

“Not”s in your mind

Negation causes shifts in thought processes

Rick Dale

Department of Psychology
The University of Memphis
<http://cognaction.org>



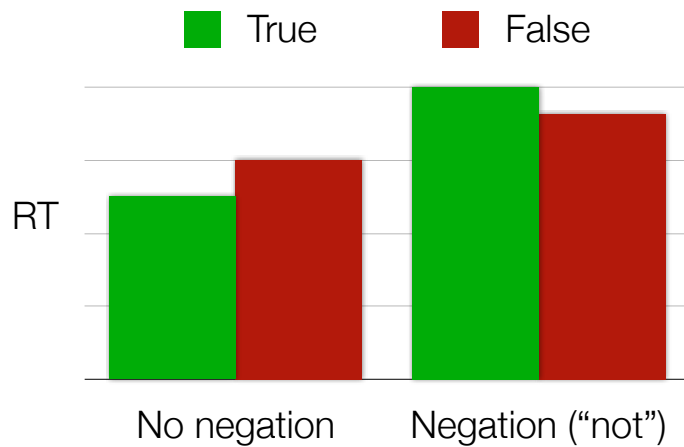
Amuse me...

- A fire is hot.
- A car has eyeballs.
- Summer is not warm.
- Winter is not hot.

Amuse me...

- A fire is hot.**
- A car has eyeballs.**
- Summer is not warm.**
- Winter is not hot.**

