The Dynamics of Categorization

Rapid Categorization Unraveled

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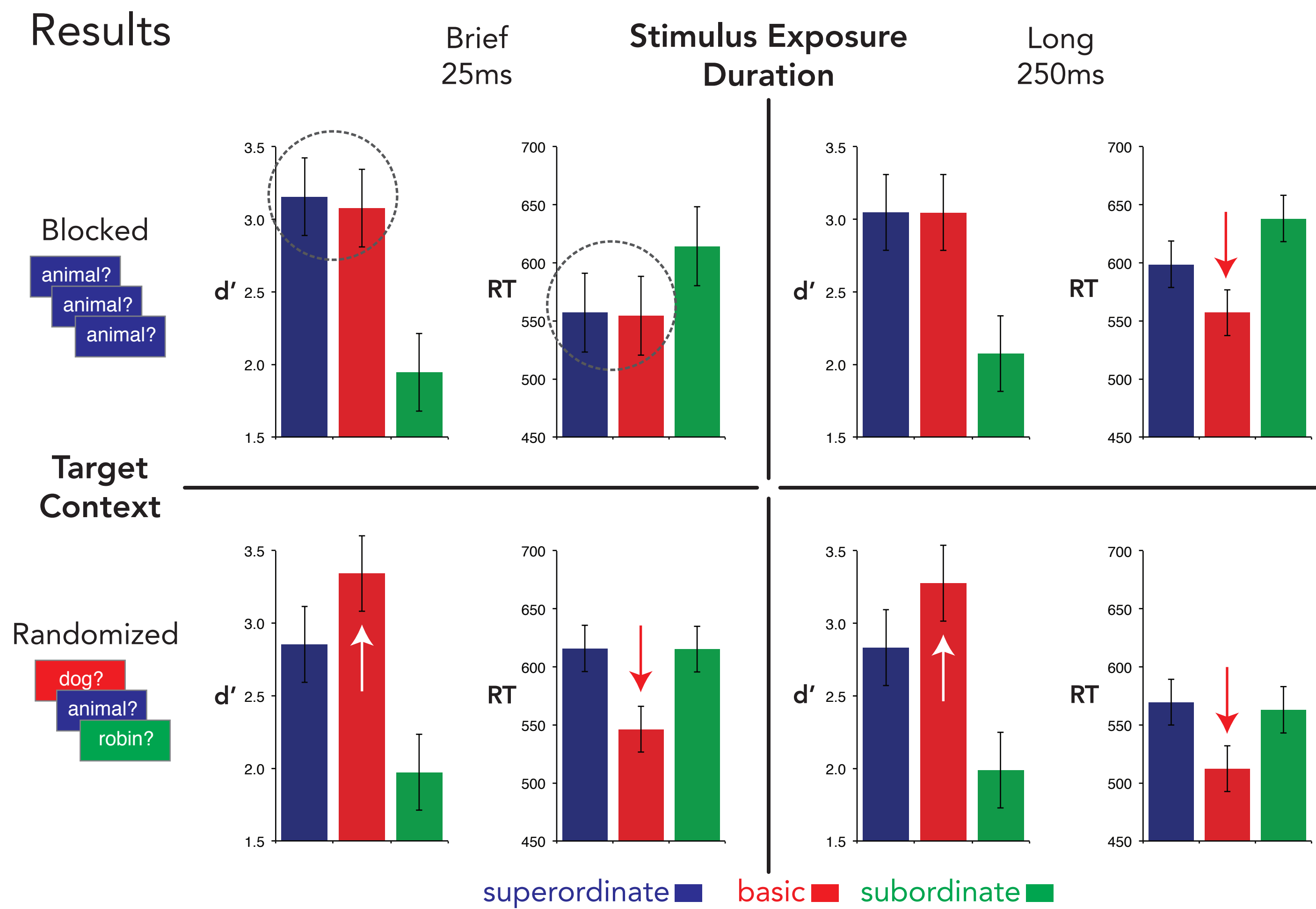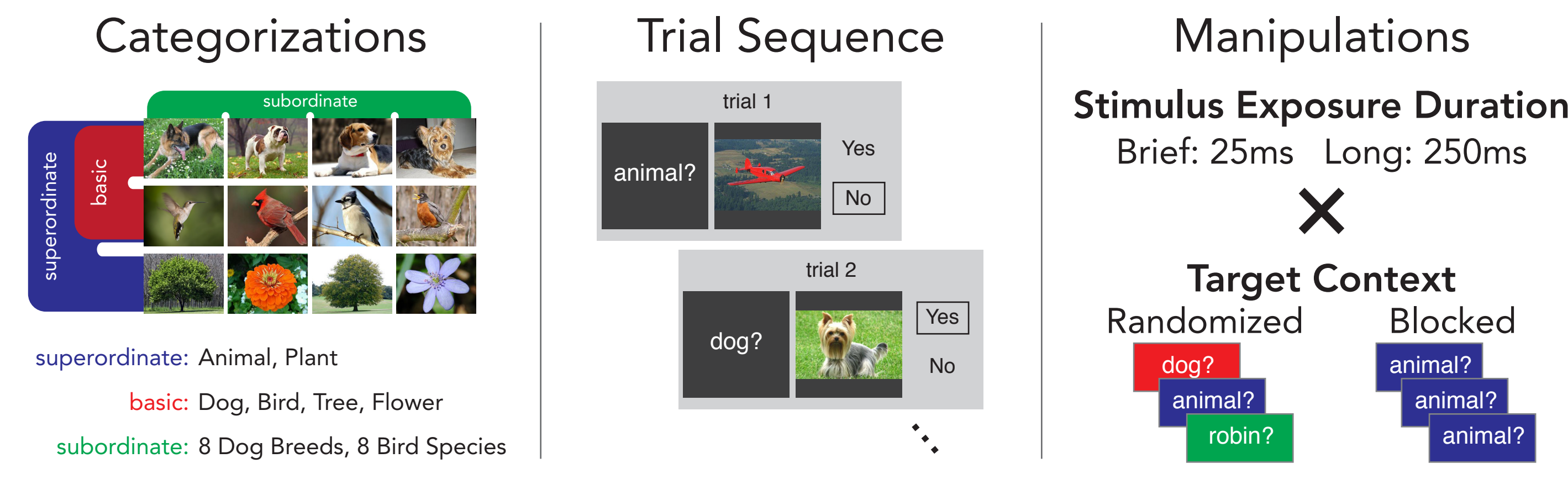
