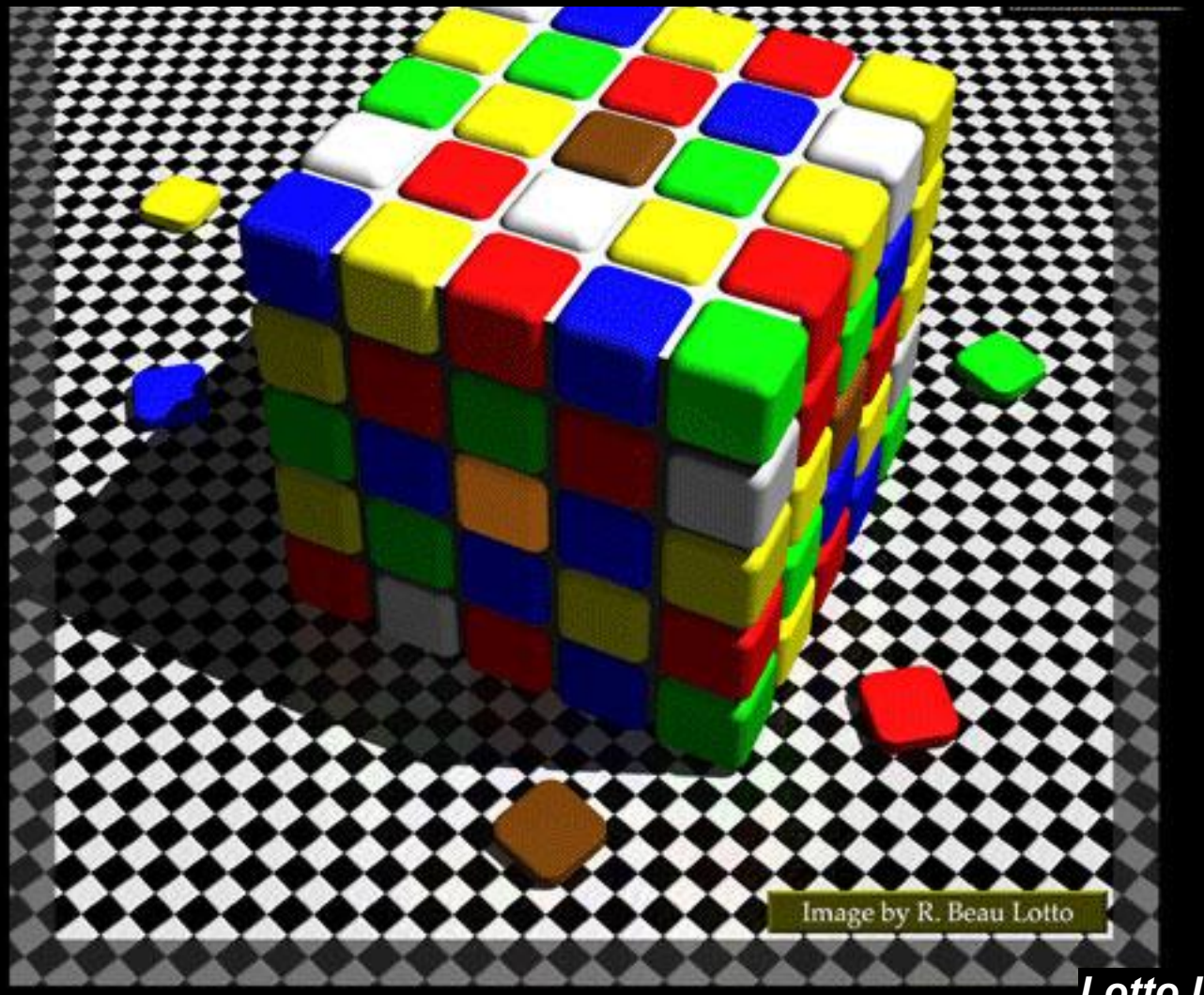
introduction to neuroscience:
brain as a machine

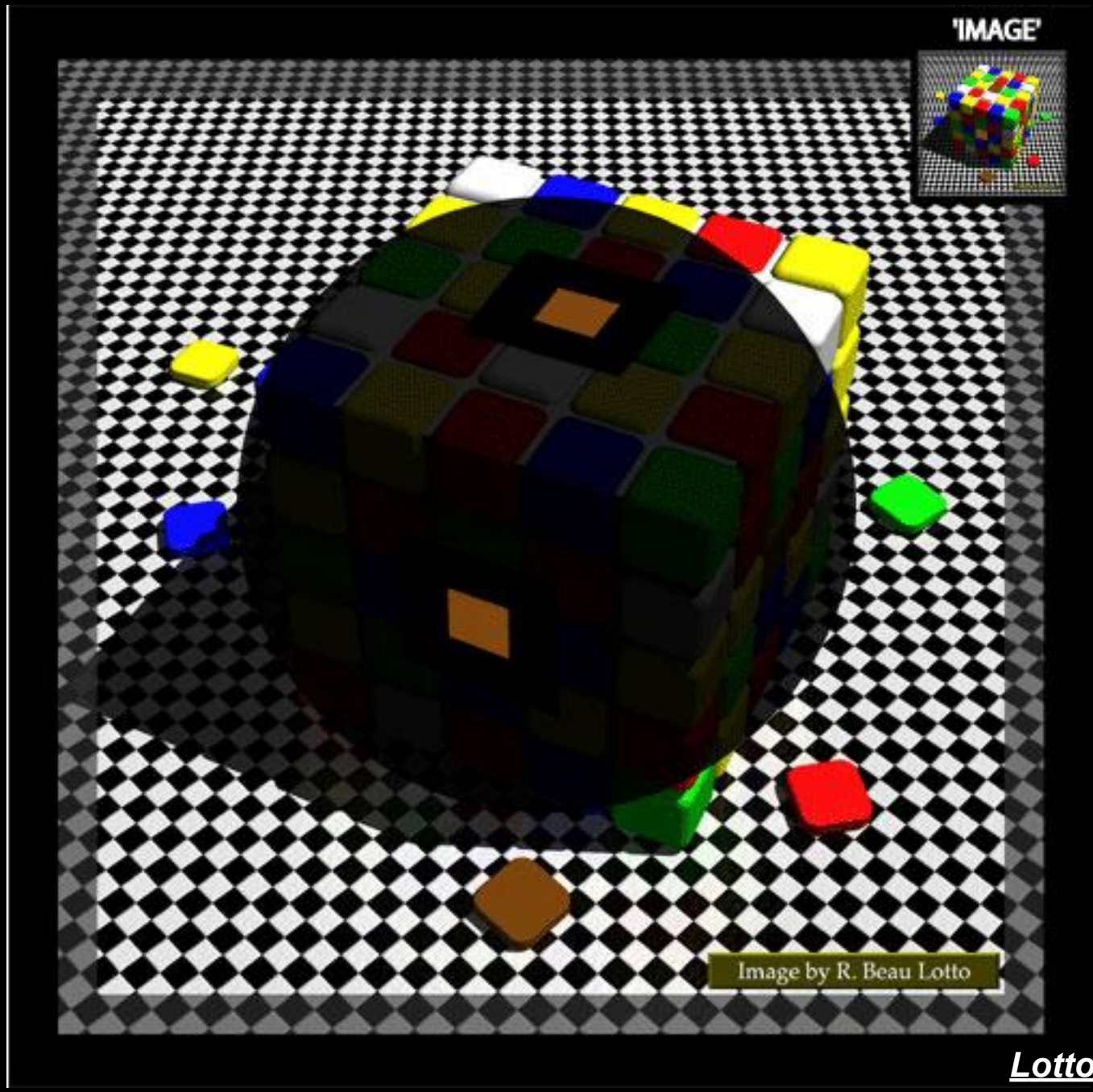
jonas kubilius | lietuvos jaunųjų mokslininkų sąjungos stovykla | 2009-07-24

color tile illusion



Lotto Lab

color tile illusion

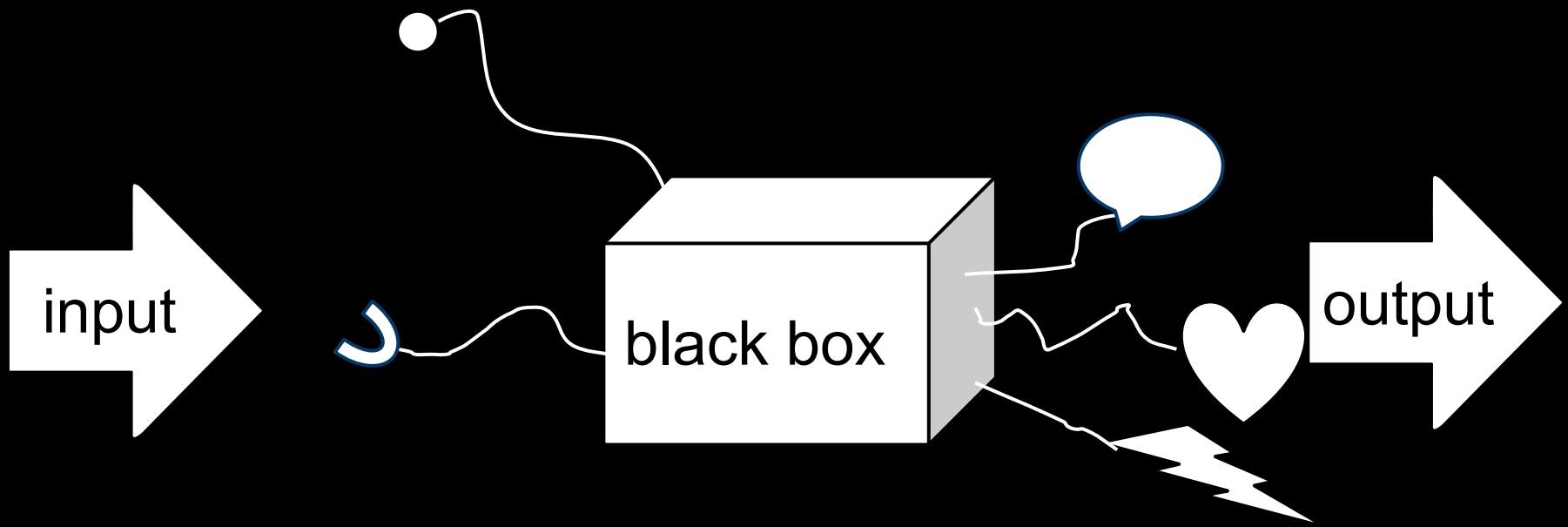


Lotto Lab

the brain

what do we know?
what don't we know?
what can we learn experimentally?

