ACUTE AND HANGOVER EFFECTS OF ALCOHOL ON EVENT-RELATED POTENTIALS (ERPs)

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INTRODUCTION

In previous studies examining the acute effects of alcohol on cognitive functioning, the ingestion of alcohol has been reported to increase the latency of the P3 component to target stimuli in target detection tasks, suggesting that the time taken to evaluate a novel stimulus is delayed\textsuperscript{1-5}. Ingestion of alcohol has also been reported to decrease P3 amplitude to target stimuli in some studies\textsuperscript{2,5}, suggesting that alcohol may decrease the allocation of attentional resources to task.

Studies of withdrawal effects in severely dependent problem drinkers report increased amplitude of early sensory components of the ERP, suggesting CNS hyper-excitability\textsuperscript{6}, although the effects on cognitive tasks in social drinkers have not been investigated.

Performance effects have been observed at lower doses with visual stimuli than with auditory stimuli\textsuperscript{7,8}, and may occur more frequently with high event-rate/ successive discrimination tasks than with low event-rate/ simultaneous discrimination tasks.

AIM: The aim of the present study was to examine the acute and hangover effects of three doses of alcohol on cognitive ERP components during a visual vigilance task in a subgroup of subjects participating in the 'hangover' study (see Lemon et al., this volume).
METHOD - Subjects:

Thirty-two male subjects participated in the ERP recording phase of the study.

Procedure:

The procedure is described in Lemon et al. (this volume).

Behavioural Task:

A visual vigilance task was utilised for the ERP recording phase (Mackworth Clock).

ERP recording:

The electroencephalograph (EEG) was recorded at Fz, Cz and Pz sites using an electrode cap, referenced to tip of nose. Trials containing horizontal or vertical EOG were rejected from ERP averages. Data were amplified using Neomedix NT114-A amplifiers with lower and upper frequency cutoffs of 0.016 and 50 Hz (3dB down). Data were continuously acquired with an 8ms sampling rate per channel and averaged offline over a 1300ms epoch with 32ms pre-stimulus baseline adjustment.

Difference waveforms were created by subtracting ERPs for the target stimuli from the ERPs for frequent stimuli. Mean amplitude and peak latency measures analysed were N2 amplitude (150-350ms), P3 amplitude (350-750ms) and P3 latency (latency of most positive peak in 350-750ms window).

BEHAVIORAL RESULTS: Mackworth Clock Reaction Time

The mean reaction times (adjusted for baseline performance) are presented in Figure 1. There was a linear dose-related increase in reaction time following acute administration of alcohol ($F=7.19$, $p=.0125$), although there were no significant effects during the hangover session.
ERP RESULTS

N2 Amplitude

The mean N2 amplitude measures (adjusted for baseline performance) are presented in Figure 2. Acutely, there were no significant effects of alcohol on the amplitude of the N2 component. There was a linear dose-related increase in N2 amplitude during the hangover session (F=7.94, p=.002).

P3 Amplitude

There were no significant linear or higher-order trends on the amplitude of the P3 component following acute administration of alcohol. There were no significant effects during the hangover session.

P3 Latency

The mean P3 latency measures (adjusted for baseline performance) are presented in Figure 3. Following acute ingestion of alcohol, the latency of the P3 component showed a linear increase (F=10.1, p=.004). There were no significant effects during the hangover session.
DISCUSSION

Acutely, alcohol delayed the time taken to evaluate a novel stimulus, as indexed by P3 latency and reaction time. Stimulus evaluation time was not significantly impaired during the hangover session.

The allocation of attentional resources was not impaired either acutely or during hangover in the present study, although the acute effects may interact with other variables\(^2\) (eg drinking history and predisposition).

Dose-related increases in N2 amplitude were observed during the hangover session. A similar effect was observed in Rohrbaugh et al's study\(^5\) when maintenance doses were supplied at 30 minute intervals over 2½ hour testing session. This effect may be related to 'drowsiness' or fatigue.

REFERENCES