

The Science of Intelligence

**Richard Haier
Insight Cruises
December 2014**

Please Note

I enjoyed our time on board and I'm happy to provide these slides but, they are provided for your personal viewing only. They are all copyrighted and cannot be used for any other purpose without my written permission.

Thx----Rich

Also, this is a pdf version of my presentations. The video clips do not function. I do not have permission to post most of them but if you have a special need to see them, please email me:

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You can also see more on my website:

www.richardhaier.com



**“There’s so much
about intelligence
that I don’t
understand.”**

...Homer Simpson

Session 3 What makes a brain smart?



European Organization for Nuclear Research

BREAKTHROUGH

Scientists celebrate as the European Large Hadron Collider, the world's largest particle accelerator, reaches a record-breaking energy level. **WORLD, A20**

Match shapes



Triangles

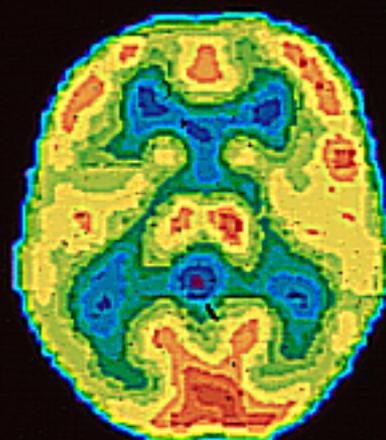
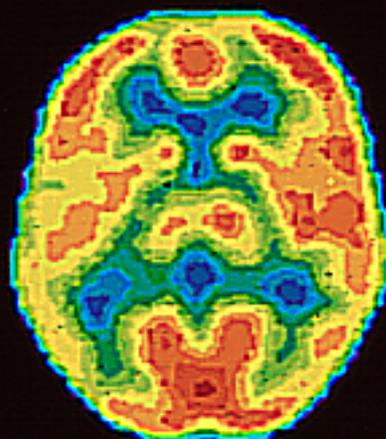


One question is whether men and women use the same brain areas for intelligence. Since there are no appreciable differences in general intelligence, we might think so...

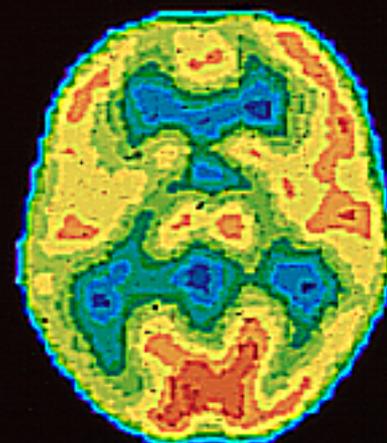
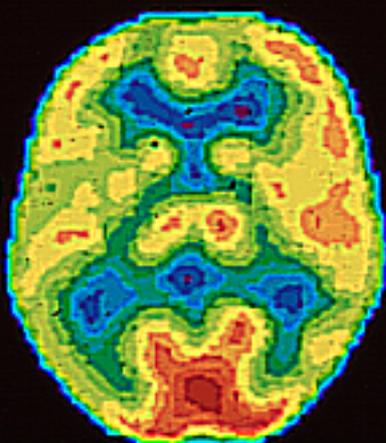
Males

Females

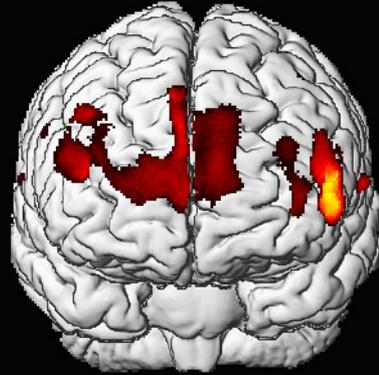
**High
SAT-M**



**Average
SAT-M**



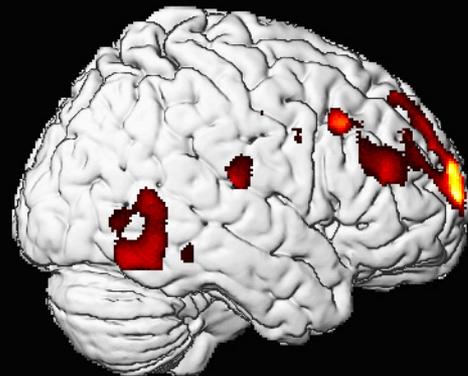
IQ/Gray Matter Correlations



**Frontal
Lobe**



**Left
Hemisphere**



**Right
Hemisphere**

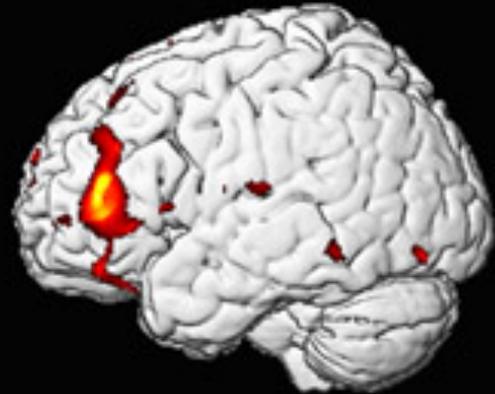
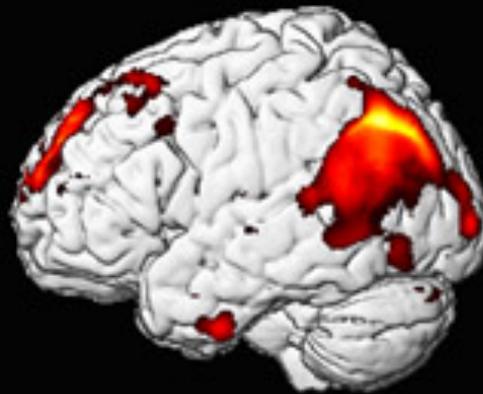
IQ

Men

=

Women

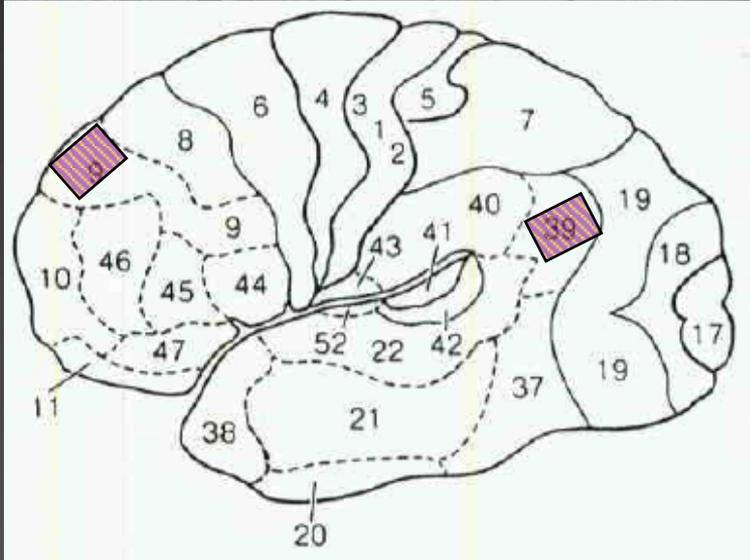
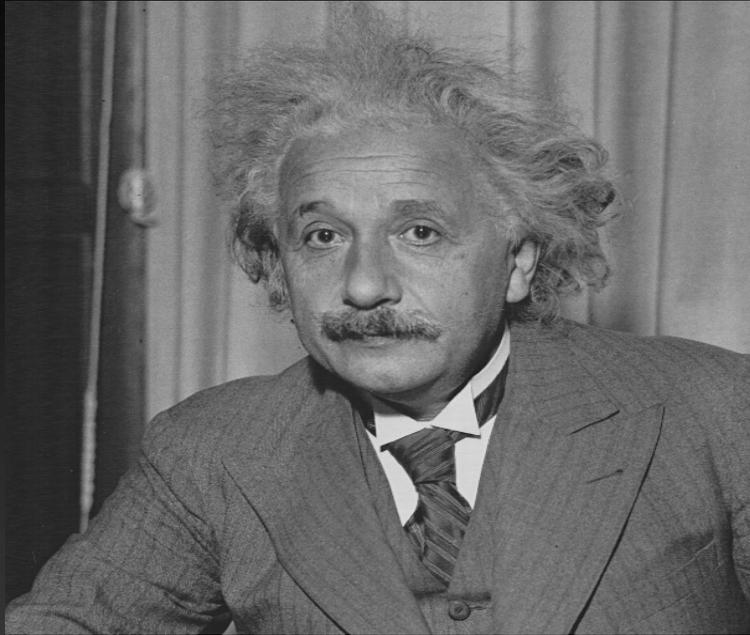
Gray Matter