functionalism

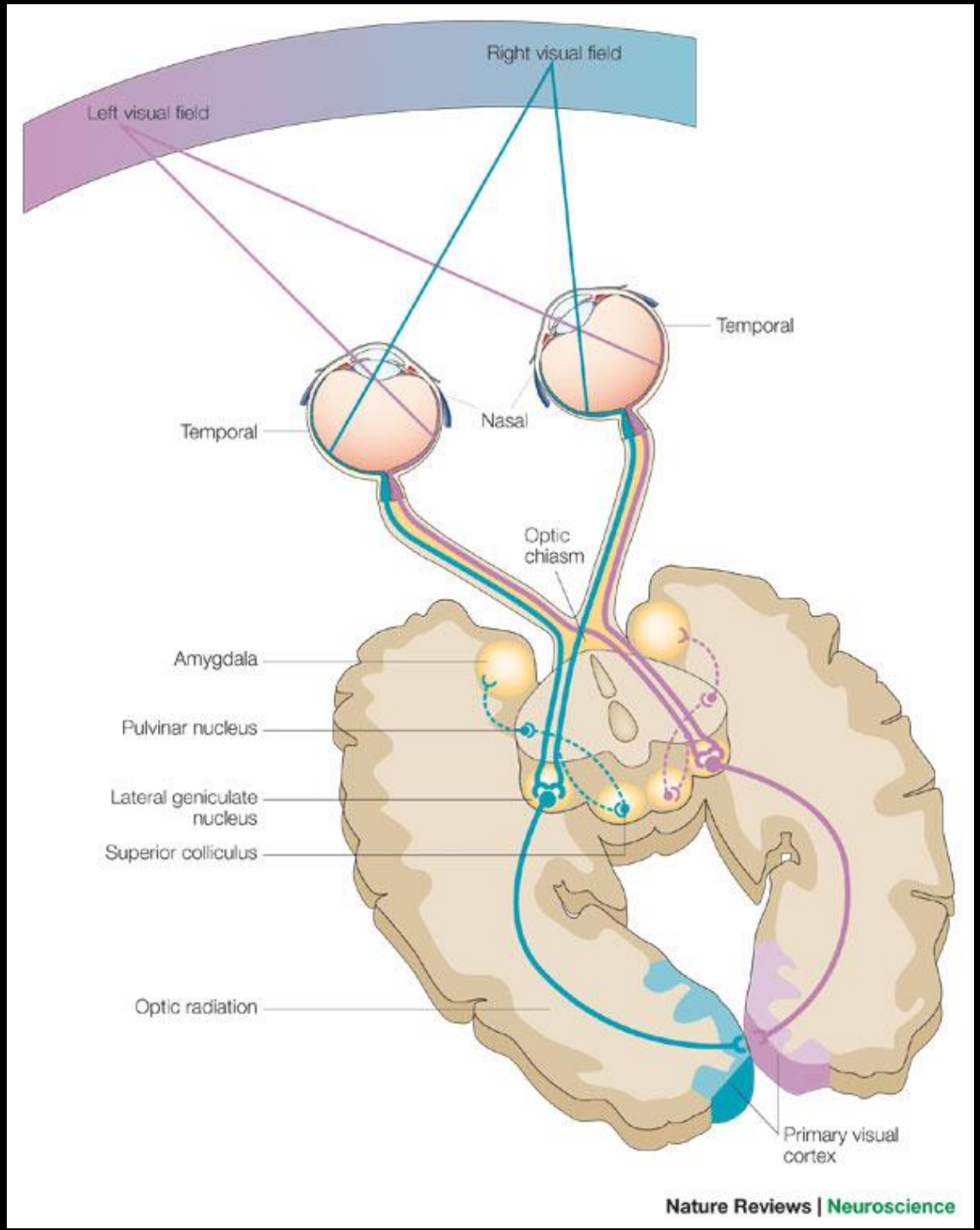


3 simple steps to consciousness

1 early vision
2 higher vision
3 higher cognitive funtions

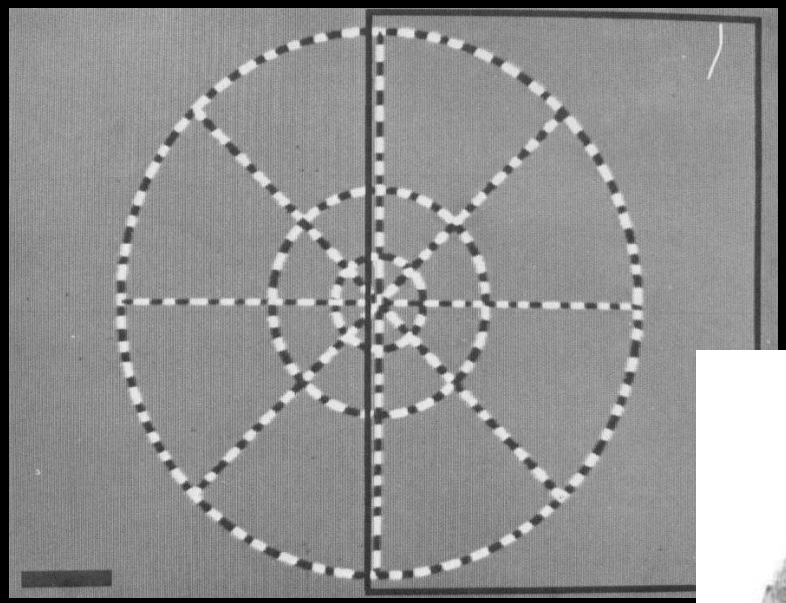
step 1

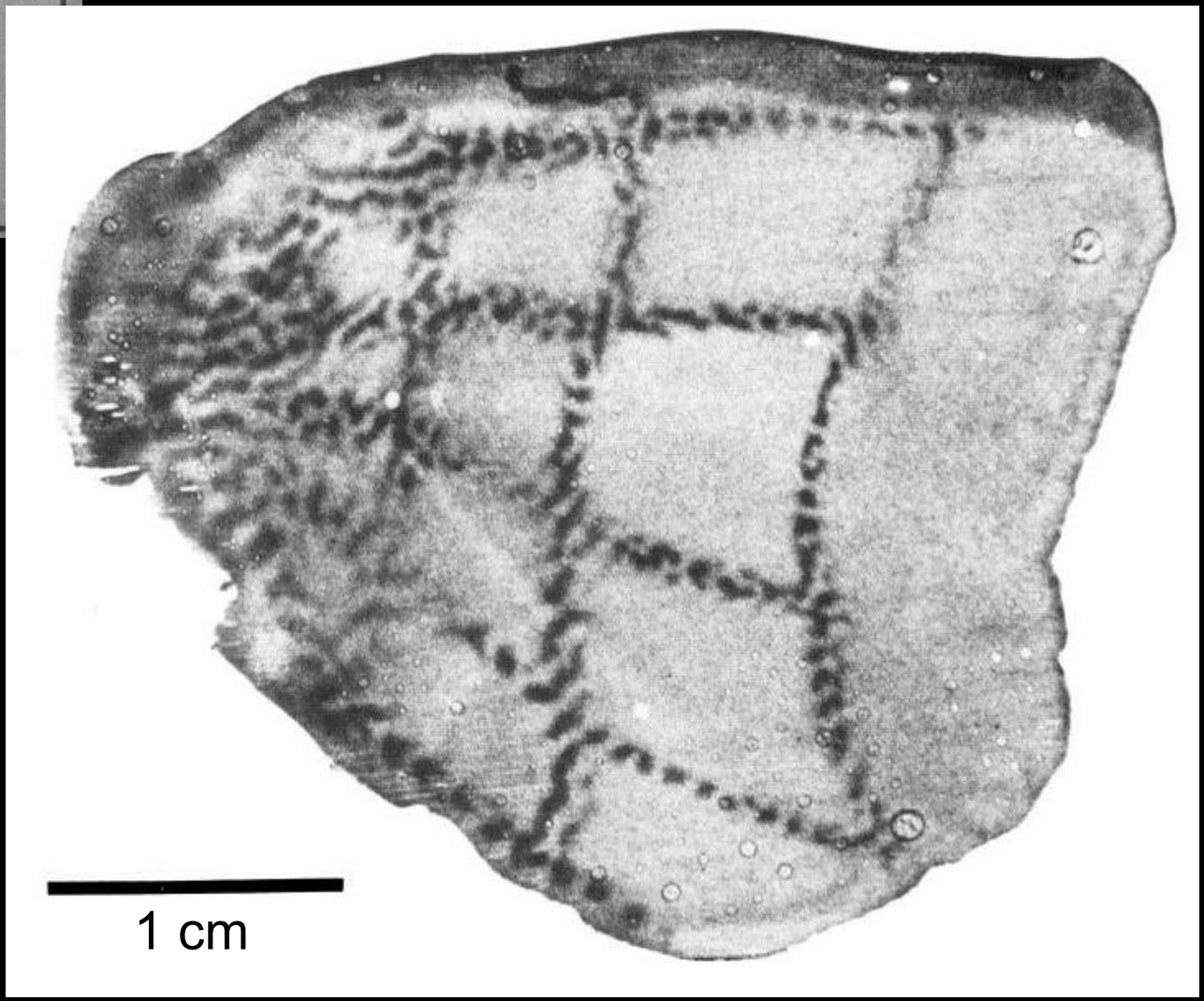
visual system



Hannula et al., *Nat. Rev. Neurosci.* (2005)