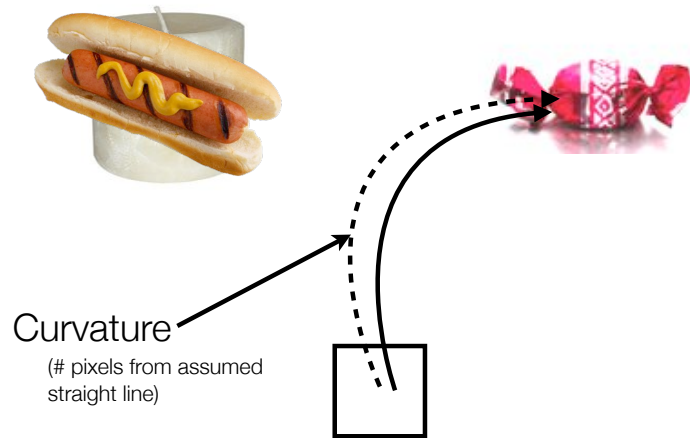
Standard result



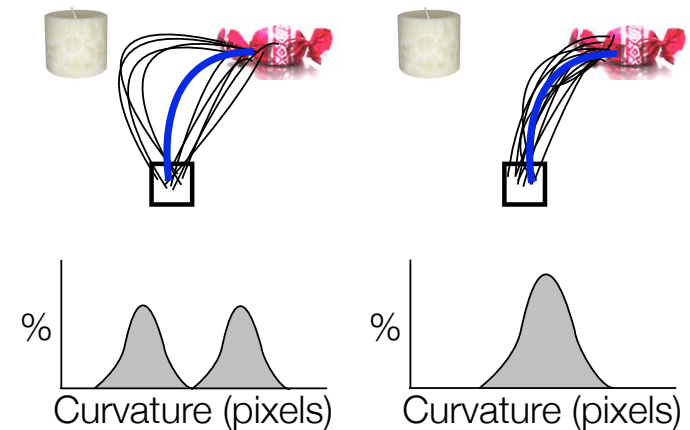
Sentence verification with negation

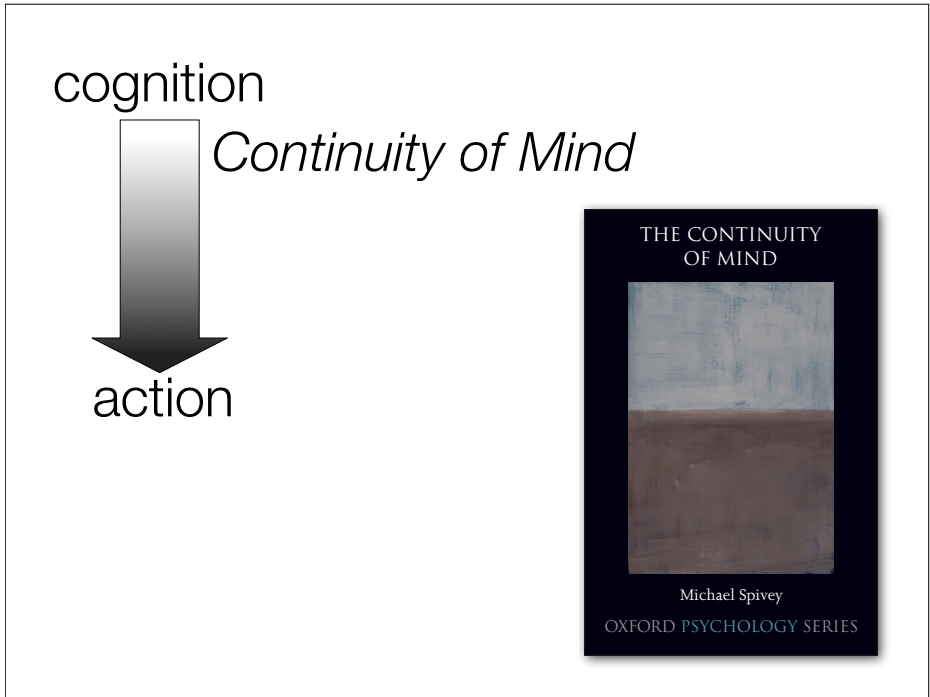
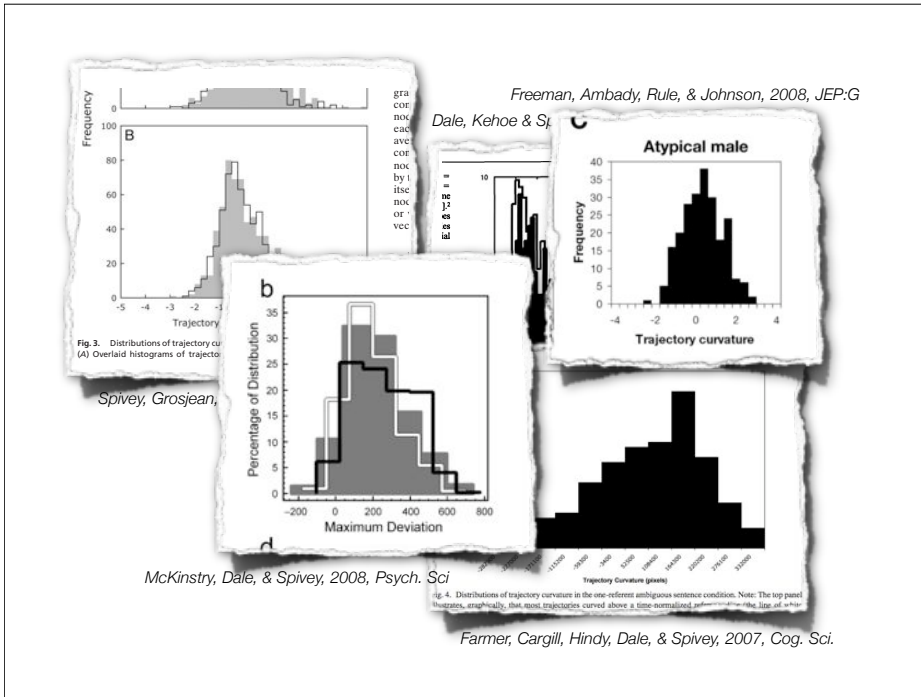
- Affirm or deny: "A fire is **not** hot."
- "In summary, our experiments suggest that negation does involve an extra step, or mental **operation**, ..."
Wason & Johnson-Laird, 1972, p. 39

