A Feature-Integration Theory of Attention

A. Treisman and G. Gelade (1980)


selective
divided
alternating
covert
attention
focused
bottom-up
overt
sustained
top-down


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divided
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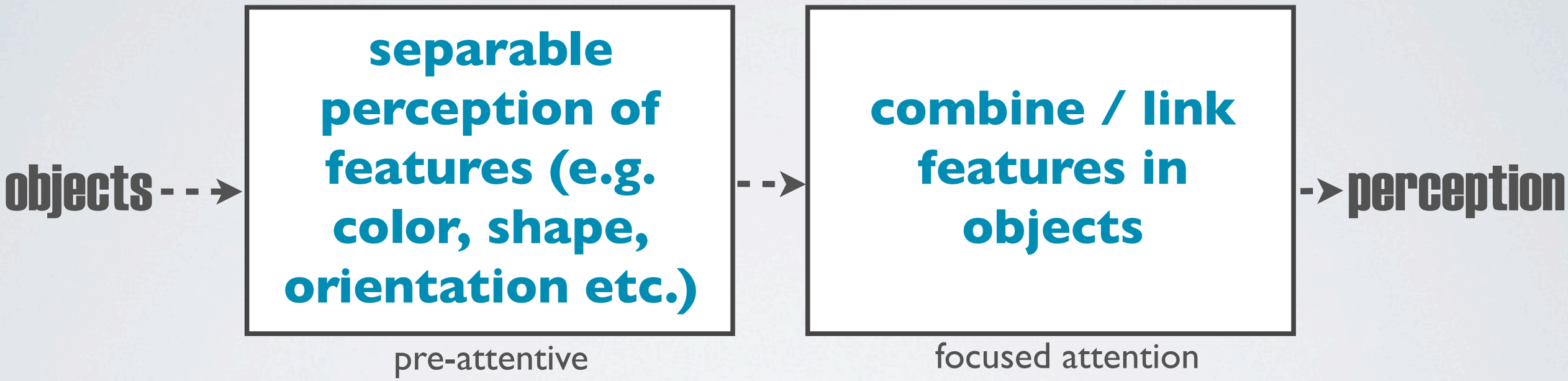
Feature Integration Theory



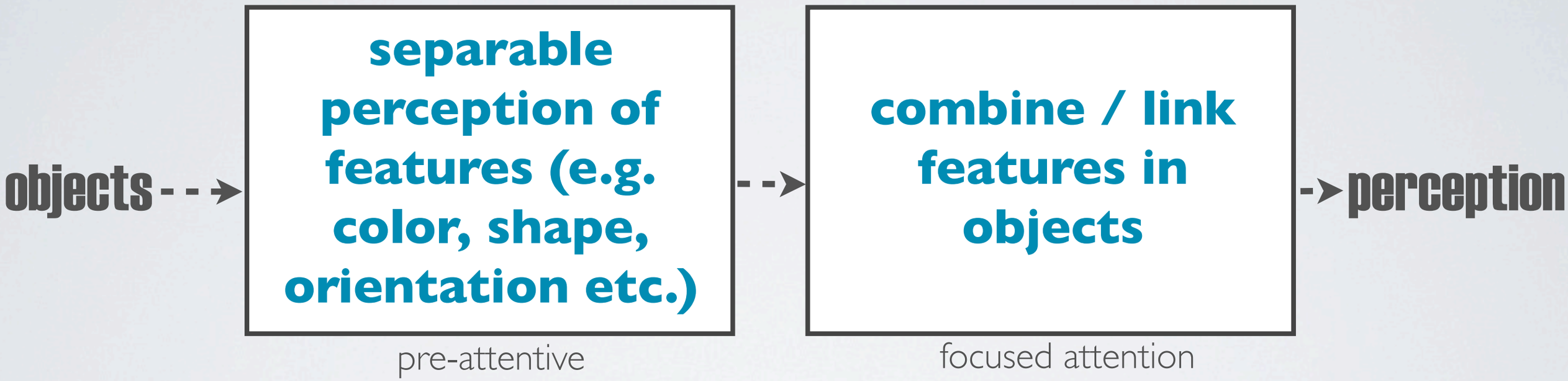
Feature Integration Theory

support

9 experiments testing predictions based on the theory

5 Areas
Visual Search
Texture Segregation
Illusory Conjunctions
Identity and Location
Interference from Unattended Stimuli

Feature Integration Theory



Feature Integration Theory

single features **can be detected in parallel** *without attention limits*

pre-attentive

conjunctions **require focal attention of each object, resulting in serial search**