White Matter

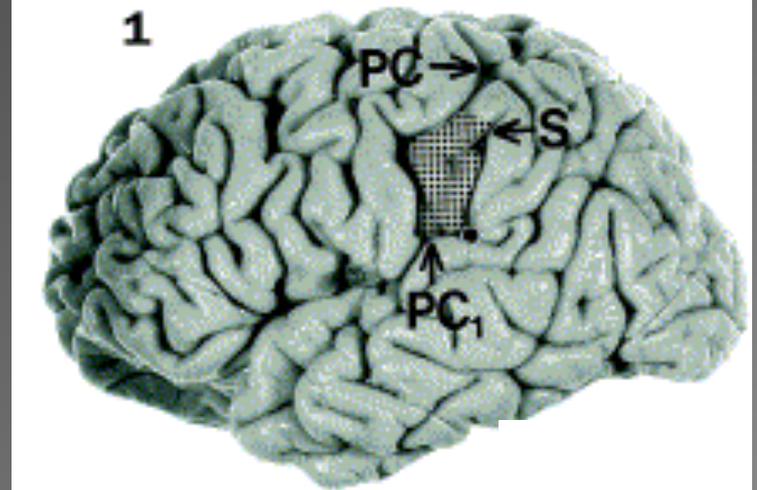


A case report of genius



4

Einstein



1

Control

BEHAVIORAL AND BRAIN SCIENCES (2007) 30, 135–187

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The Parieto-Frontal Integration Theory (P-FIT) of intelligence: Converging neuroimaging evidence

Rex E. Jung

*Departments of Neurology and Psychology, University of New Mexico, and
The MIND Research Network, Albuquerque, NM 87106*

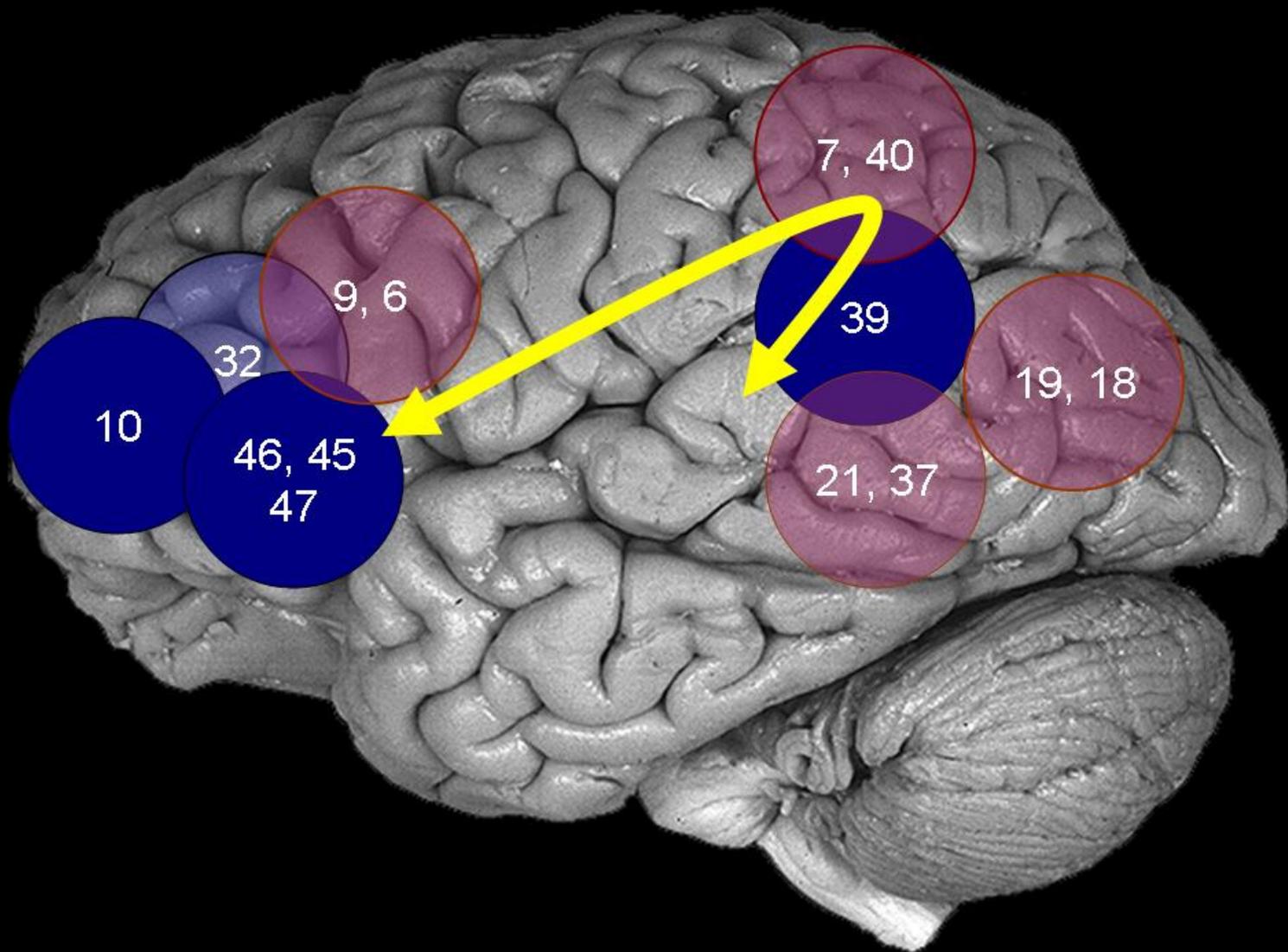
rjung@themindinstitute.org www.themindinstitute.org

