Comparing the effects of feature-based attention on SSVEPs and behaviour

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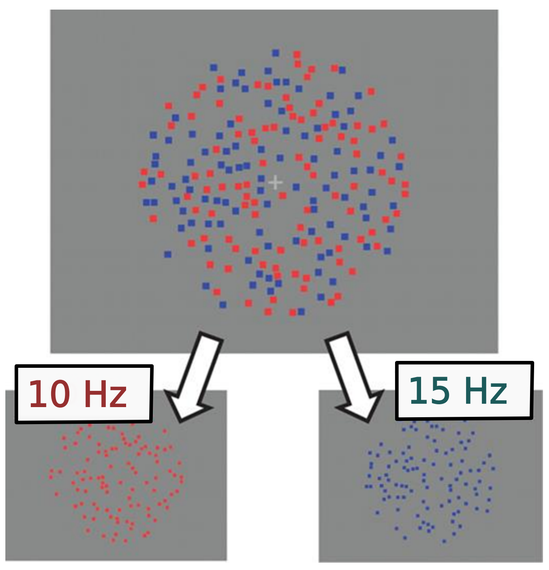
Introduction

Numerous studies have shown that feature-based attention results in faster reaction times and enhanced cortical responses to the attended feature (e.g. colour or orientation). Here we examined whether changes in the distribution of reaction times reflect attentional selection assessed by means of steady-state visual evoked potentials (SSVEPs).

Summary

- When feature-based selection is possible, decision threshold lowers and evidence is accumulated at a higher rate, resulting in faster reaction times.
- Measures of the magnitude of attentional selectivity (SSVEPs and reaction times) are correlated.

