Purpose

To investigate the effect of sleep deprivation and incentive on the P300 and CNV

Background

P300: Positively associated with measures of attention, arousal, motivation as well as target salience and importance.

CNV: Linked to frontal lobe functioning.

Also associated with measures of attention, arousal, motivation.

The P300 and CNV are both known to be reduced in amplitude after sleep deprivation, but increased by motivation (incentive).

Will the introduction of an incentive after sleep deprivation counteract the effects of sleepiness on these ERPs?

Methods

Participants
- 17 females (aged 19-45), Normal sleepers

Procedure
- Go/NoGo CNV, If first stimulus is green, respond to second (blue) stimulus as fast as possible. If first stimulus is red, do not respond to second stimulus.
- 10 Go and 30 NoGo trials
  - Non-Incentive (NO Pay) Condition: regular CNV
  - Incentive (Pay) Condition: participants paid $0.10 for each trial with RT < 250 ms
  - ISI=2.0s, ITI=5.5-7.5s

Conditions
- Alert (~3 hours awake)
- Sleepy (~21 hours awake)

ERPs
- P300 (at Pz), CNV (at Cz: E-wave 400ms pre-S2)
- Baseline: 200ms pre-S1, referred to balanced ears

Results

Incentive manipulation was successful. RTs were faster for incentive trials $F(1,16)=18.37, p=.001, \eta^2=.53$ However, there was no effect of alertness, nor any interaction.

The P300 amplitudes showed a clearer distinction between the Go and NoGo trials in the incentive condition $F(1,16)=5.62, p=.03, \eta^2=.26$

After controlling for the NoGo CNV amplitude there was a comparable interaction in the E-wave $F(1,16)=4.28, p=.055, \eta^2=.21$

Conclusions

After 21 hours of wakefulness, people are less able to distinguish between important (respond, Go trials) and unimportant (do not respond, NoGo trials) as evidenced by the P300 and CNV. This electrophysiological evidence occurs despite preserved behavioural performance as evidenced by response times.

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