The Cognitive Structure of Everyday Events

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Support
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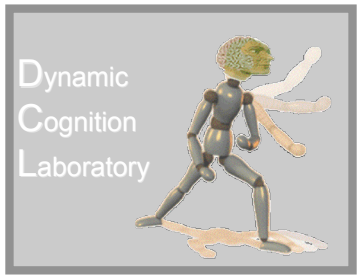

DRAFT SLIDES, 6/17/04

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What is an event?

- A segment of time at a given location that is perceived by an observer to have a beginning and an end

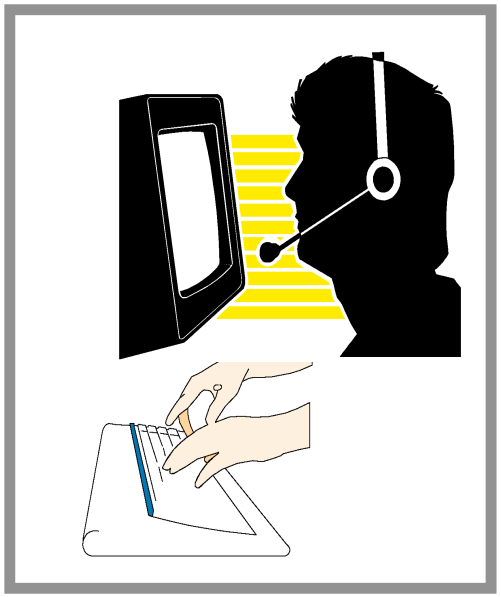
(Zacks & Tversky, 2001, Psych. Bull.)

Yes, but what sorts of events?

- Everyday, goal-directed activity
- Short (< 10 minutes)
- Examples:
  - Making a bed
  - Washing a car
  - Ironing a shirt

Experimental procedure

- Observers watch videos of others performing activities
- Tap a key to mark “natural and meaningful” events
- Vary event grain
  - Fine
  - Coarse



<interactive animation>

Event segmentation

- Reliable
  - Across individuals P(agree) = .28
  - Test-retest > year = .38 (Speer et al., 2003, CABN)
- Hierarchical organization of large-scale and small-scale events (Zacks, Tversky & Iyer, 2001, JEP: General)

Three questions about the neurophysiology of event perception

- Is segmentation a concomitant of normal perception?
- Does brain activity distinguish large from small events?
- What can the neuroanatomy tell us about how event parts are detected?