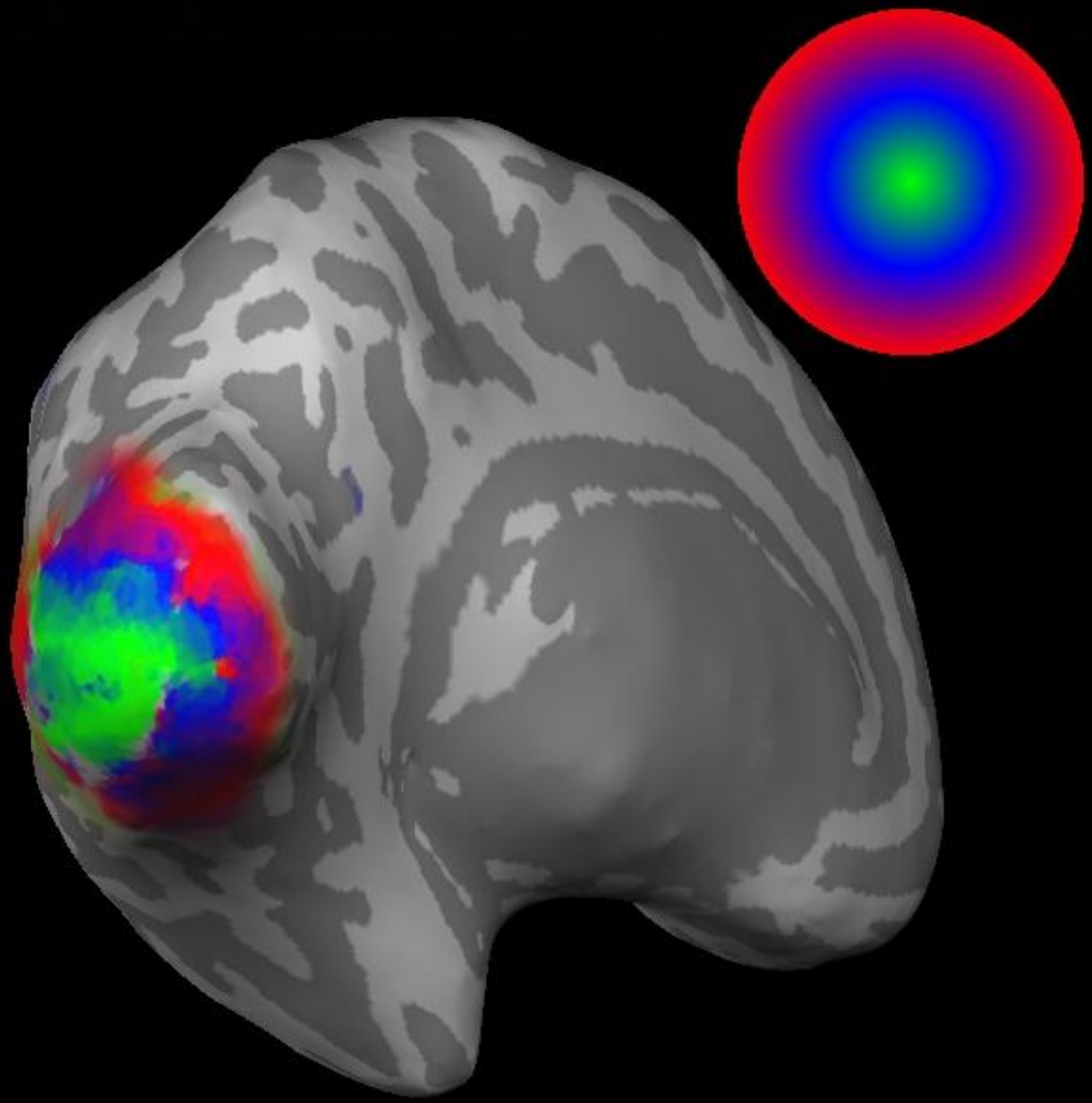
retinotopy





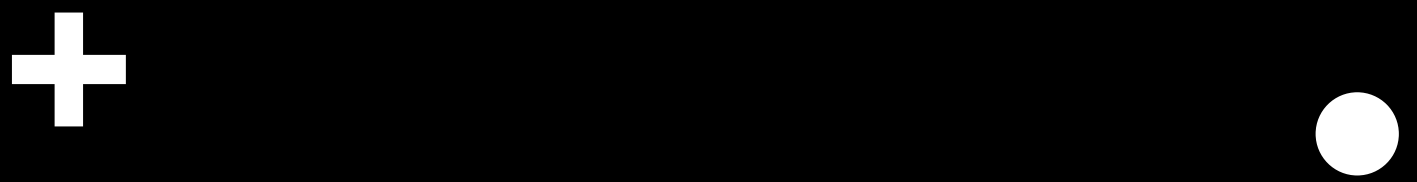
Tootell et al., *J. Neurosci.* (1988)