focused attention

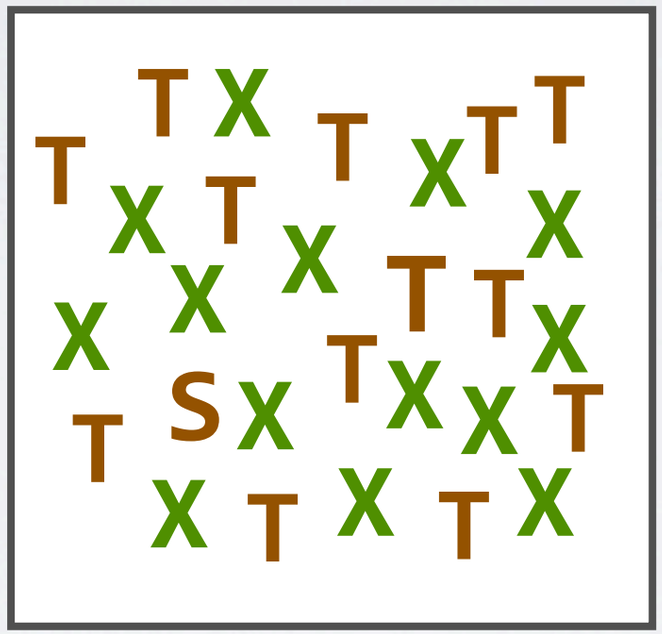
Visual Search

feature

find the **S** *or* **blue**

Visual Search

feature



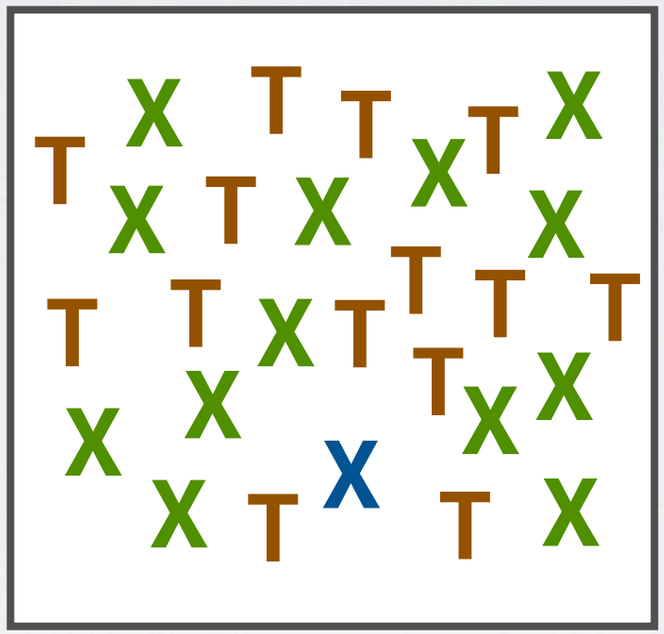
Visual Search

feature

find the **S** *or* **blue**

Visual Search

feature



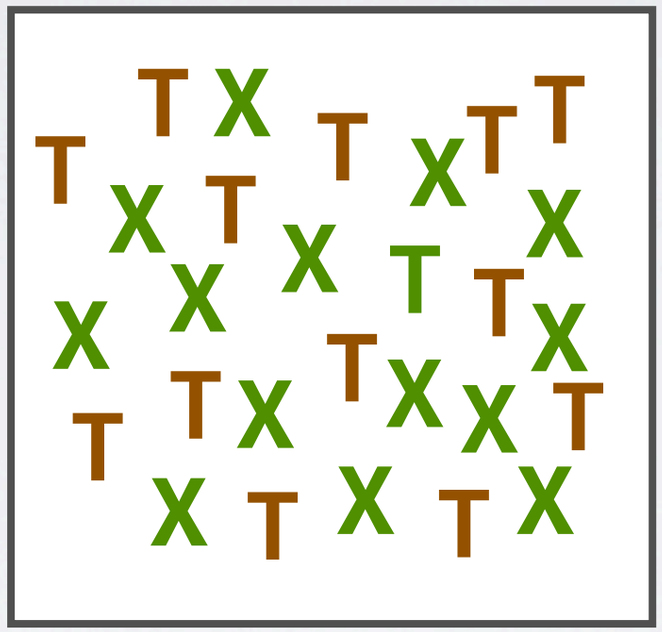
Visual Search

conjunction