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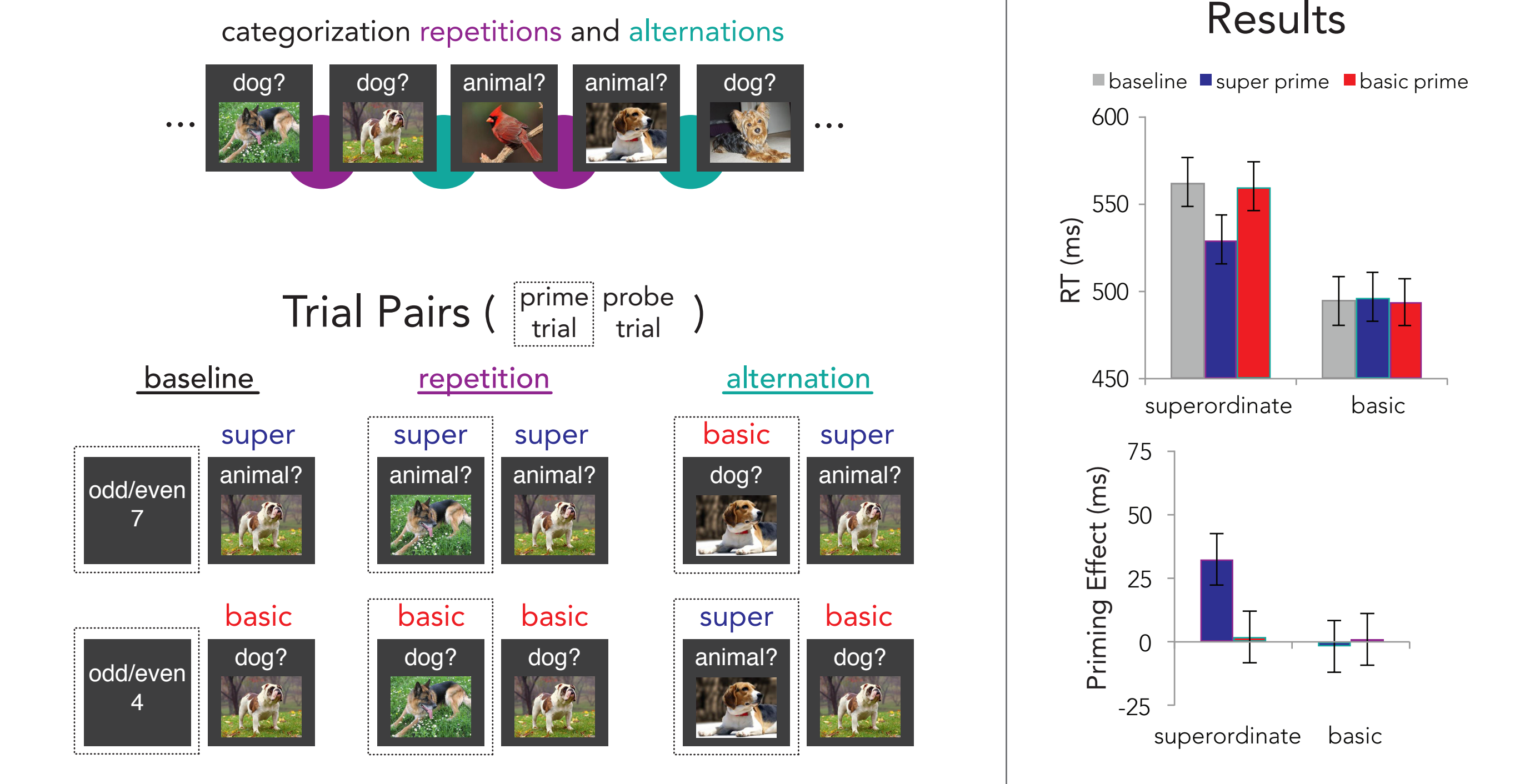
Motivation