retinotopy

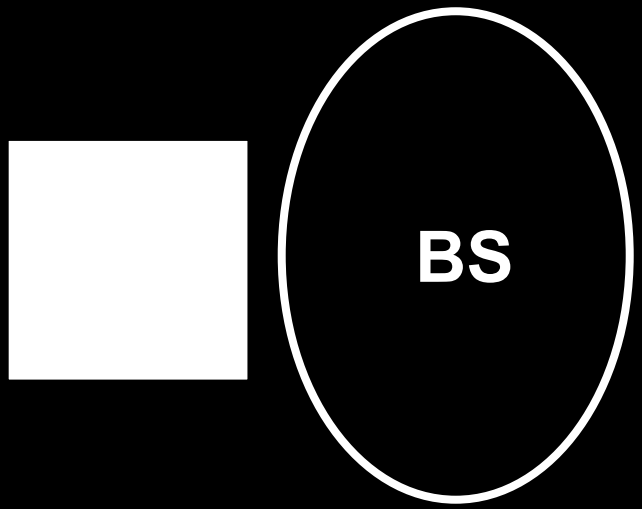


from E. Vul

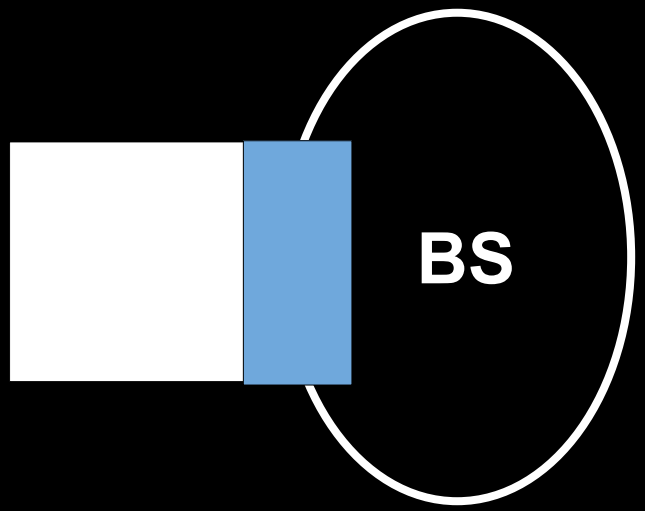
blind spot demo



blind spot demo



stimulus

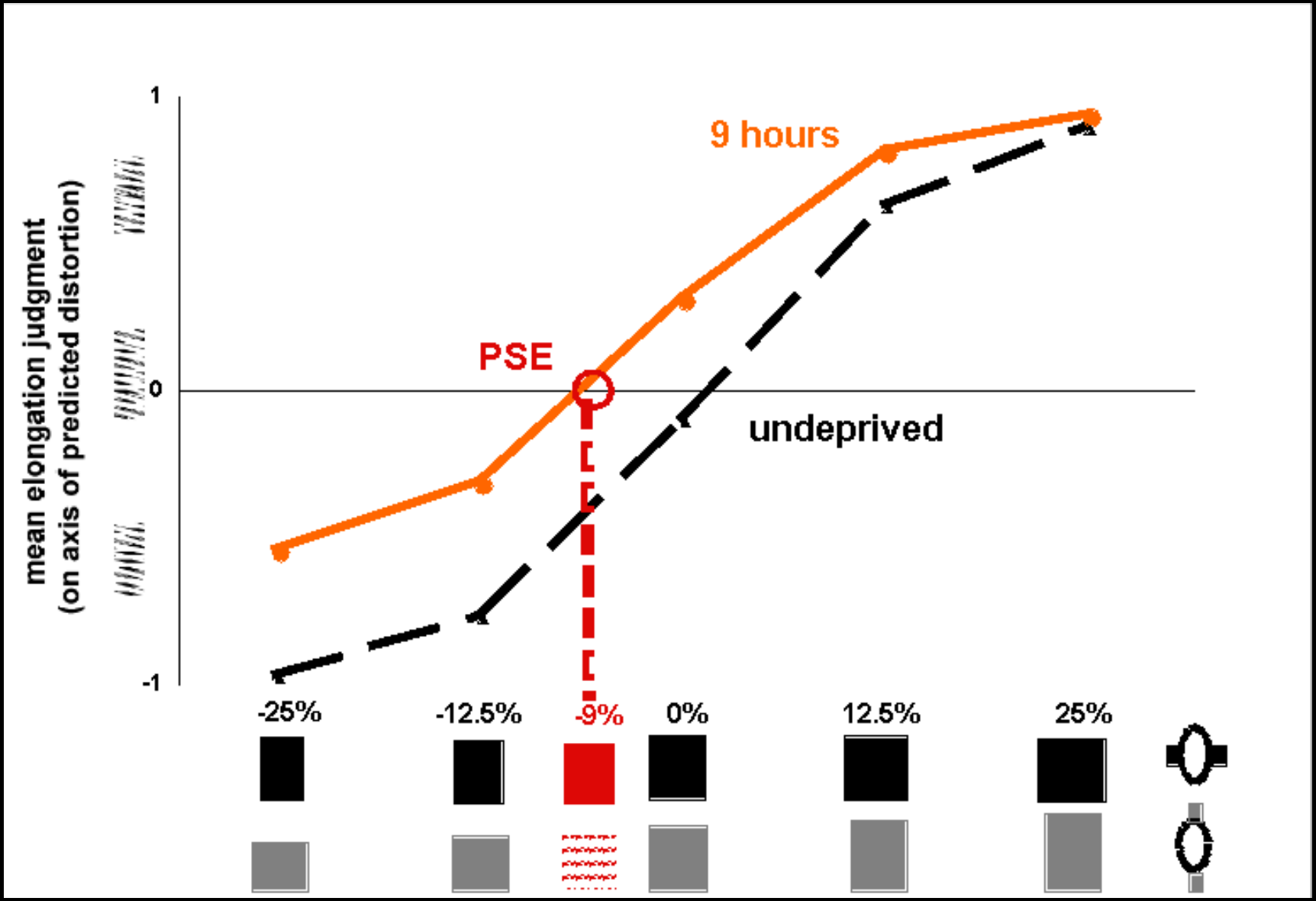


percept

blind spot demo

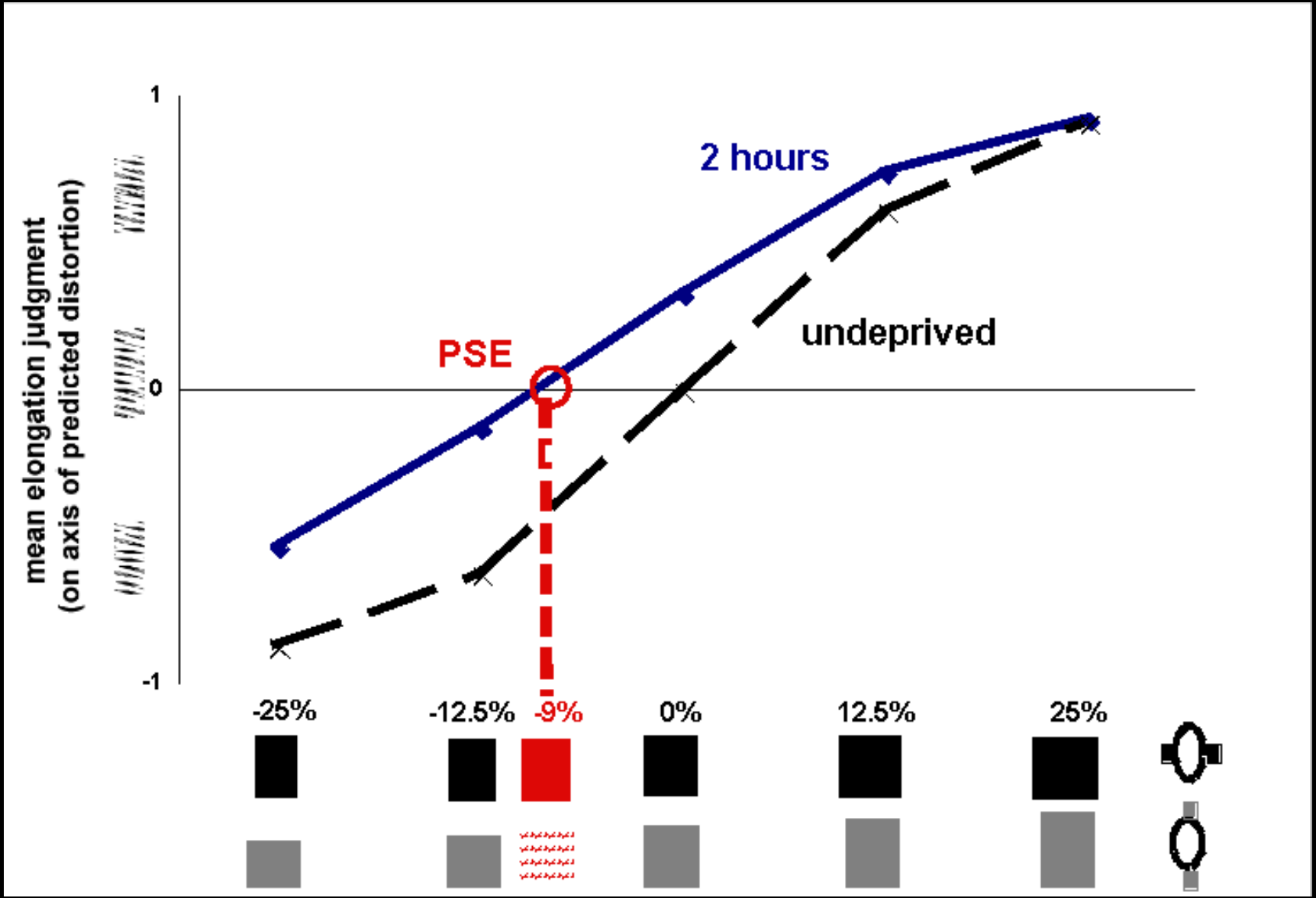
your perception will be distorted in:
9 hours
2 hours
10 minutes
1 second

blind spot demo



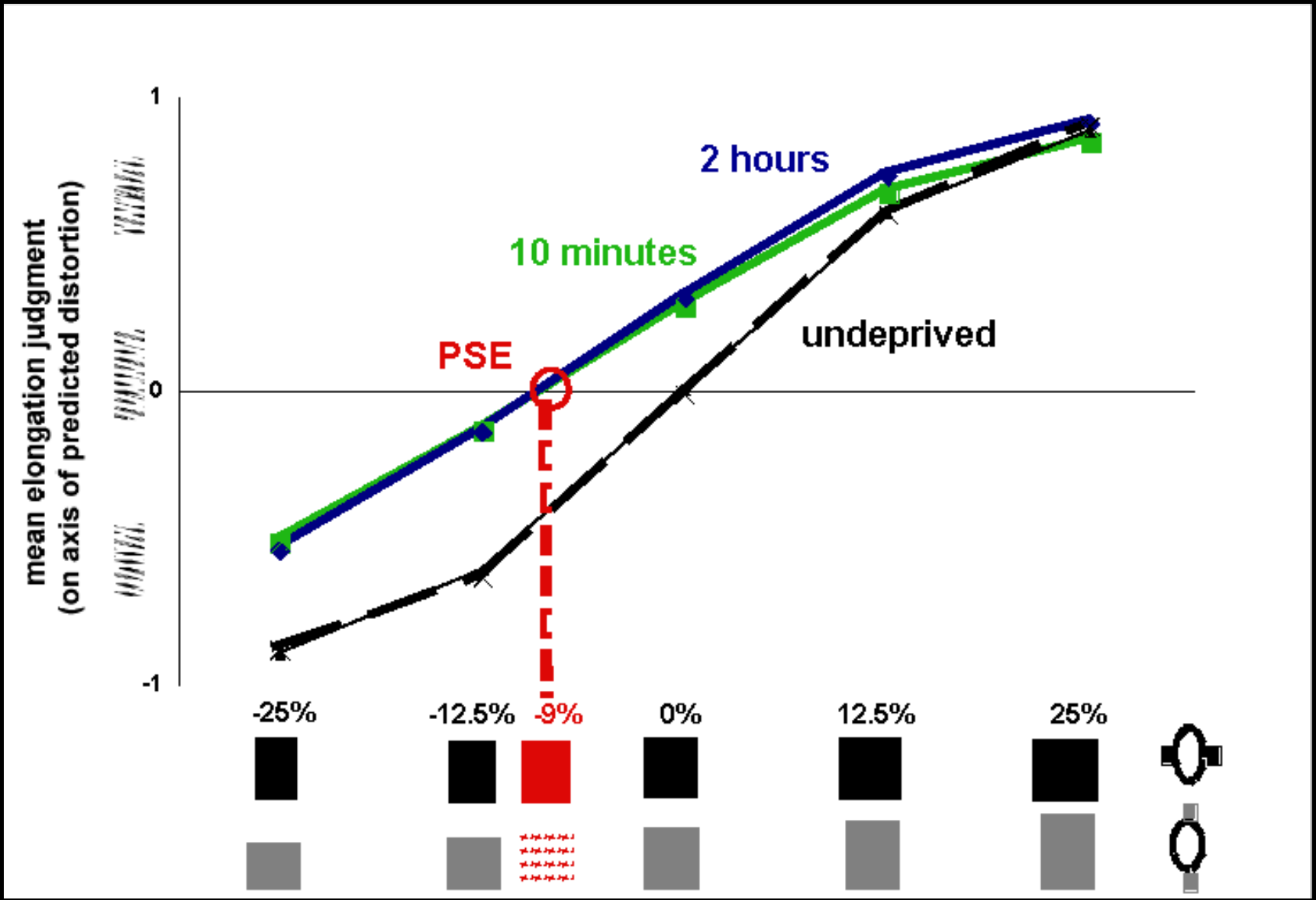
Dilks et al., *J. Neurosci.* (2007)

blind spot demo



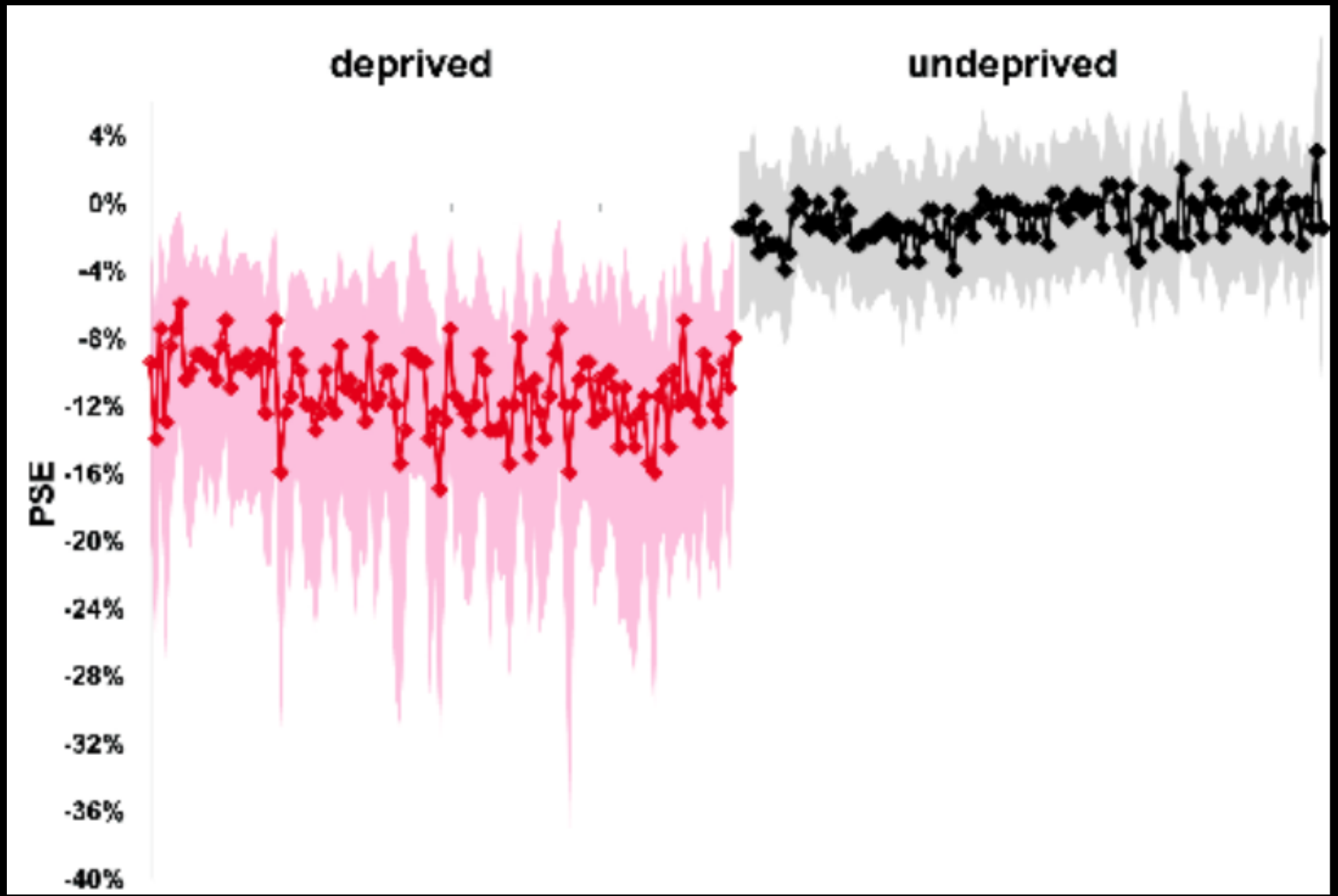
Dilks et al., *J. Neurosci.* (in press)

blind spot demo



Dilks et al., *J. Neurosci.* (in press)

blind spot demo



Dilks et al., *J. Neurosci.* (in press)

