
PERCEPTUAL ORGANIZATION UNDER INATTENTION

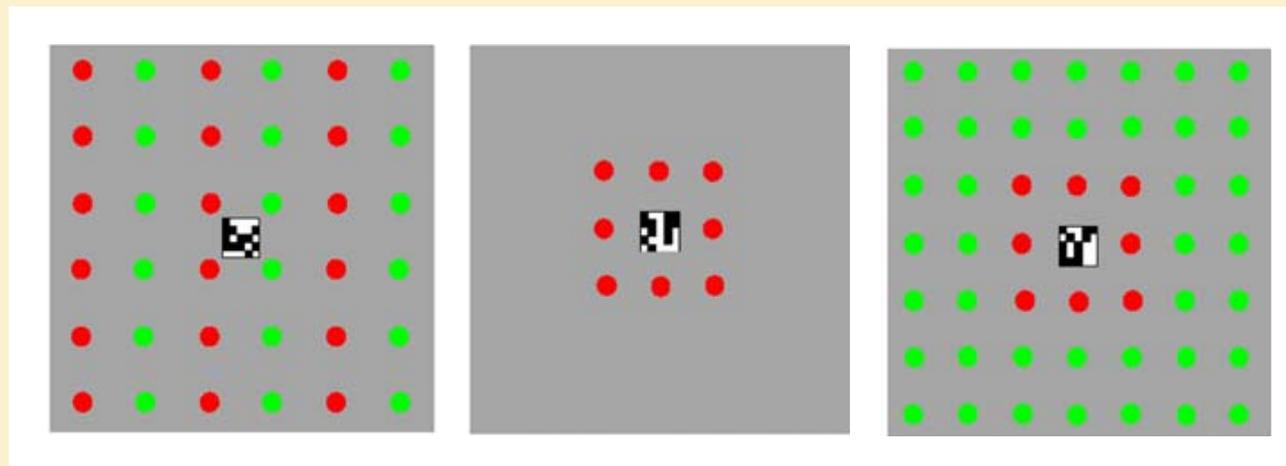
DOES PERCEPTUAL ORGANIZATION REQUIRE ATTENTION?

Studies that examined the question of whether or not perceptual organization requires attention yielded contradicting results:

- Mack et al. (1992) - Perceptual organization requires attention.
 - Moore and Egeth (1997), Lamy et al. (2006) - Perceptual organization does not require attention.
 - Kimchi and Razpurker-Apfeld (2004) - it depends on the organization.
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Kimchi & Razpurker-Apfeld (2004) - attentional demands depend on the organization:

- attention is not required for columns/rows organization by color similarity, or for shape configuring.
- attention is required when the shape was surrounded by additional elements of a different color.



What alters attentional demands in grouping?

- Different grouping principles
 - Different processes involved in the organization
 - Competition between multiple alternative organizations
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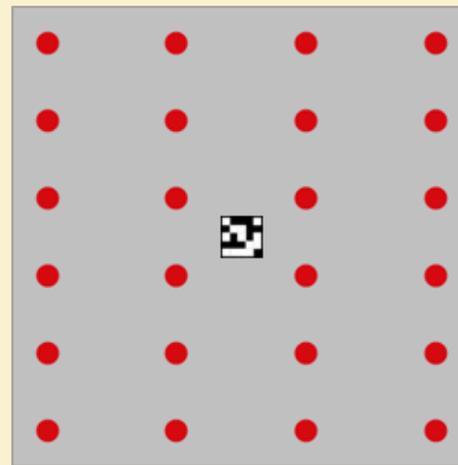
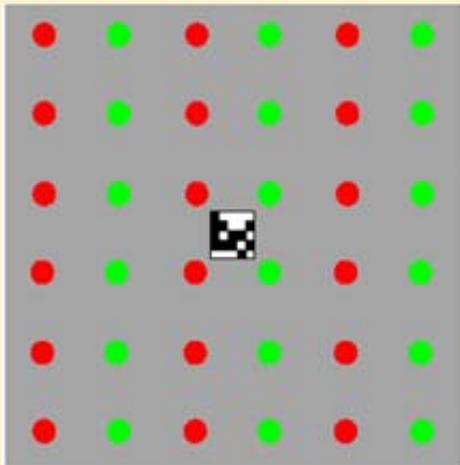
THE CURRENT STUDY

- Experiments 1 and 2 examined whether different grouping principles elicit different attentional demands.
 - Experiments 3 and 4 examined the demand for attention when the organization involves multiple processes.
 - Experiment 5 examined whether attention plays a role in resolving the competition between alternative grouping organizations.
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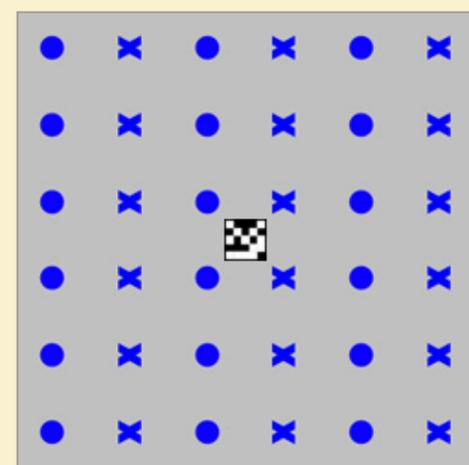
EXPERIMENTS 1 & 2

Different attentional requirements for different grouping principles?