Animal *superordinate*
Dog *basic*
Golden Retriever *subordinate*
Mr. Snuffles *identity*

We recognize objects at different levels of abstraction.

Some of these category levels are available before others.

Which category level is reached *fastest* during object perception?

Basic-level Advantage
Standard category verification task

e.g., Jolicoeur et al., 1984; Mack et al., 2009; Rosch et al., 1976; Tanaka & Taylor, 1991

Exposure Duration >250ms
Target Context Randomized

superordinate basic subordinate

Superordinate-level Advantage
Ultra-rapid category verification task

e.g., Macé et al., 2009; Mack & Palmeri, VSS 2010

Exposure Duration <30ms
Target Context Blocked

superordinate basic

Bridging Paradigms

Exp. 1: Exposure Duration × Target Context

Categorizations — subordinate / basic / superordinate

superordinate: Animal, Plant
basic: Dog, Bird, Tree, Flower
subordinate: 8 Dog Breeds, 8 Bird Species

Trial Sequence — trial 1 (animal? Yes/No), trial 2 (dog? Yes/No)

Manipulations
Stimulus Exposure Duration Brief: 25ms Long: 250ms
×
Target Context Randomized / Blocked

Results

Stimulus Exposure Duration
Brief 25ms / Long 250ms

Target Context: Blocked, Randomized

d', RT axes

superordinate basic subordinate

Time Course of Perceptual Encoding

Exp. 2: The Dynamics of Perceptual Processing

Trial Sequence
animal? / dog?
stimulus — mask
variable exposure duration
25 33 50   75   125   250 time (ms)

Blocked Target Context

Results
Sensitivity (d')
Exposure Duration (ms)
superordinate / basic

A crossover in performance with increasing exposure durations: superordinate advantage with brief, basic advantage with long.