Cognitive dynamics



Cognitive dynamics

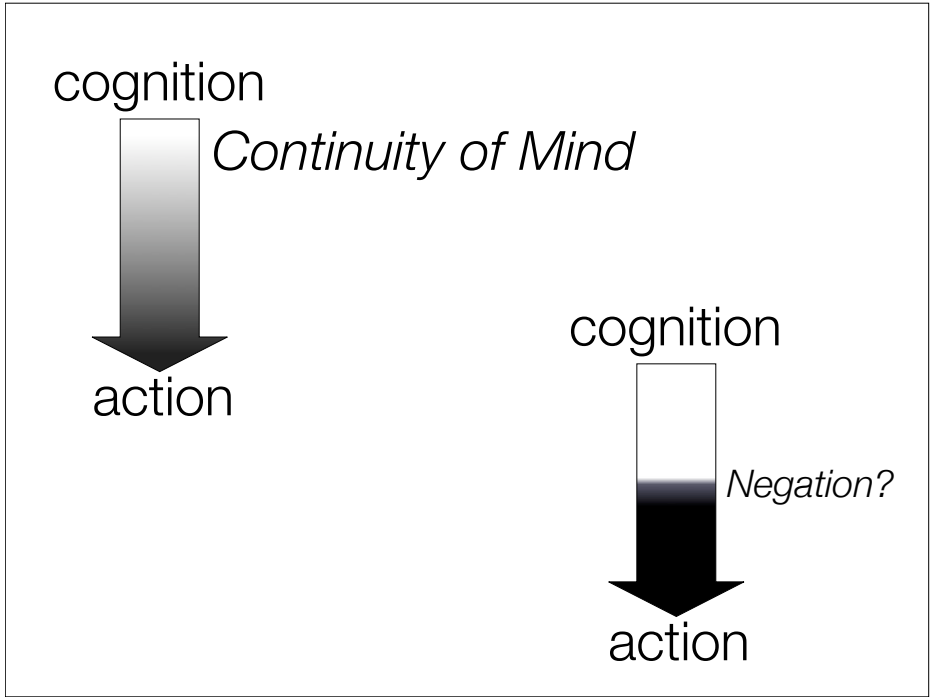


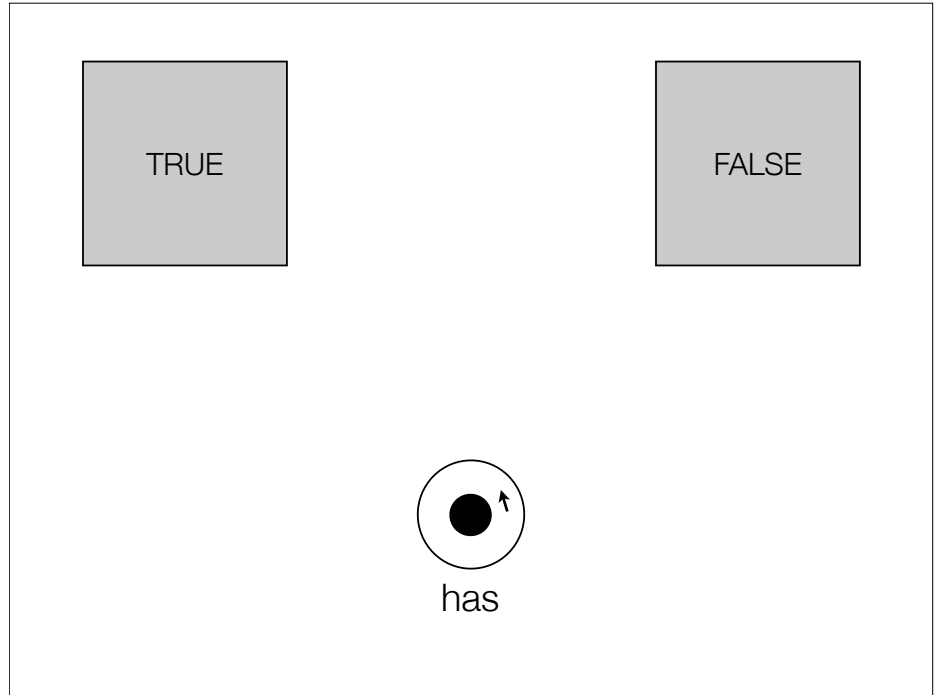
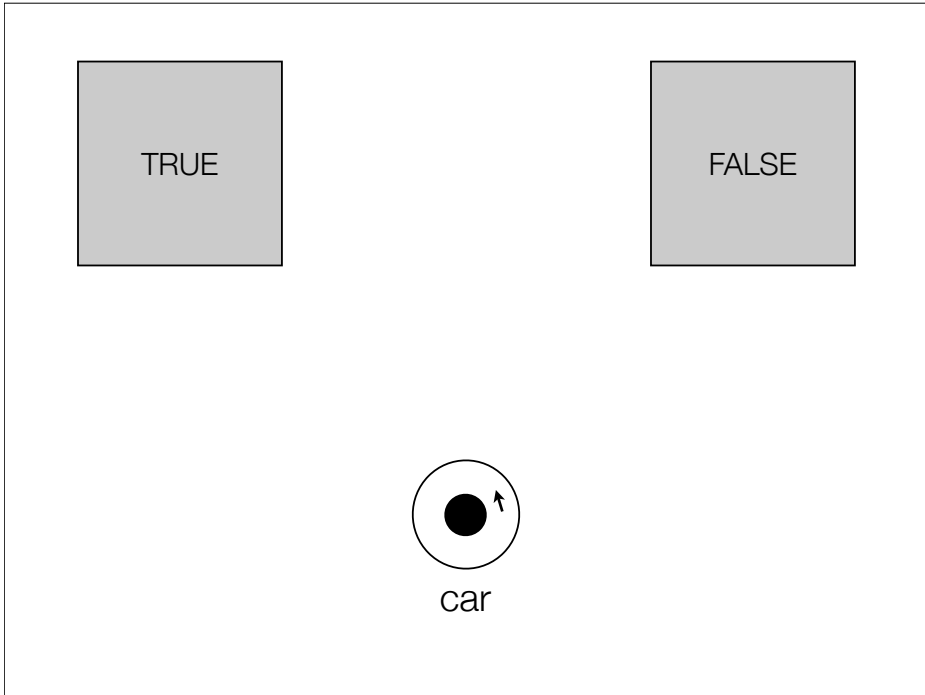
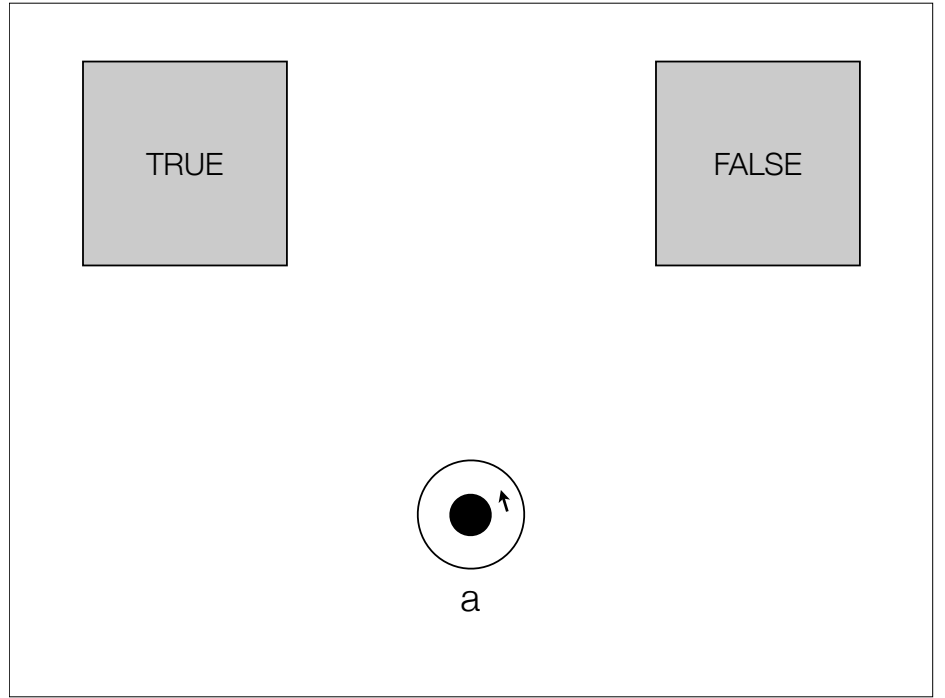
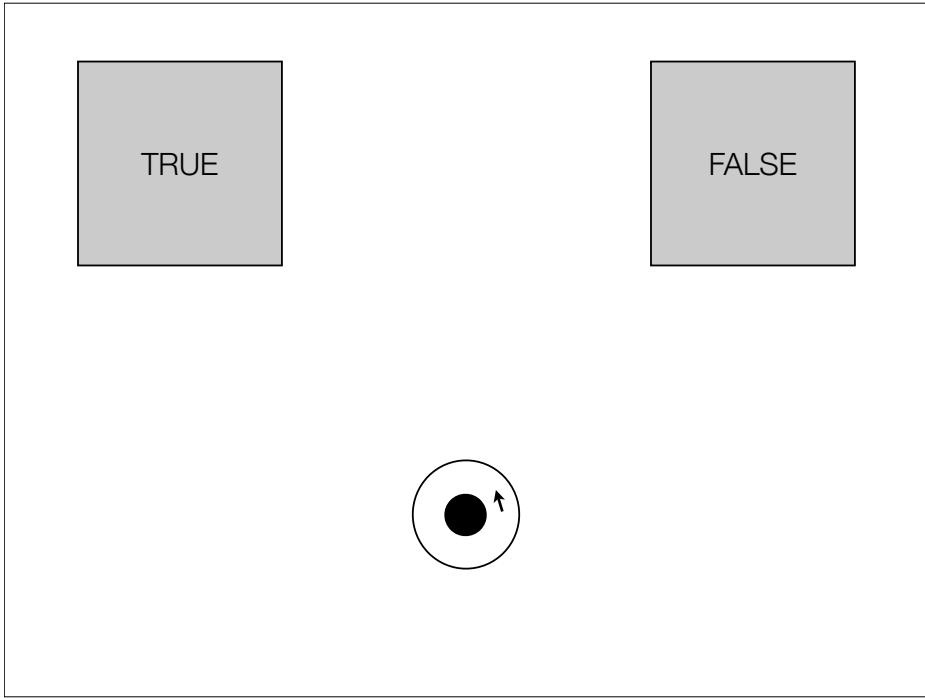