find the **T**

Visual Search

conjunction



Experiment 1

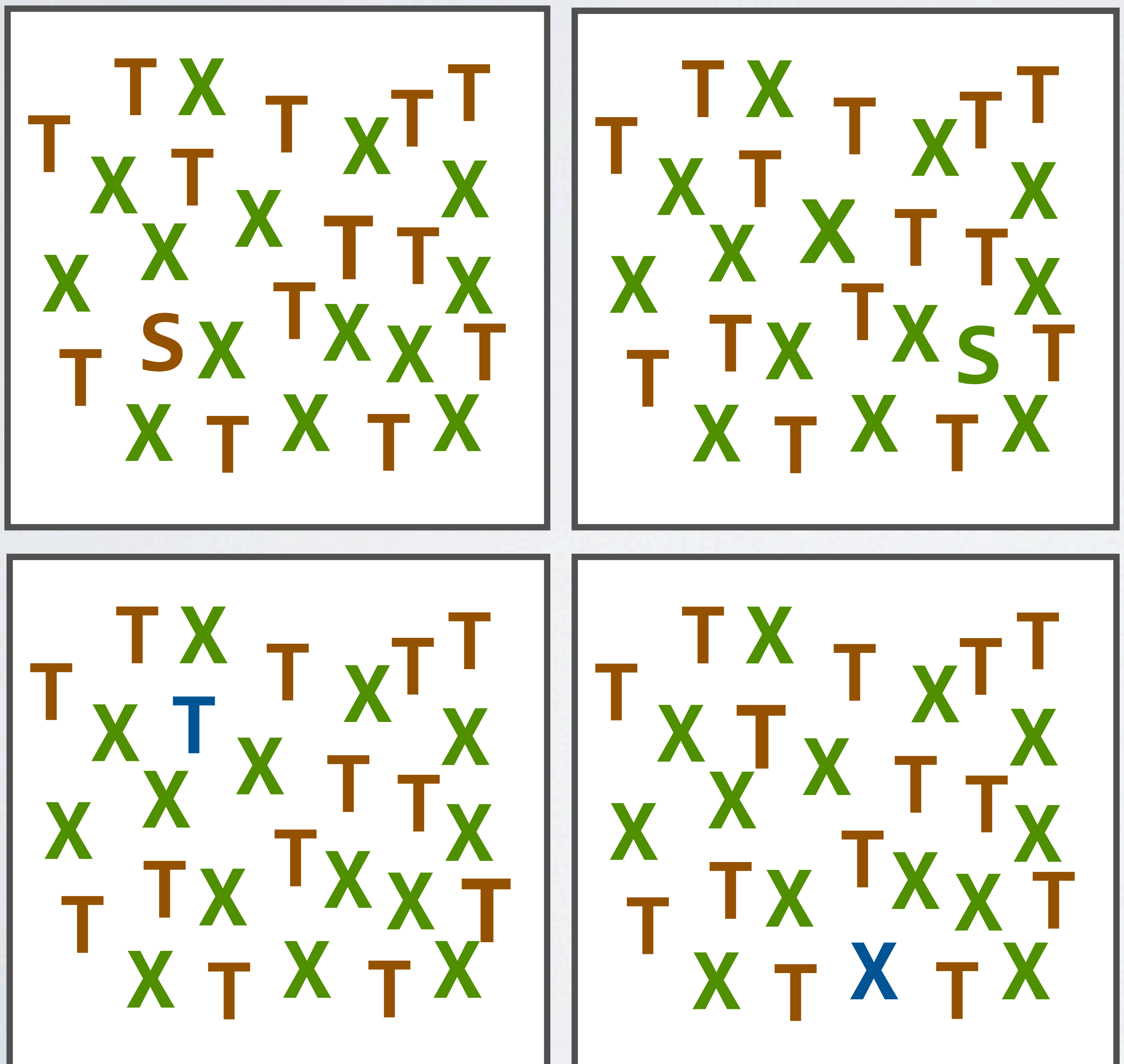
Distractors: X ,T

Target: "**S** *or* **blue**," T

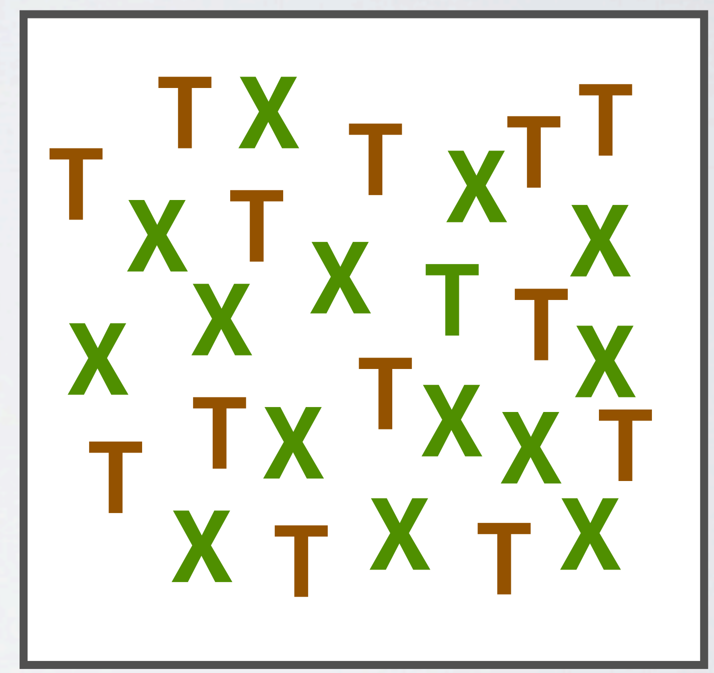
Feature

S

blue



Conjunction



Visual Search

results

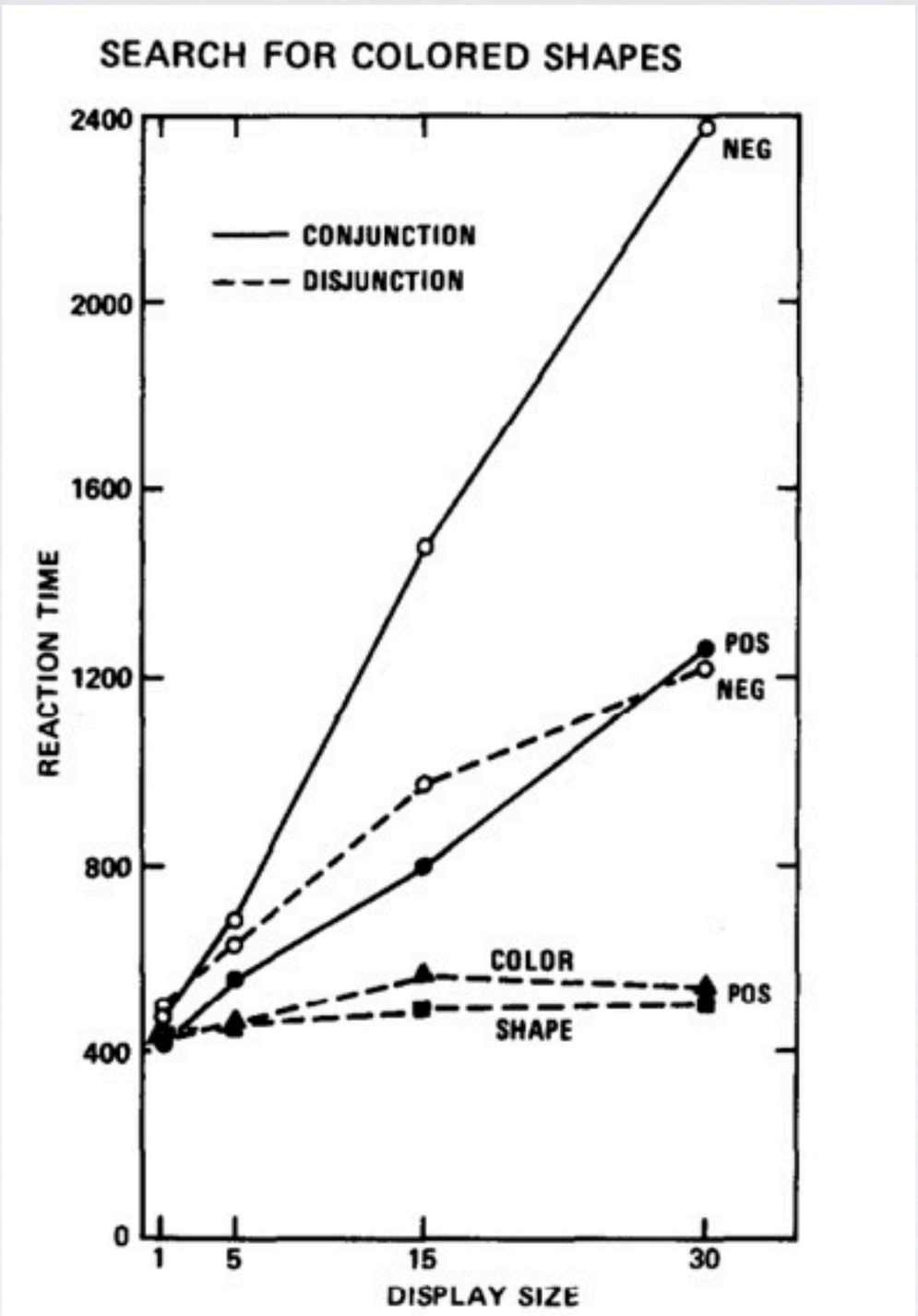
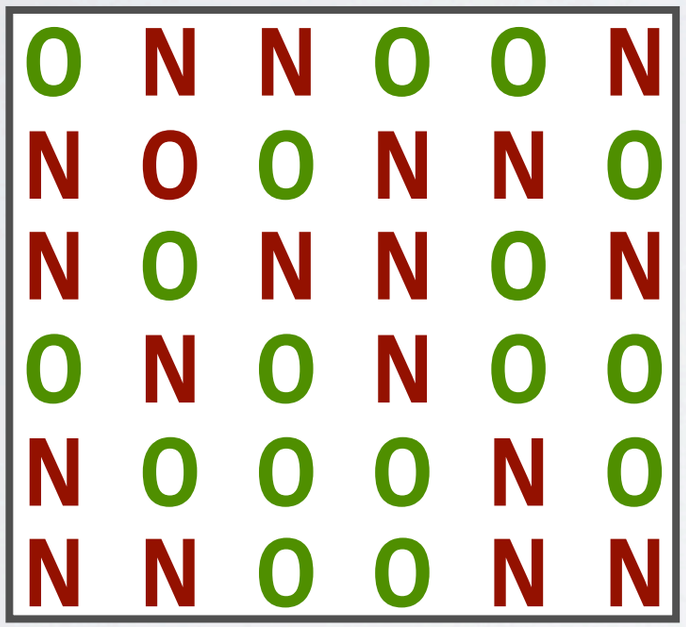


