Redundant Coding Can Improve Segmentation in Multiclass Displays

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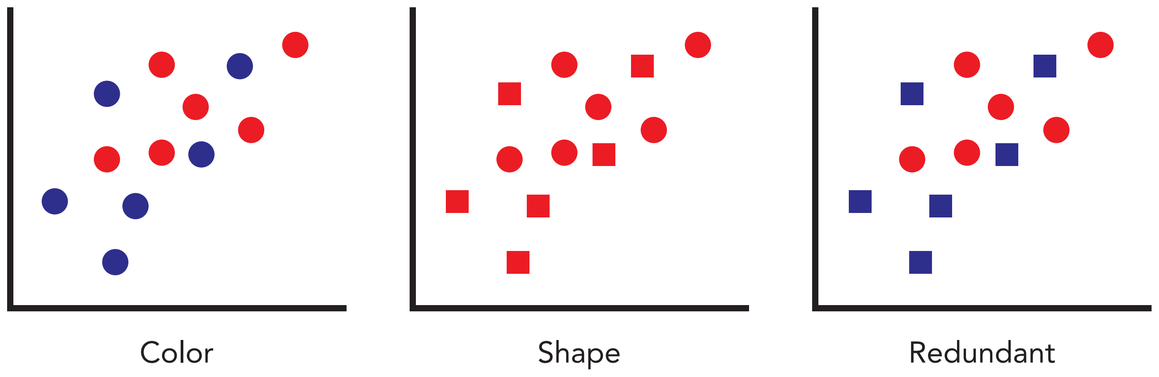
REDUNDANT CODING

Graphs and maps often depict multiple datasets, or *classes*, that are important to distinguish quickly and efficiently.

These classes are designated by differences in easily perceived visual features, such as colors or shapes.

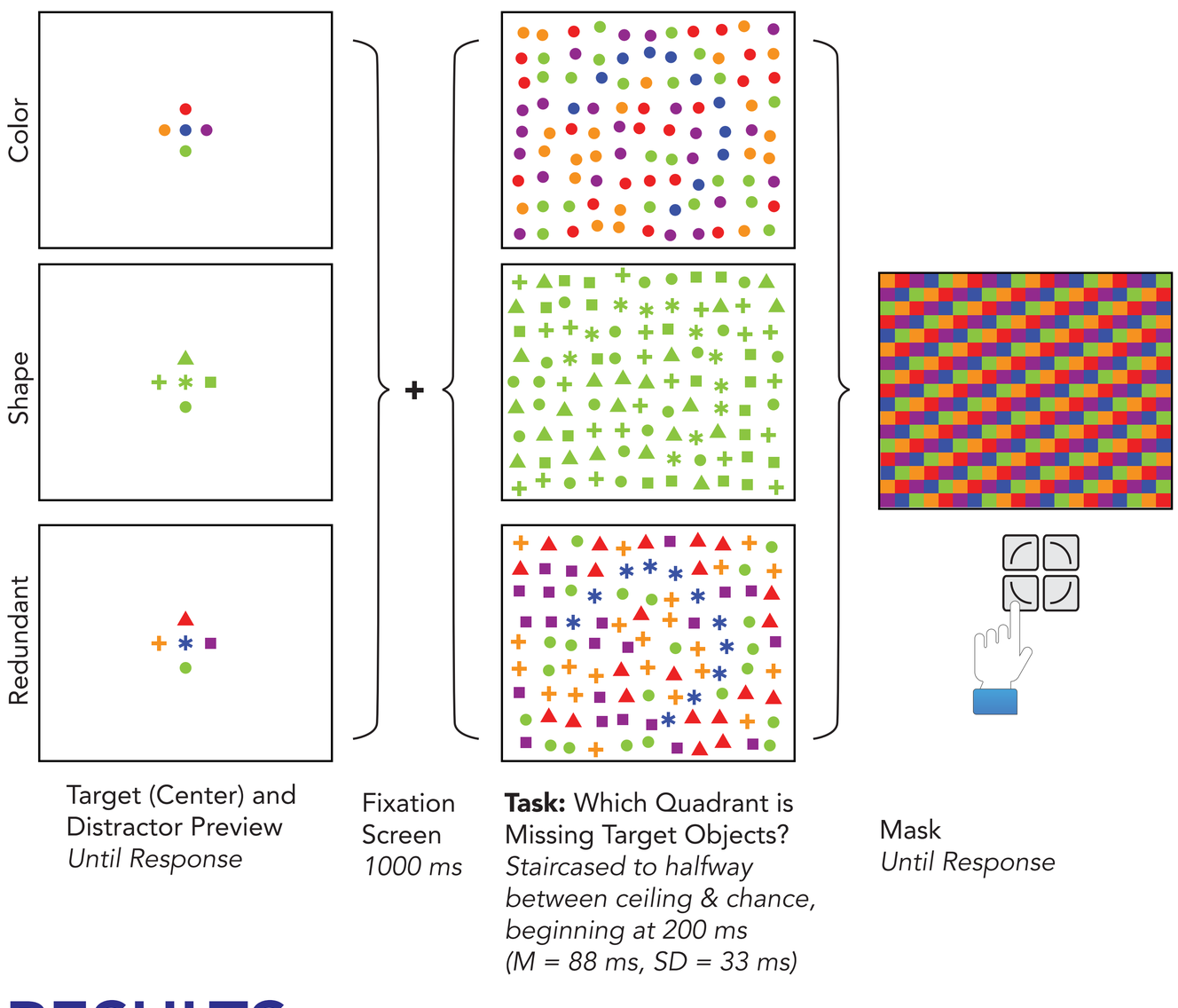
Visual cues are often used in combination as a *redundant coding*[1].



