Using frequency tagging to measure visual perception and selective attention in health and disease

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Unique-feature search

Conjunction search
Conjunction search

Checkerboard with Attended Color

FFT Amplitude (µV)

Frequency (Hz)

12.5 Hz

16.7 Hz
Unique-feature search

Checkerboard with Attended Color

FFT Amplitude (µV)

Frequency (Hz)
“Attended” = cued colour in search array
“Unattended” = non-cued colour in search array
Enhancement  
Suppression  
Both

SSVEP Amplitude

Unattended  (uncued colour)
Attended  (cued colour)
Baseline  (irrelevant colour)
Charles Bonnet Syndrome in macular degeneration
a) Time sequence of events:
- 2200 ms (present/absent? T/L?)
- 1200 ms (fixation)
- 1000 ms (target, white noise)
- 0 ms (fixation)

b) Visual display with a grid of T characters.

C) Electroencephalogram (EEG) maps for MD and MD+CB conditions with accuracy (%) scale:
- MD: Map on the left
- MD+CB: Map on the right
- Accuracy scale from 65% to 100%
Conclusions

• **Frequency tagging** is a useful tool for examining the effects of stimulus competition and top-down biases in visual search.

• During active search for feature conjunctions in central vision, neural activity is **enhanced for target features** (e.g., colour) at irrelevant locations in the periphery.

• **No evidence for suppression** of neural activity associated with distractor features at irrelevant locations in the periphery.

• Charles Bonnet Syndrome in macular degeneration:
  • is associated with **hyper-excitability in early visual areas**
  • may reflect **feedback of signals from higher visual areas**
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• David Painter (Hitachi, Japan)
• Susan Travis (UQ)

POSTER – TAT014: Attending to the unseen: the effects of spatial attention on neural responses to visible and invisible stimuli (Smout, Mattingley)
Behavioral/Cognitive

Neural Responses to Target Features outside a Search Array Are Enhanced during Conjunction but Not Unique-Feature Search

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Unilateral spatial inattention – ‘neglect’

Mort et al. (2003)

Fruhmann-Berger & Karnath (2005)

Mattingley et al. (1995)
Charles Bonnet Syndrome

Lullin saw: “from time to time, in front of him, figures of men, of women, of birds, of carriages, of buildings … All these visions appear to him in perfect clarity and affect him as strongly as if the objects themselves were present.”