Functional MRI

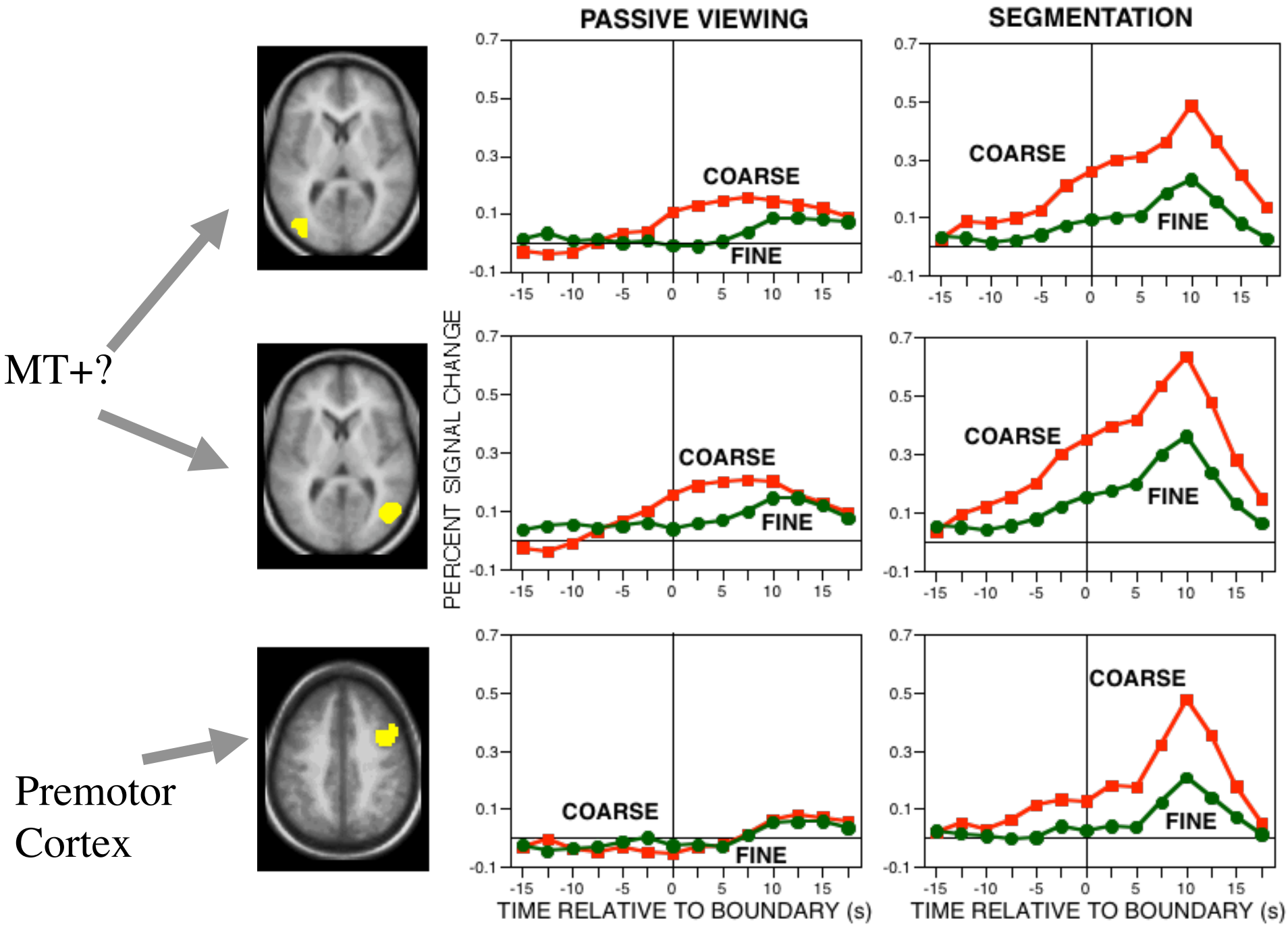
- fMRI: Measures local changes in blood properties due to neural activity
- Good temporal resolution (2.16-2.36 s)
- Good spatial resolution (3.75 mm)

(Zacks, Braver, et al., 2001, Nat. Neuro.)

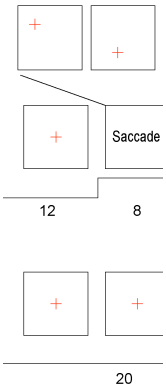
Key problem: How to observe without disturbing?

- Solution:
  - Use observers' event boundaries to define "trials."
  - Collect segmentation data after functional imaging.

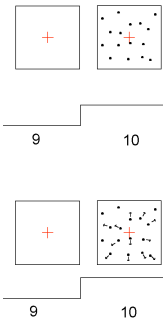
- Scans 1-4: passive viewing
- Training on coarse segmentation
- Scans 5-8: coarse segmentation
- Training on fine segmentation
- Scans 9-12: fine segmentation