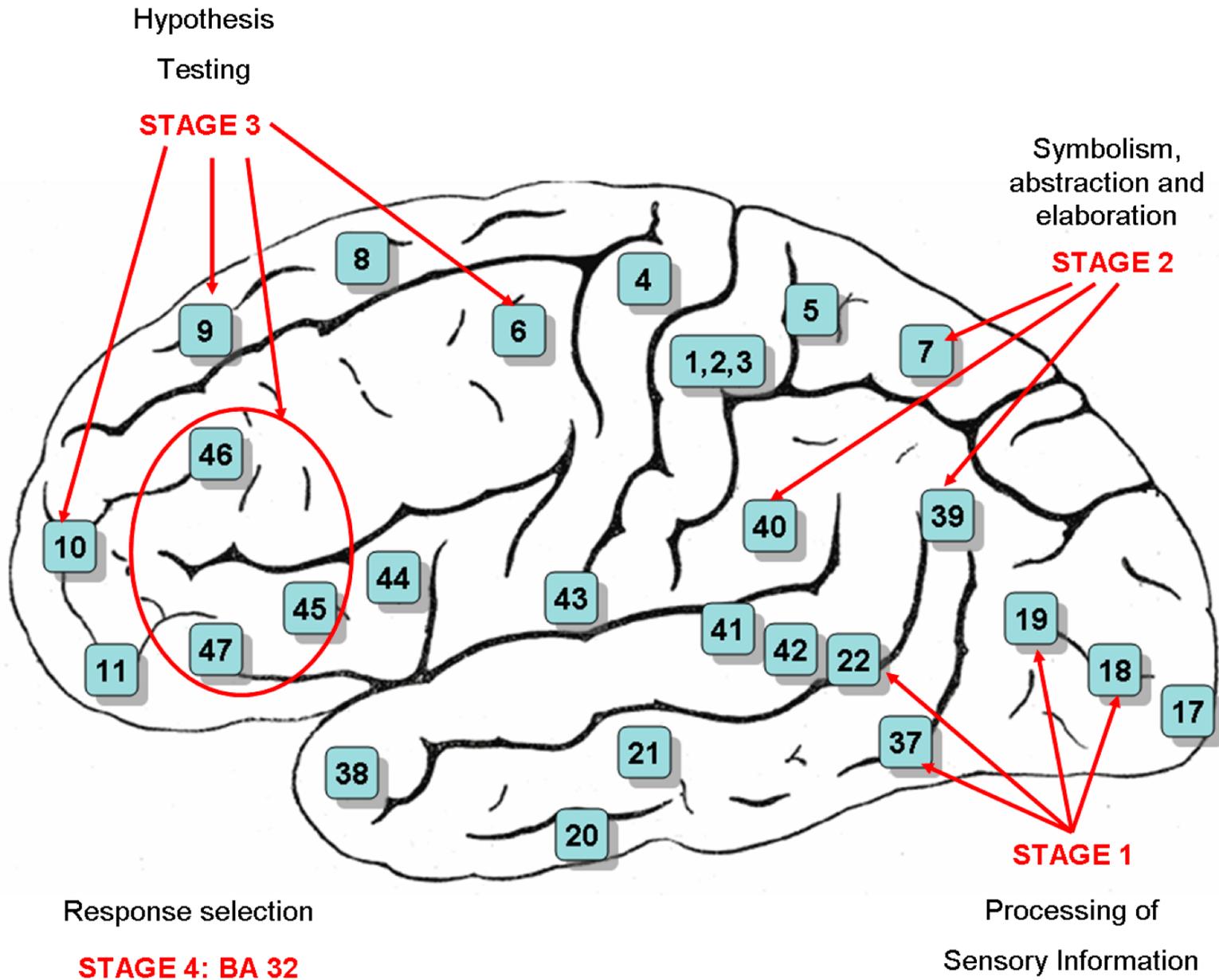
www.positiveneuroscience.com

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neurology/haier/haier.html](http://www.ucihs.uci.edu/pediatrics/faculty/neurology/haier/haier.html)





Hypothesis

Testing

STAGE 3

Symbolism,
abstraction and
elaboration

STAGE 2

Response selection

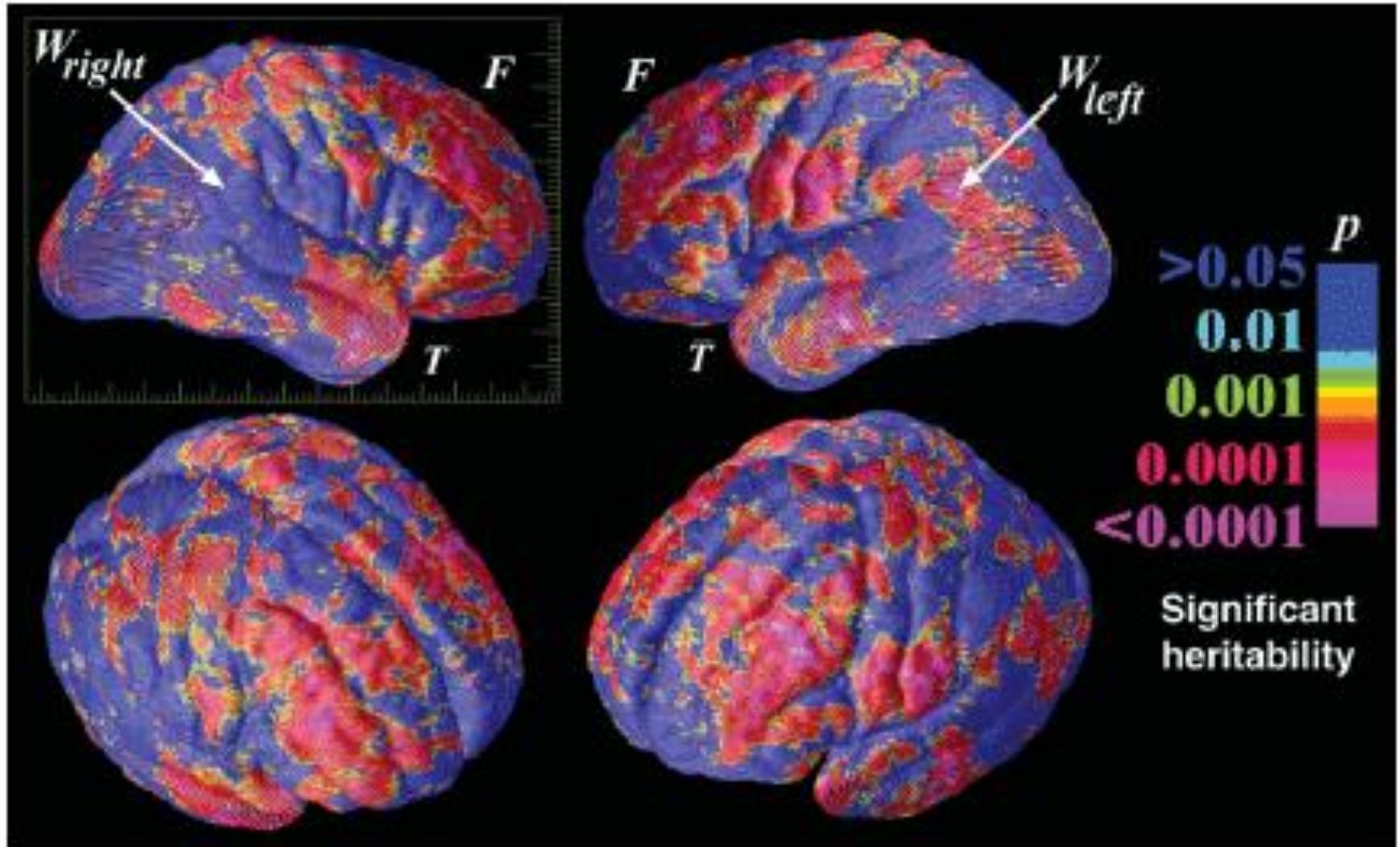
STAGE 4: BA 32

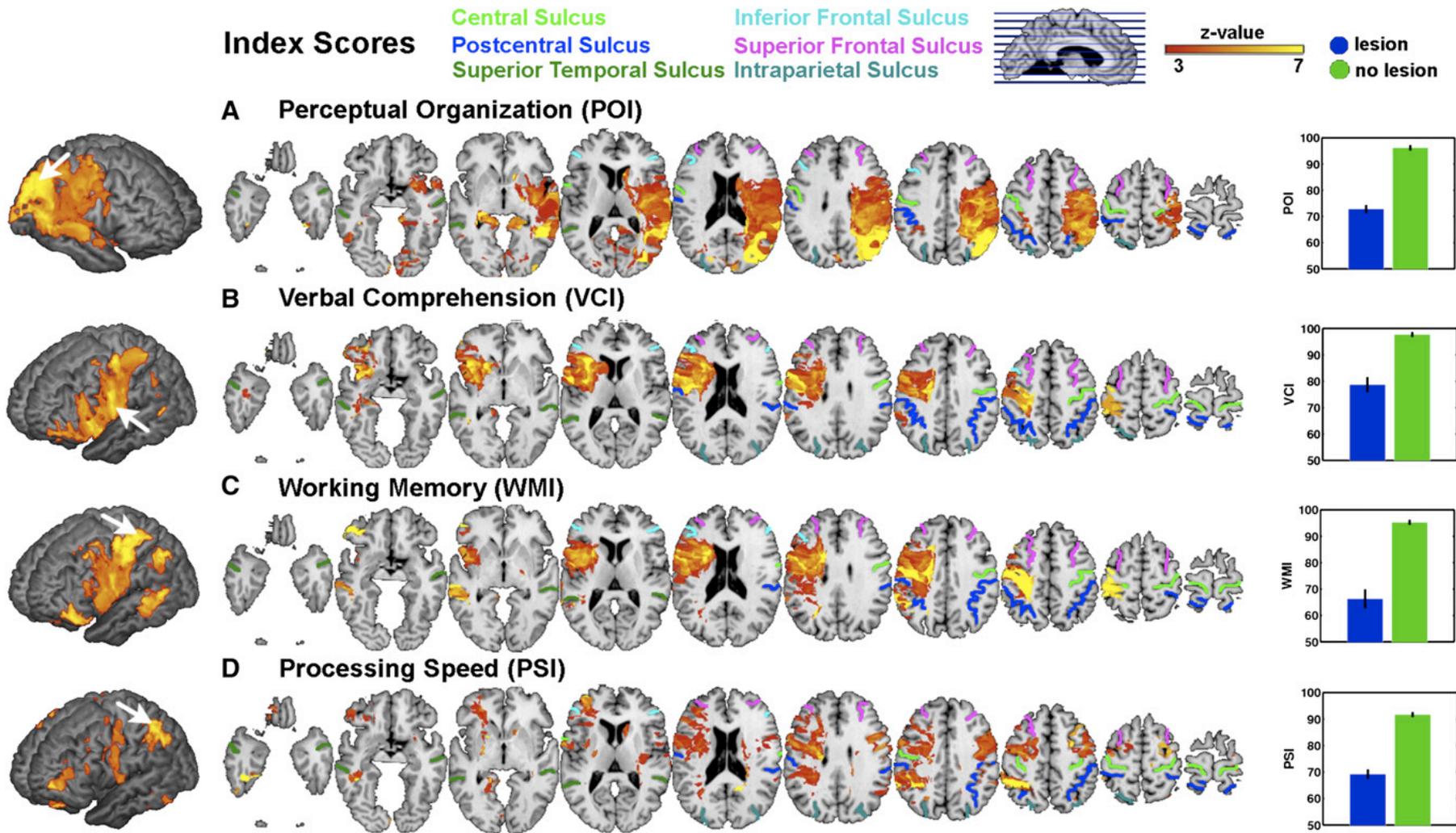
Processing of
Sensory Information

STAGE 1

The PFIT areas in the front and back of the brain are areas related to memory, attention, and language---suggesting that intelligence is built on these fundamental cognitive processes.