Redundant features may improve selection/grouping of collections.[2]
However, selective attention to visual features[3] can be inefficient[4-6] or ineffective[7] when they are conjoined, and adding complexity can be harmful.[8]

Question: Is redundant coding **better** than simply using the **most discriminable feature on its own**?

DESIGN



Methodology
We constructed an abstracted task designed to model situations in which observers judge the shape of a class's distribution.

Task
Which quadrant is missing the target objects?

Procedure
Target & Distractor Preview ▶ Fixation Cross ▶ Test Display ▶ Mask

Conditions
Color (top), Shape (center), Redundant (bottom)

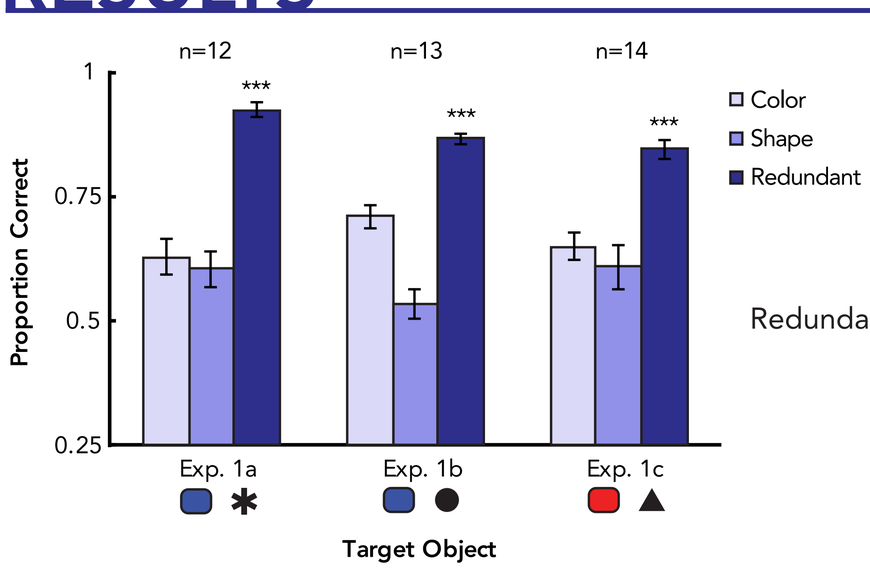
Hypothesis
If attending to redundantly encoded objects yields better visual selection and subsequent global shape detection, then:

redundant features accuracy > either feature alone accuracy

Exp. 1a-1c replicated the findings across three target color-shape combinations:

Target Features	**Stimulus Features**
Exp. 1a: and/or	Colors
Exp. 1b: and/or	Shapes
Exp. 1c: and/or	*Exp. 1a*:
	Exp. 1b,1c:

RESULTS



Redundant features > either feature alone

CONCLUSION

Redundant coding:

- is **better** than even the **most discriminable feature on its own**
- can improve visual differentiation of classes in a crowded display (Experiment 1)
- leads to stronger visual grouping of objects (Experiment 2 - *see handout*)

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