Proximity
Exp. 1



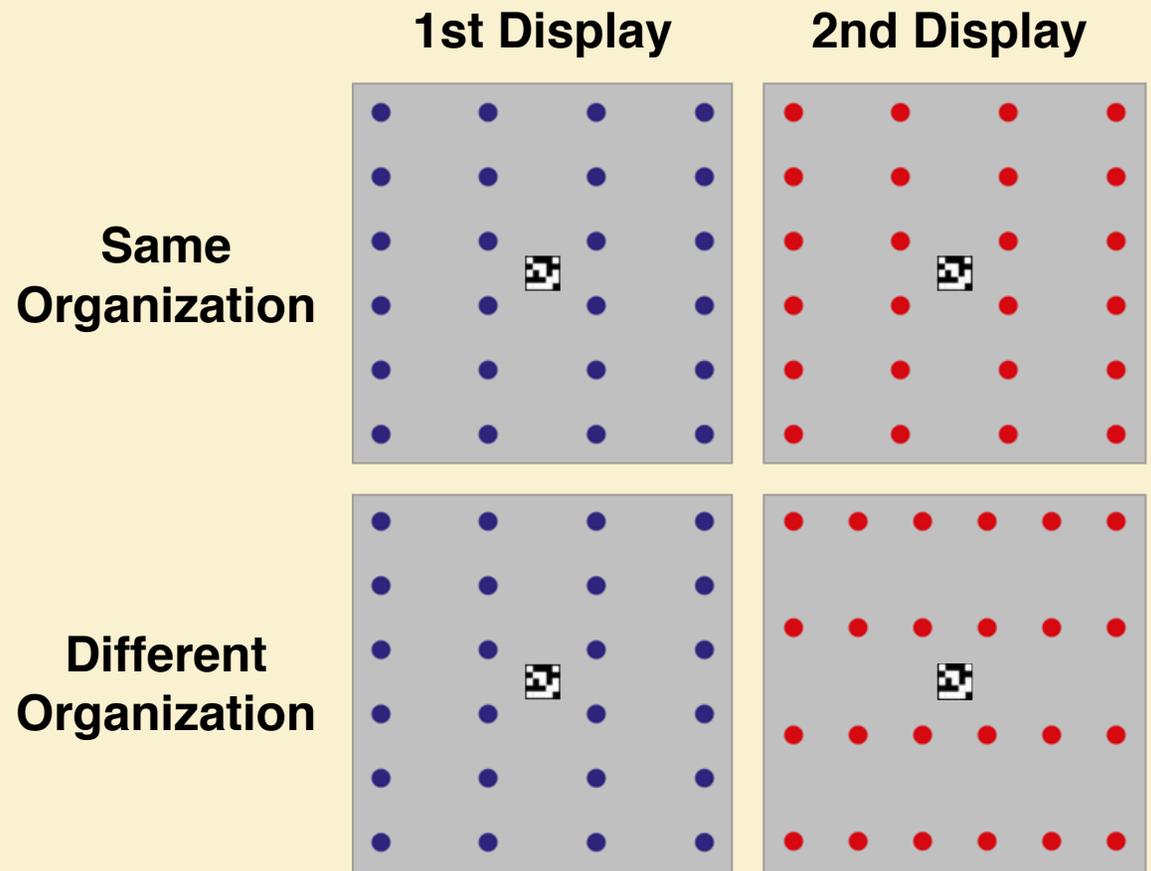
Shape Similarity
Exp. 2



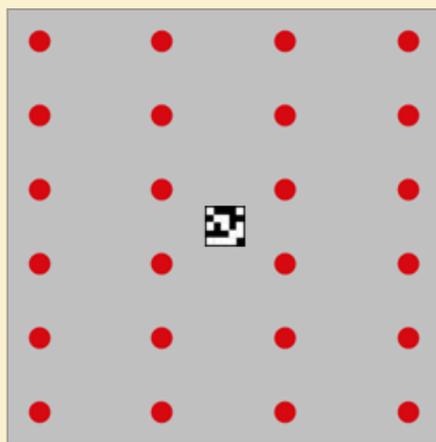
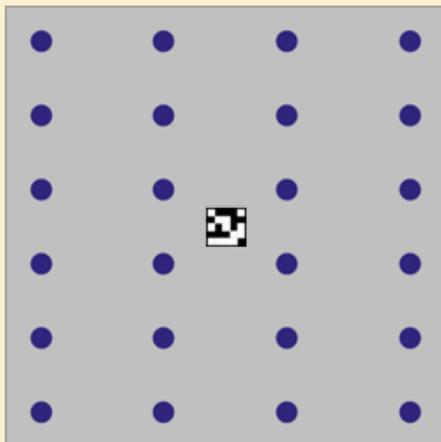
THE INATTENTION PARADIGM

(E.G., DRIVER ET AL., 2001)

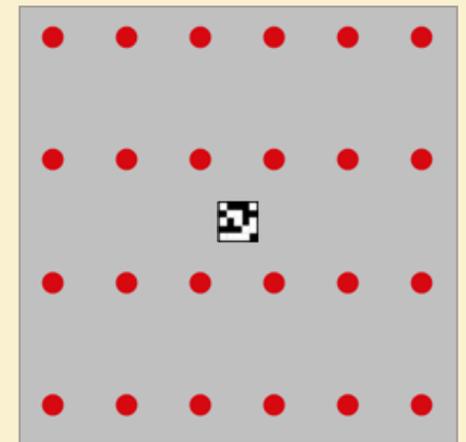
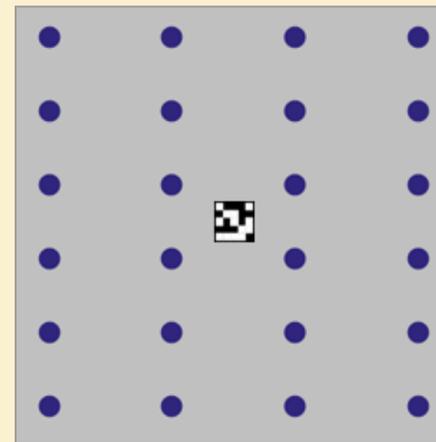
- **Trial** - a fixation mark followed by two consecutive briefly presented displays.
 - Central matrix - same or different.
 - Background organization - same or different.
 - The two factors were manipulated independently.
- **Task** - change detection in the central matrix.



If an organization is accomplished without attention, then responses to the matrix should be facilitated when a change in the background is congruent with a change in the matrix, compared with when it is incongruent.



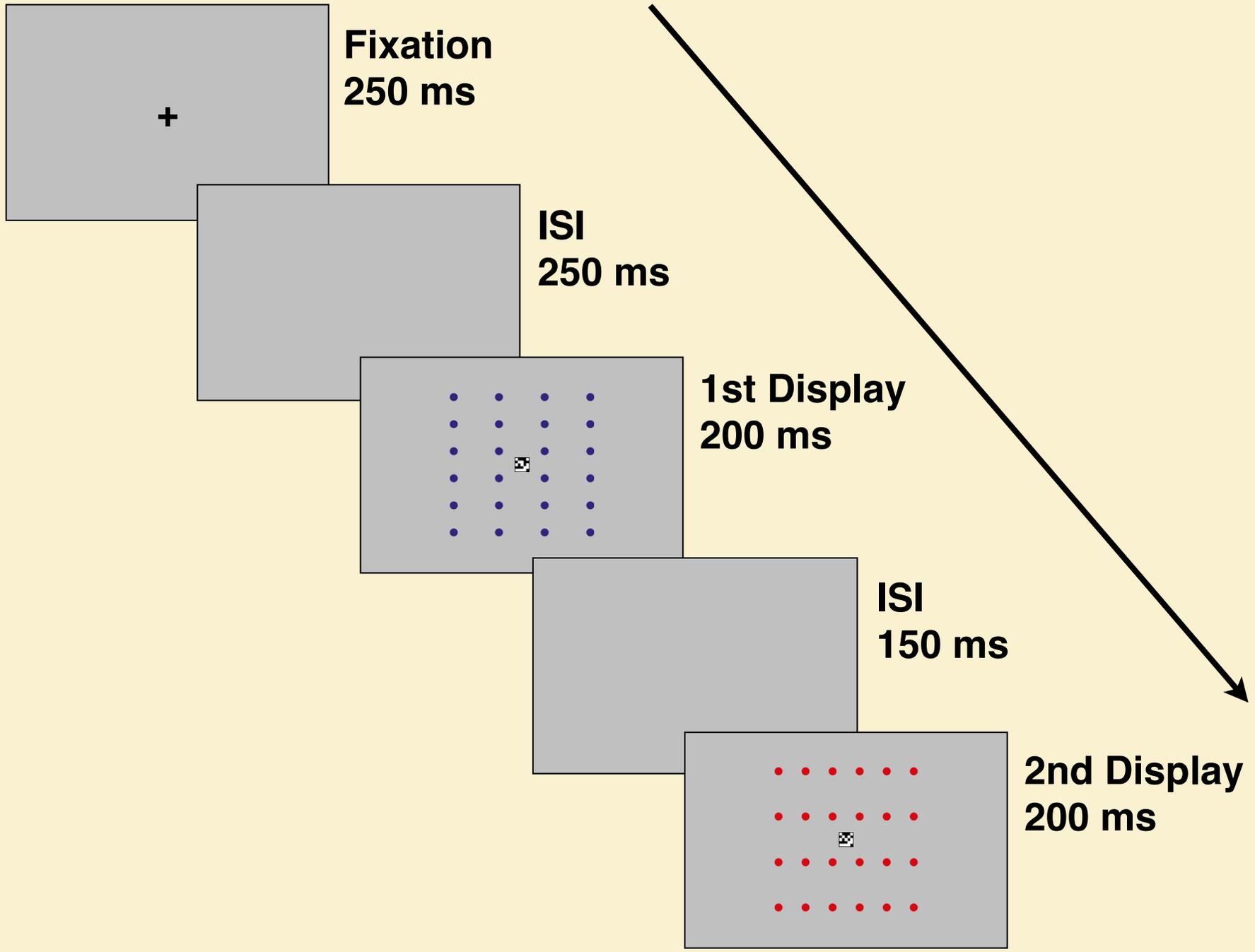
Congruent



Incongruent

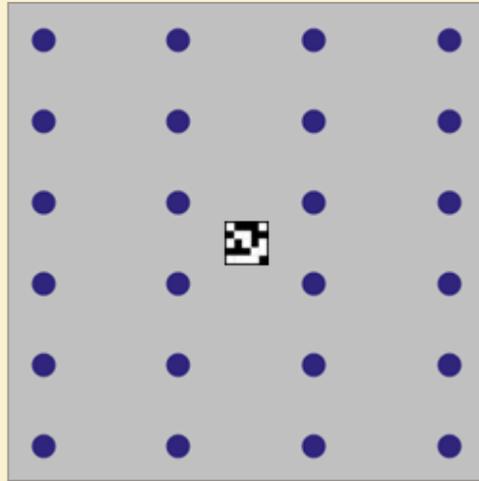
Measure - an interaction between target and background conditions, leading to congruency effects:

- Target “same” responses should be faster and/or more accurate when the background stays the same than when it changes.
 - Target “different” responses should be faster and/or more accurate when the background changes than when it stays the same.
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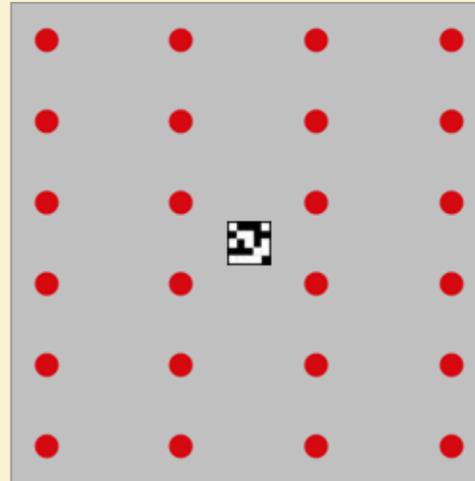


Proximity
Exp. 1

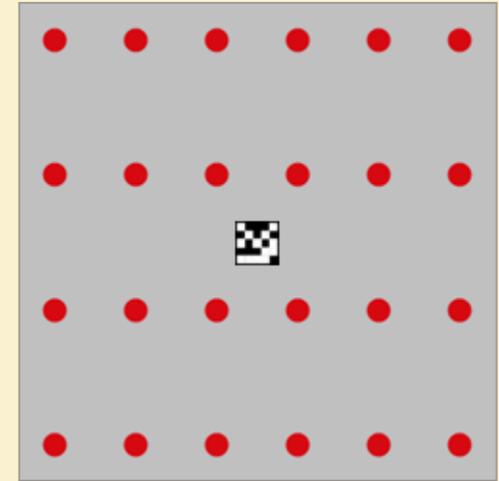
**1st
Display**



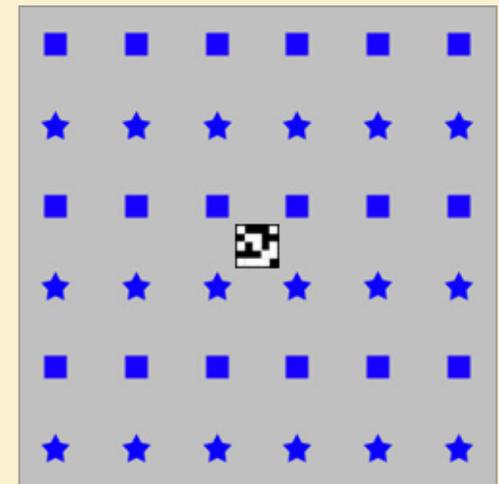
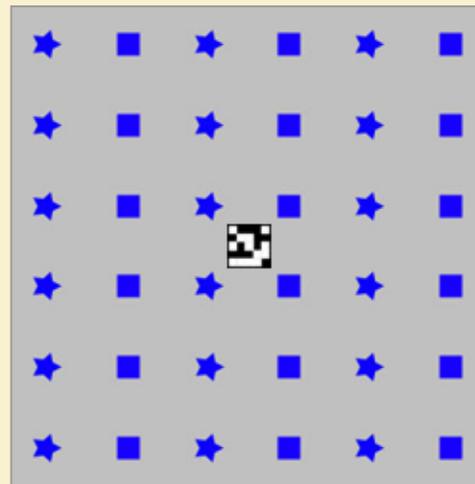
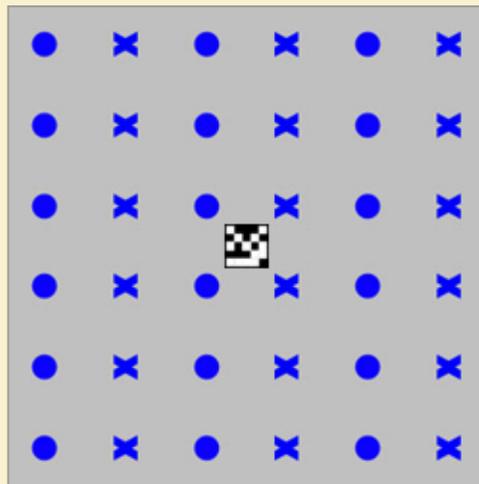
**2nd Display
Same
Organization**