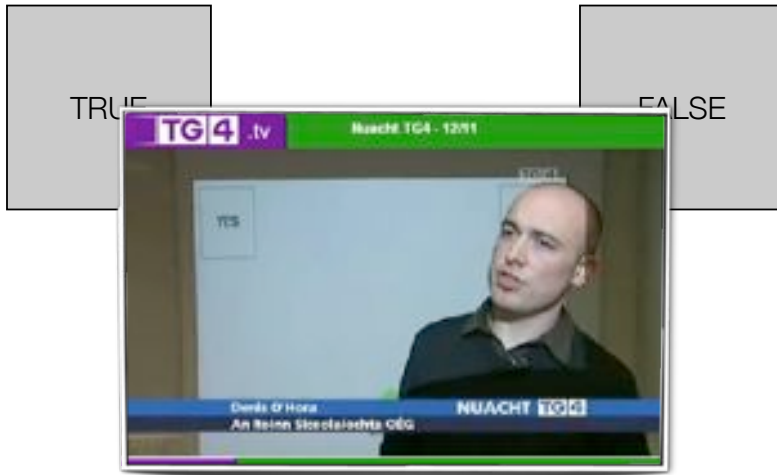
Sentential negation

- Affirm or deny: “A fire is **not** hot.”
- “In summary, our experiments suggest that negation does involve an extra step, or mental **operation**, ...”

Wason & Johnson-Laird, 1972, p. 39







wheels.