Dilks et al., *J. Neurosci.* (2

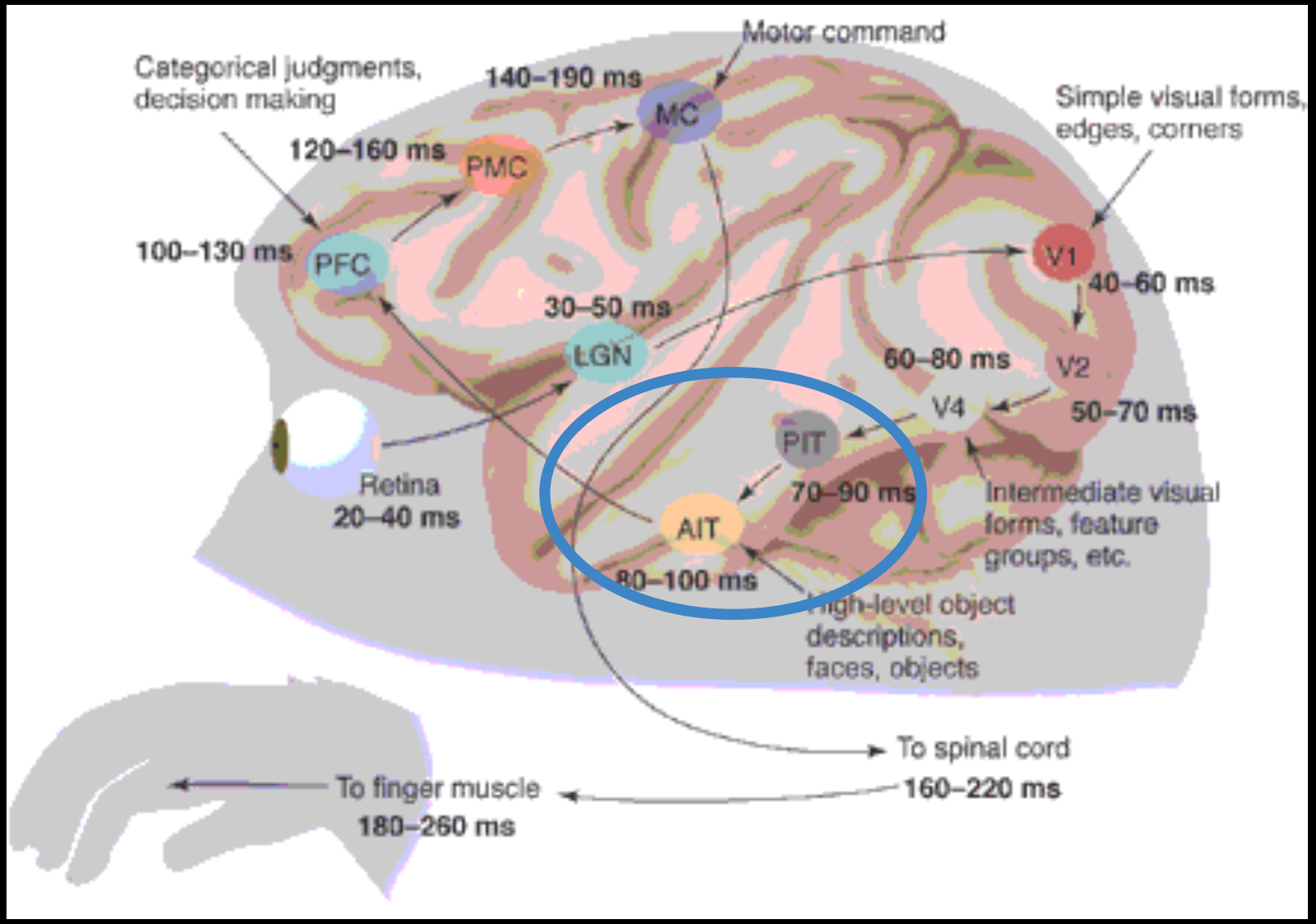
to manipulate your vision

visual system can change
– easily
– rapidly

can we force it to change?
to misrepresent the world?

step2

visual system



C. Cain; from Thorpe & Fabre-Thorpe, *Science* (2001)

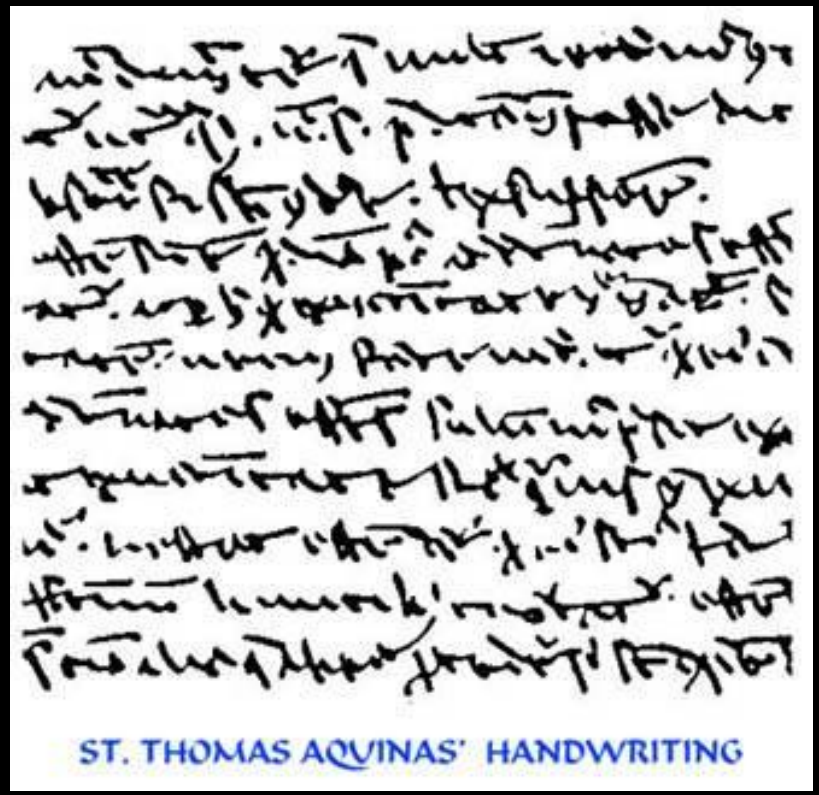
modularity

information processing:
distributed or specialized?

prosopagnosia

cannot recognize faces
can recognize objects,
places, letters

mod. from B. Balas

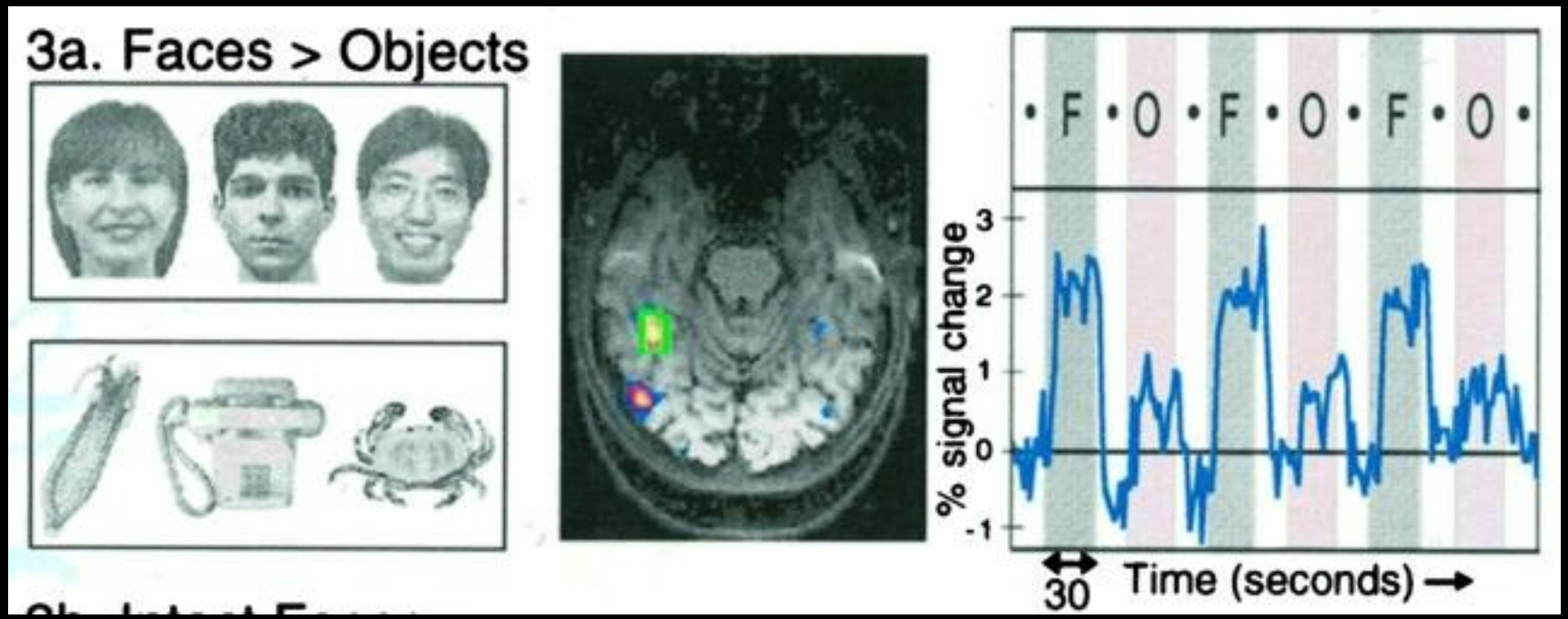


from M. Ogilvie

fMRI

Image Editor @ Flickr

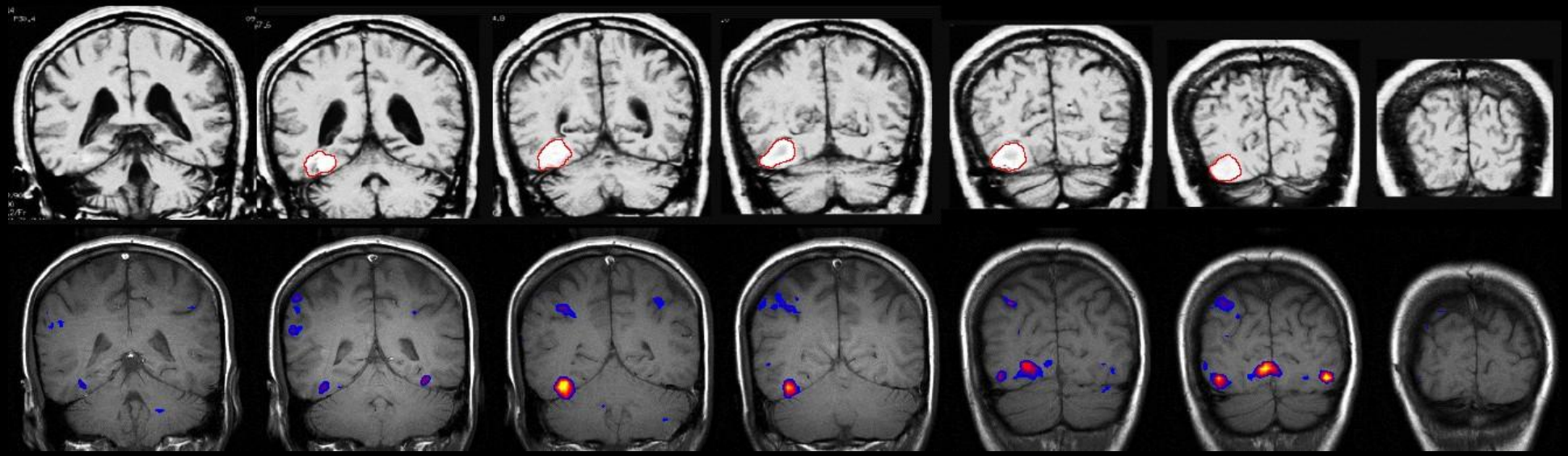
face module?