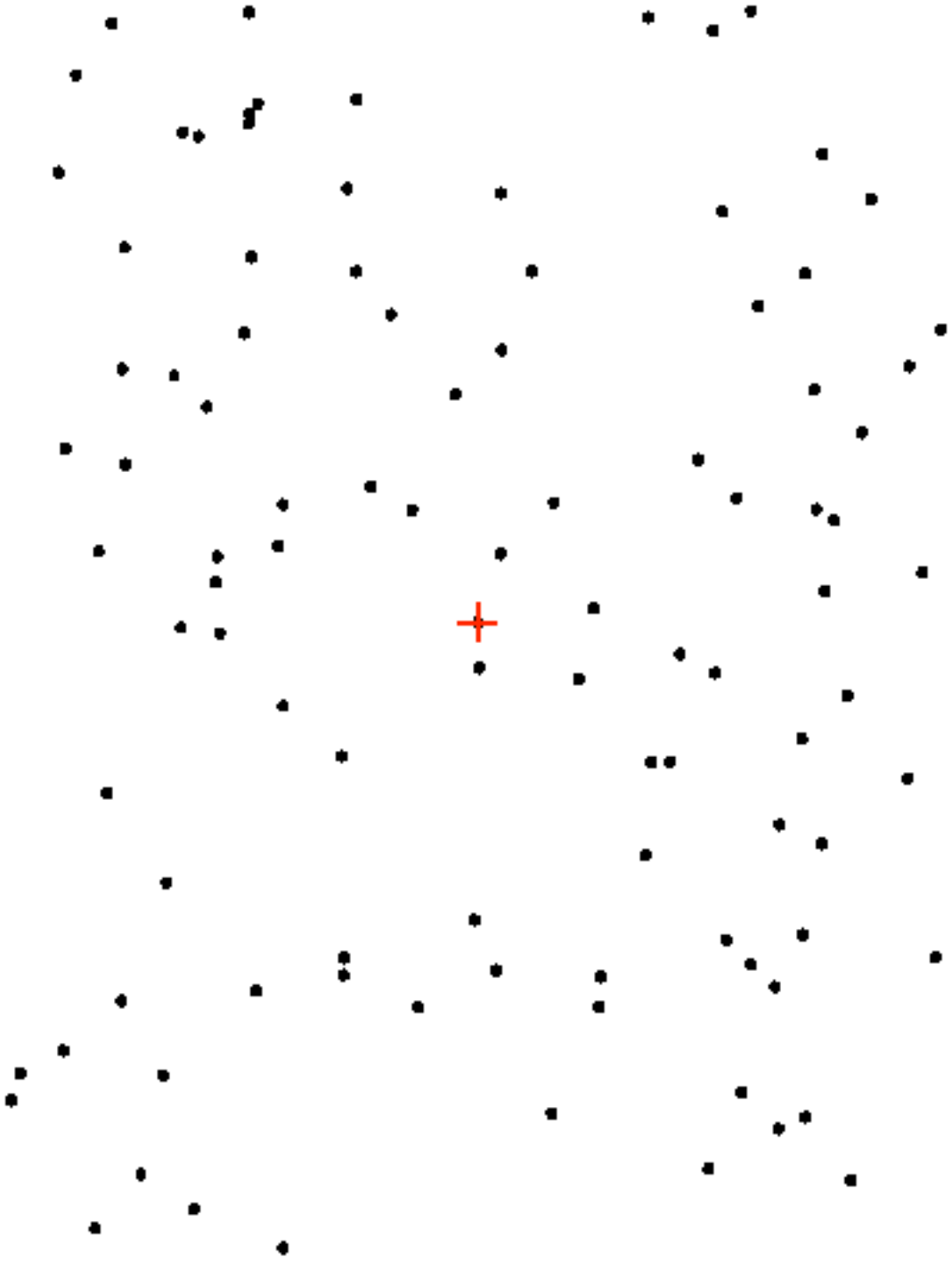

PASSIVE VIEWING
SEGMENTATION
MT+?
Premotor Cortex
COARSE
FINE
PERCENT SIGNAL CHANGE
TIME RELATIVE TO BOUNDARY (s)
0.7
0.5
0.3
0.1
-0.1
-15
-10
-5
0
5
10
15

