Attention rhythmically modulates the quality of sensory representations

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Introduction

Visual attention fluctuates over time and modulates information processing periodically (θ-θ).

Behaviors: performance increases and decreases over time at low frequencies (4-10 Hz)

- Alpha (8-12 Hz) during sustained attention
- Theta (4-7 Hz) during attentional exploration

What is the mechanism underlying rhythms in attention?

Hypotheses

Rhythms in performance (high vs. low) are linked to fluctuations in the quality of sensory representation (orientation)

Fixation

Planned: n = 15

n = 9

Participants:

- Alpha (8-12 Hz) during sustained attention
- Theta (4-7 Hz) during attentional exploration

PreCue

Check for successful attentional manipulation

ISI 2 delays)

Introduction

60
400
and 2 possible locations

Discrimination task: C gap

Response 2

50% correct

50% Gabor present in each patch

C Gap?

Noise

Only

Probes

Gabor

Noise

Response 2

Detection task: Vertical Gabor vs. C Gap (C presents in each patch 30% correct)

Valid (213) Invalid (12)

Noise Gabor

Display & Response Only

Detection task: C gap position (easy vs. hard)

14 possible ISI 2 & ISI 3 intervals

Probes

Decision task: Individual Average ± SEM

Valid (140) Invalid (25)

α & β

Decision weight

Validation

Performance fluctuates over time

α & β

Energy computation

Performance for all presented probes and 25 filter orientations

One example Probe

Filter

1 or 2

Filter

1 or 2

Fluctuations in the

Hypotheses

n

3

Individual

Valid Invalid

α & β

Decision weight

Validation

Performance fluctuates over time

α & β

Energy computation

Performance for all presented probes and 25 filter orientations

One example Probe

Filter

1 or 2

Filter

1 or 2

Conclusion and References

Sustained attention (θ-θ):

- Attention is periodically modulated at the Alpha frequency
- Hypothesis 1: During periods of high performance, there is an enhancement of the relevant features

Exploratory attention (invalid):

- Attention is periodically modulated at the Theta frequency
- Hypothesis 2: During phases of high performance, there is an enhancement of the relevant features compared to phases of low performance

Conclusion and References


VanRullen R., 2016, TiCS

[7]


[3]

[4]

[11,12]

Dugué L., et al. 2016, TiCS

[11,12]

Dugué L., et al. 2019, NPG Asia

[11,12]

Dugué L., et al. 2019, iScience

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Conclusions & Acknowledgements

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