Kanwisher et al., *J. Neurosci*. (1997)

prosopagnosia

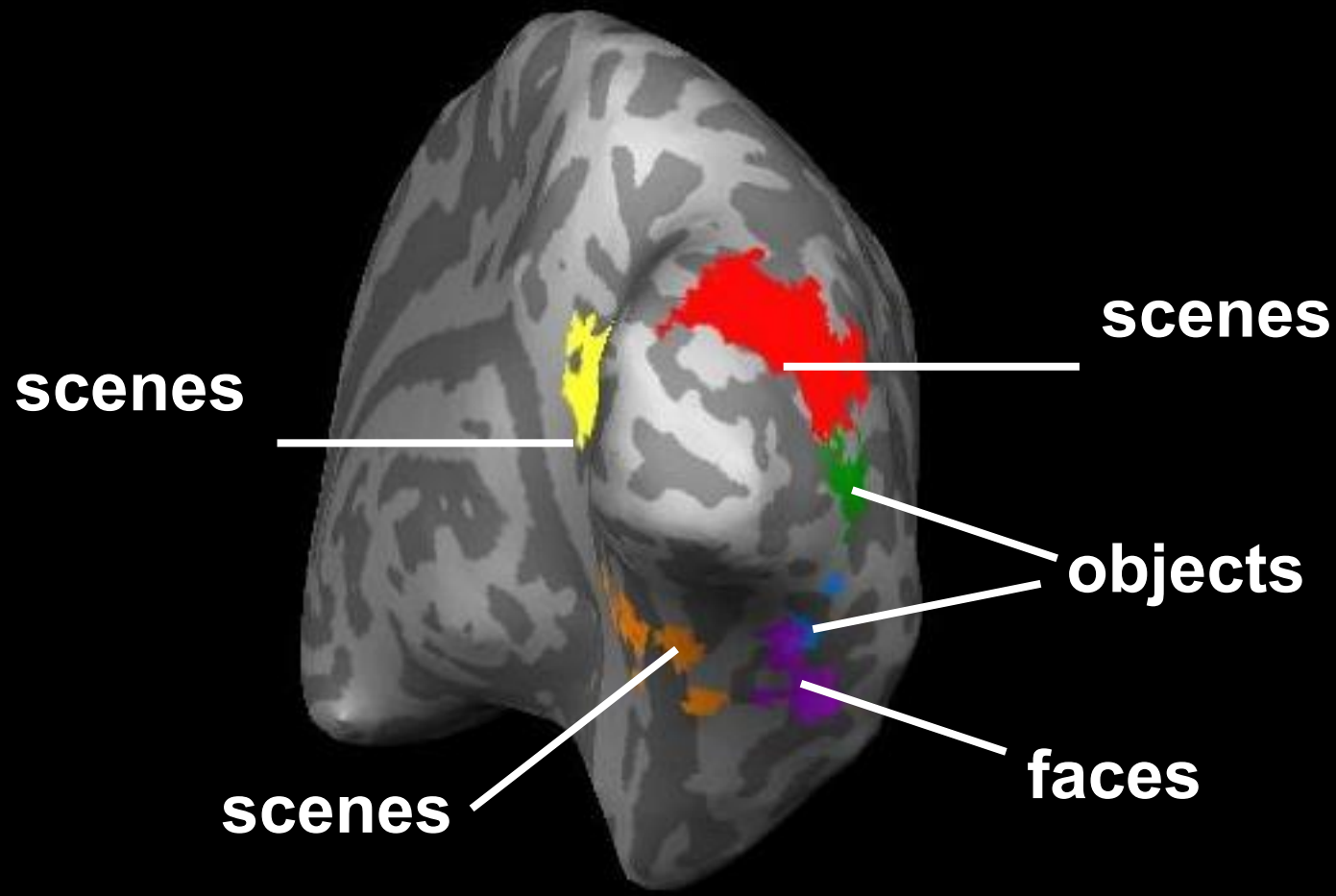
prosopagnosic patient



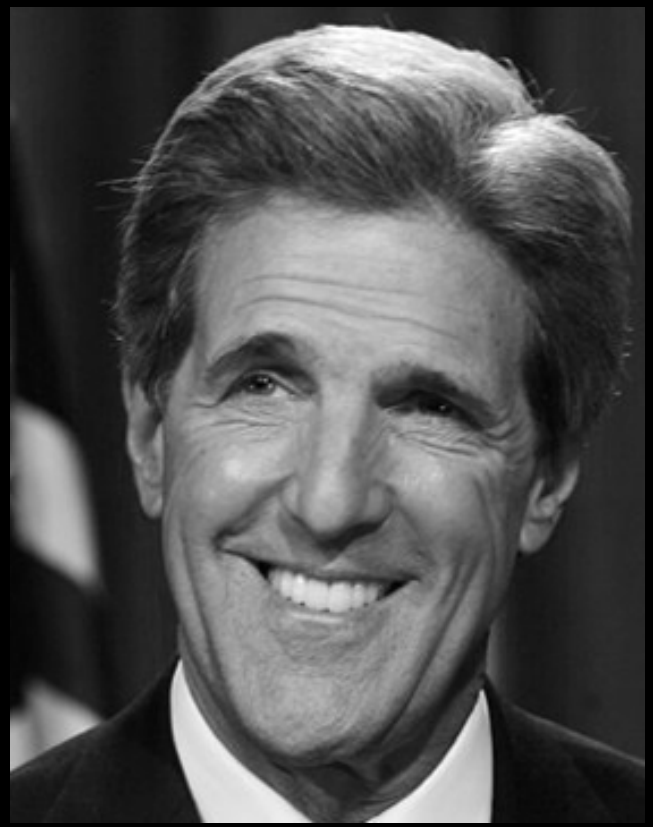
nancy kanwisher

mod. from N. Kanwisher, Wada & Yamamoto, *J. Neurol. Neurosurg. Psychiatry* (2001)

category-selective regions



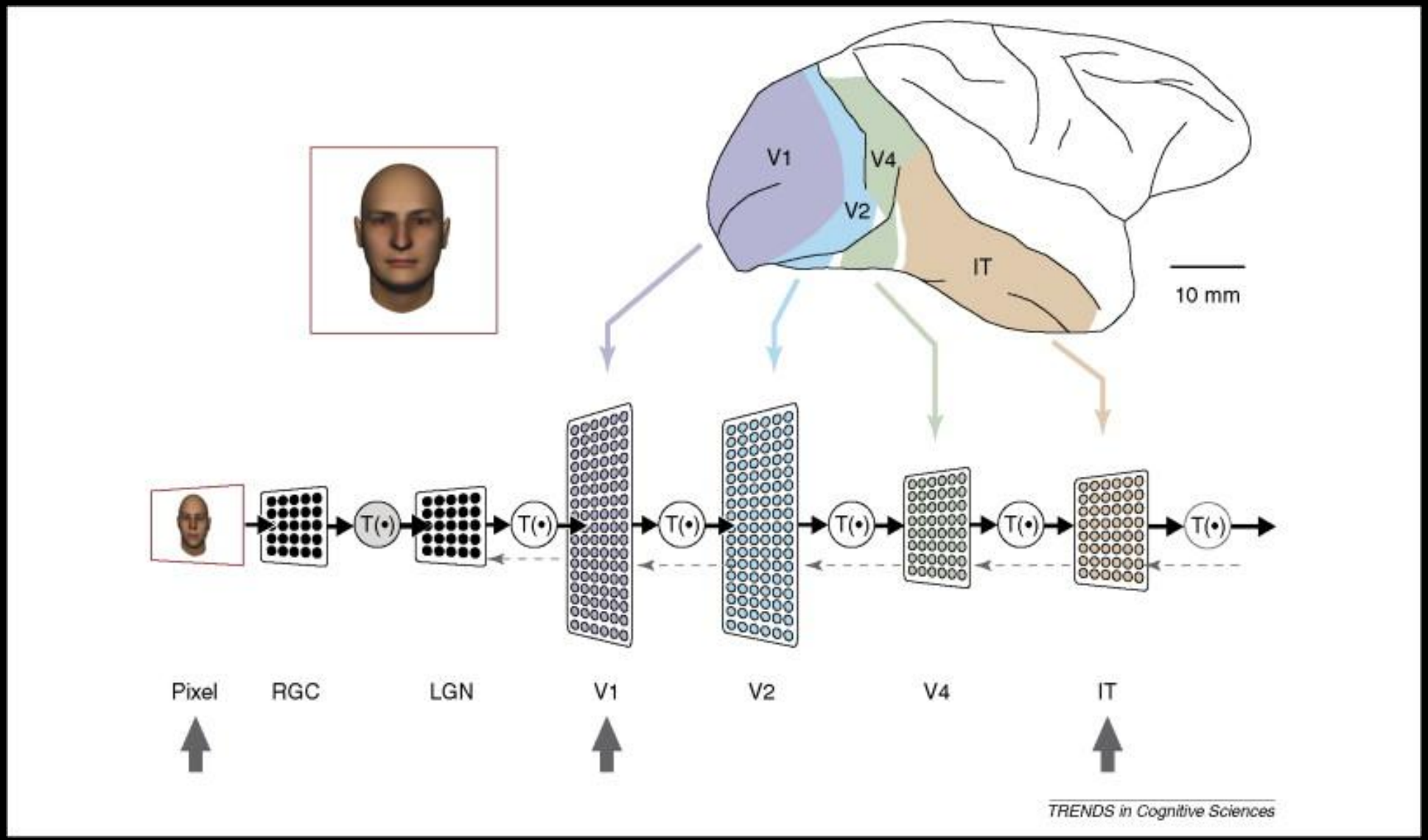
face aftereffect



everything depends on the viewpoint

from N. Kanwisher

visual system



DiCarlo & Cox, *TiCS* (2007)

step3

warmth

physical warmth ➡ intrapersonal warmth

Williams & Bargh, *Science* (2008)

framing

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

– If Program A is adopted, 200 people will be saved.