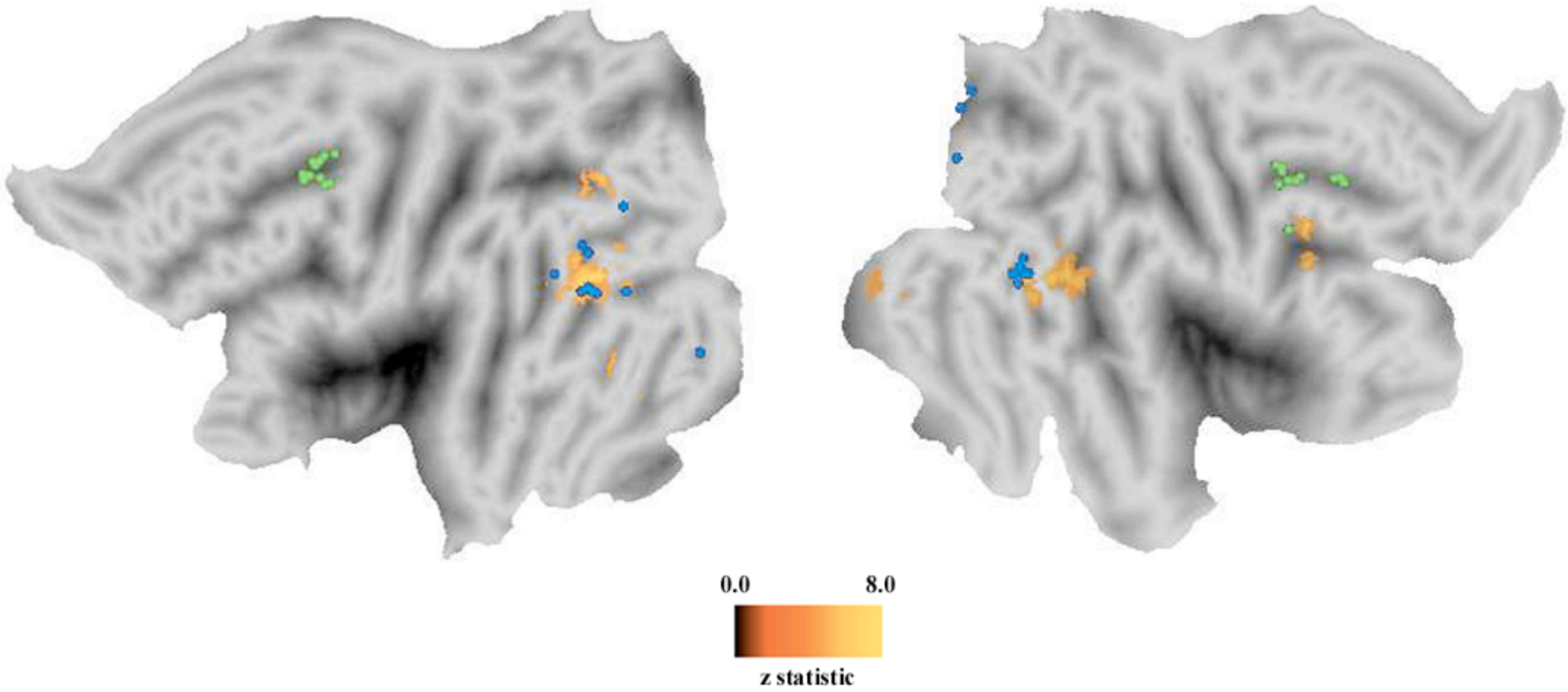
Localization Sc



Localization Sc







(Swallow et al., 2003, NeuroImage)

Neural processing

- Is event segmentation a concomitant of normal perception?
  - YES
- Does brain activity distinguish large from small events?
  - YES
- What can the neuroanatomy tell us about how event parts are detected?
  - Prominent activity in MT+
  - Motion processing?

