Effects of ethanol on sensitivity to future consequences of action and on response suppression.

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Background

Acute ethanol consumption has effects that resemble frontal lesions in some respects, for example executive dysfunction and disinhibition (Giancola, 2000; Källmén and Gustafson, 1998).

Bechara et al. (1994) have developed a gambling task which shows performance deficits that are selective for patients with lesions in the prefrontal cortex. Such patients seem to be unaffected by the potential future consequences of their actions, and to be influenced only by the immediate effects.

We have investigated the effects on ethanol on the Iowa Gambling Task (IGT), as well as another measure of frontal lobe dysfunction that appears not to have been studied with ethanol before, the Hayling Test (HT: Burgess and Shallice, 1997)

Methods.

We randomised 30 female and 27 male volunteers aged 18-25 to receive a single dose of ethanol or placebo. The ethanol dose was 0.7 g/kg in females (maximum 55g) and 0.8 g/kg in males (maximum 66g) given as vodka mixed with orange juice. IGT and HT were assessed starting at 45 minutes post-dose. A battery of other tests of attention, psychomotor function and mood was carried out starting at 30, 75 and 105 minutes post-dose. Blood alcohol concentrations (BAC) were measured using a breathalyser. Statistical analysis used the Wilcoxon rank sum test

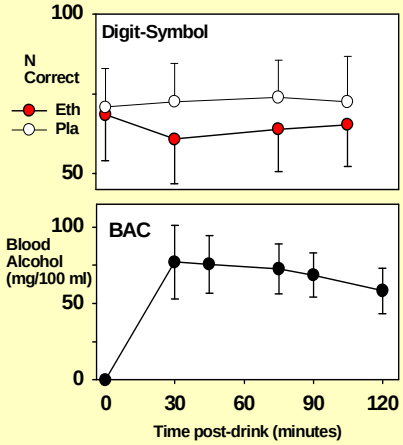
Results and Discussion

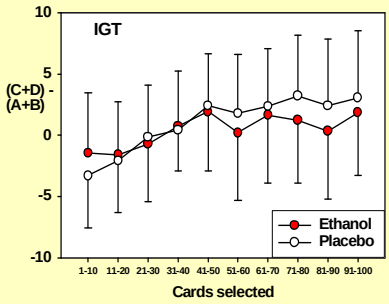
Maximum blood alcohol concentrations (BAC) occurred at 30 minutes post-drink (mean 77.1 mg/100ml, S.D. 24.0).

The Digit Symbol test showed a clear reduction in the number of correct substitutions, with a similar time course to that of the BAC. The differences between placebo and ethanol were significant at the 30 minute ($z=3.28$ $p=0.0010$) and 75 minute ($z=2.69$ $p=0.0072$) time-points.

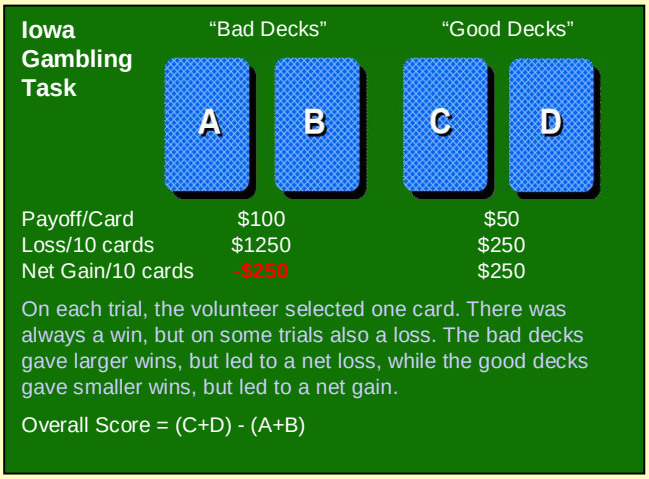
Performance on the IGT was very similar for the ethanol and placebo conditions. Both groups showed the normal pattern of initial selection from the "bad decks" which give greater rewards per card, with a gradual shift towards the "good decks". This is in contrast to the pattern seen with prefrontal patients, who maintain a preference for the "bad decks" even though they end up consistently losing over the longer term.

The HT showed a non-significant trend for a slowing in Section 2 of the task, suggesting the possibility that ethanol may lead to impairment in response suppression. This would need to be further investigated in a separate study.





Iowa Gambling Task



Hayling Task

Section 1: Fifteen sentences read aloud, for example:

He posted the letter without a _____

The response should be an appropriate word, so **stamp**

Section 2: Fifteen sentences read aloud, for example

The dough was put in the hot _____

The response should be an **unrelated** word

In each case the response and the time taken was recorded, and the response classified as connected, somewhat connected, or unconnected with the sentence

Effects of ethanol on tests of frontal lobe function.

Task, Measure	45 minute Time-Point		
	Placebo	Ethanol	z, sig
Iowa Gambling Task			
(C+D)–(A+B)	10.14 (23.9)	4.14 (30.08)	0.67 n.s.
Hayling Test, Time (s)			
Section 1	7.57 (5.60)	8.59 (6.81)	0.41 n.s.
Section 2	17.0 (10.1)	29.1 (29.4)	1.57 n.s.

Means are shown, (standard deviation in brackets).
n.s. not significant

Conclusions

No evidence was seen of insensitivity to future consequences of action with ethanol in doses producing blood levels around the UK legal limit for driving and substantial decrements to psychomotor function

References.

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