

INTERINDIVIDUAL VARIABILITIES IN COGNITIVE PERFORMANCE DEGRADATION AFTER ALCOHOL CONSUMPTION AND SLEEP LOSS ARE RELATED.

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Introduction

The sleep inducing effects of alcohol as well as the increase in sleep propensity and sleepiness after sleep loss have been linked to the adenosinergic system in the brain. While the performance impairing effects of ethanol have partly been related to the inhibitory effects of cerebral adenosine, sleep loss has been found to increase adenosine receptor density. The interindividual variability of cognitive performance impairments after alcohol intake as well as after sleep loss is extensive. Thus, we examined in humans whether performance degradations resulting from sleep loss and alcohol consumption are related.

Methods

Performance in a 10-min Psychomotor Vigilance Task (PVT) was tested in 47 healthy volunteers (mean age 27 ± 5 (SD) years, 21 females) at 6 pm 1) after an 8 hour control night, 2) after alcohol consumption (aiming at a blood alcohol concentration (BAC) of 0.08%), and 3) after 35 hours of total sleep deprivation. After alcohol intake, 35 of the participants reached a BAC of more than 0.06% prior to the performance testing (mean BAC 0.074%, SD 0.009%, min. 0.063%, max. 0.095%) and were included in the analyses. Two recovery nights were scheduled between conditions.

Results

Performance impairments due to acute alcohol intake and due to 35 hours of sustained wakefulness were calculated as differences from performance under control conditions. The degree in performance degradation correlated highly between both conditions (i.e. 10% slowest reaction times: Pearson's $r=0.73$, $p<0.0001$; standard deviation of reaction times: $r=0.75$, $p<0.0001$; mean reaction time: $r=0.59$, $p=0.0002$).

Conclusions

Participants whose PVT performance proved to be vulnerable to the effects of alcohol consumption were also vulnerable to sleep loss, whereas individuals who were resilient against the effects of alcohol were also less susceptible to the impact of sleep deprivation. These results suggest that the effects of alcohol and sleep deprivation on performance are mediated – at least in part – by a common pathway that may involve the adenosinergic system in the brain.