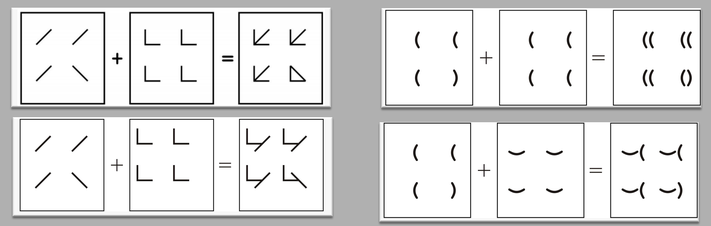
Target Localization Responses Diagnose Emergent Features in Singleton Pop Out

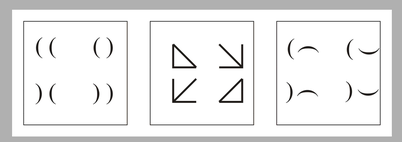
James R. Pomerantz, Bethany Qiang, Andrew Austin, and Kimberley Orsten
Department of Psychology, Rice University, Houston, Texas, USA

Grouping and Configural Superiority



According to the Theory of Basic Gestalts, perceptual grouping can be diagnosed by *Configural Superiority Effects* like the ones above. Wholes are more discriminable than their parts because of Emergent Features, such as closure, parallelism, collinearity, and symmetry.

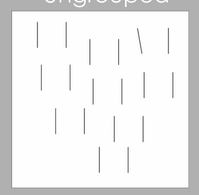
Perceptual grouping can also be diagnosed *by Garner Interference*: when elements group, they will be attended to at once, and so variation in a task-irrelevant element will cause interference in responding to the relevant one.



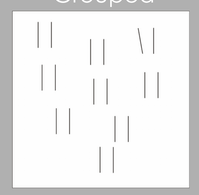
Purpose: Validate a new diagnostic for grouping

Key idea: If subjects are asked to point to a singleton target in a search display of homogeneous distractors, their responses should center on that unique target. However, if that target groups with a nearby distractor, their responses should center on the whole group, not on the single odd target.

Ungrouped



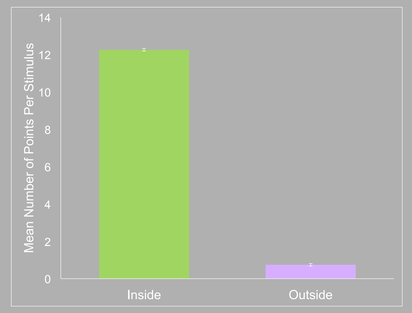
Grouped



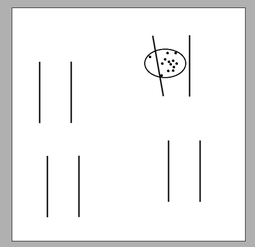
The target is the tilted line in a field of verticals.
The Grouped display is identical to the Ungrouped except for a horizontal shift of half the line segments.

Between Ss design: half saw grouped displays, half saw ungrouped.
Task: "Touch where you see a difference. Please move through the images as fast as you can without losing accuracy."
Coordinates of touch on touch screen display, RTs were recorded.

Results: Ss point toward center of group…

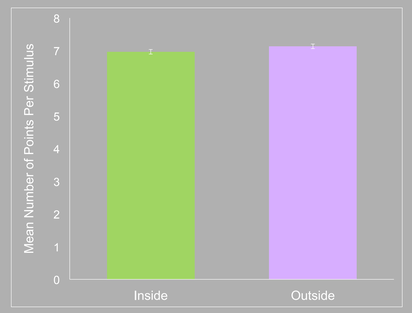


Grouped

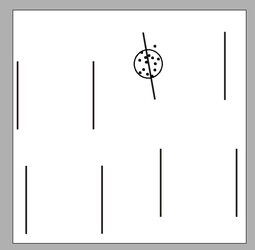


P<.01

Ss point at target when there is no group, and…

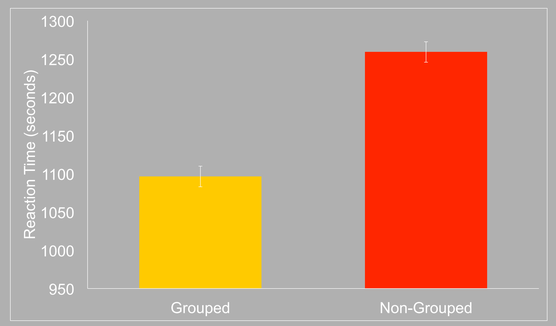


Ungrouped



P=.26, ns

Ss are faster with grouped than ungrouped lines



P<.01

Conclusions

When Ss pointed toward and touched "where you see a difference," they touched the individual differently oriented line segment in the Ungrouped condition, as expected.

When the same line segments were shifted to group into pairs, Ss touched near the center of the pair, i.e., in between the uniquely tilted line and the homogeneous distractor near it.

According to the Theory of Basic Gestalts, the features that drive mid-level vision are not the seemingly "basic" features like line orientation but rather emergent features that arise when stimuli group (and are probably the cause of that grouping).

When line segments group into pairs, the odd pair pops out because it lacks the emergent feature of parallelism that the other pairs possess.

Perceiving emergent features is also faster than perceiving basic features, as the RT data show. This is consistent with configural superiority effects found with line pairs, where Ss are faster judging whether two lines are parallel than judging the orientation of either line.

Consistent with this, a tiled line may pop out of a field of vertical lines not because it has a unique orientation but because it breaks the parallelism existing elsewhere throughout the display. Pop out generally may arise through items breaking symmetries than through items being unique.

References

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Pomlab