Experiment 1



Task: detecting coherent motion (400 ms streaks) in any colour

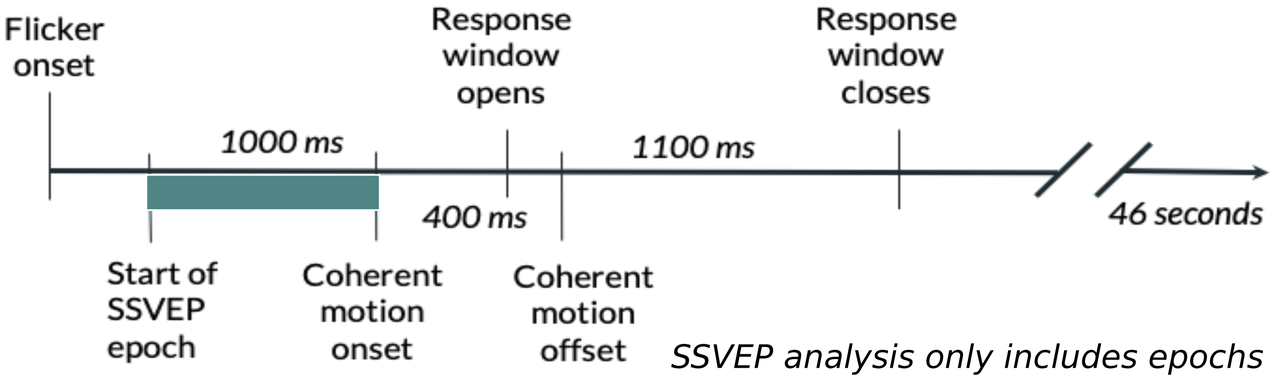
Condition 1: Color Cue

75% targets in attended colour
25% targets in unattended colour

Condition 2: Neutral Cue

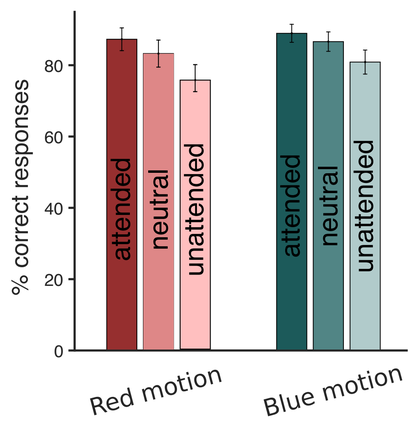
50% targets in each colour

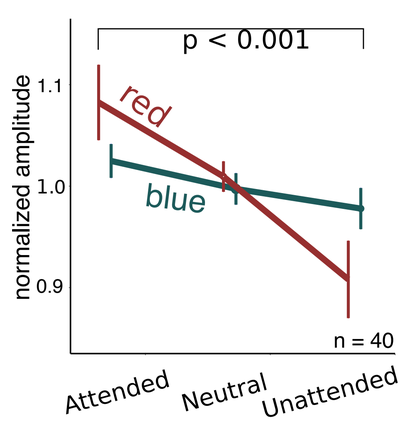
864 Attended, 576 Neutral and 288 Unattended events
n = 40

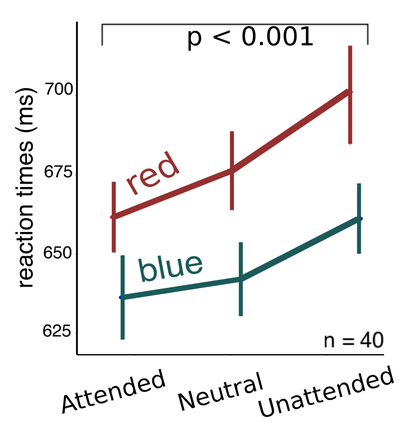


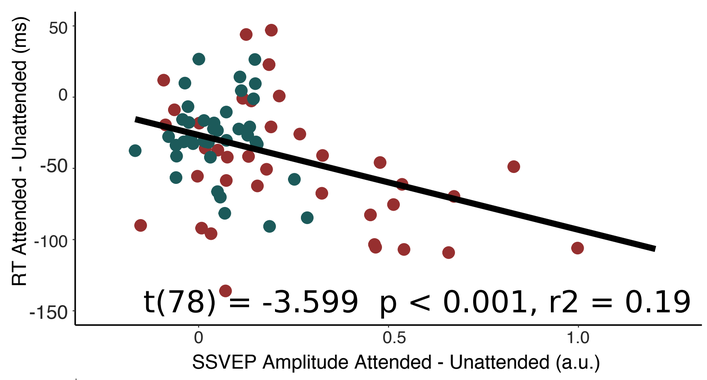
SSVEP analysis only includes epochs preceding a correct response

Do SSVEPs predict behaviour?