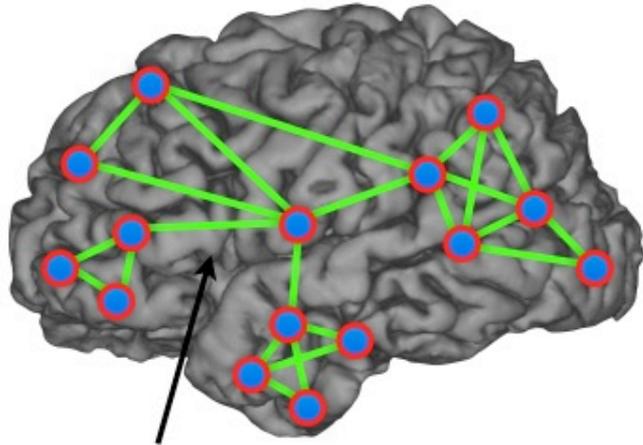
Heritability of gray matter





Glascher et al. *Neuron*, 2009

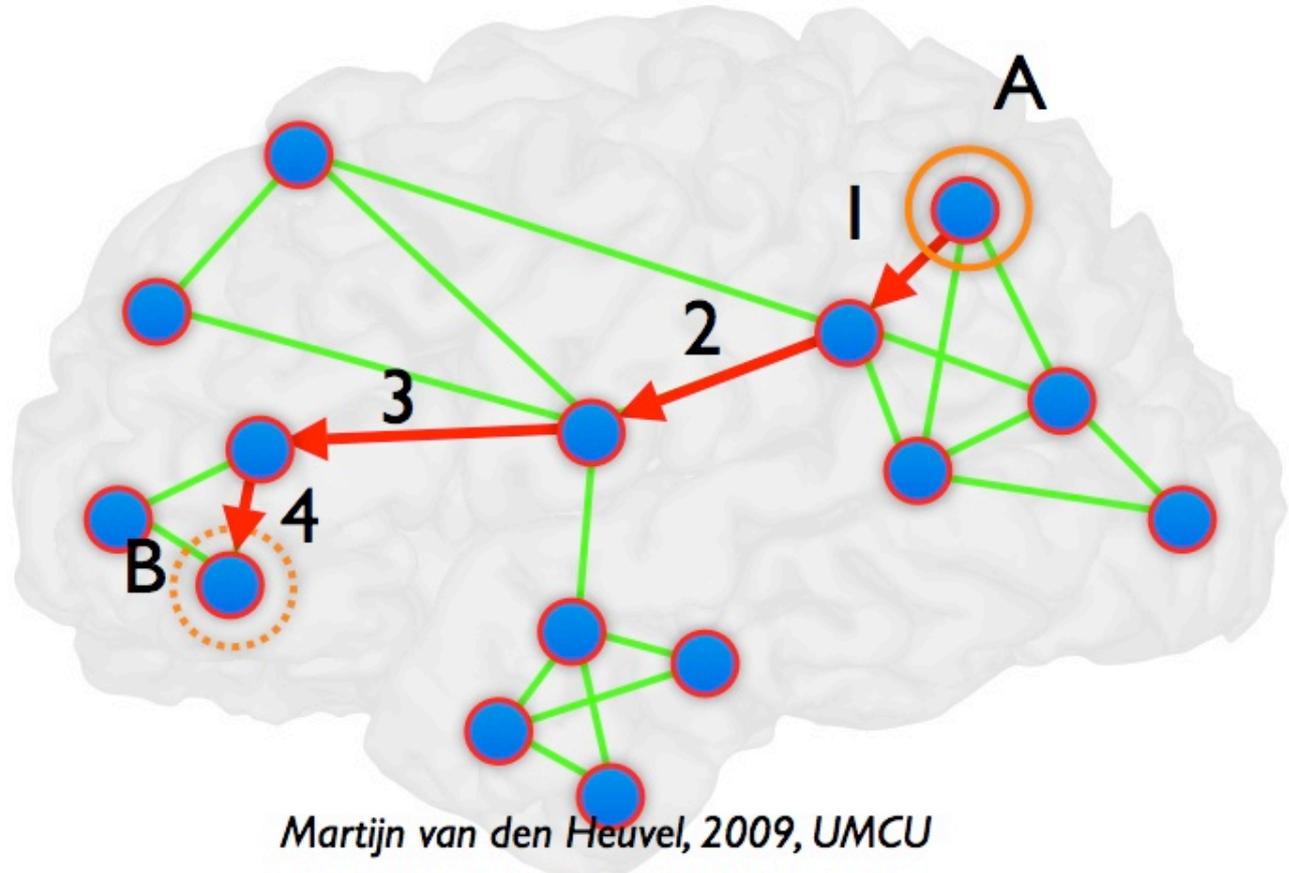
functional brain network



functional
connection

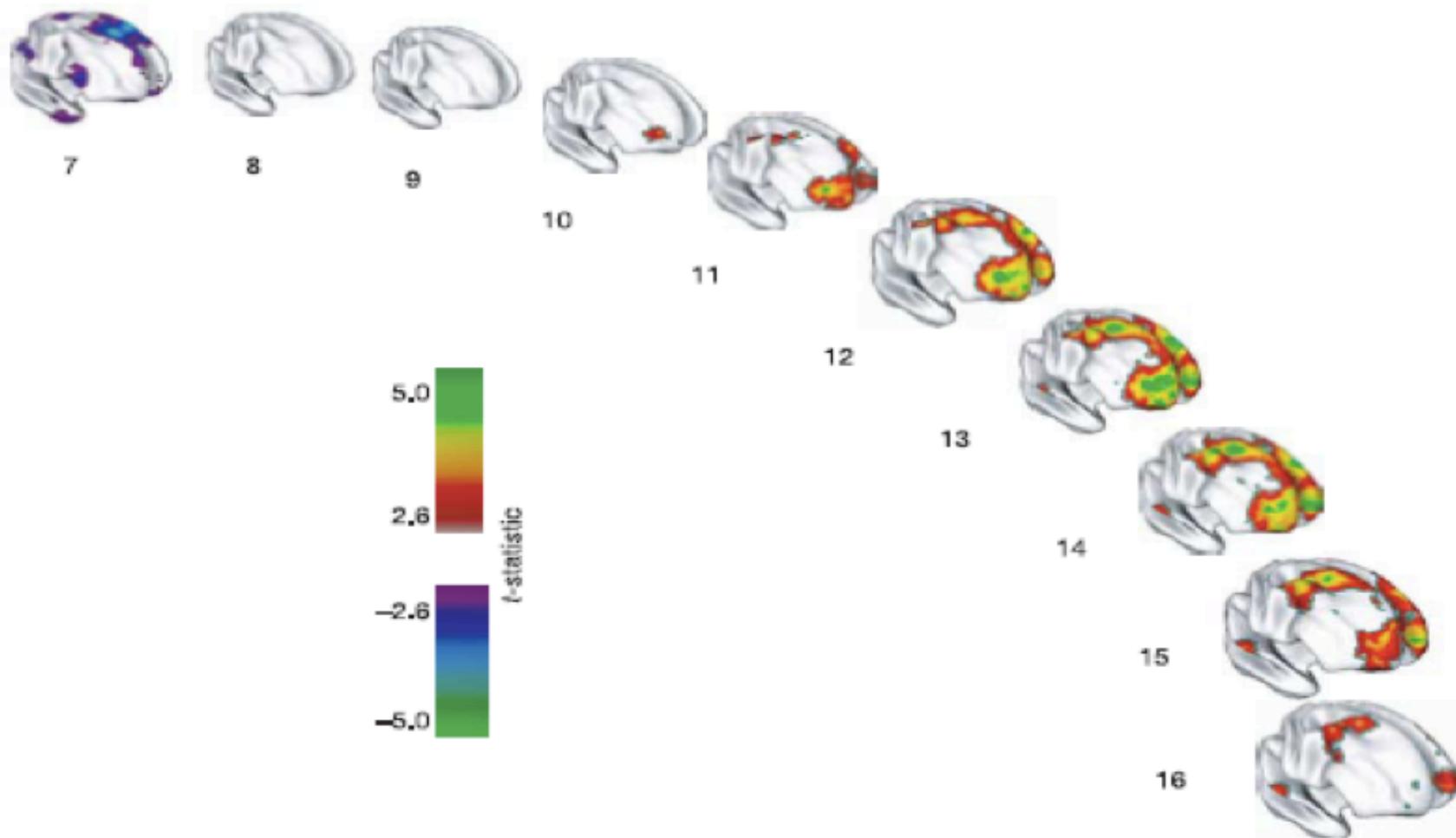
Path Length:

How to travel in the shortest way
from A to B?