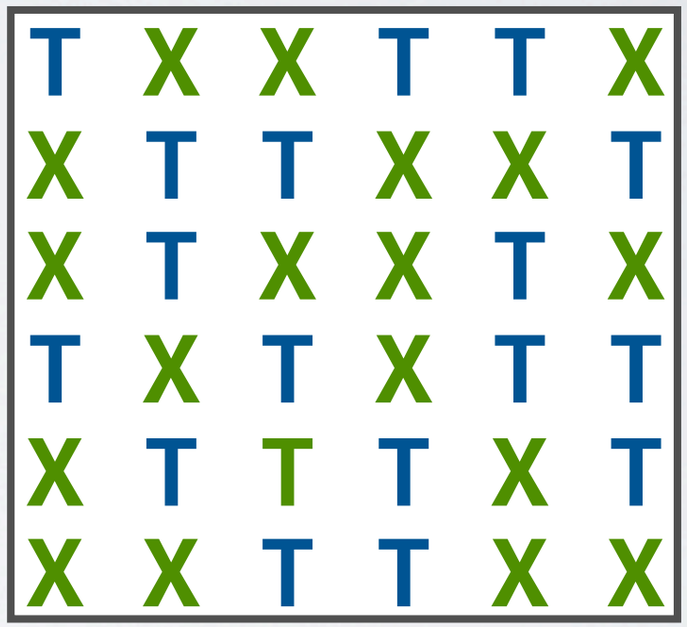
FIG. 1. Search times in Experiment I.

Experiment 2

Condition: easy
Distractors: **O** , **N**
Target: **O**



Condition: difficult
Distractors: **X** , **T**
Target: **T**



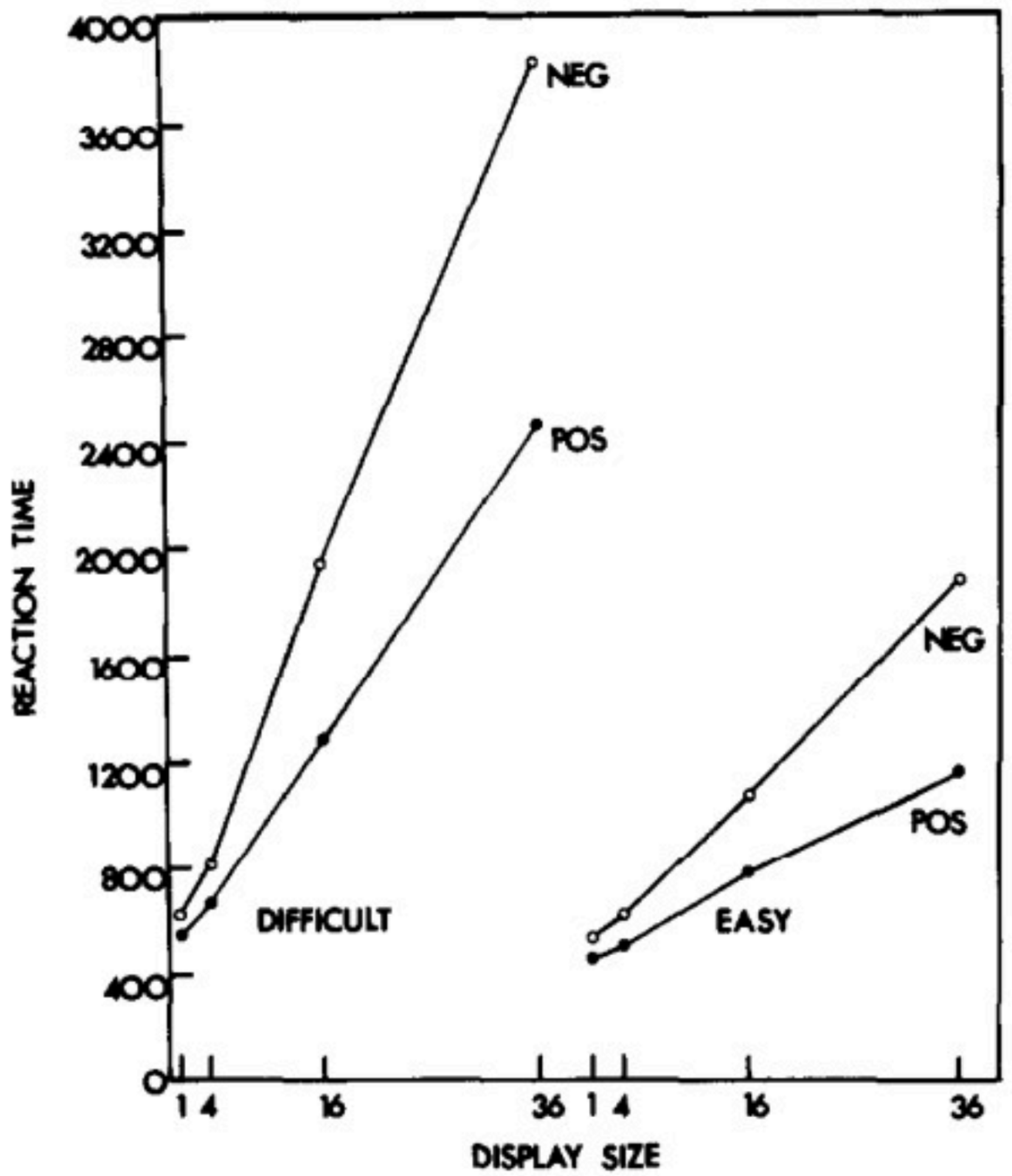


FIG. 3. Search times in Experiment II.