**2nd Display
Different
Organization**

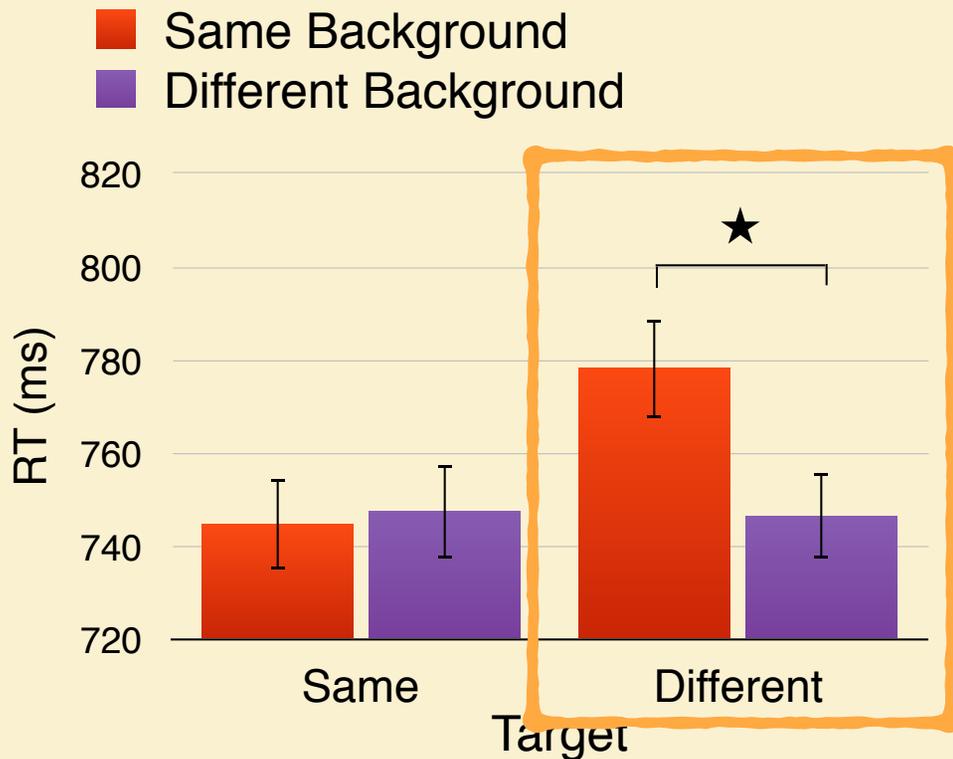


**Shape
Similarity**
Exp. 2



RESULTS

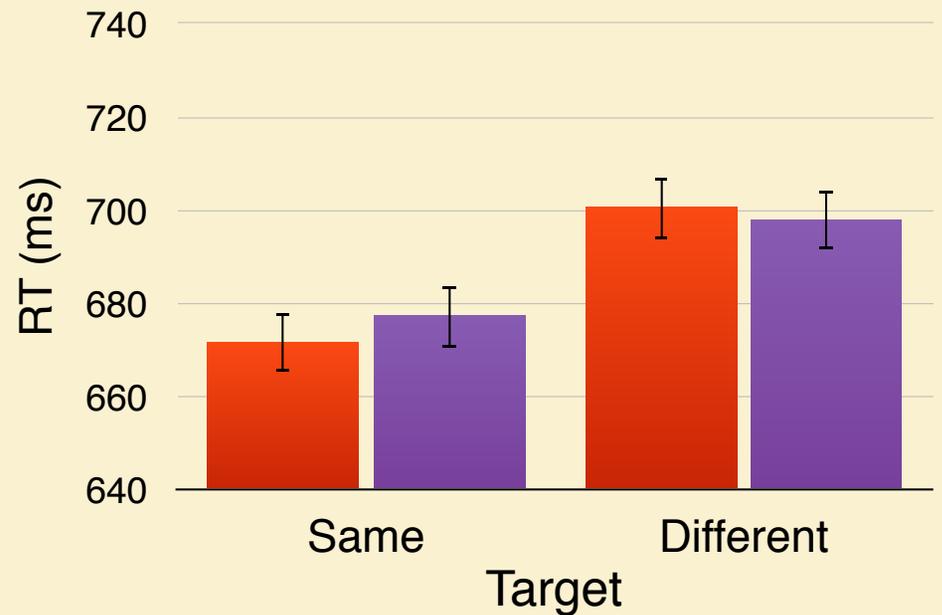
Proximity - The interaction between target and background conditions was significant for RT.



N = 20

[AC, $F < 1$; RT, $F(1, 19) = 7.92, p < 0.02, \eta_p^2 = 0.29$]

Shape Similarity - No interaction was found.



N = 28

[AC, $F(1, 27) = 1.84, p > 0.18, \eta_p^2 = 0.06$; RT, $F < 1$]

SURPRISE QUESTIONS

To confirm that the background displays were unattended participants were asked surprise questions immediately after the last trial, inquiring about the background in the last display.

- What was the organization in the background (columns or rows)?
 - Proximity - 12/20 (60%) correct reports.
 - Shape Similarity - 14/28 (50%) correct reports.
 - Was there a change in organization in the background between displays in the last trial (change or no change)?
 - Proximity - 16/28 (57%)
 - Shape Similarity - 16/28 (57%) correct reports.
-

SURPRISE QUESTIONS & CONTROL

Shape Similarity -

- What were the shapes in the background in the last display (stars & squares or circles & Xs)?
 - 13/28 (46%) correct reports.
 - Control experiment -
 - 88% correct identification of the shape similarity grouping (second display of each trial).
 - 85% correct detection of a change in organization in a trial.
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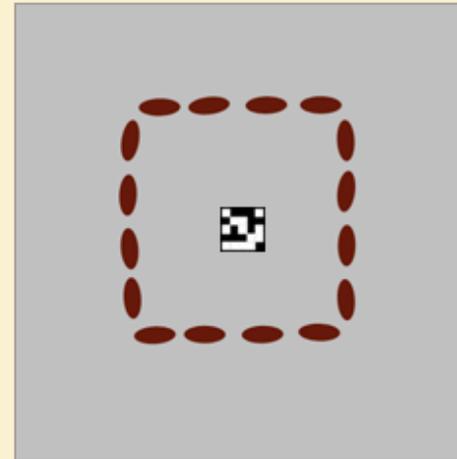
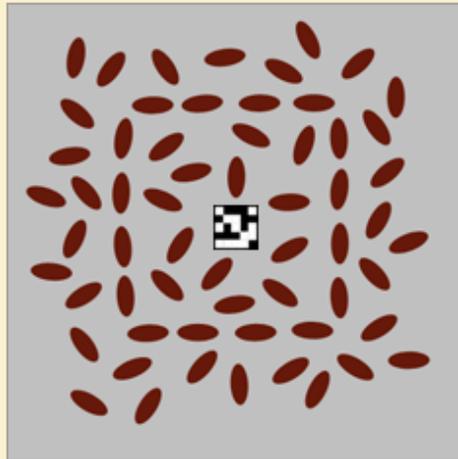
CONCLUSION I

Different grouping principles have different attentional demands.

EXPERIMENTS 3 & 4

Is attention needed when multiple processes are involved in the organization?

**Element
Segregation
& Configuring
Exp. 3**



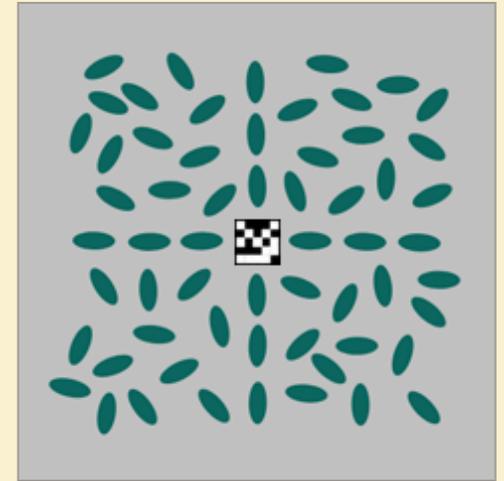
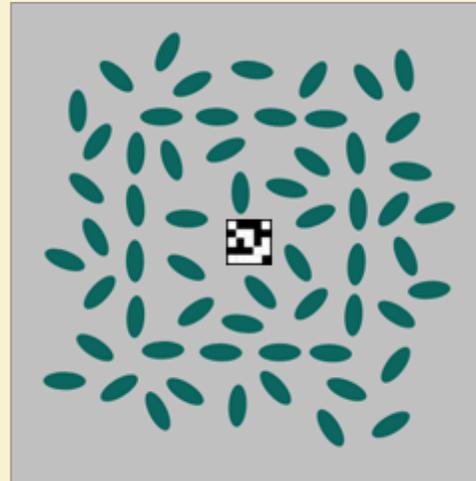
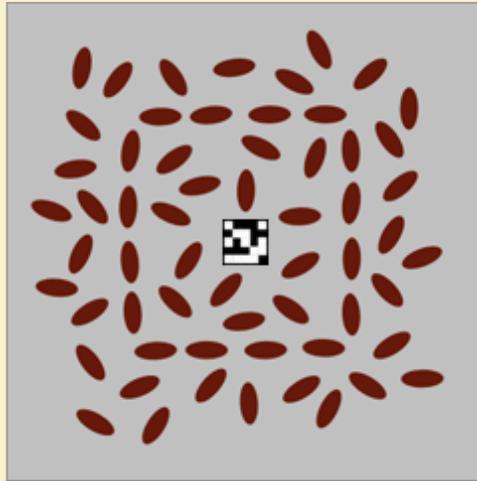
**Configuring
Exp. 4**