Exp. 3: Encoding in a Glance

Trial Sequence
animal? / dog?
stimulus — mask
fixed exposure duration, variable mask SOA
25 33 50   75   125 time (ms)

Blocked Target Context

Results
Sensitivity (d')
Mask SOA (ms)
superordinate / basic

The gradual rise in basic performance suggests a longer encoding process for basic categorization when exposure durations are brief.

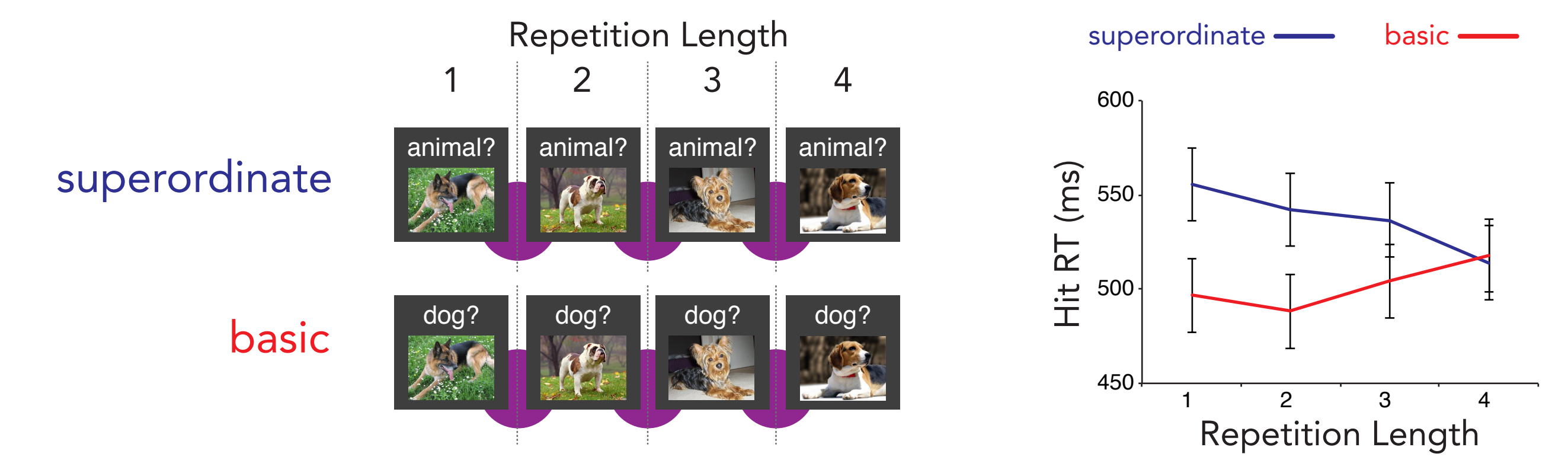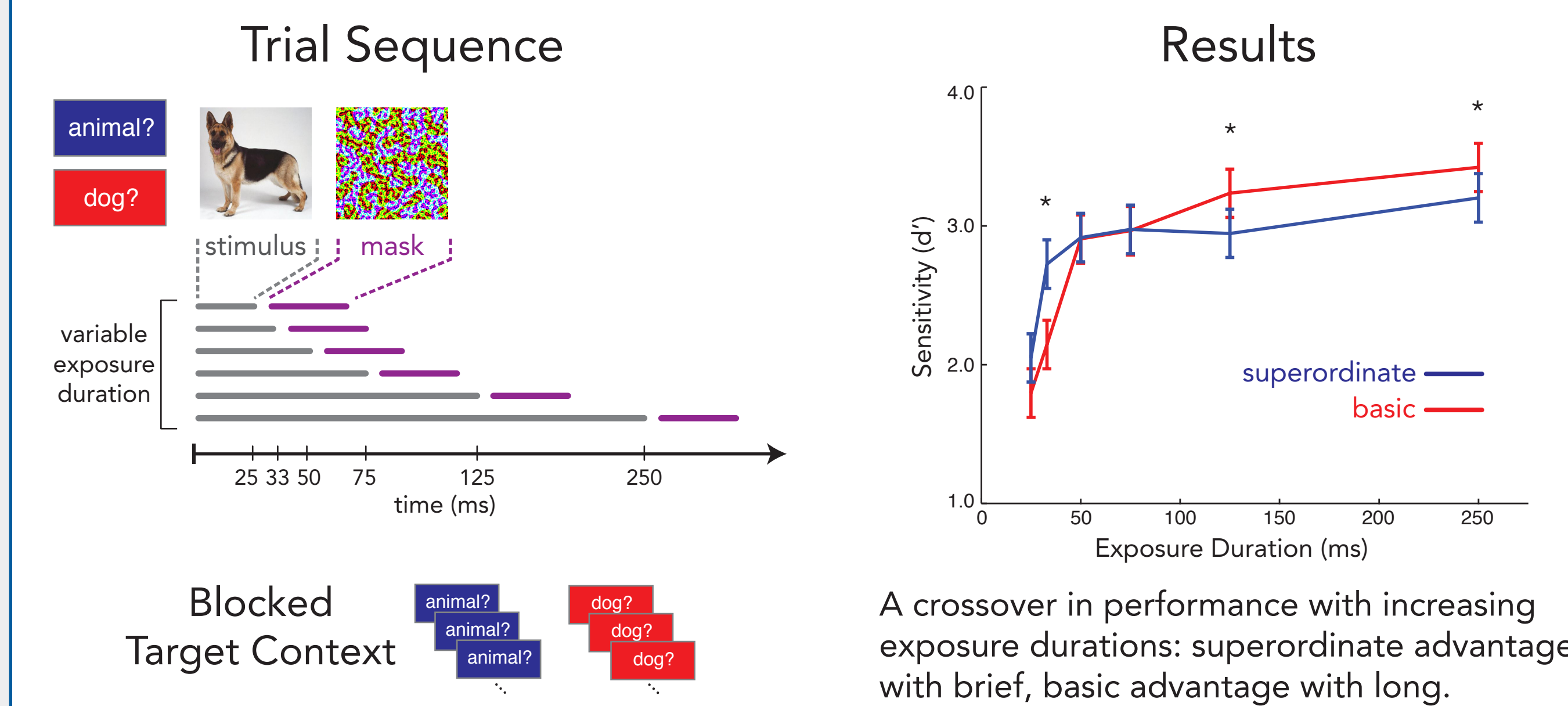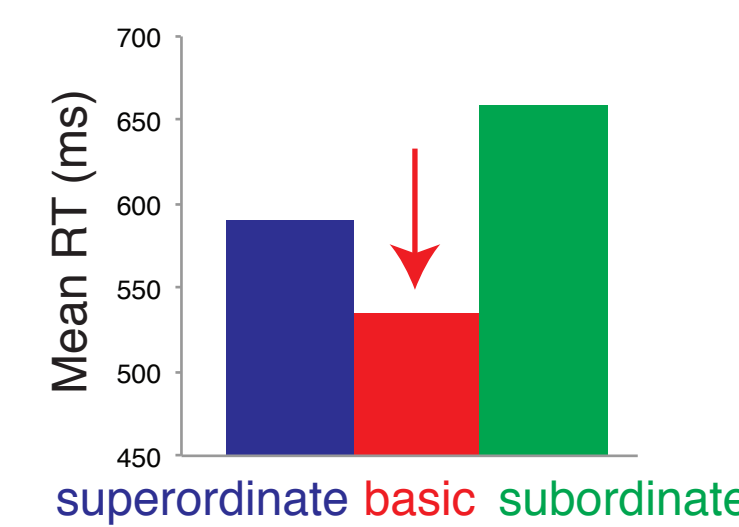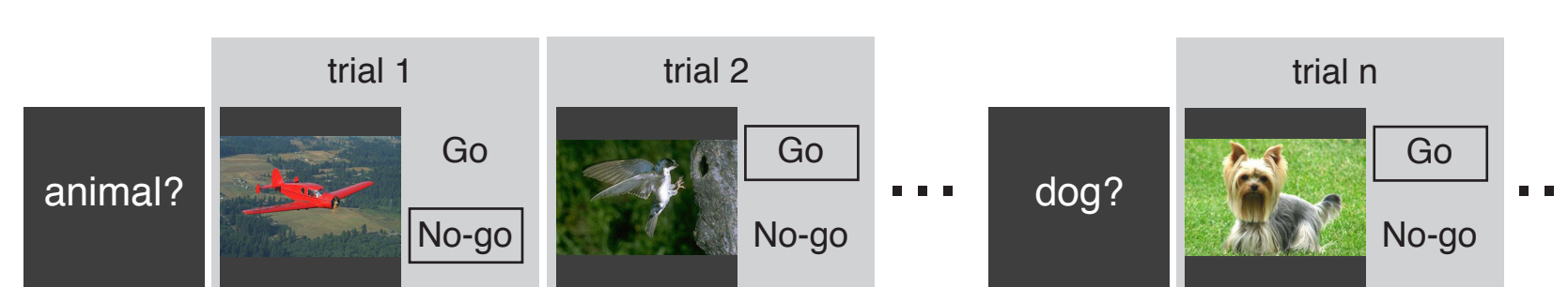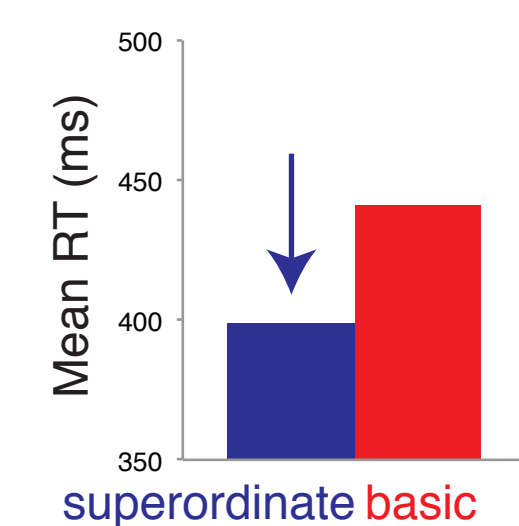## Target Category Context

