear regression models including Beverage group and flanker performance variables as factors and executive function and quantity/frequency of alcohol use as covariates. Results showed:
  - Significant main effect of Beverage group, \(F(2, 76) = 3.92, p < .05\)
  - Significant Beverage group x Compatibility effect interaction, \(F(2, 78) = 5.54, p < .01\) Separate partial correlations (controlling for covariates) between CE_acc and risk score for each beverage group (see Figure 6) showed that the relationship between the compatibility effect and risk score was significant only in the placebo condition.

7. Relations between Neural Indices of Self-Control and Risk-Taking.

- A set of regression equations tested whether neural indices of self-regulatory control and self-reports of risk-taking were associated, and whether any such relationships would be moderated by alcohol. Unfortunately, in each model tested none of the main effects or cross-product terms were significant predictors of risk scores (all \(p > .23\)).

CONCLUSION

- Alcohol decreased the ERN and impaired post-error performance adjustment (see also Bartholow et al., 2009; Rüdigerinkhof et al., 2002). However, no relationship was found between neural indices of self-regulatory control and self-reports of risk-taking.
- An association between the size of the compatibility effect in accuracy and risk score emerged for Placebo participants. This finding suggests a potential compensatory effect among placebo subjects. That is, people that tend to take more risks while intoxicated may have a stronger empathy about alcohol’s disinhibiting effects, and thus might try hard to compensate for anticipated impairment they expect alcohol to have on their cognitive functioning and task performance. This finding suggests that alcohol expectancy may actually lead to performance improvement for individuals that are prone to taking risks. Further analyses controlling for alcohol expectancies in this group could elucidate this effect.

REFERENCES