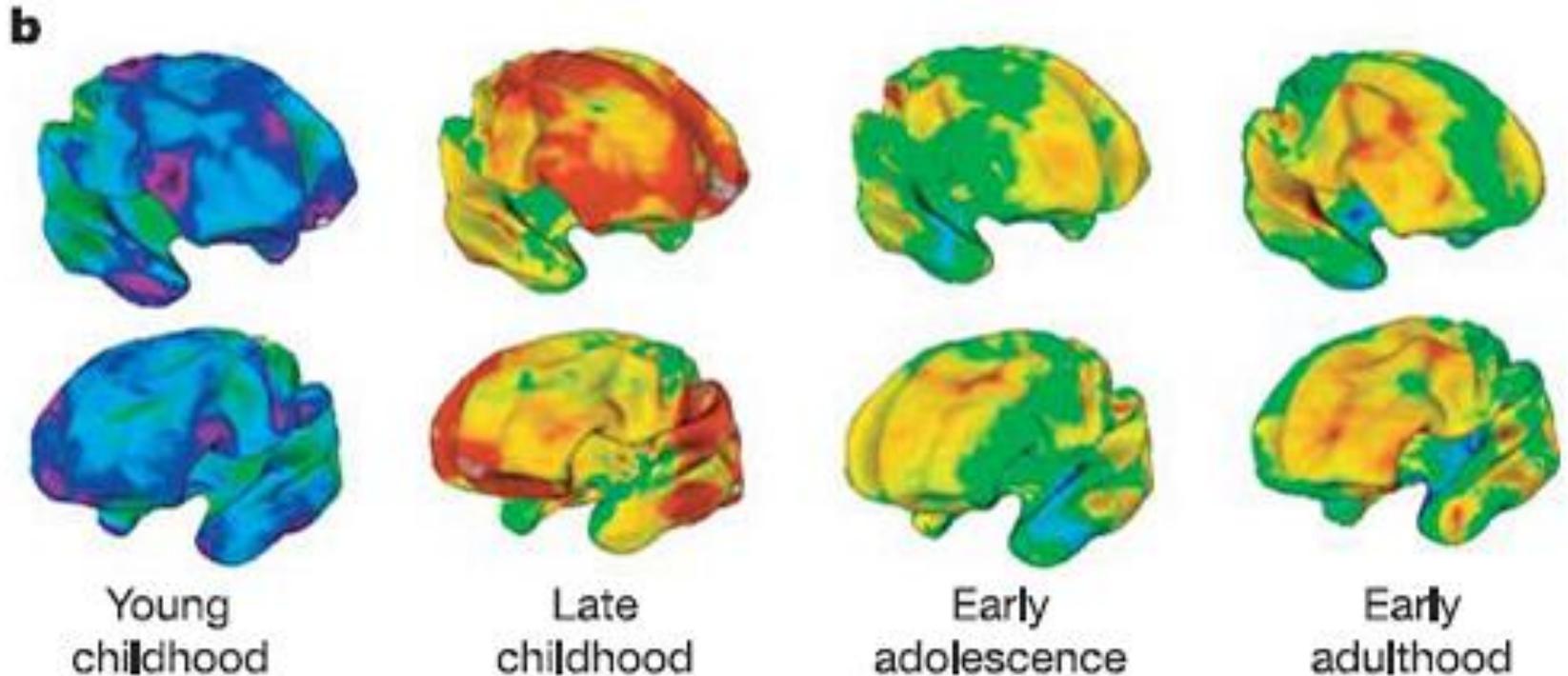


Martijn van den Heuvel, 2009, UMCU

Development of cortical thickness/IQ



Thickness of Cortex



[blue indicates thicker cortex goes with lower IQ;
red indicates thicker cortex goes with higher IQ]

magneto-encephalo-gram (MEG)

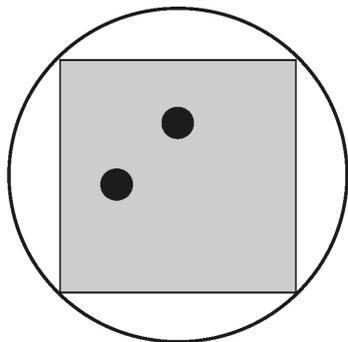
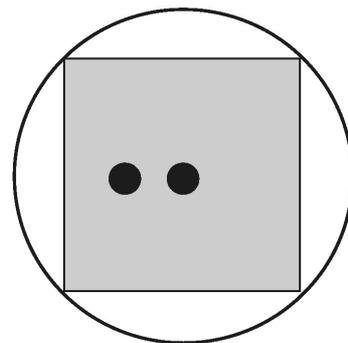
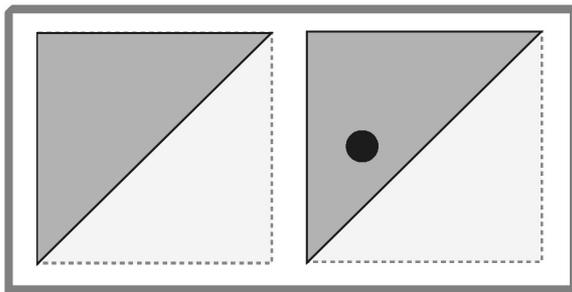
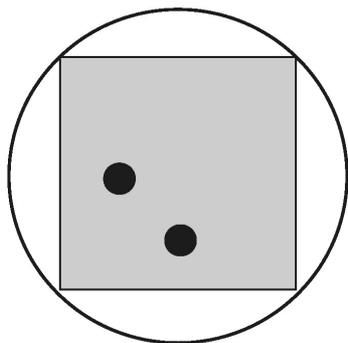
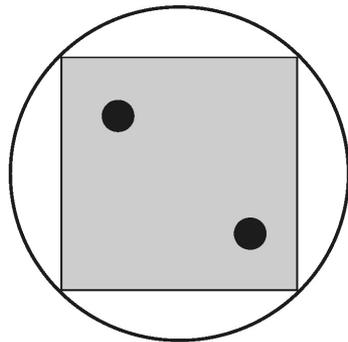


magneto-encephalo-gram (MEG)