– If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

Which of the two programs would you favor?

Kahneman & Tversky, *Science* (1981)

framing

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

– If Program C is adopted 400 people will die.

– If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Which of the two programs would you favor?

Kahneman & Tversky, *Science* (1981)

fundamental attribution error

Rasa did not submit her homework

– Rasa is a lazy student

You did not submit your homework

– You are a bright student, you simply did not have time last night to work on it.

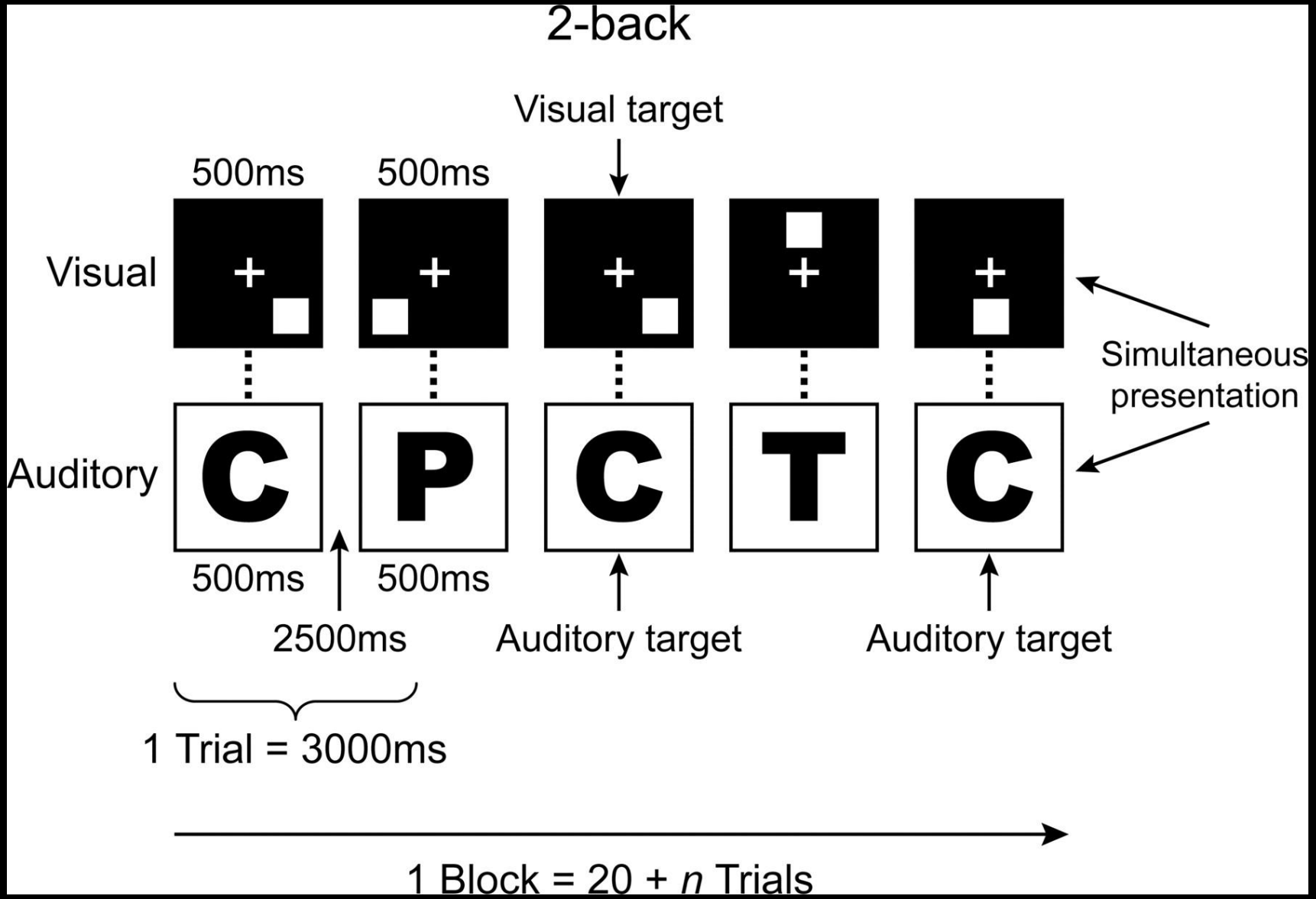
Real life example: comments online

improve yourself

Fluid intelligence (Gf) is the ability to find meaning in confusion and solve new problems. It is the ability to draw inferences and understand the relationships of various concepts, independent of acquired knowledge.

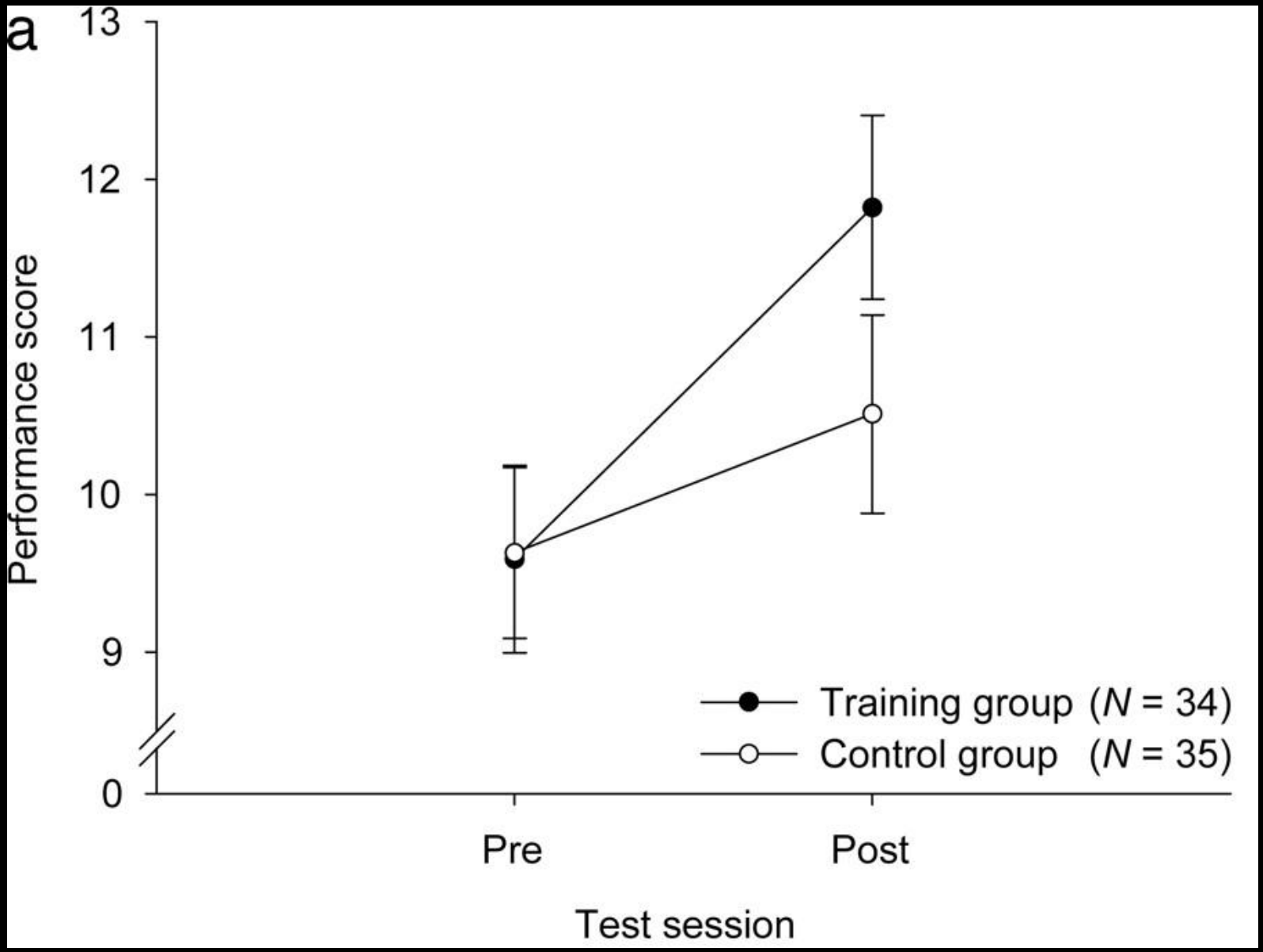
Wikipedia

improve yourself



Jaeggi et al., *PNAS* (2008)