**1st
Display**

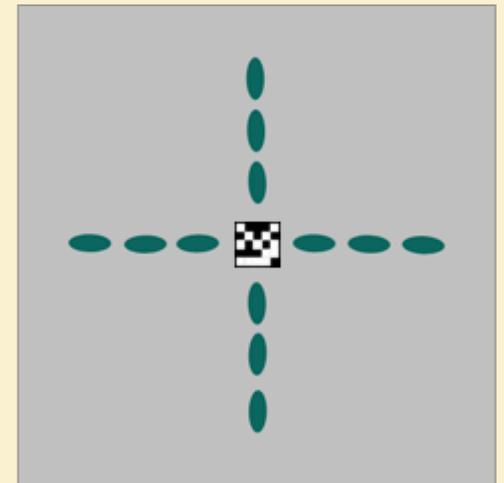
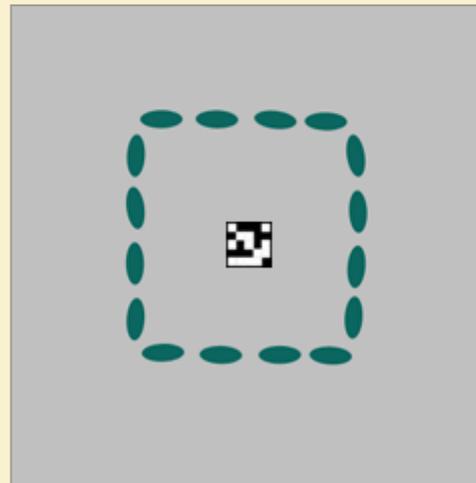
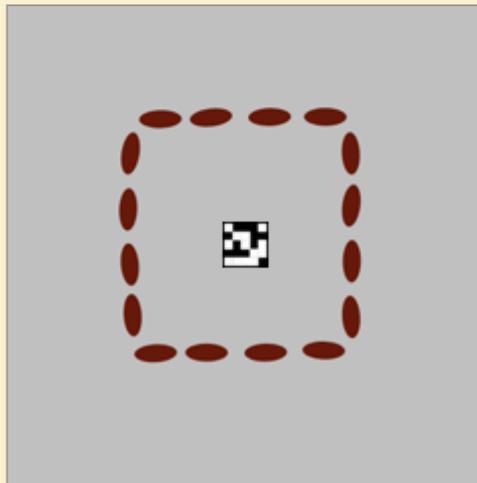
**2nd Display
Same
Organization**

**2nd Display
Different
Organization**

**Element
Segregation
& Configuring
Exp. 3**

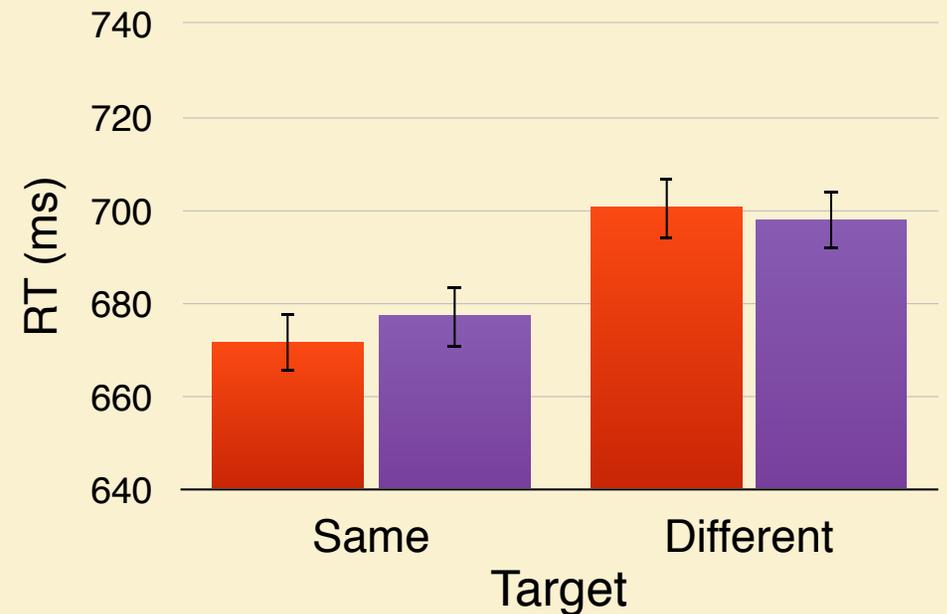
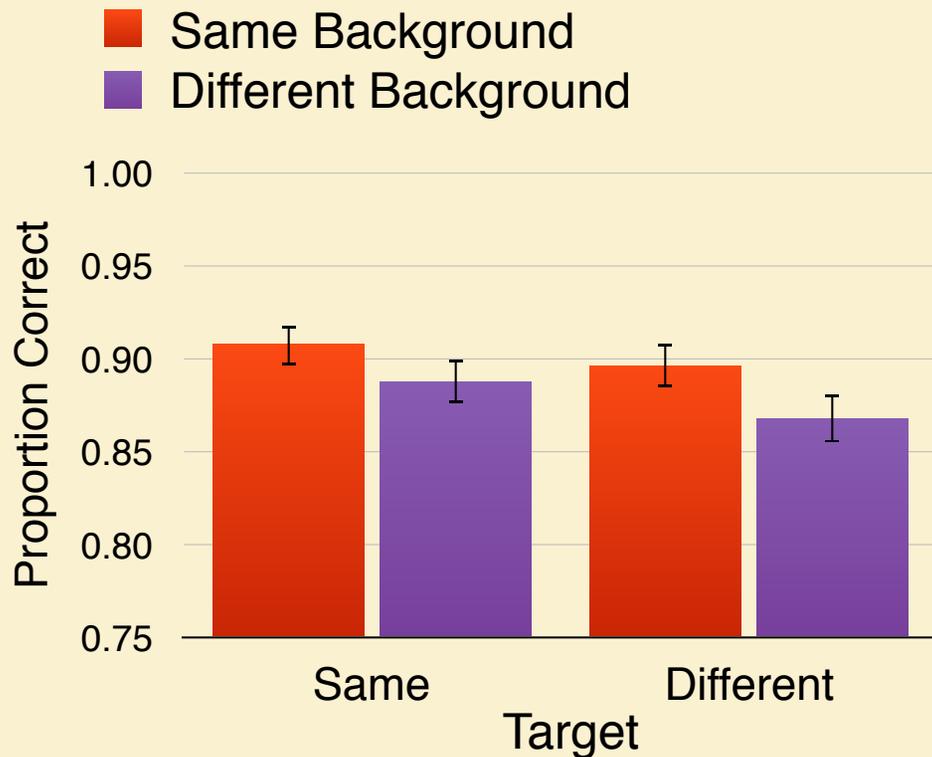


**Configuring
Exp. 4**



RESULTS

Element Segregation & Configuring - No interaction was found.