Experiment 3

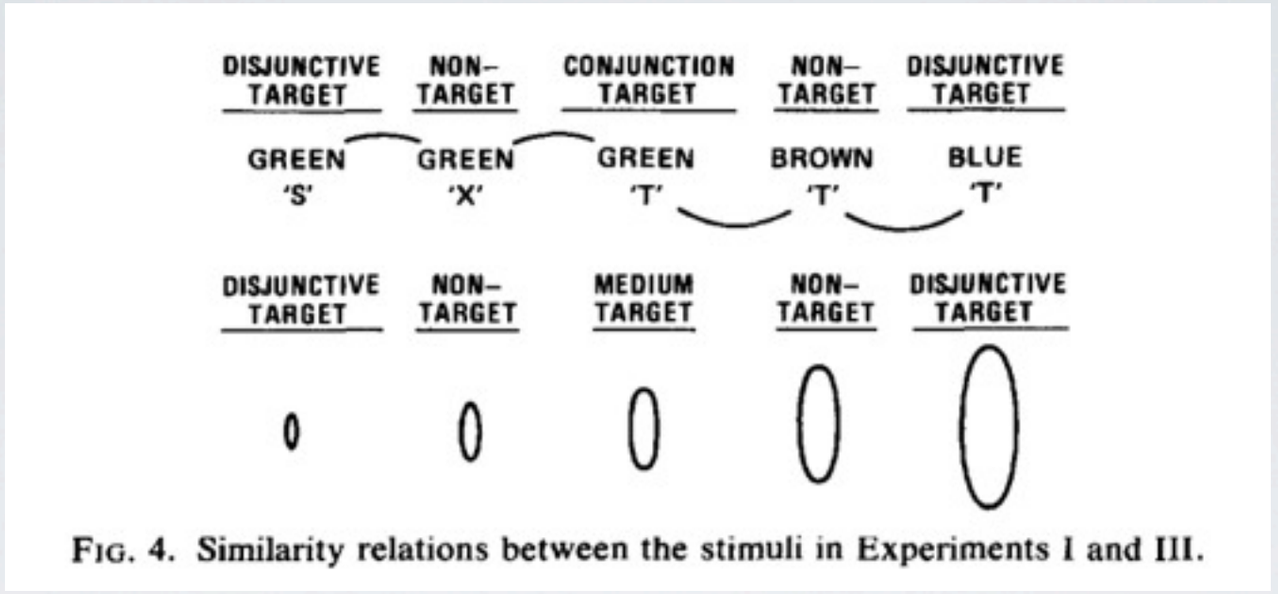
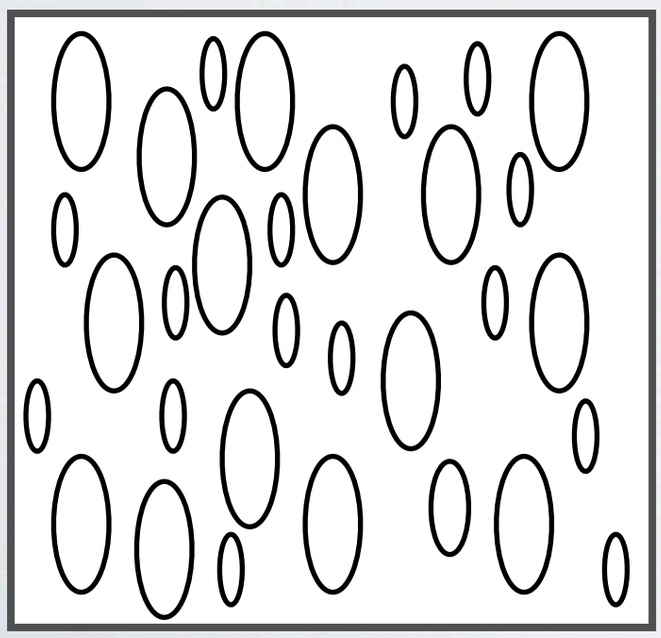


FIG. 4. Similarity relations between the stimuli in Experiments I and III.

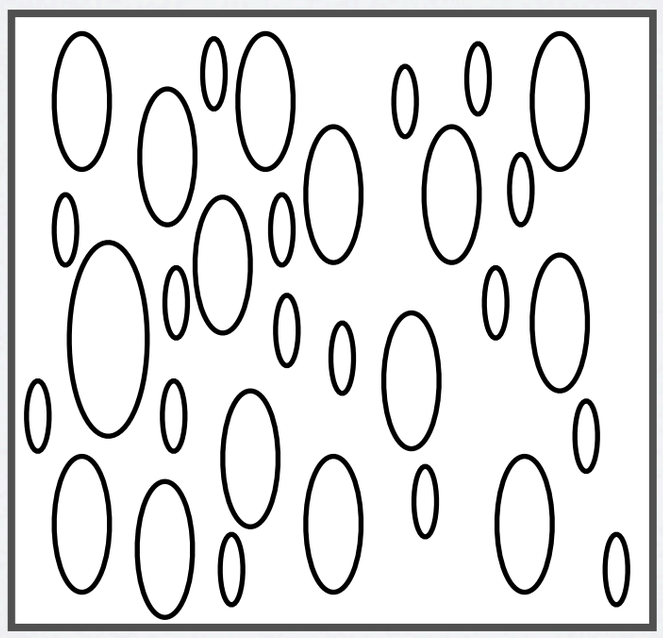
Distractors: , Target:

Distractors: , Target:

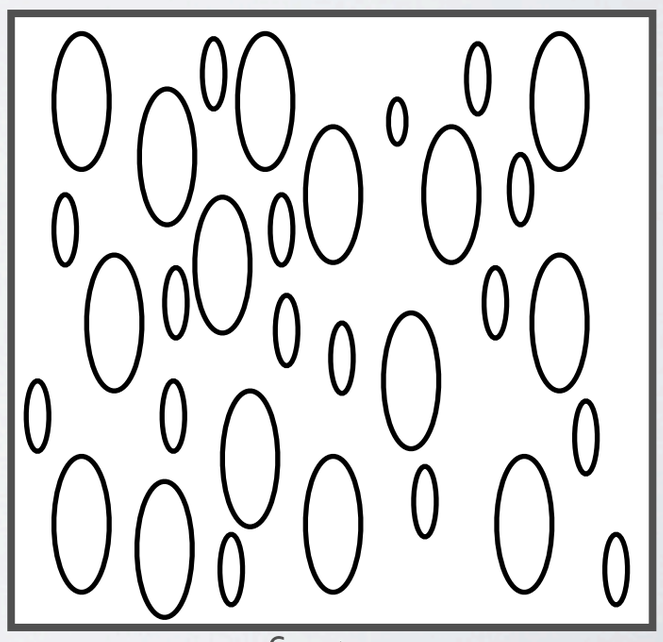
Distractors: , Target:



conjunction



feature



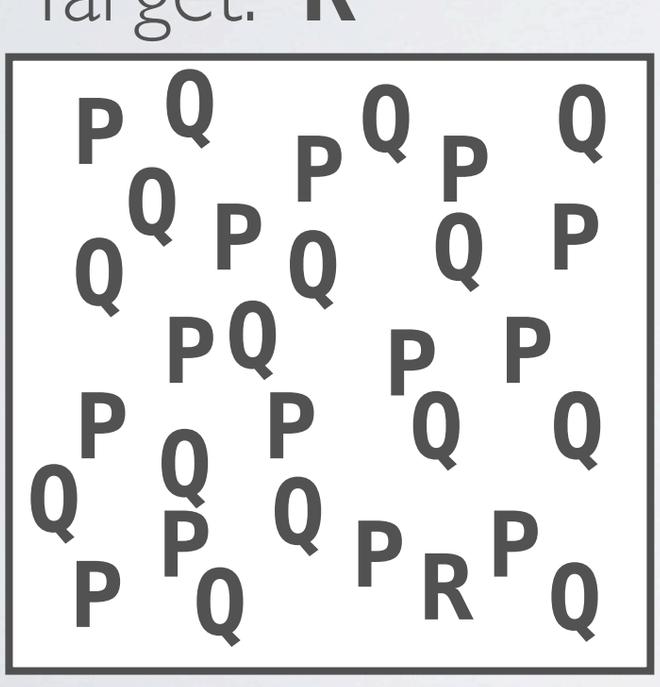
feature

Experiment 4

P+Q=R illusory "R"

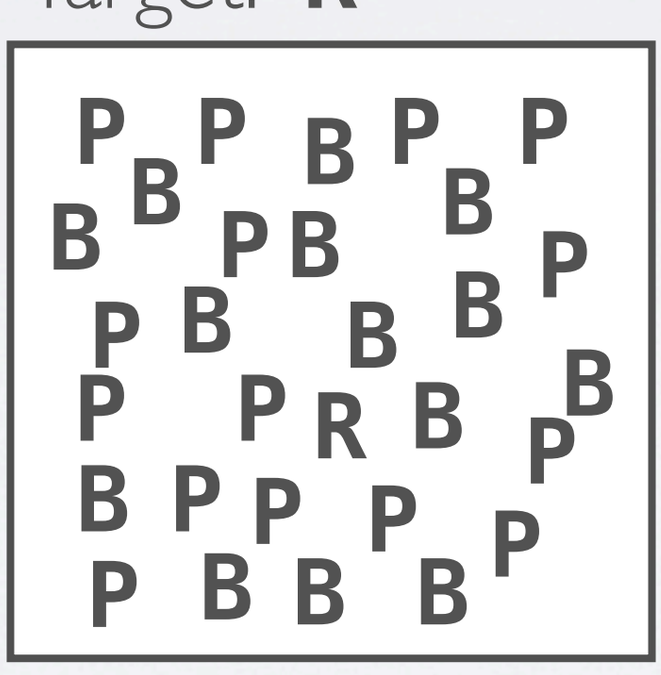
(I+Z=I=T) illusory "T"