Exp. 4: Local Shifts in Context

Between-trial effects in Randomized Target Context?

categorization repetitions and alternations
... dog? dog? animal? animal? dog? ...

Trial Pairs (prime trial / probe trial)

baseline / repetition / alternation
odd/even 7, odd/even 4, super, basic

Results
RT (ms) baseline / super prime / basic prime
superordinate basic

Priming Effect (ms)
superordinate basic

Faster superordinate categorization after many repetitions

Repetition Length 1 2 3 4
superordinate / basic

Hit RT (ms)
Repetition Length
superordinate / basic

Conclusions

The speed of categorization depends on a variety of factors. You may spot *animal* faster than *bird*, but only in a glance and when *animal* is the only thing in mind.

Early in processing, perceptual information for superordinate categories is available quickly leading to a superordinate-level advantage. A basic-level advantage emerges with more time for encoding.

Local shifts in experimental context affect superordinate categorization. Basic categorization is relatively automatic. With only a few repetitions, superordinate categorization is as fast as basic categorization.
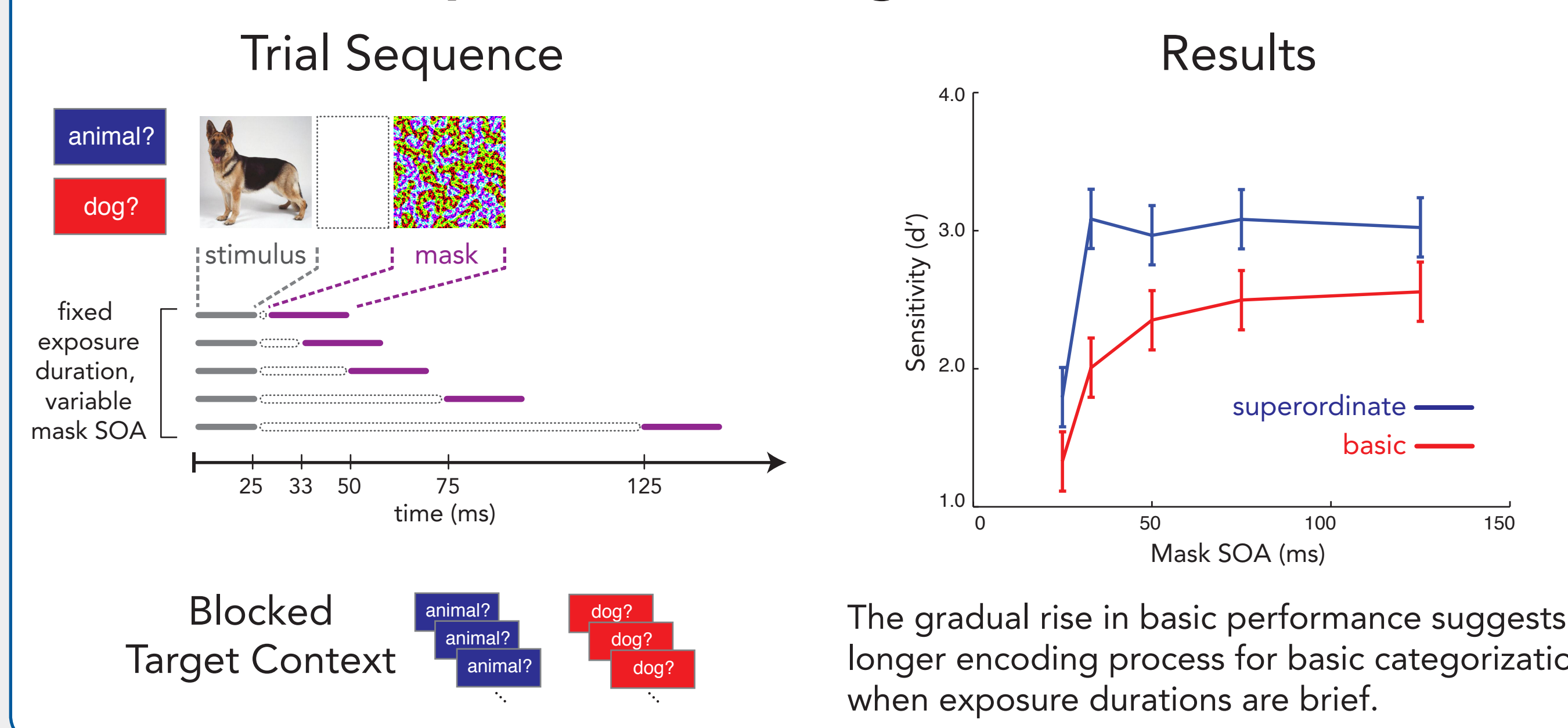
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Acknowledgements

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Temporal Dynamics of Learning Center