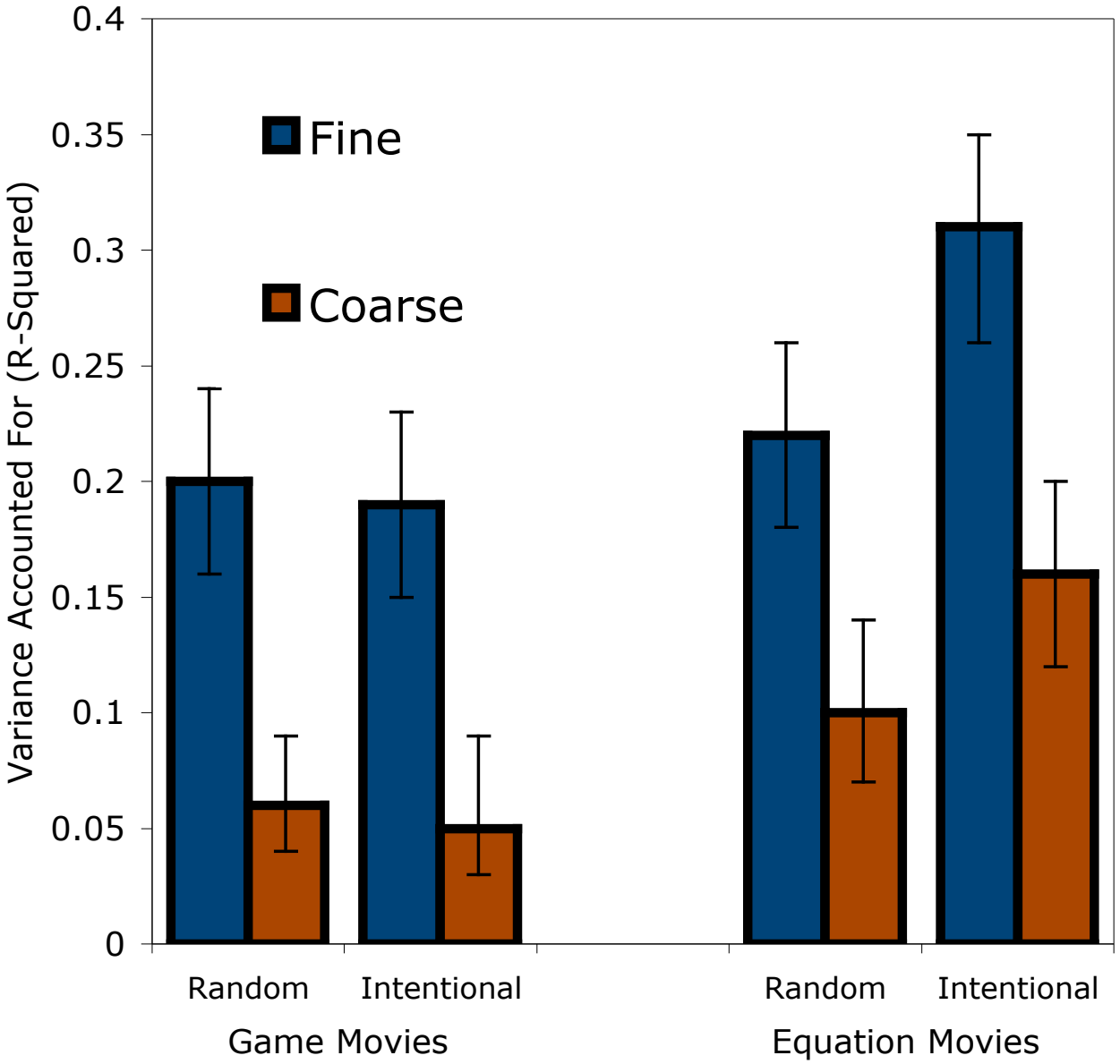
Movement and segmentation

- How do people use motion information to encode activity?

(Zacks, in press, Cognitive Science)

- Attribution manipulation
  - Intentional
  - Random
- Stimulus manipulation
  - Game
  - Equation

<interative animation>


0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Variance Accounted For (R-Squared)
Fine
Coarse
Random
Intentional
Random
Intentional
Game Movies
Equation Movies