Sentence verification

A fire is cold
False, no negation

A fire is hot
True, no negation

A fire is not hot
False, negation

A fire is not cold
True, negation

12 item types total

Stimuli

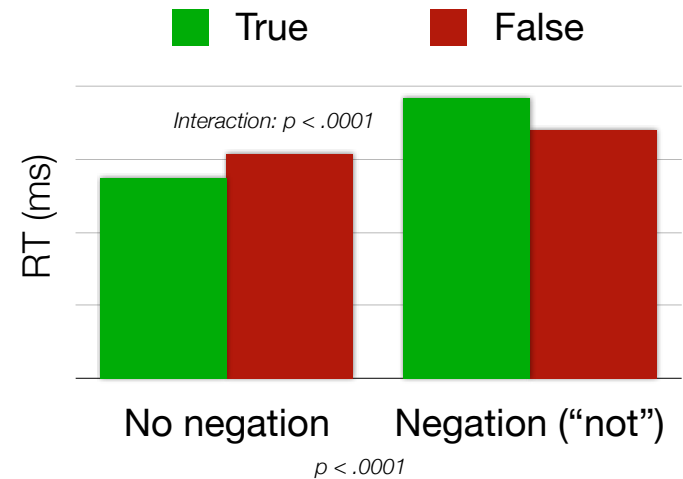
SHIFTS IN COGNITIVE DYNAMICS 29

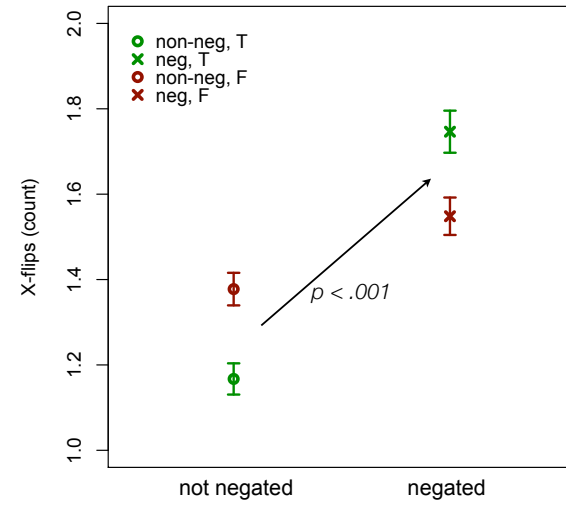
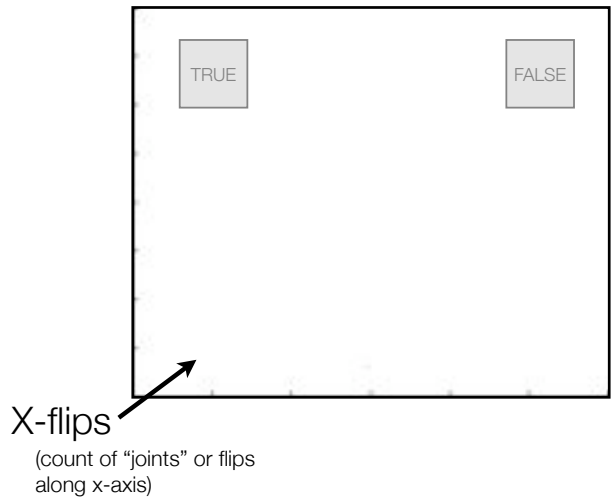
Appendix

1	2
a pillow is (not) soft/hard	cars have (no) wheels/wings
circles are (not) shapes/square	wrestlers are (not) string/weak
pants have (no) legs/arms	ice is (not) cold/warm
people (never) ride/fly bikes	a dog has (no) legs/arms
phones are (not) dialed/eaten	the earth is (not) round/square
the sky is (not) blue/green	elephants are (not) large/small
a bear is (not) large/small	clouds are (not) in the sky/ground
grass is (not) green/blue	a rose is (not) red/blue
the ground is (not) below/above	elastics are (not) stretchy/rigid
secrets are (not) private/public	bananas are (not) yellow/purple
a fire is (not) hot/cold	a tree (does not have) a trunk/door
a rocket is (not) fast/slow	a pen (does not) contain ink/food

