Dissociating Sources of Sustained Attention Failures via Reward

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Introduction
- Performance declines across time in vigilance tasks at least partly due to attentional lapses
- Overload theories of the vigilance decrement predict reward has no effect on performance whereas underload theories predict an improvement in performance.
- We investigated the impact of reward on performance during a sustained attention task using EEG alpha oscillations as an indicator for attentional lapses

Method
Continuous Temporal Expectancy Task (CTET)
- Images of faces and cars presented sequentially
- Respond only when a long duration image (90% trials) is presented

Behavioral Results
- n = 8 (reward) n = 9 (no reward), between subjects
- 2000ms response window
- 360 trials/block; 10 ~5 min block
- 15 bins of 24 trials (~20 sec/bin)
- Baseline adjusted by subject’s practice block

EEG Results
- Fast Fourier Transform 8-12 Hz Alpha
- Epoch [-4000ms,800ms] around target stimulus onset
- Statistical analysis on 9 posterior electrodes (orange box)

Behavioral Results
- Baseline Corrected Hit(Retardations)

EEG Results
- Pre Target Total Power
- Pre Target Evoked Power

Summary
Behavior
- The vigilance decrement persisted in both groups
- Reward does not alleviate the vigilance decrement
- Ceiling effects may attenuate the effect of reward
- High variability in task performance demands higher n

EEG
- Greater for pretarget miss-hit for total and evoked* alpha
- Greater miss-hit difference* for no reward group
- May reflect phase dependent influence of alpha on sustained attention
- Phase dependency may vary depending on levels of motivation

Conclusion
The relationship between alpha and lapses of attention is impacted by monetary reward, possibly due to phase specific information.

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