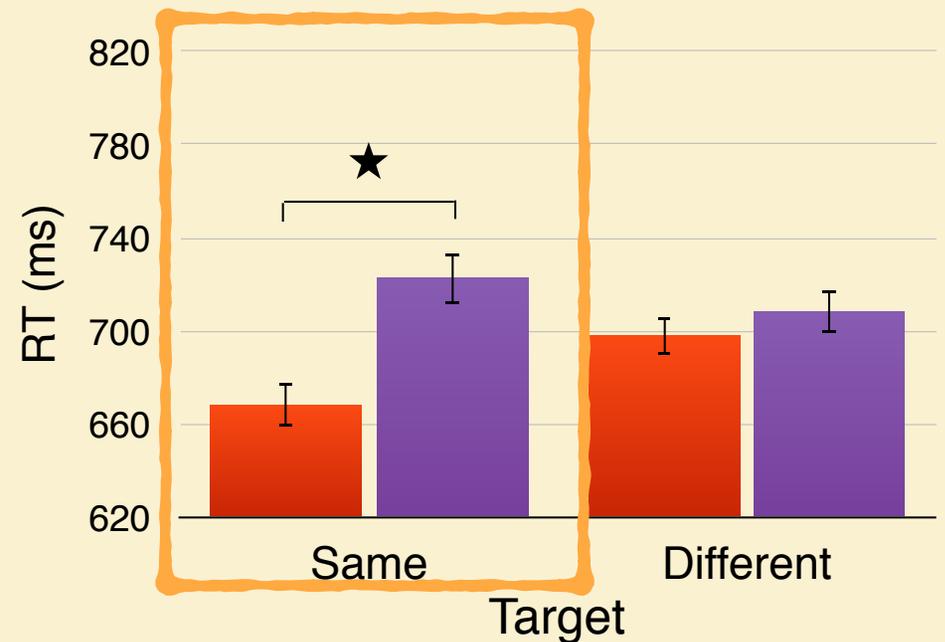
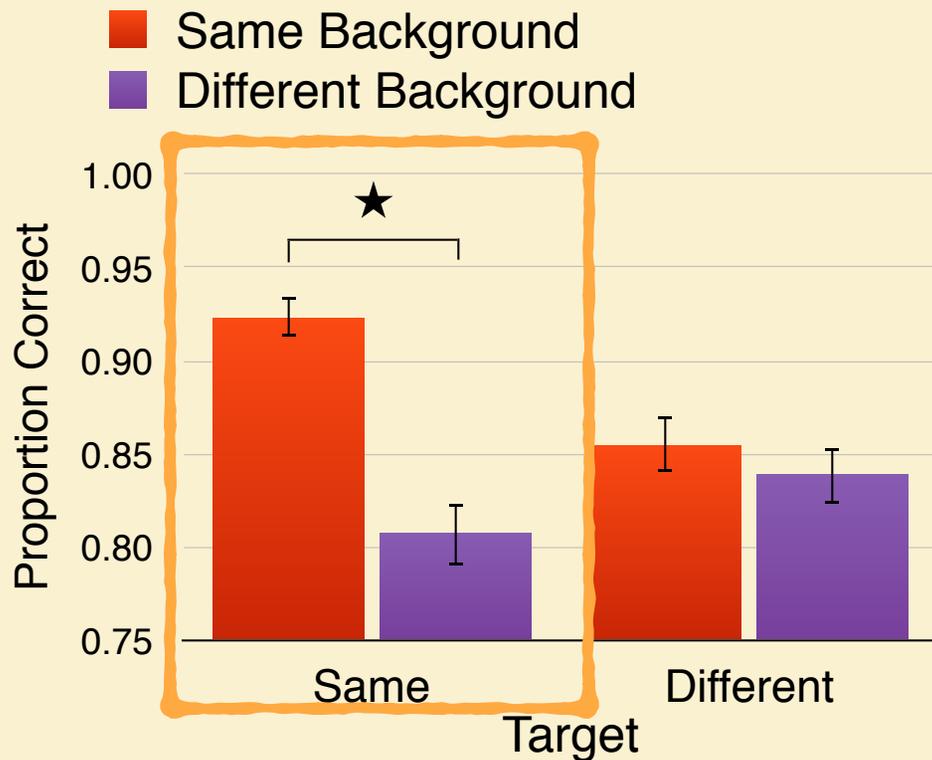


N = 18

[AC, $F < 1$; RT, $F(1, 17) = 1.6$, $p > 0.22$, $\eta_p^2 = 0.09$]

RESULTS

Configuring - The interaction between target and background conditions was significant for accuracy and RT.



N = 15

[AC, $F(1, 14) = 9.08$, $p < 0.01$, $\eta_p^2 = 0.39$; RT, $F(1, 14) = 7.72$, $p < 0.02$, $\eta_p^2 = 0.36$]

SURPRISE QUESTIONS & CONTROL

- What was the shape in the background (square or cross)?
 - Element segregation & configuring - 7/18 (39%)
 - Configuring - 7/15 (47%)
 - Was there a change in organization in the background between displays in the last trial (Change or no change)?
 - Element segregation & configuring - 11/18 (61%)
 - Configuring - 7/15 (47%)
 - Control experiment -
 - 94% correct identification of the collinear shape (second display of each trial).
 - 91% correct detection of a change in organization in a trial.
-

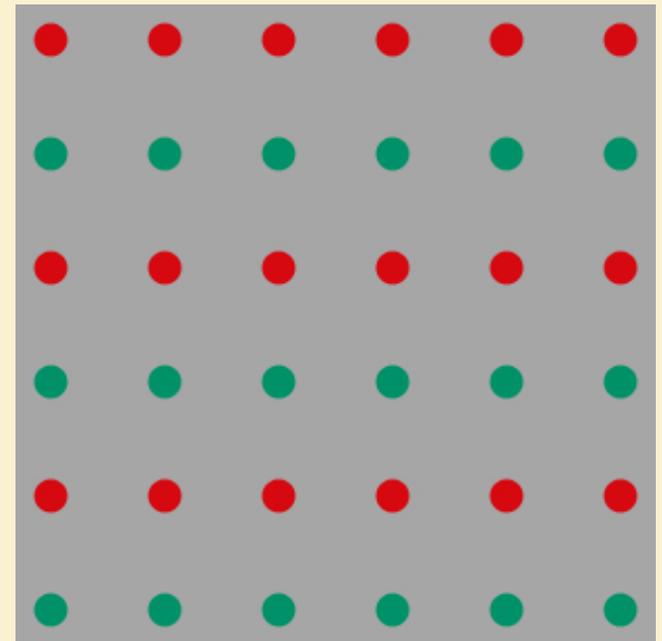
CONCLUSION 2

Attention is needed when multiple processes, i.e., element segregation and configuring, are involved in the organization.

EXPERIMENT 5

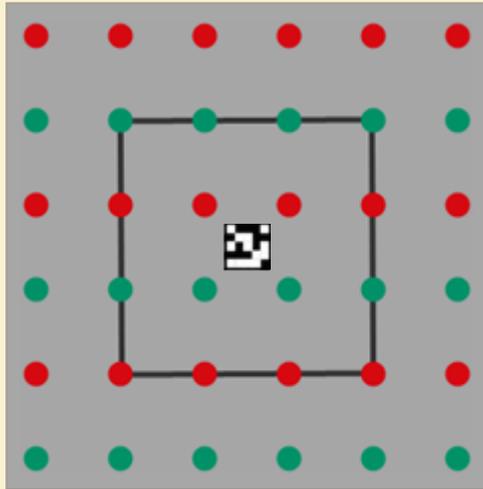
Is attention needed when multiple grouping organizations are possible in the visual scene?

- **Competition** - processing of both organizations.
- If this competition is resolved without attention, only one organization should affect performance when tested under inattention.