Distractors: **P** , **Q**
Target: **R**



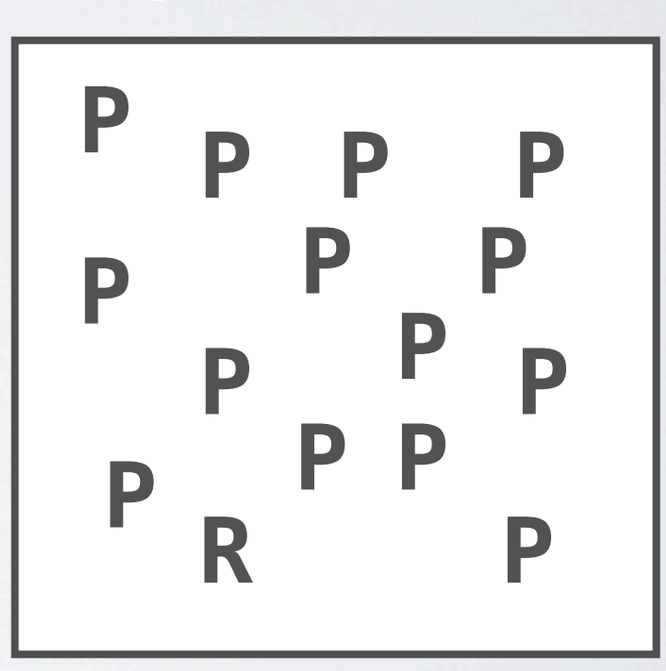
illusory conjunction

Distractors: **P** , **B**
Target: **R**



non-illusory conjunction

Distractors: **P**(**Q**,**B**)
Target: **R**



single feature

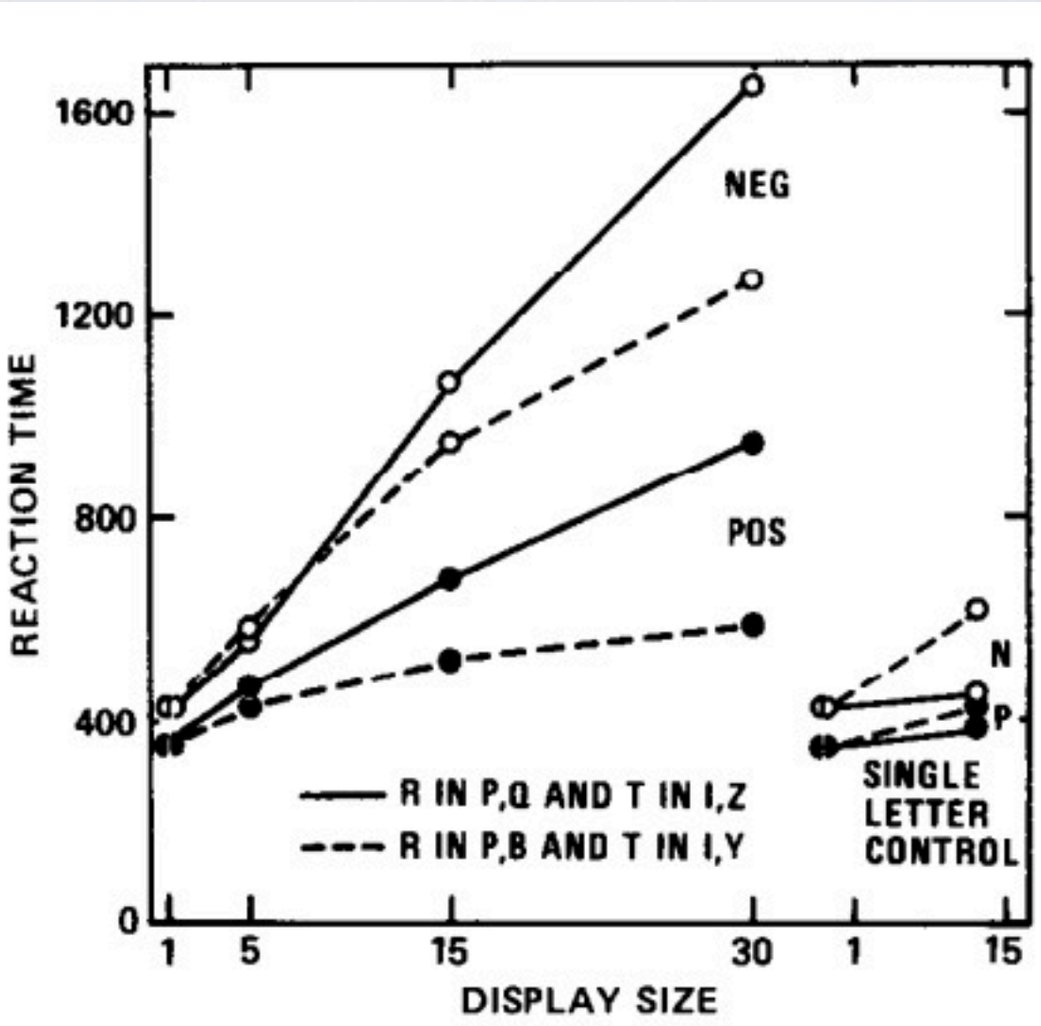
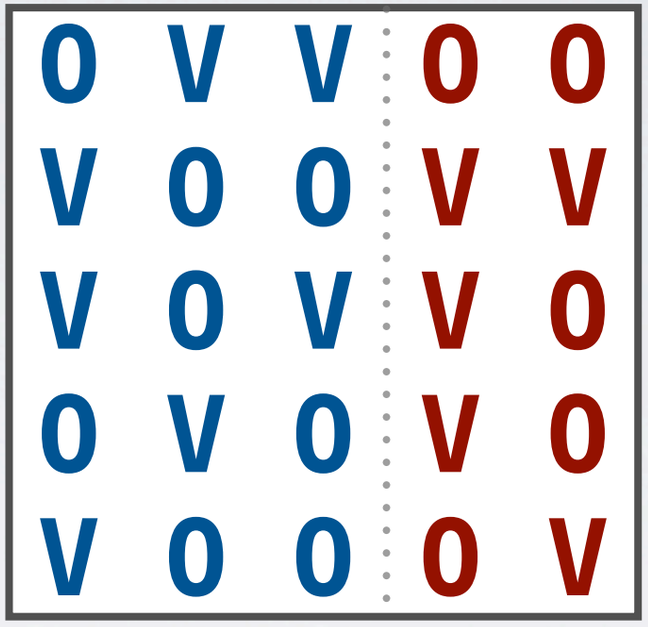


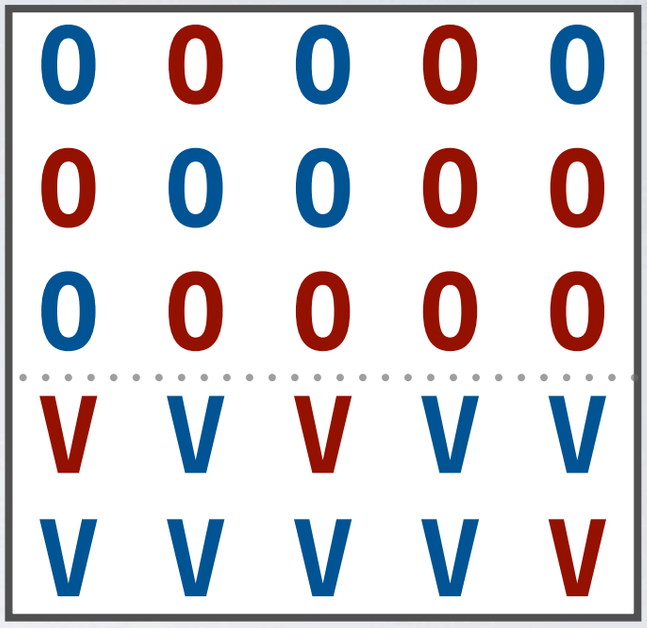
FIG. 6. Search times in Experiment IV.

Experiment 5

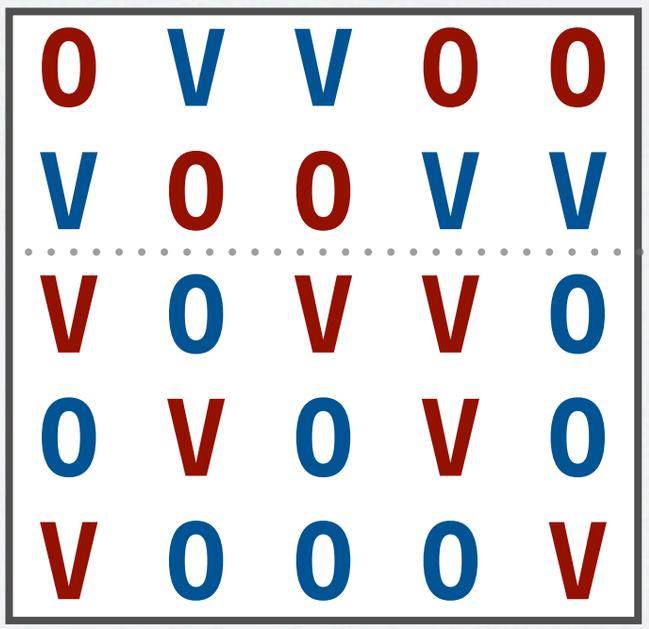
Task: sort by boundary (horizontal vs vertical)



