



## Groups detect wholes better than parts

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### Are groups of observers more sensitive to redundant (wholes) or distributed (parts) stimuli?

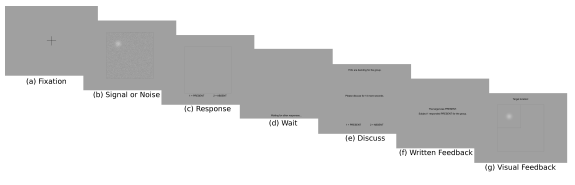
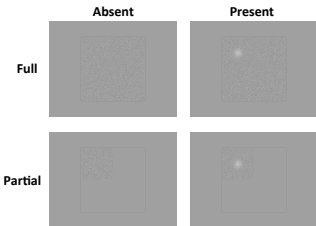
#### Methods

• **Task & Stimuli:** present/absent detection of a Gaussian bump in additive Gaussian white Noise.

• **Two Conditions:**

**Full** – Each observer receives an identical copy of the whole stimulus.

**Partial** – The stimulus is divided into four quadrants and each observer receives a single quadrant.

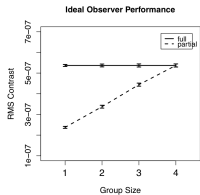


**Schematic of an experimental trial.** (a) Fixate for 1.5 seconds. (b) A 500-ms stimulus presentation. (c) Individuals respond with a key press (1 for “present”, and 2 for “absent”). (d) Wait. (e) Discuss and respond as a group. (A “random” subject was designated to provide a response for the group.) (f) Written feedback. (g) Visual feedback (only when the target was present).

#### • Ideal Observer

Ideal observer simulations were performed using the same experimental parameters as human observers.

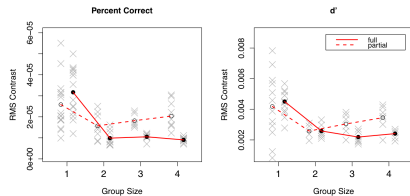
The ideal decision rule is to take the maximum of the summed likelihoods for the signal and no signal templates relative to their prior probabilities (Braje, et al., 1995).



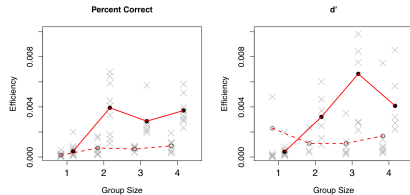
**Performance** was measured by the RMS contrast corresponding to 71% correct or the equivalent  $d'$ .

**Efficiency** was also calculated relative to an ideal observer to control for stimulus information differences across conditions.

#### Results



- In both conditions, adding a second observer resulted in the largest performance increase.
- Groups of sizes 3 and 4 tended to perform better in the full condition than in the partial condition.



- Groups of 2 or more observers tended to be more efficient at detecting redundant signals than distributed signals.

- Overall, redundant information (wholes) lead to more robust group-level decisions than distributed information (parts).

#### References

Braje, W. L., Tjan, B. S., Legge, G. E. (1995). Human efficiency for recognizing and detecting low-pass filtered objects. *Vision Research*, 35(21), 2955-2966.

- Data were collected for 67 groups of sizes 1–4.
- For groups of size 1, subjects participated in both conditions (order was counterbalanced).
- Subjects in groups larger than 1 participated in only one condition.
- RMS contrast thresholds were measured by a 2-down, 1-up adaptive staircase procedure.
- Subjects were arranged around a table so that they could not see each other's monitors.