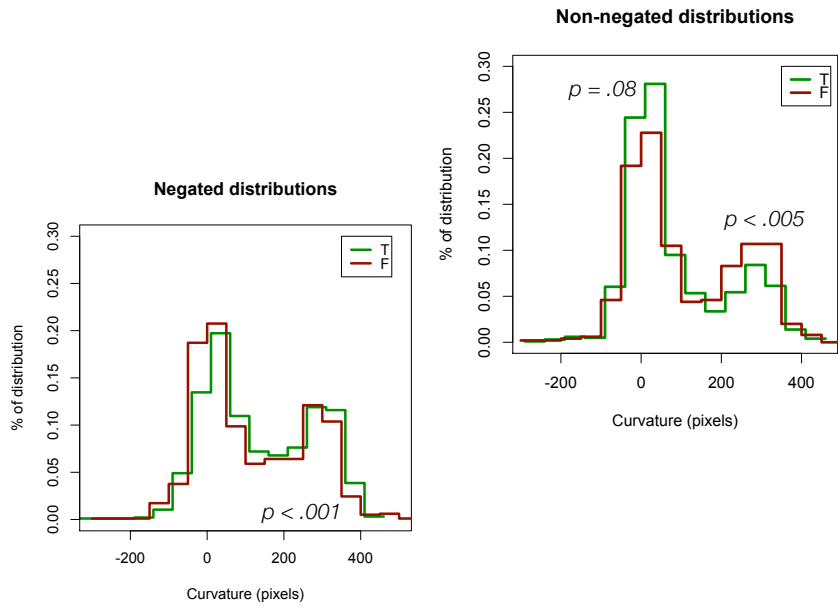
Dale & Duran, under review

Real results

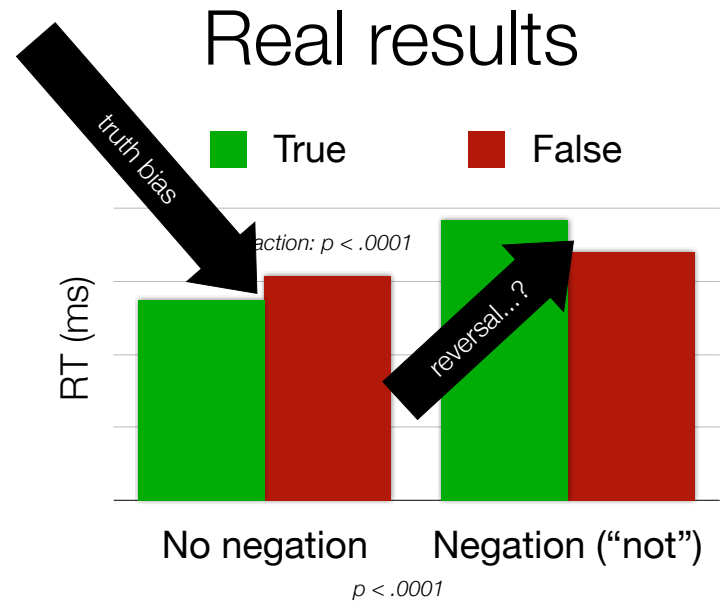




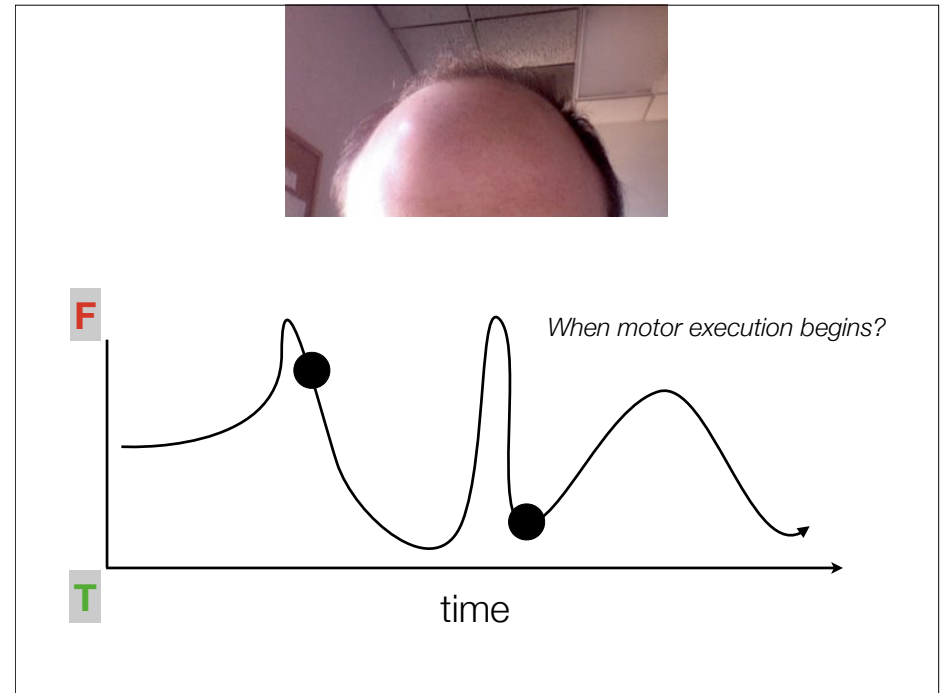
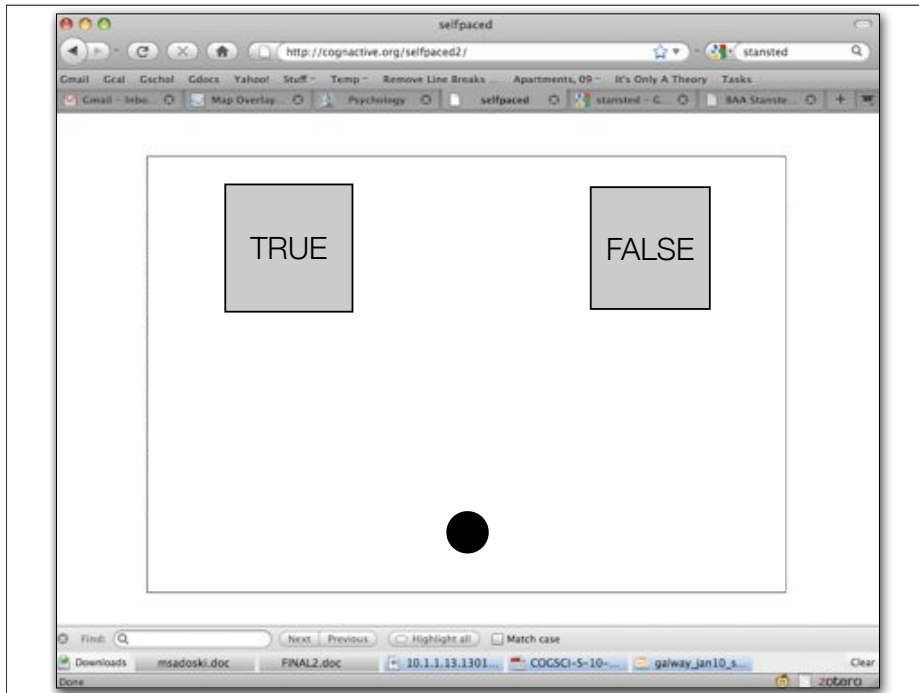
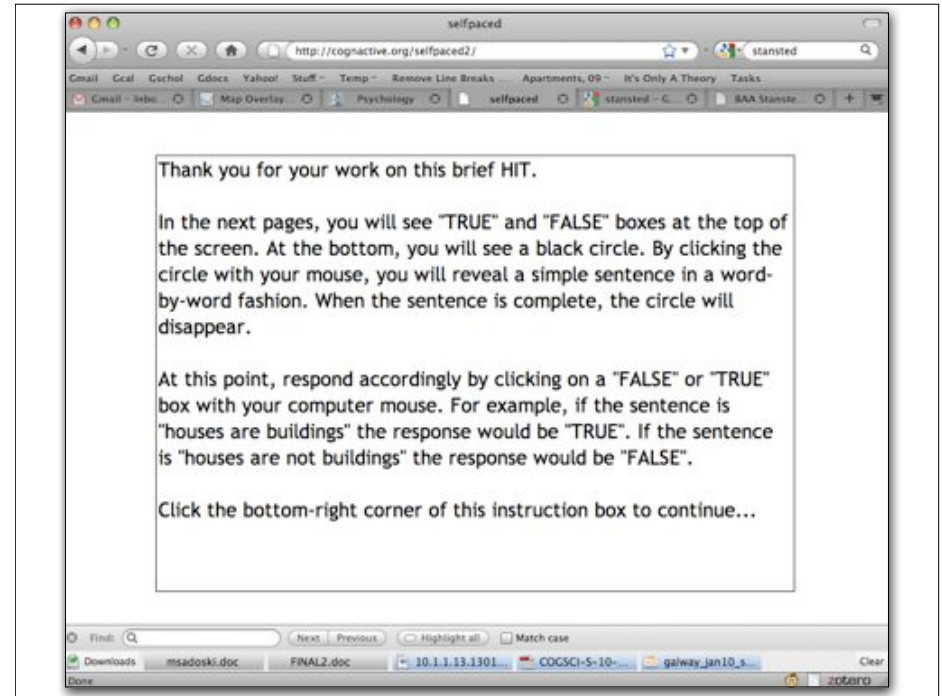
Dale & Duran, under review