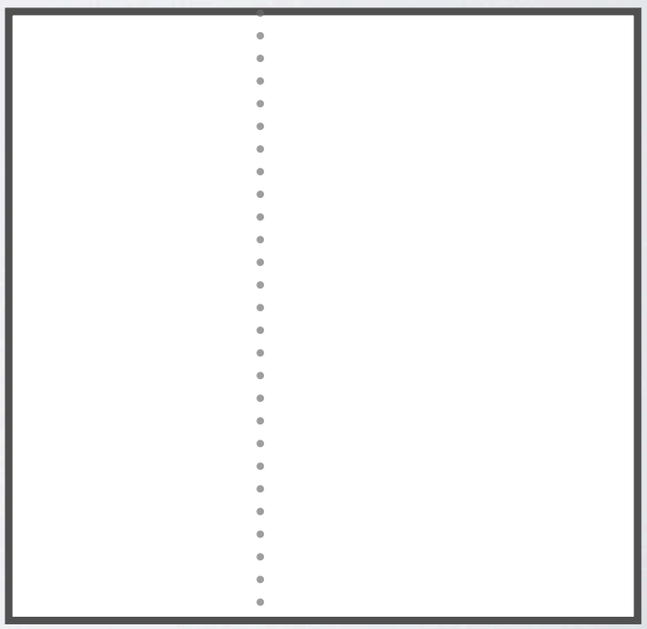
color



shape



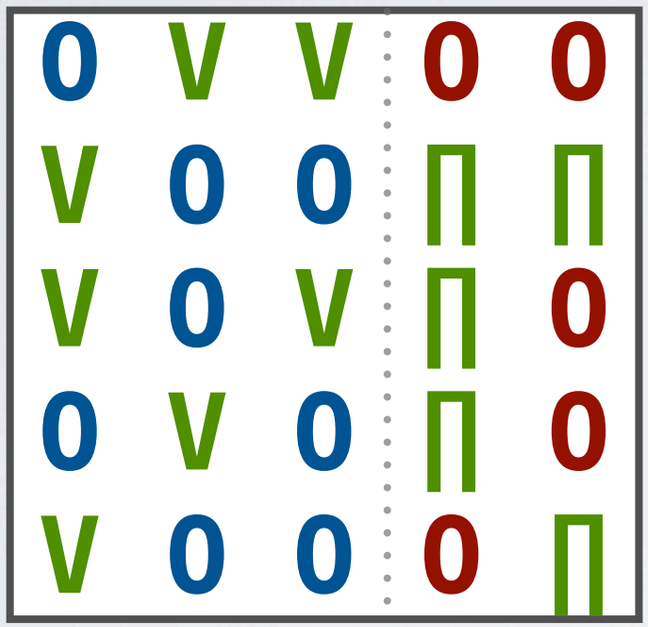
conjunction



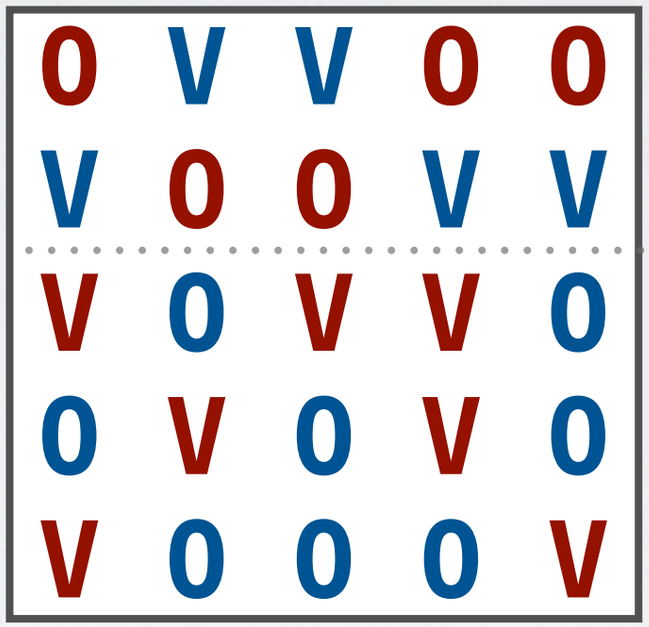
control

Experiment 6

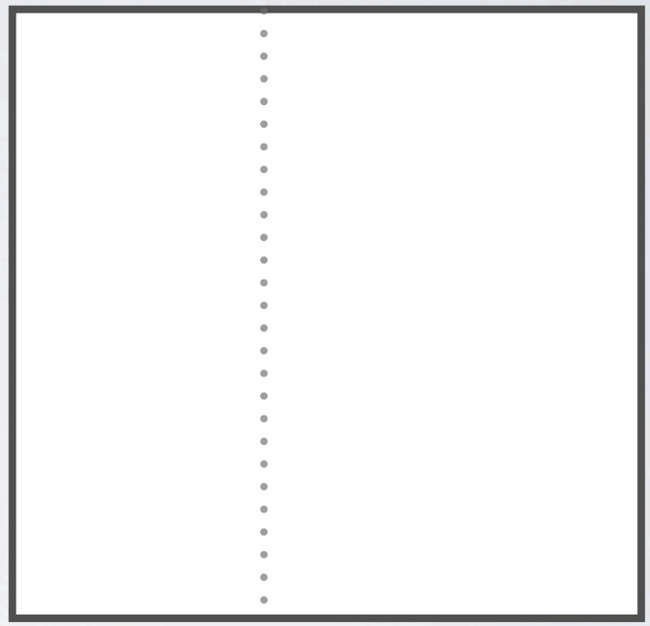
Task: sort by boundary
(horizontal vs vertical)



disjunctive feature



conjunction



control

Experiment 7

boundary determined by non-intersecting pairs of
[P, R, E, F, O, Q, X, K]

O	R	R	Q	Q
R	O	O	P	P
R	O	R	P	Q
O	R	O	P	Q
R	O	O	Q	P

interesting cases

"single feature":(PO/RQ), (EO/FQ)
"conjunction":(PQ/RO),(FK/EX)

Experiments 8/9

Distractors: **O** , **X**
Target: **H** (**H** , **X** , **O**)

O	**X**	**O**	**O**	**H**	**X**
X	**X**	**O**	**X**	**O**	**O**

disjunctive feature

Distractors: **O** , **X**
Target: **X** , **O**

O	**X**	**O**	**O**	**X**	**X**
X	**X**	**O**	**X**	**O**	**O**

conjunction

Applications to Graphics

encoding variables that represent **individual features** (e.g. color, orientation, intensity, movement) are ***good for search tasks***

unique combinations of features do **not** create ***pop-out effects*** in the same way as **unique features**

Questions?