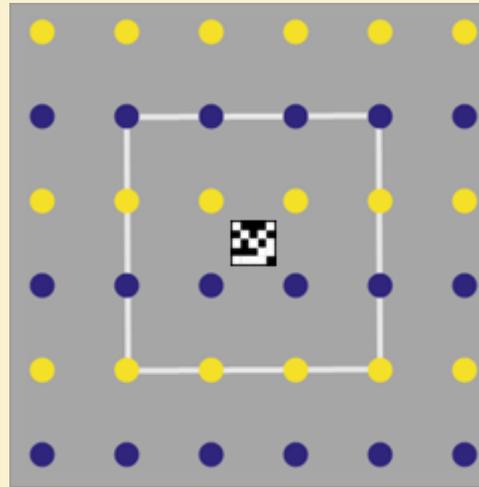


**Same
Connected
Shape**

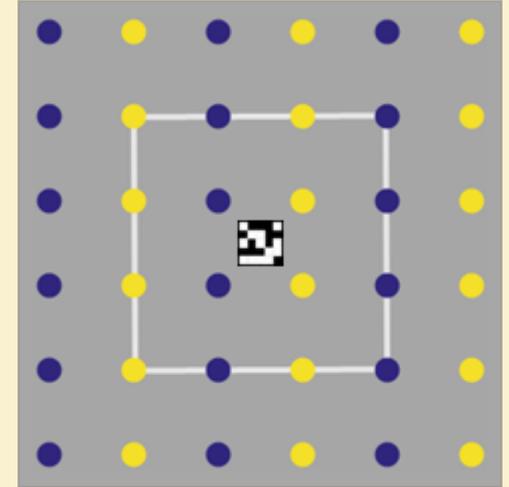
1st Display



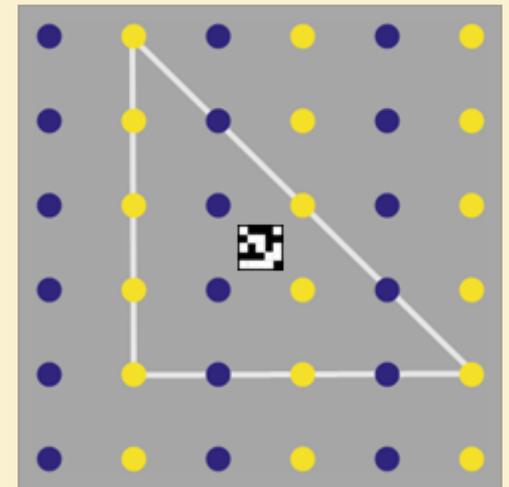
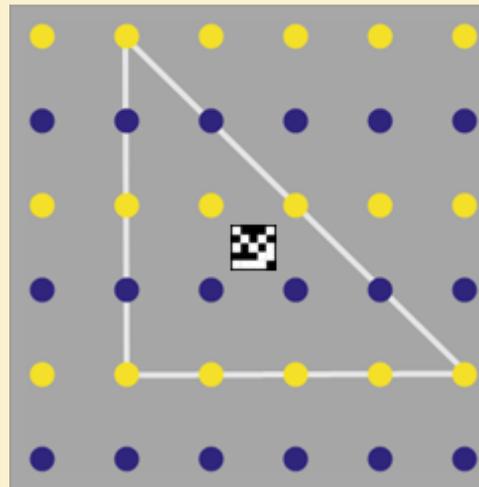
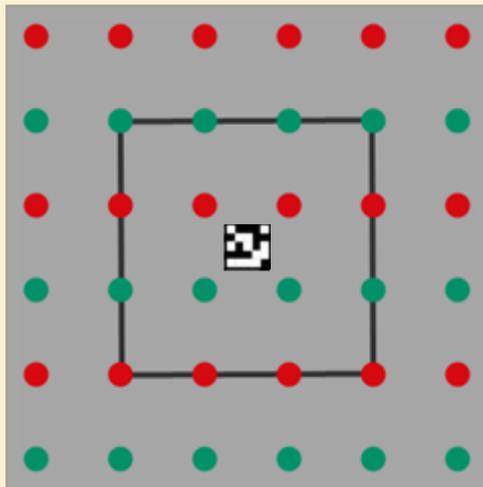
**2nd Display
Same Color
Organization**



**2nd Display
Different Color
Organization**

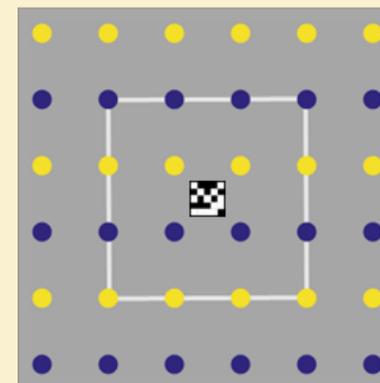
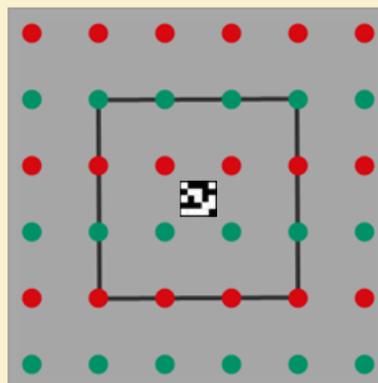


**Different
Connected
Shape**

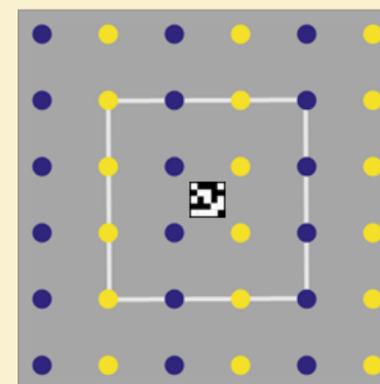
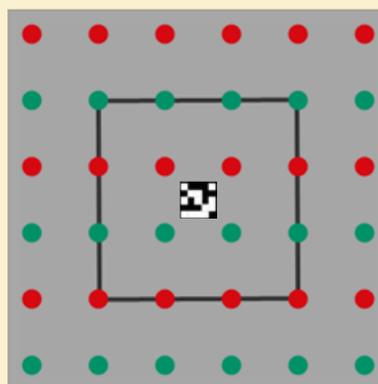


For target “**same**” responses:

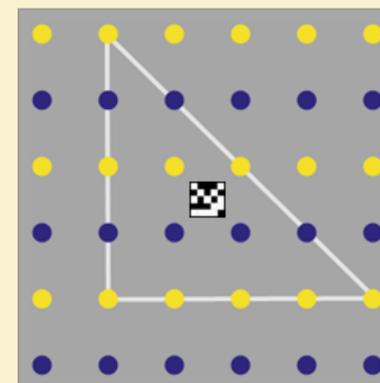
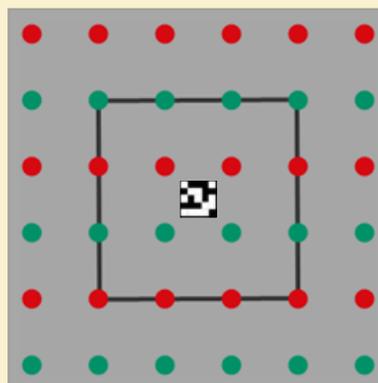
same color organization
&
same shape



different color organization
&
same shape

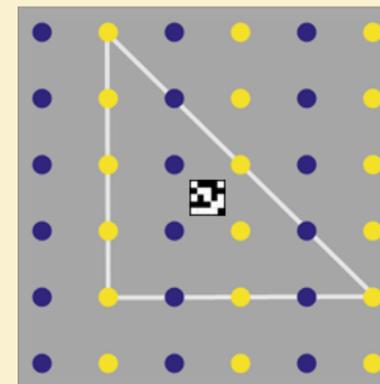
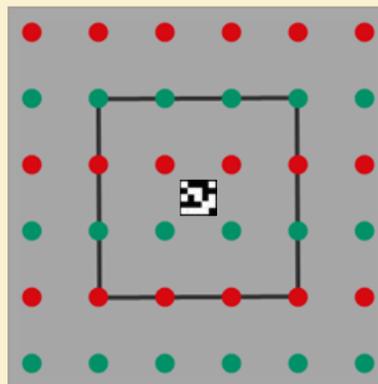


same color organization
&
different Shape

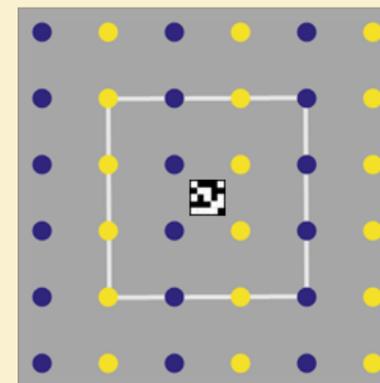
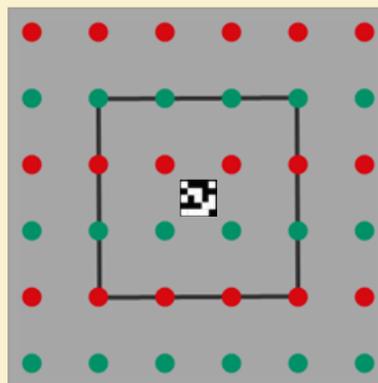