improve yourself



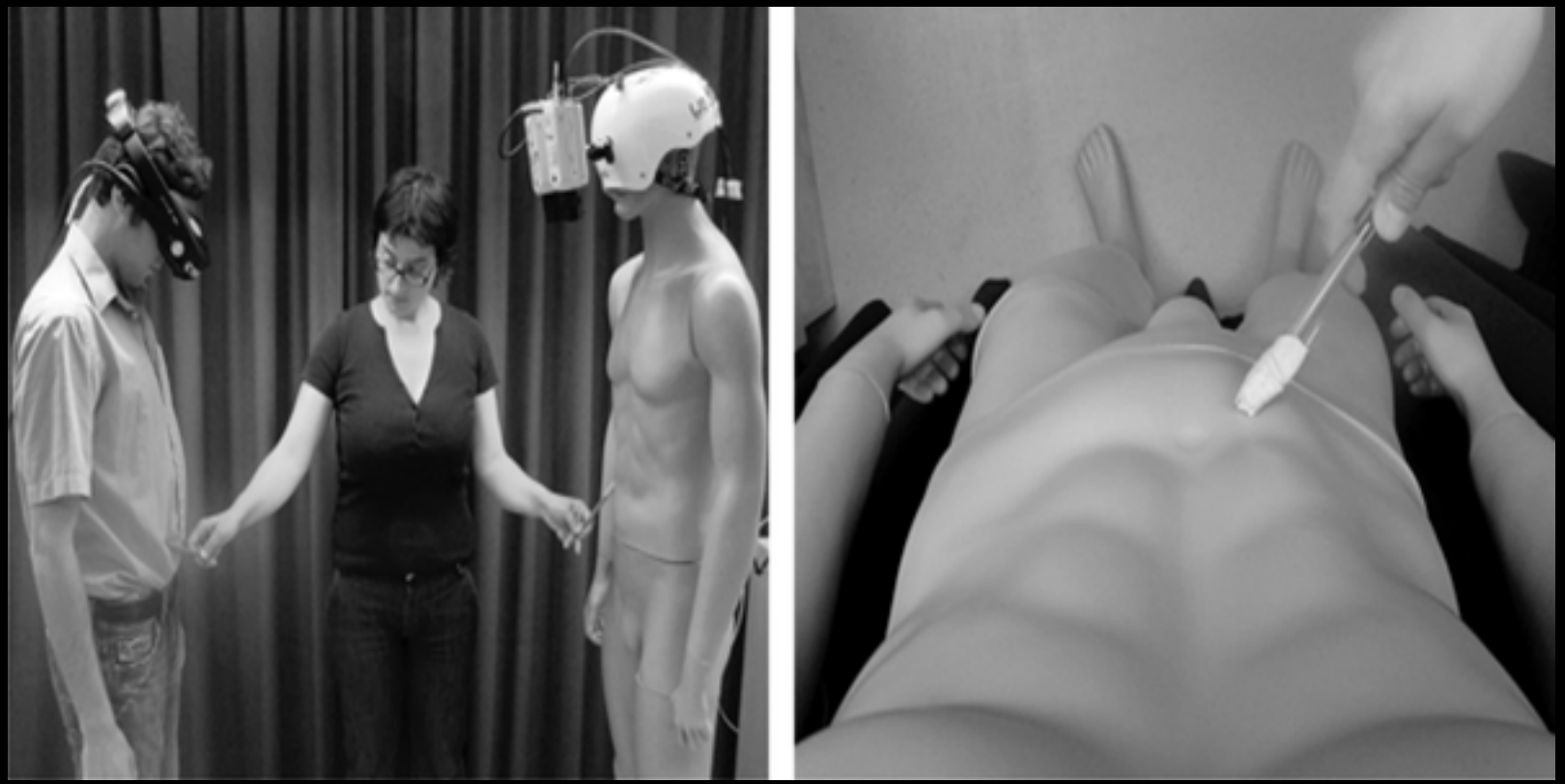
Jaeggi et al., *PNAS* (2008)

con
scious
ness

simple to complex

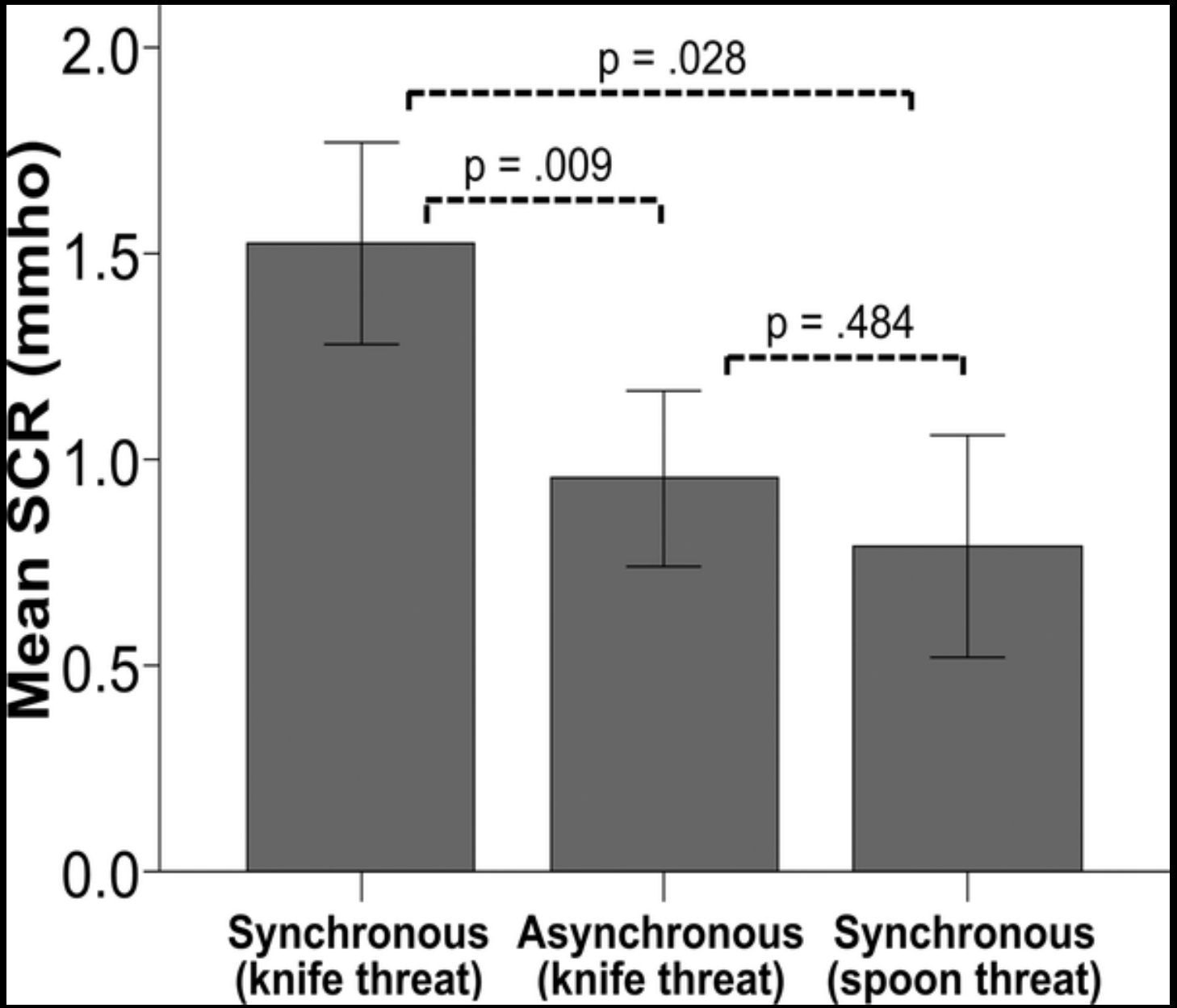
is there anything special about consciousness?

out-of-body experience



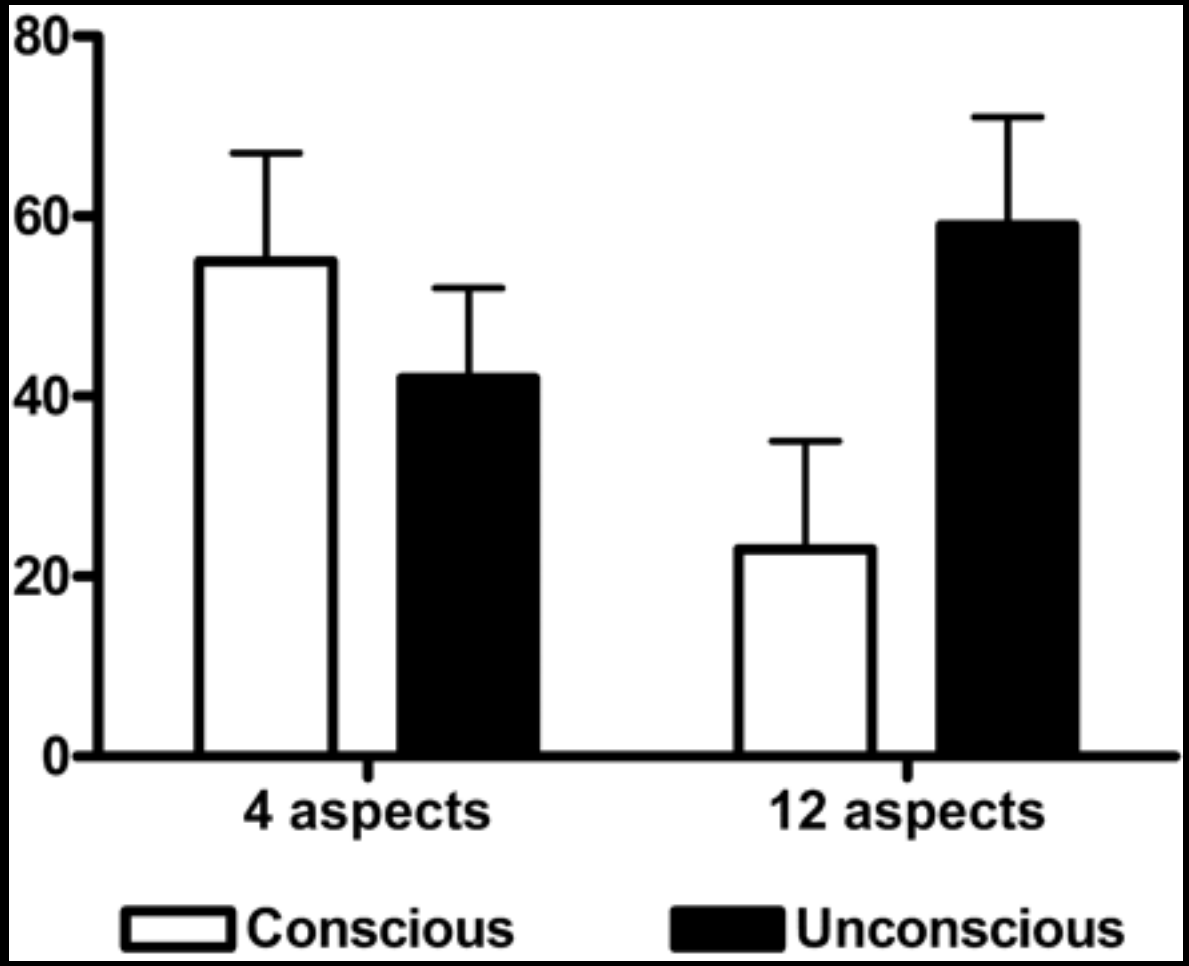
Petkova & Ehrsson, *PLoS ONE* (2008)

out-of-body experience



Petkova & Ehrsson, *PLoS ONE* (2008)

conscious decisions



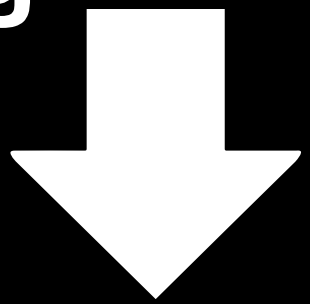
Dijksterhuis et al., *Science* (2006)

simple to complex air france 447

replacement
slow

pitot tubes
malfunctioning

storm



crash

simple to complex

is there anything special about consciousness?

maybe it is a result of interactions of simple components

thank you

slides available at jonaskubilius.mp | qbilius@gmail.com