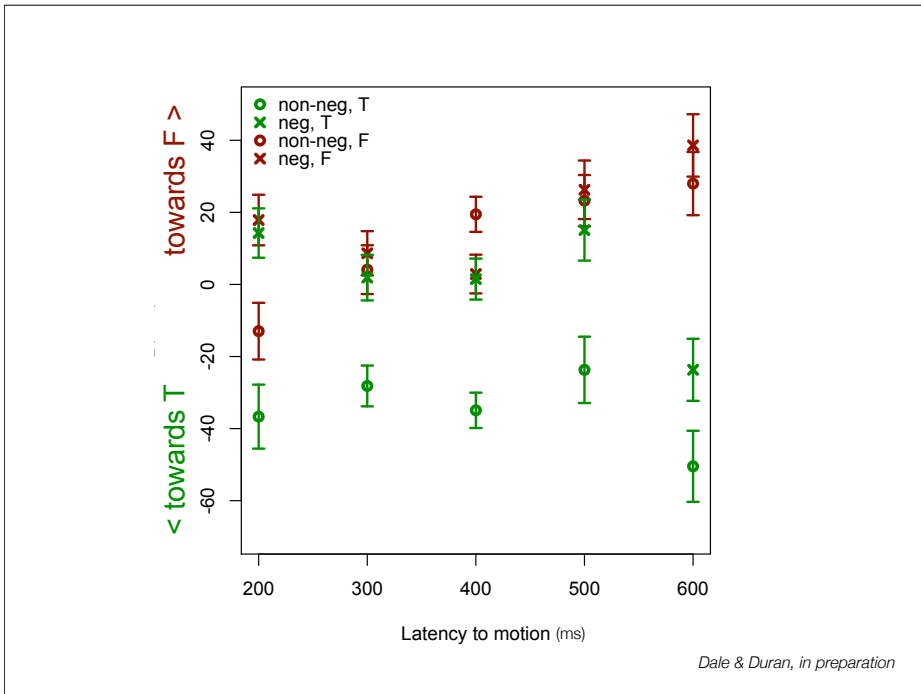
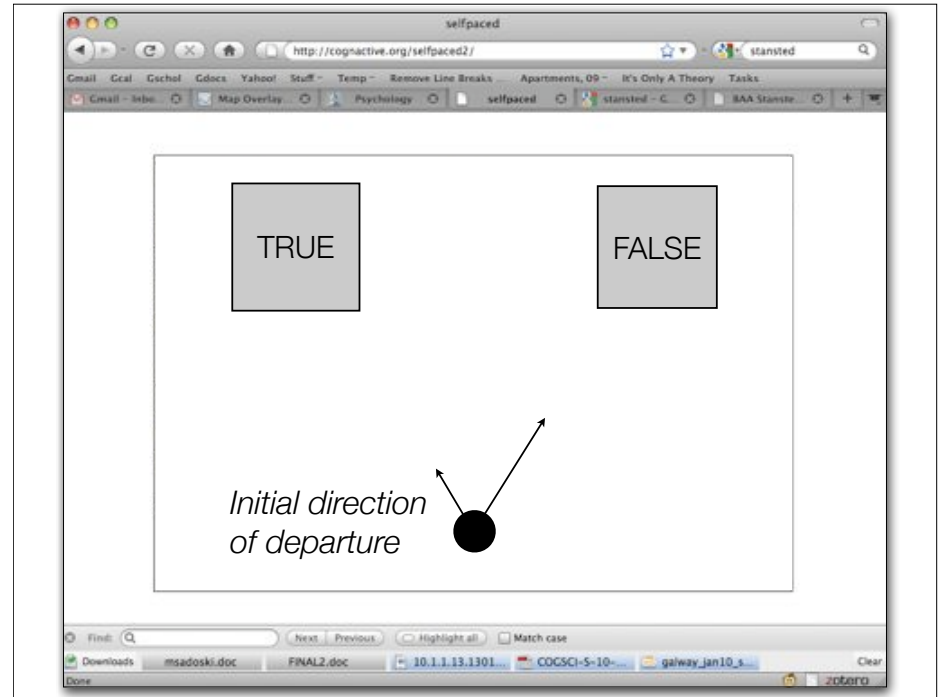
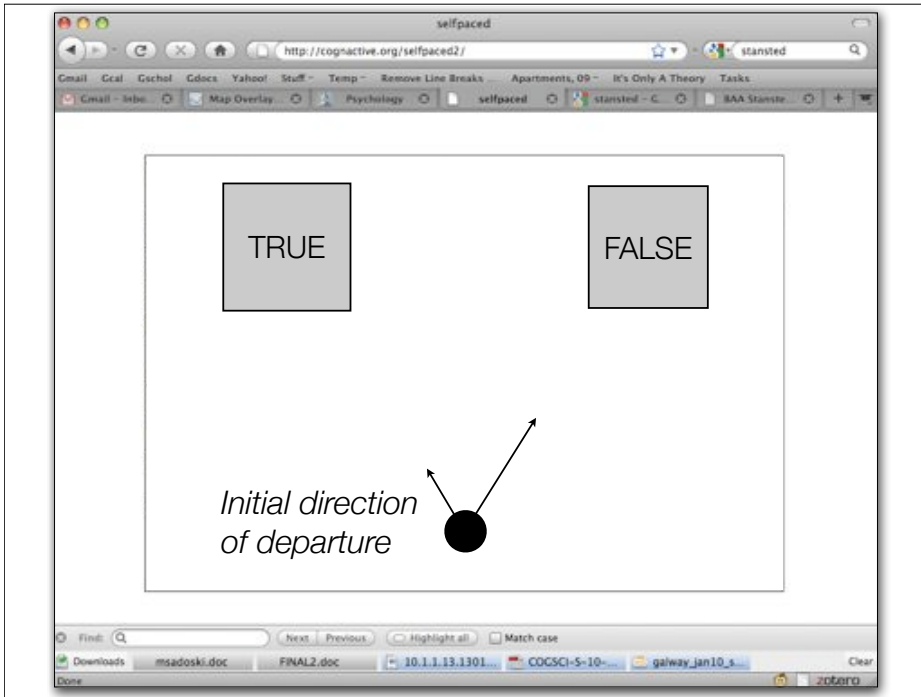


