

Guided Search is associated with modulated neuronal excitability to Target and Distractor features in early visual regions

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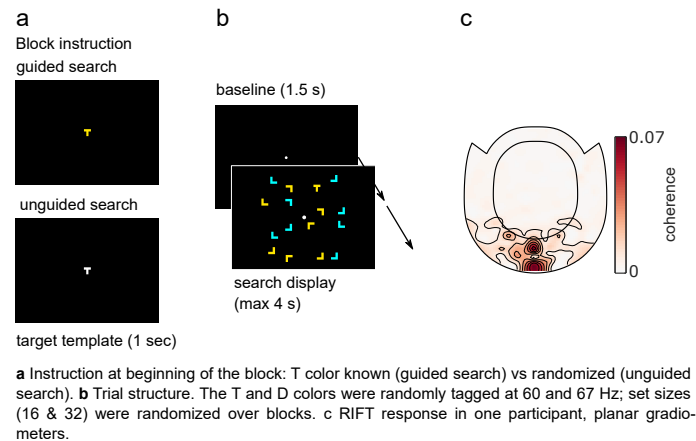
Feature guidance in visual search

Visual search models have long suggested that search is facilitated by a "priority" or "activation" map, guiding attention towards items having Target (T) features and away from items having Distractor (D) features^{1,2}. In this MEG study, we use Rapid Invisible Frequency Tagging (RIFT) in a classic Visual Search paradigm, to understand the neuronal mechanisms underlying feature guidance. RIFT is a novel technique to probe neuronal excitability in primary visual cortex (V1)³⁻⁵.

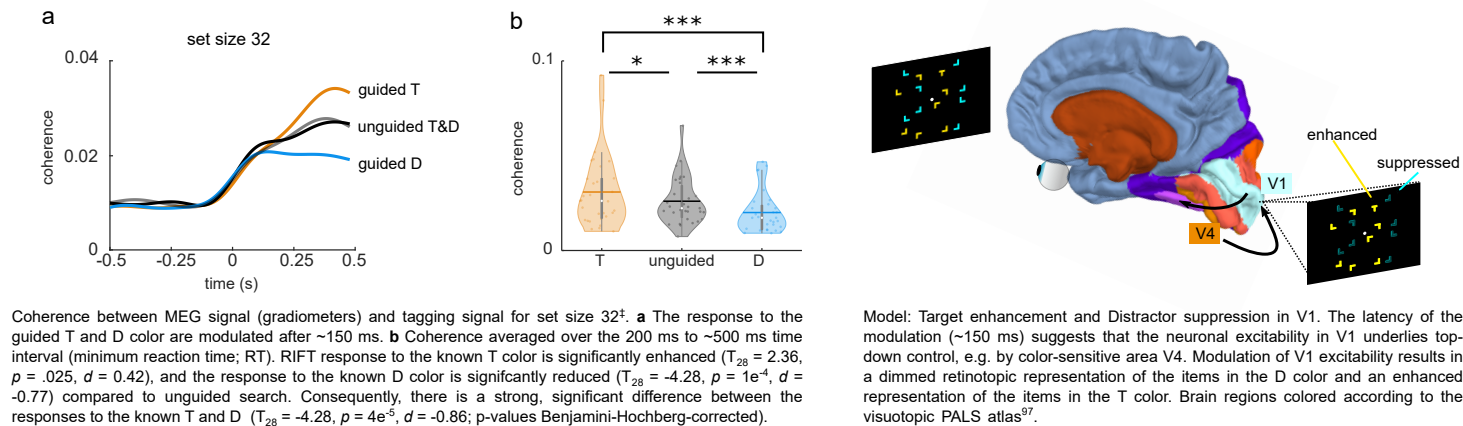
Hypotheses:

1. Neuronal excitability (RIFT) to the T feature is enhanced and response to D feature is reduced in guided (pre-defined T) compared to unguided (undefined T feature search).
2. Faster reaction times are preceded by enhanced alpha power.
- 3.1. Pre-display alpha power reflects a targeted inhibition and is only enhanced in the guided search condition. OR
- 3.2. Pre-display alpha oscillations impose an untargeted "blanket" inhibition in guided and unguided search.

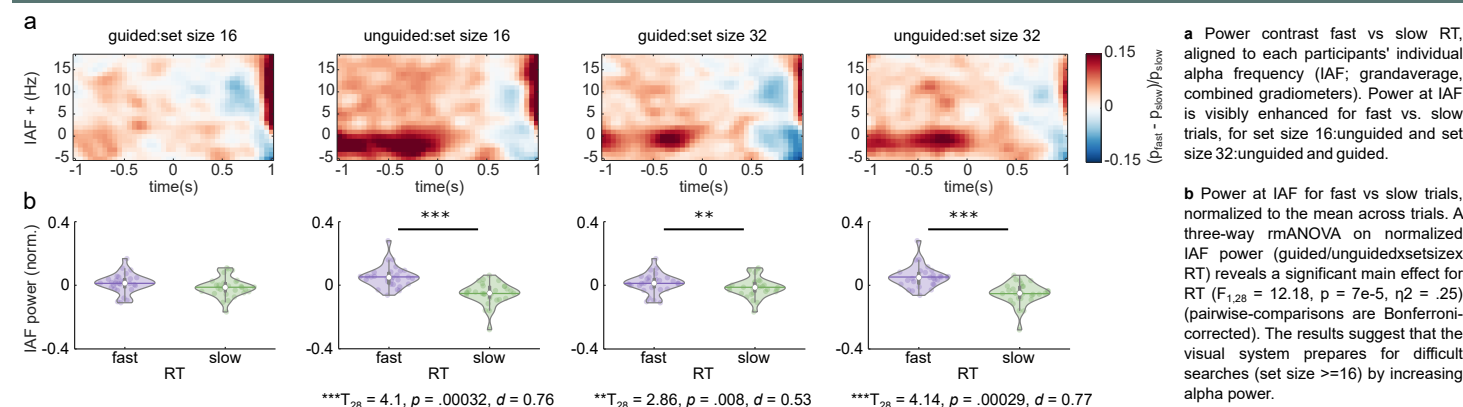
Visual Search: Rapid Frequency Tagging & MEG



Target features are boosted & Distractor features are suppressed in primary visual cortex



Stronger pre-search alpha power predicts faster reaction times



Conclusions

We propose that visual search is guided by an interplay of alpha inhibition, boosting of Target features and inhibition of Distractor features. Alpha oscillations impose a pulsed "blanket" inhibition on the upstream signal from V1 along the visual hierarchy. The excitability of V1 neurons is modulated by a higher-order area, e.g., V4, based on whether they encode Target or Distractor features. Attention will be guided to objects whose representations are strong enough to overcome the inhibition, here, objects sharing the Target color.

[†] Coherence was not significantly modulated for set size 16.

References

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