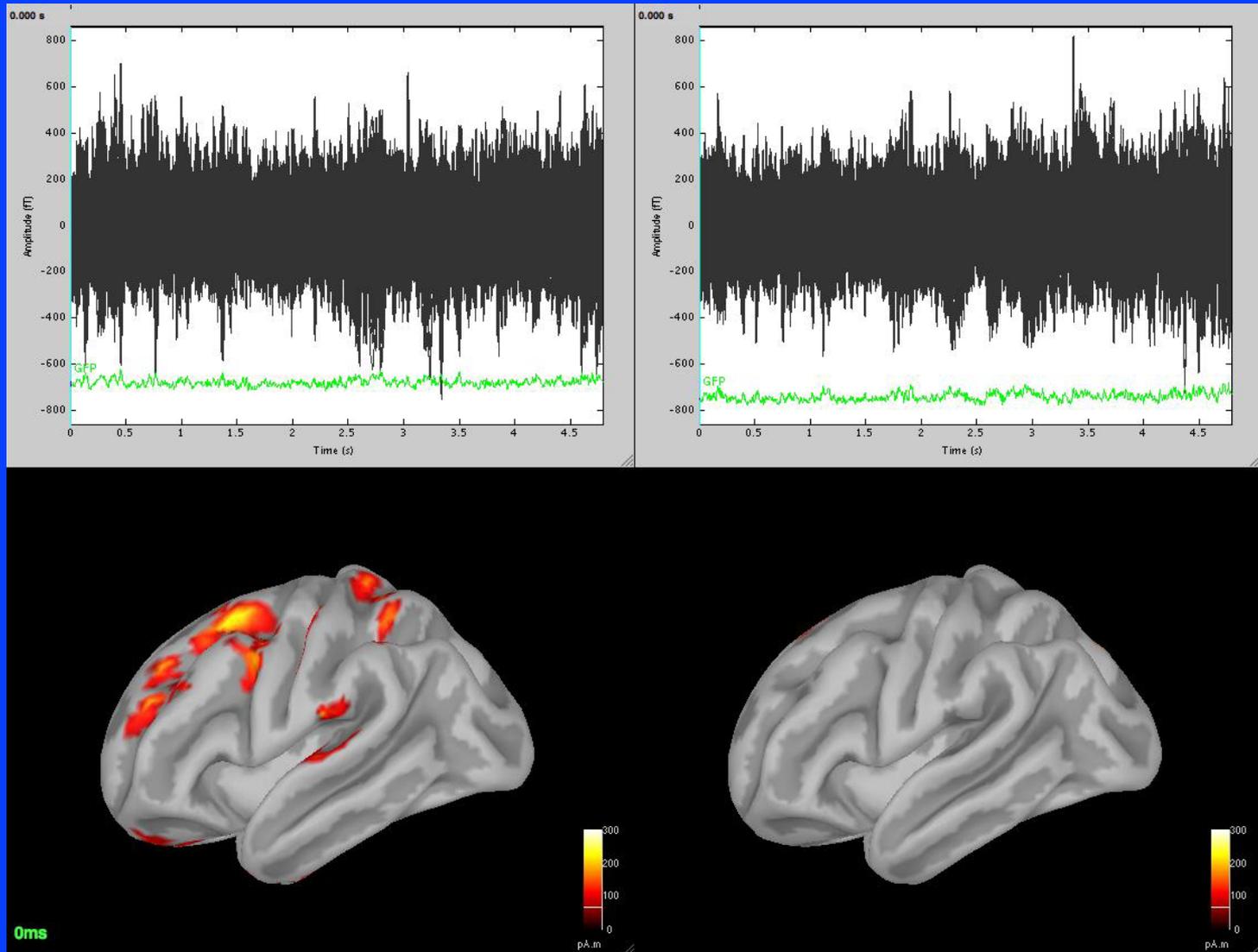
Robert Thoma

0 ms

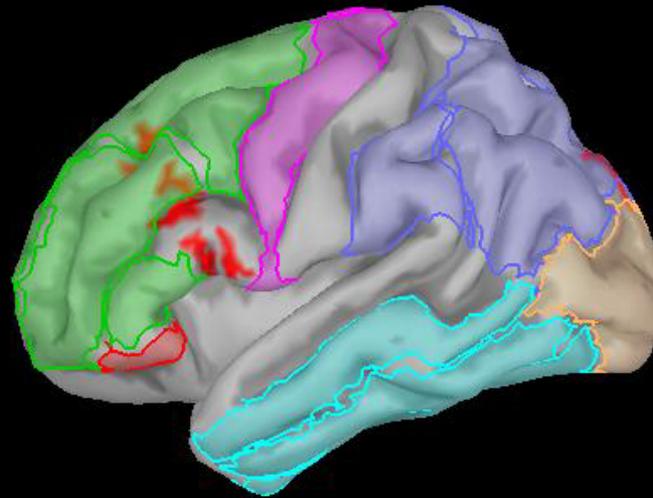
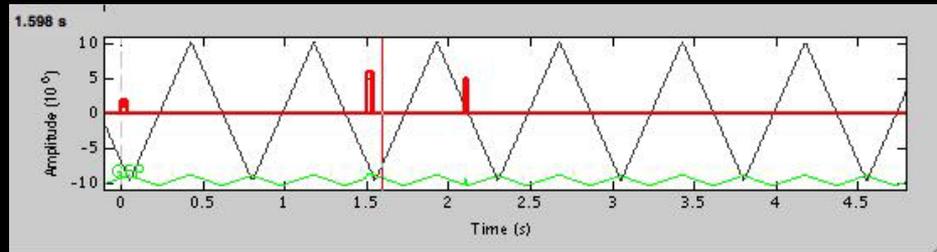




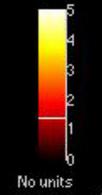
Item PF13 5 low vs 5 high



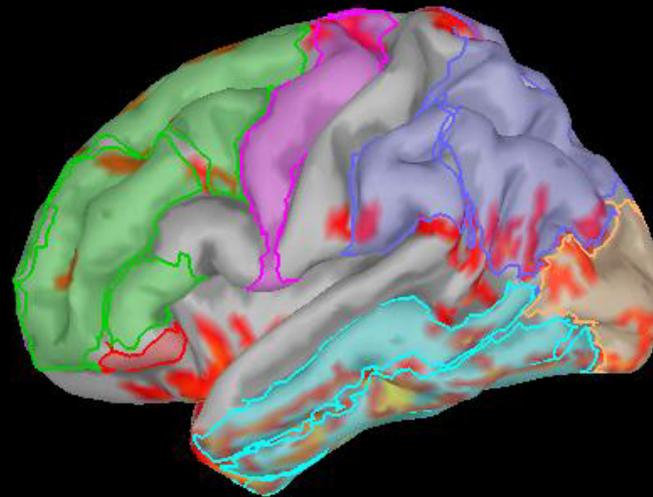
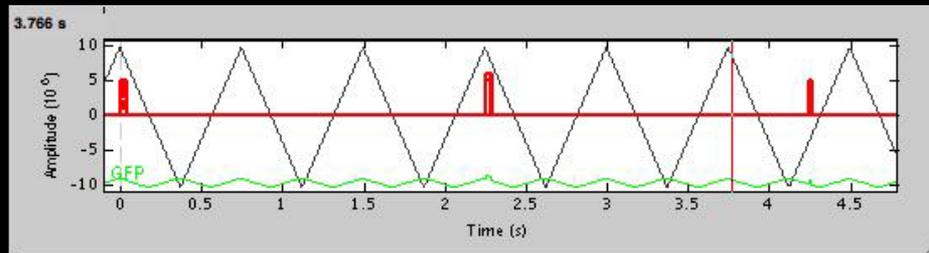
High IQ person item 13 500ms pre button press