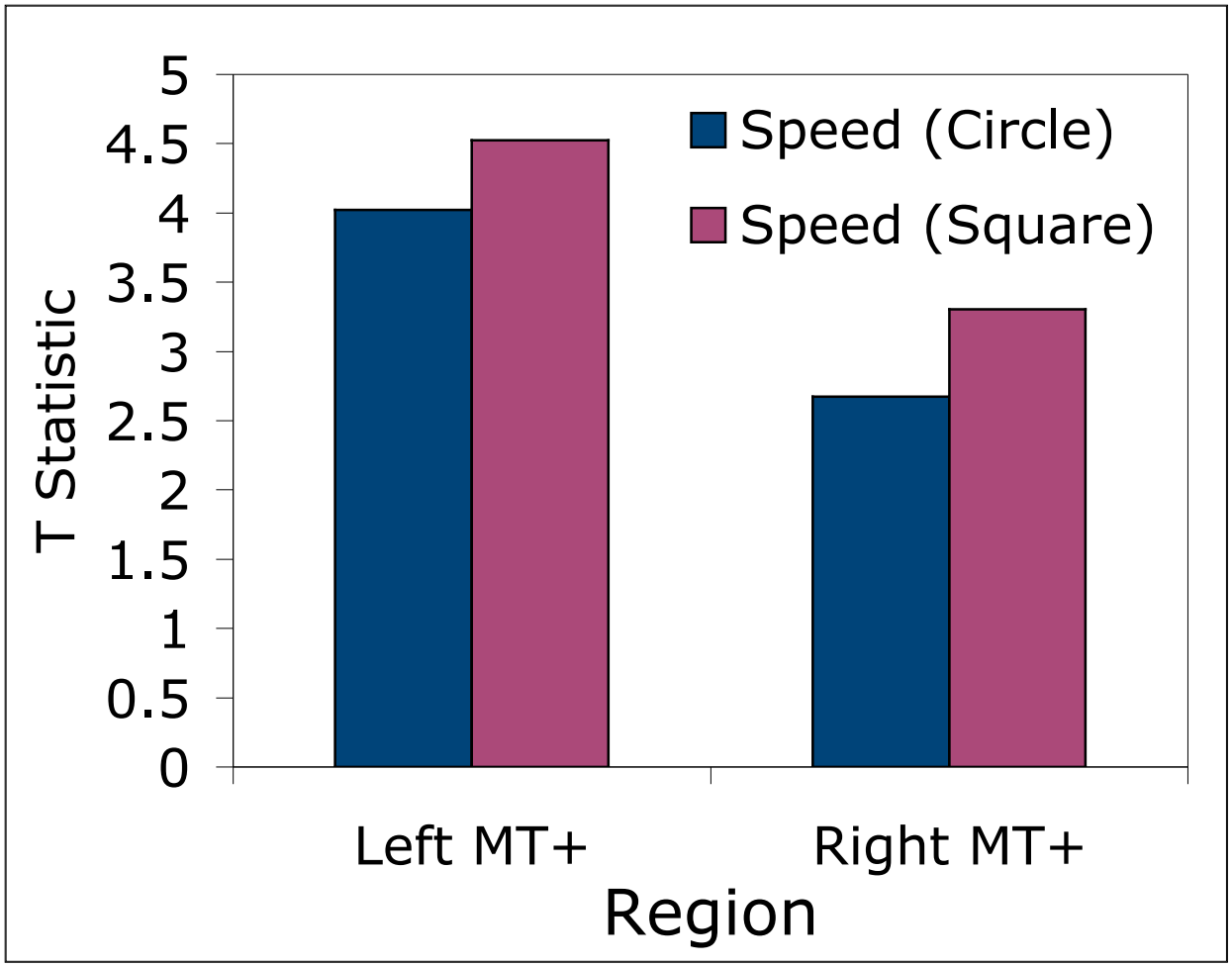
Movement and segmentation

- Movement information can be used to identify event boundaries
- When activity is intentional, something more is happening

Functional MRI of Simple Animations

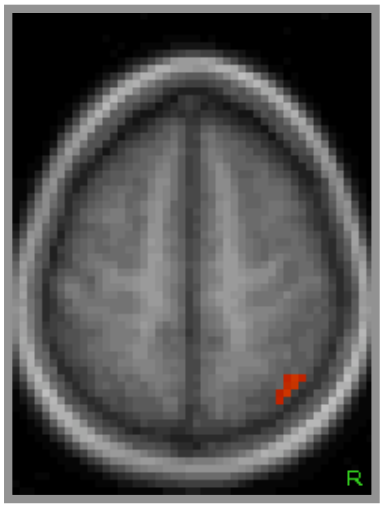
- Random animations
- Passive viewing during scanning
- MT+ localizer

MT+ Correlated With Object Speed



Occipito-parietal Cortex Correlated With Object Acceleration

z = 30



z = 51

Conclusions

- Event segmentation is a reliable concomitant of normal perception
- Perceptual and neural processing distinguish large-scale and small-scale events
- The perception of event structure is related to
  - bottom-up processing of movement
  - top-down processing of goals, plans, and conventions

Dynamic Cognition Laboratory

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