ATTENTION CAPTURE ALTERS MOTION DISCRIMINATION

(506)

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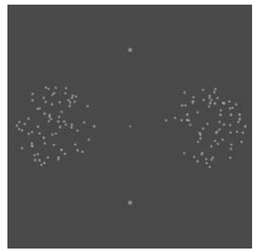
Introduction

Considerable work has been aimed at understanding the interaction between endogenous and exogenous factors in the control of attention (1,2,3). Neural correlates of endogenous attentional control have been found during detection and discrimination tasks (4,5,6). We are designing a stimulus that will allow us to examine the interacting roles of cuing and attention capture in control of attention during a motion discrimination task. We will use this stimulus during both behavioral and physiology experiments.

Methods

- 2AFC motion direction discrimination task
- Motion stepped briefly (160 msec) from incoherent to coherent
- Choice was indicated with a saccade in the direction of motion at the end of the trial
- Stimulus was a pair of random dot motion patches:
  - Motion coherence ranged from 7% to 82%
  - Motion patch diameter of 8° and eccentricity of 8°
  - Dot density of 1 dot per square degree
  - Dot diameter of 0.165°
  - Motion velocity of 12 °/sec
  - Dot lifespan of 80 msec
  - Presented on CRT, refresh rate 75 Hz, viewable dimensions 35° by 22°
  - Luminance values: background 18 cd/m^2, motion dots 53 cd/m^2, choice dots 39 cd/m^2
- Eye movements measured with ISCAN to a typical precision of 0.1°

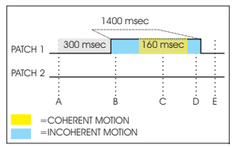


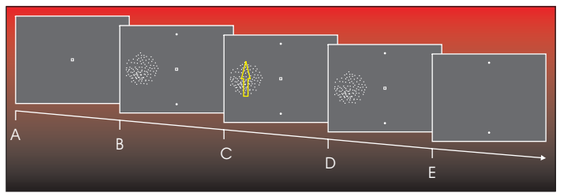
Sample frame from stimulus

Stimuli

1. Single Patch

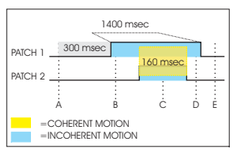
- Only discriminandum appears
- 1/3 of trials per session
- Brief pulse of coherent motion

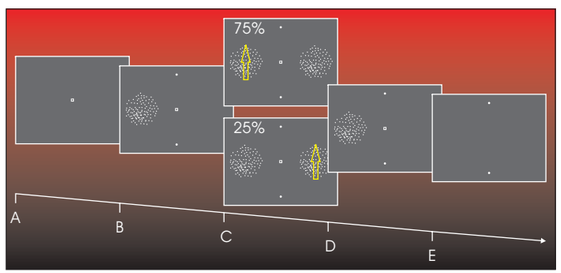




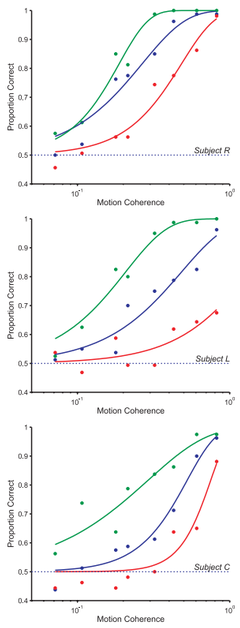
2. Cued Patch (75% Valid) + Capture Patch

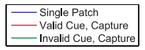
- Discriminandum appears simultaneously with capture patch
- 2/3 of trials per session





Results





- Human subjects' performance on baseline motion discrimination task varies with motion coherence (blue lines).
- Attention capture away from the cued patch decreases performance on the discrimination task (green lines).
- Attention capture to the motion patch increases performance on the discrimination task (red lines).
- N=320 per coherence value. Fits are two Weibull CDF for ease of data visualization.

Conclusions and some Caveats

- These results support the conclusion that attention capture alters performance on a motion discrimination task. When attention is captured toward the discriminandum, performance improves, and when attention is captured away performance is impaired.
- In addition, these effects seem to override endogenous attention allocation.
- Interpretation of these results is clouded by the following:
  - Is motion discrimination somehow different when the patch first appears, and would this be an alternate explanation of the enhancement of performance by attention capture?
  - This stimulus does not provide independent control of endogenous and exogenous attention effects.

REFERENCES

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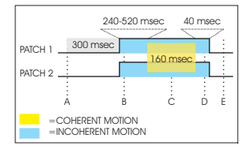
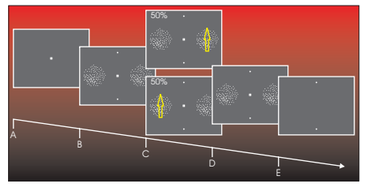
Design Revisions

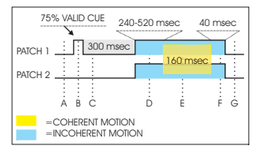
- Separate baseline condition with two motion patches more appropriate to direct comparison with endogenous attention case.
- Separate endogenous attention condition has 75% valid cue and two motion patches.
- Separate exogenous attention condition that has a 40-msec delay between patch and coherent motion onset.

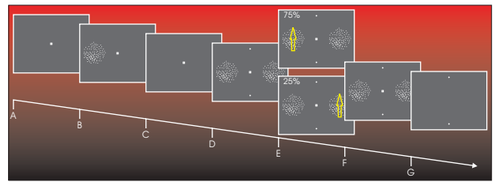
1. Baseline



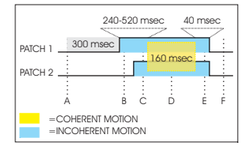


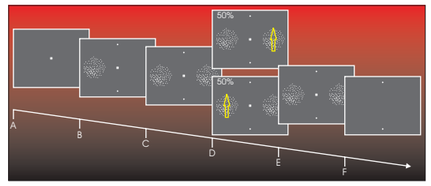
2. Endogenous



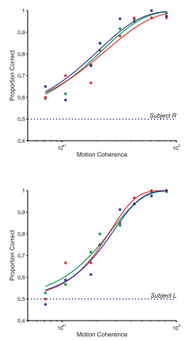


3. Exogenous



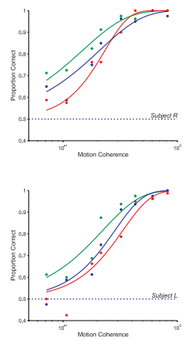


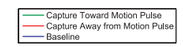
Endogenous Condition Results



- No appreciable cuing effect.
- Task too easy? Perhaps pulse is too long, so subjects are switching attention between locations?

Exogenous Condition Results





- Reduced capture effects.
- Is 40 msec too long of an SOA?
- Is endogenous drive required for full impact of attention capture?