For target “different” responses:

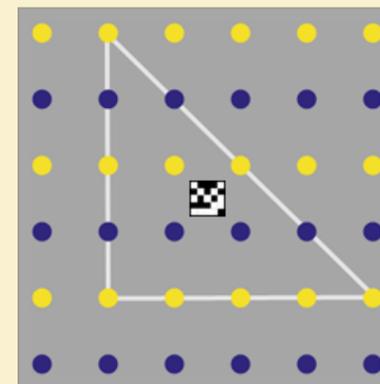
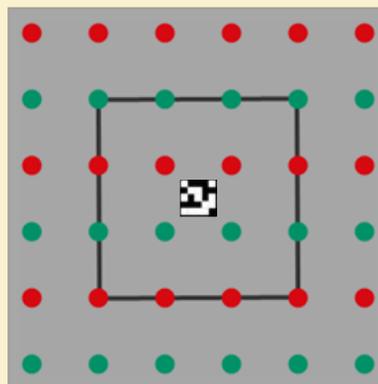
different color organization
&
different shape



different color organization
&
same shape

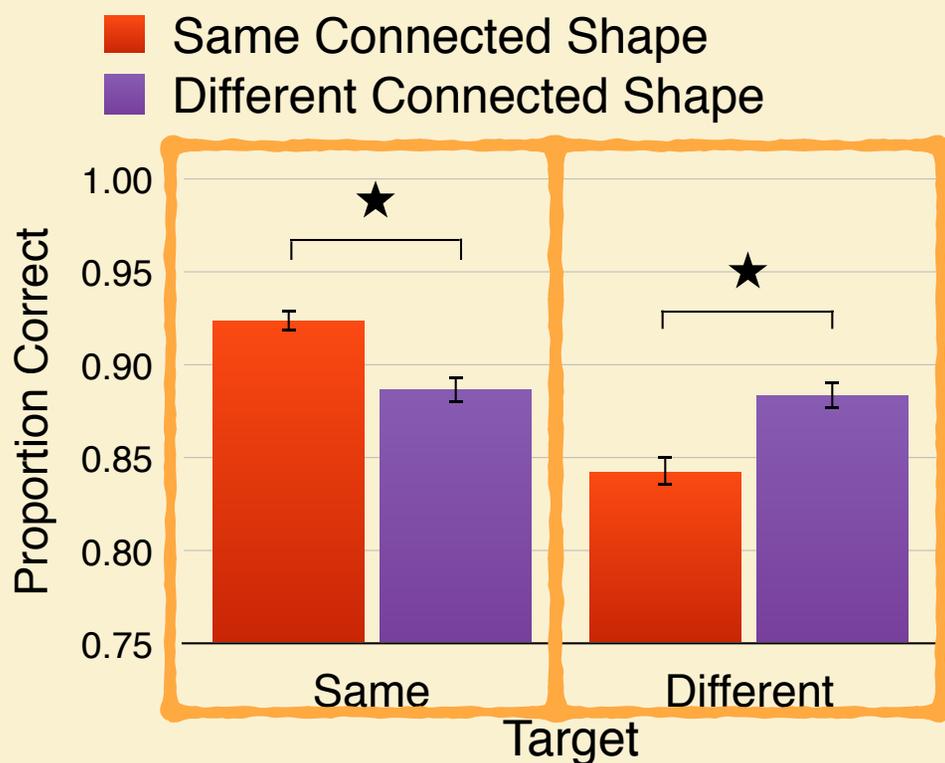


same color organization
&
different Shape



RESULTS

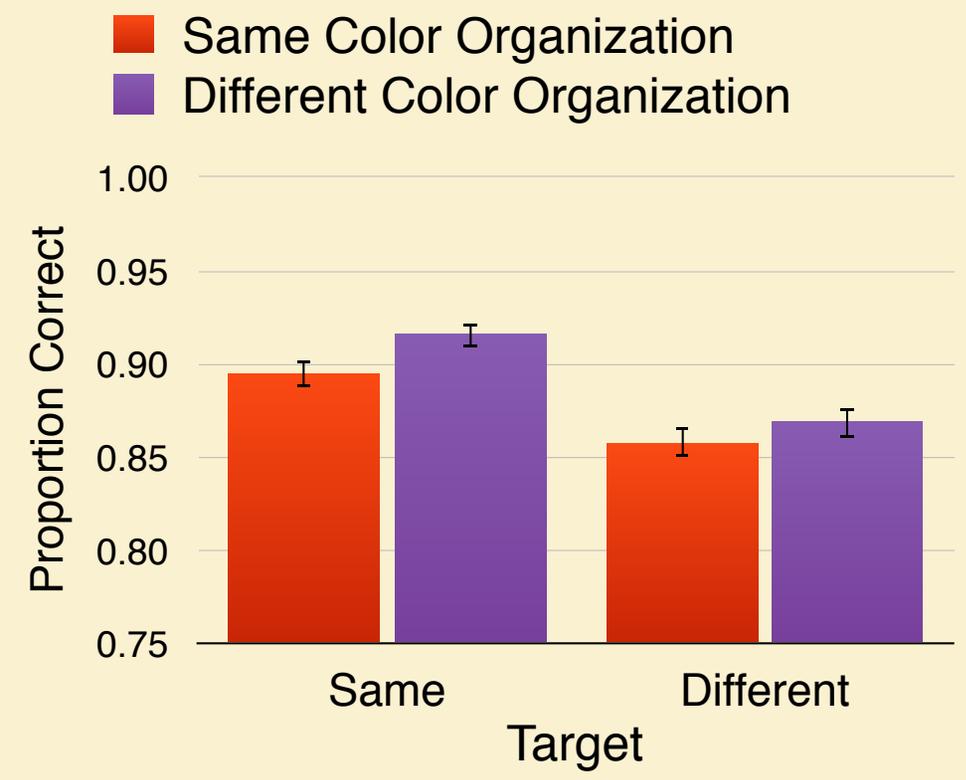
3-way interaction - No interaction was found between target, shape, and color organization conditions.



N = 25

[AC, $F(1, 24) = 28.51, p < 0.0001, \eta_p^2 = 0.54$; RT, $F < 1$]

2-way interactions - an interaction was found between target and shape conditions. No interaction was found between target and color organization conditions.



[$F_s < 1$, for AC and RT]

SURPRISE QUESTIONS

- What was the shape in the background (triangle or square)?
 - 11/25 (44%) correct reports
 - Was there a change in organization in the background between displays in the last trial (change or no change)?
 - 13/25 (52%) correct reports
-

CONCLUSION 3

The competition between grouping organizations can be resolved without the aid of attentional resources.

SUMMARY

- Attentional demands vary for different grouping principles.
 - Attention is not required for configuring elements into a shape when no segregation from additional elements is needed (see also Kimchi & Razpurker-Apfeld ,2004)
 - Attention is needed when multiple grouping processes are involved in the organization. Organizations that involve element segregation and configuring, cannot be accomplished without attention.
 - Attention does not seem to be required for the resolution of the competition between grouping organizations.
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THANK YOU!
