The Clash of Visual Categories

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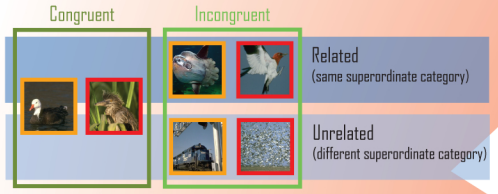
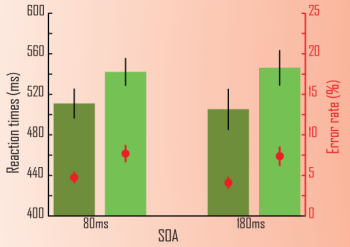
How do multiple simultaneously active visual categories interact?
What is the influence of semantic distance on this interaction?

- Activity evoked in the infero-temporal cortex (ITC) takes time to decay.
- ITC is organized hierarchically
  (e.g. Patterns of activity elicited by a bird and a dog are less distinct than the patterns of activity elicited by a bird and a car)
- The presentation of two objects in rapid succession should induce interaction of neuronal activities. This interaction could be influenced by the hierarchical organization of ITC.

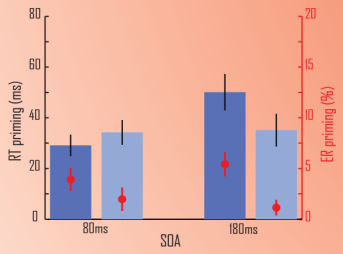
Experiment 1: basic Bird/non-bird categorization



Raw behavioral results

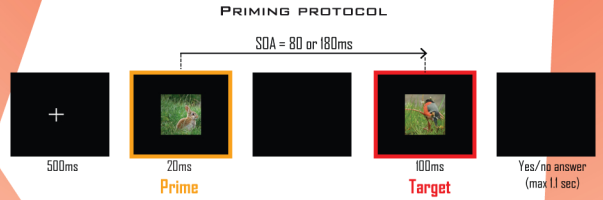


Priming effect (incongruent-congruent)



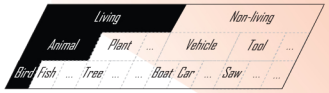
Better performance (RT and ER) in congruent than incongruent condition.
Larger priming effect for related than unrelated primes.
Suggest a competition between simultaneously active category representations dependant on common object attributes.

Priming protocol



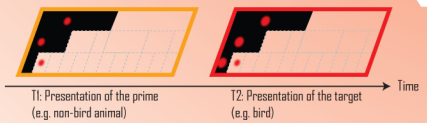
Schematic organization

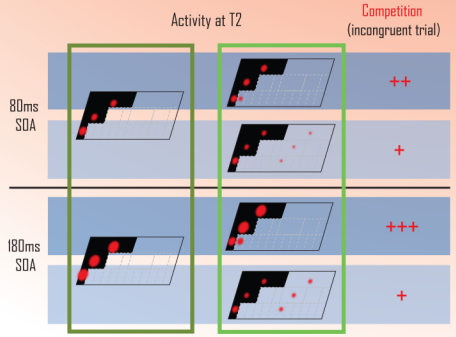
Areas in black represent the activity expected for a bird image.



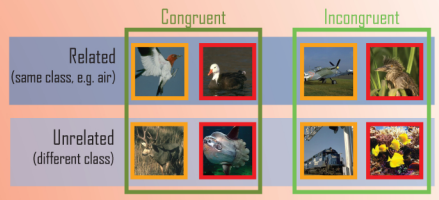
Example of activity in an incongruent trial

Neuronal activity elicited by the stimulus is represented in red.

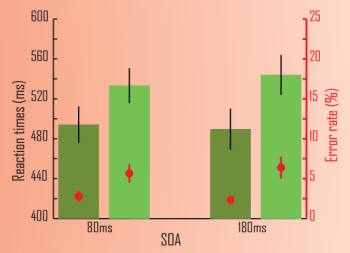




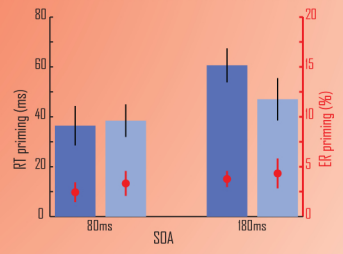
Experiment 2: superordinate Animal/non-animal categorization



Raw behavioral results

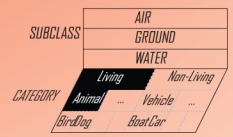


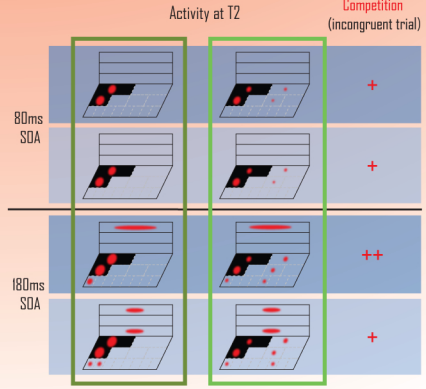
Priming effect (incongruent-congruent)



Better performance (RT and ER) in congruent than incongruent condition.
Larger RT priming effect for related than unrelated primes at 180ms SOA.
Non-diagnostic attributes (possibly semantic) also induce competition between simultaneously active representations.

Schematic organization





Conclusion

- Object attributes are automatically processed.
- The residual activity elicited by a prime affects a subsequent target categorization.
  - the more an incongruent prime shares attributes with the target, the larger the interference.
  - non-diagnostic attributes also interfere with the target categorization but only when enough time is given to process the prime.
- These results suggest a competition between patterns of activity elicited by objects presented in close succession. The amount of competition depends on the extent of overlap between activity patterns.

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