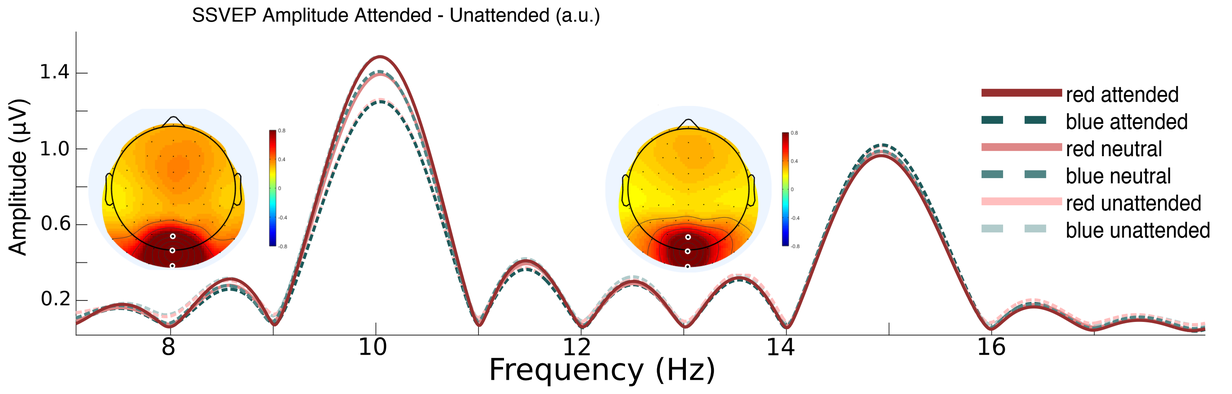




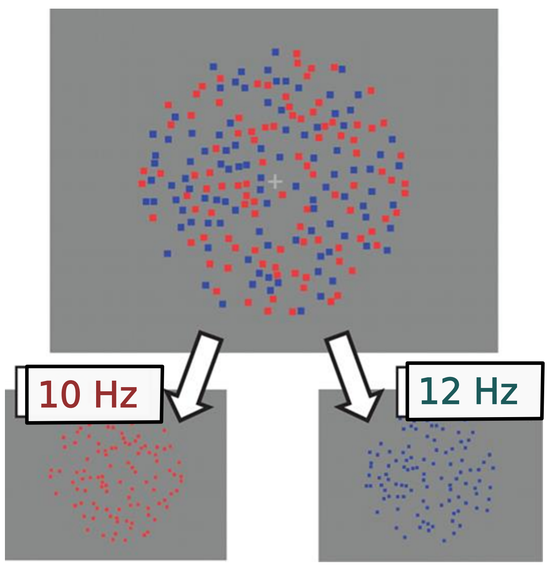




Participants with stronger attentional modulation of SSVEP amplitudes also show stronger modulation of reaction times



Experiment 2



Task: detecting coherent motion and reporting its colour

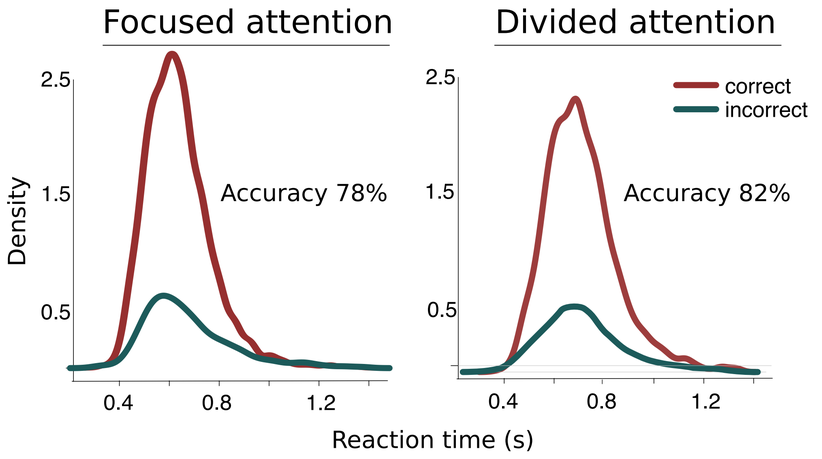
Condition 1: Focused attention
Detect targets in cued colour only

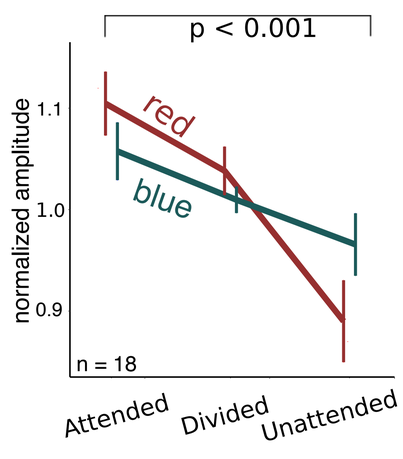
Condition 2: Divided attention
Detect all targets and report their colour

576 Focused attention events, 1152 Divided attention events
n = 18

Focused attention results in lower decision threshold separation and higher drift rate compared to divided attention. The difference in threshold separation likely reflects response strategy. Both parameters change by 10-15%, which is consistent with observed differences in SSVEP amplitudes between the two conditions.

How are RT distributions affected?





	Focused	Divided	
Drift rate	1.54 ± 0.3	1.31 ± 0.3	$p = 0.02$
Threshold separation	1.14 ± 0.2	1.30 ± 0.2	$p < .001$
Non-decision time	0.42 ± 0.2	0.41 ± 0.2	n.s.