Dale & Duran, under review



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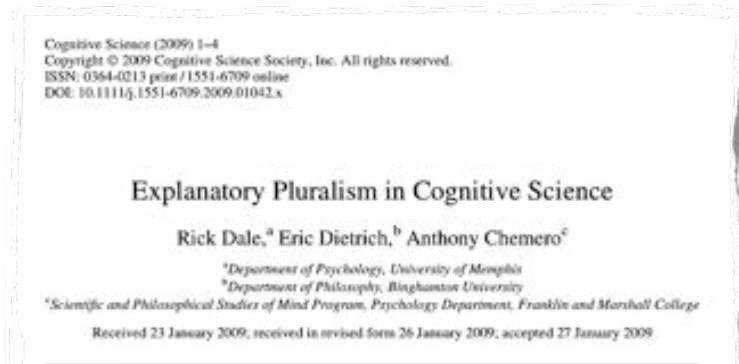


Summary

- Negation induces “jointy” or “shifty” trajectories, suggesting rapid “discrete-like” structure of thinking.
- Negation appears to induce an initial directional bias towards false, potentially explaining interaction.

Broader implications

- Negation as “operator” on dynamics
- Kelso & Engstrøm, 2006:
continuous ~ discrete



Thank you

Nick Duran Michael Spivey



U. Memphis



UC Merced



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