1598ms

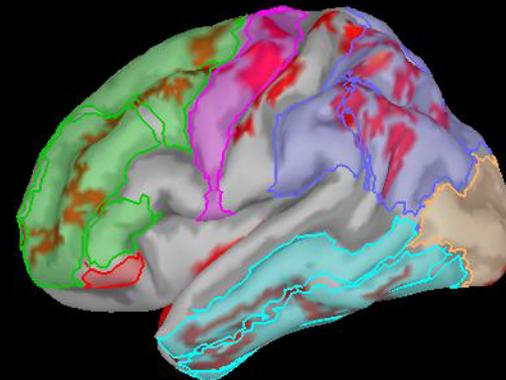
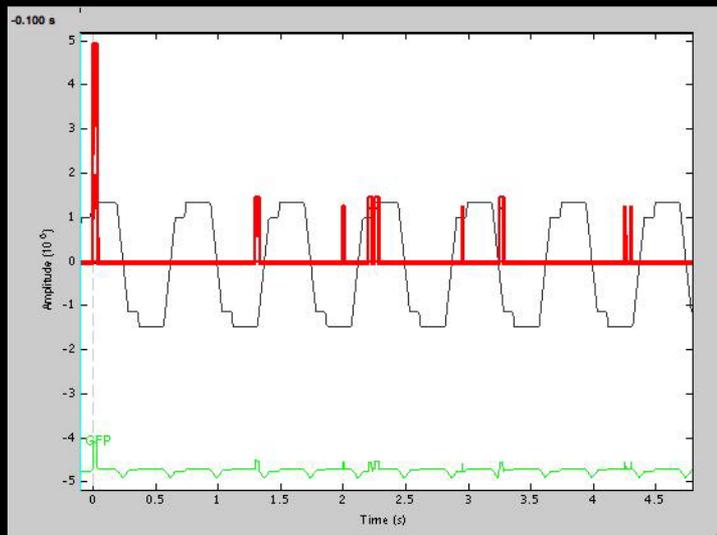
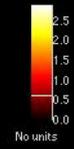
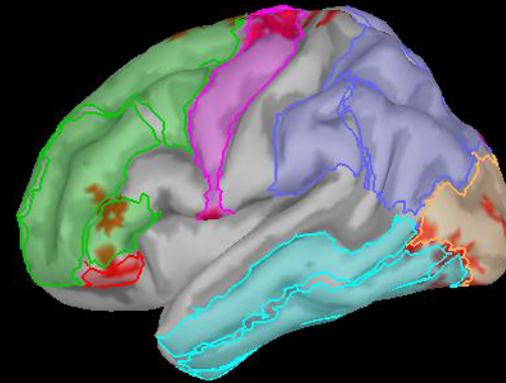
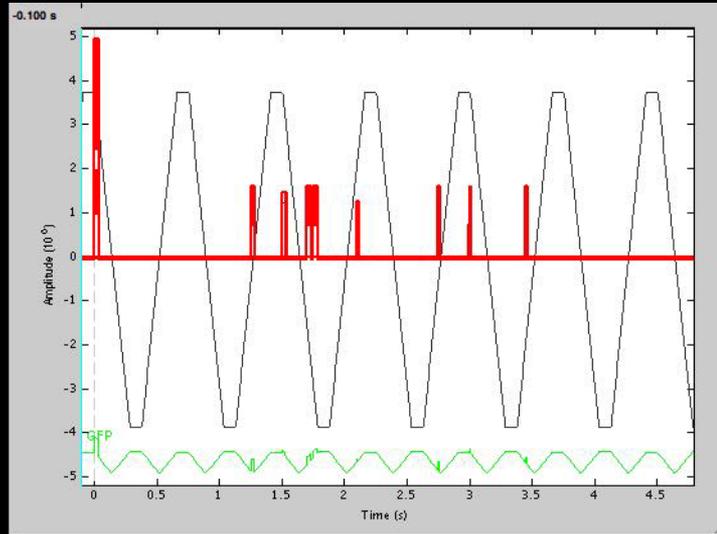


Low IQ person item 13 500ms pre button press



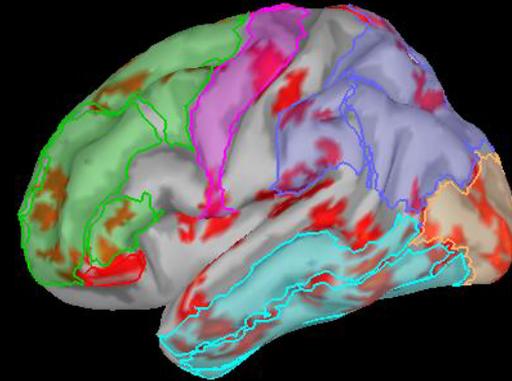
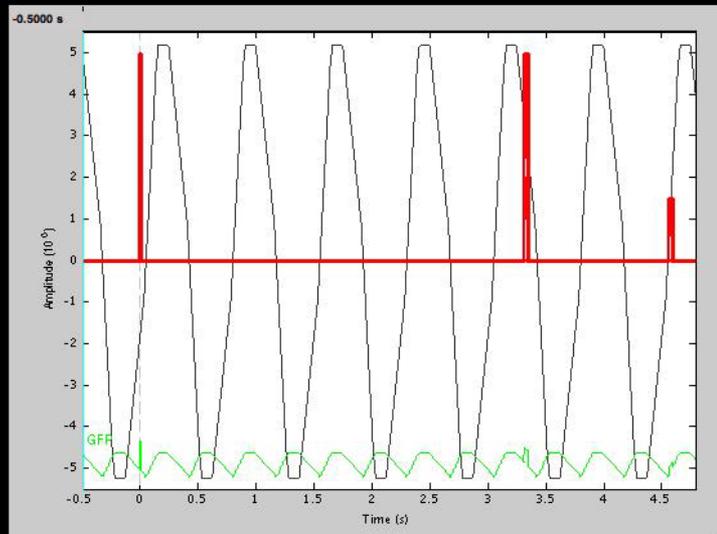
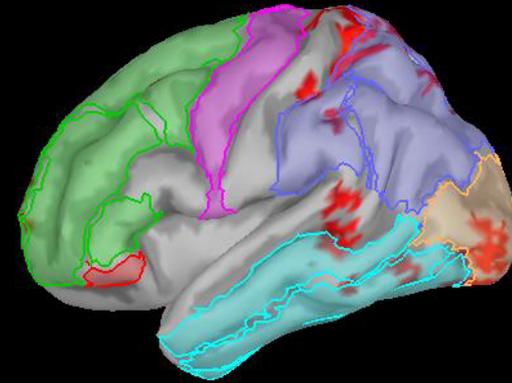
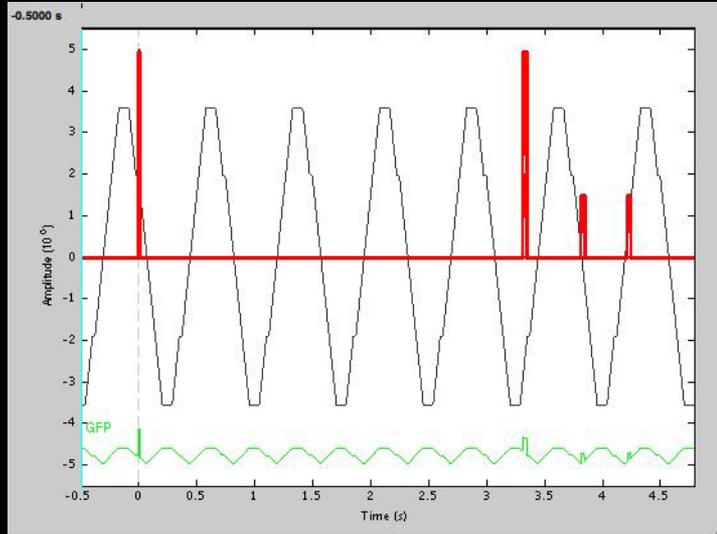
1 sec after stimulus

Ave hi and low groups



-100ms

500msec before button press ave hi and low groups



-500ms

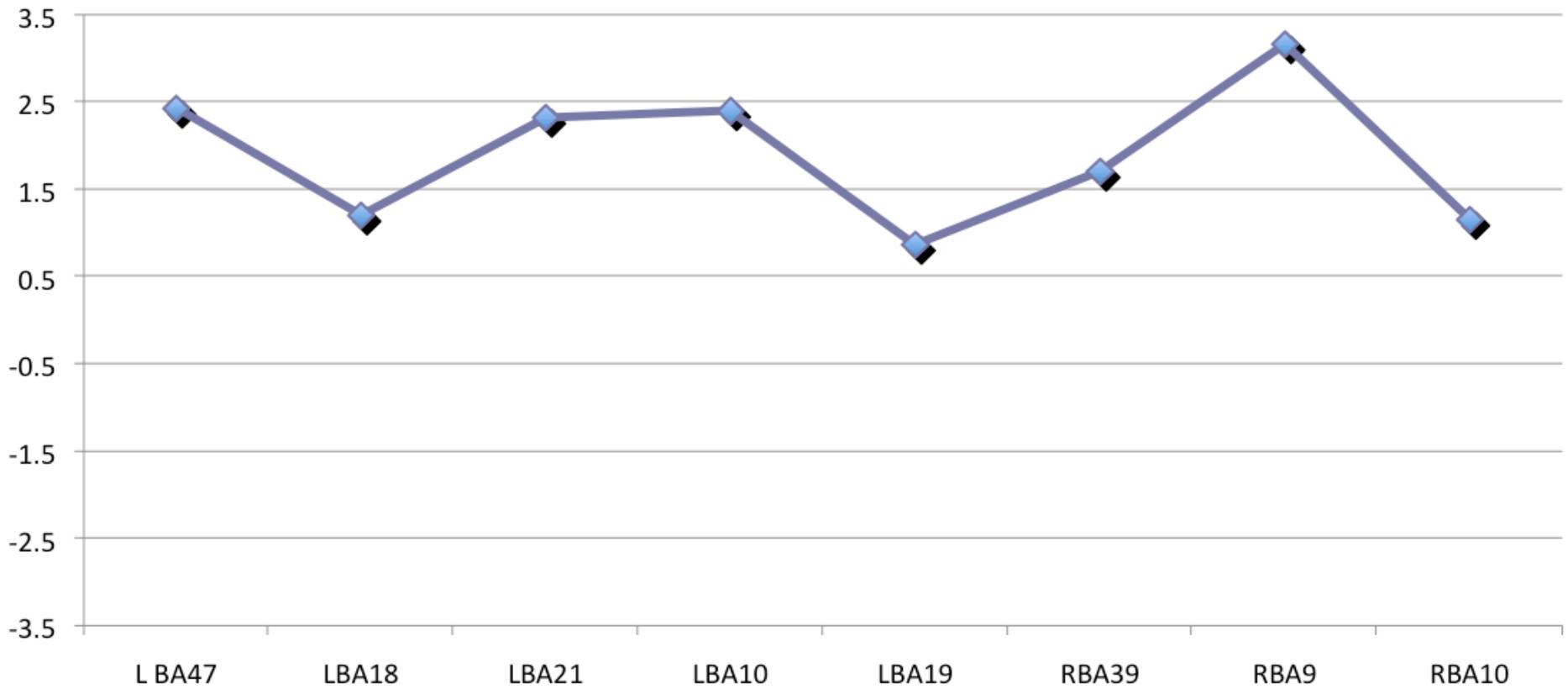
Two Lessons from Brain Imaging Studies So Far:

- 1. Not all brains work equally well.**
- 2. Not all brains work the same way.**

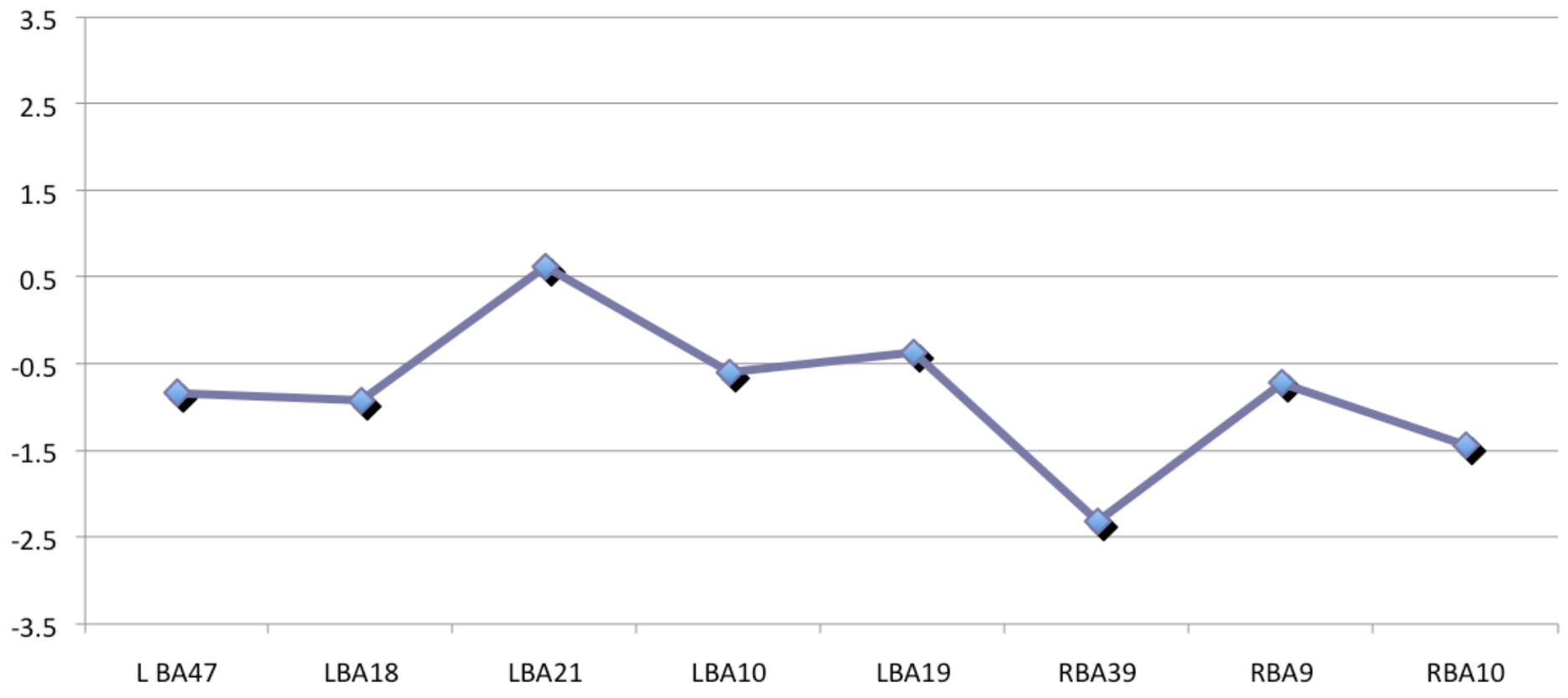
**Therefore, a brain scan
may provide useful
information about how
an individual memorizes,
learns & thinks
(intelligence)**

Scientific American Mind, Nov/Dec 2009

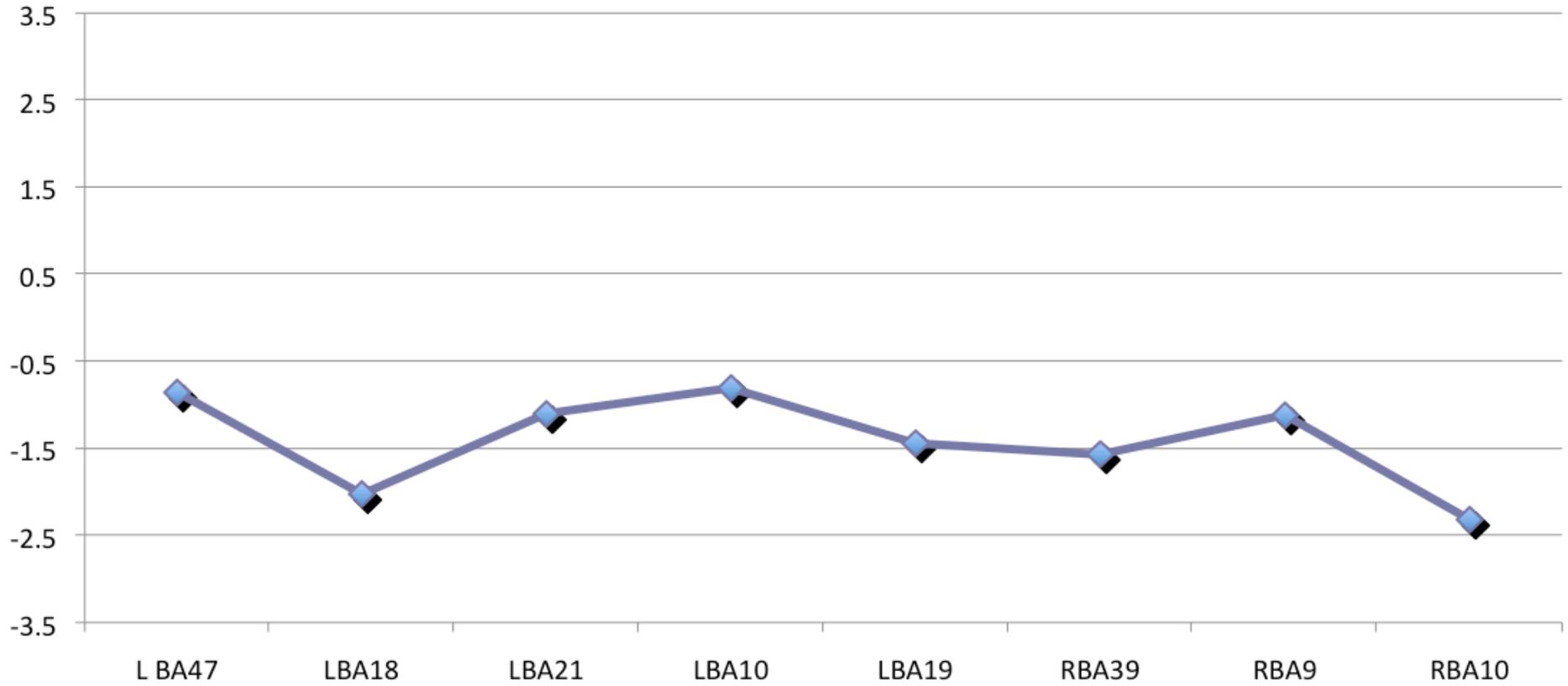
General Intelligence 144



General Intelligence 60

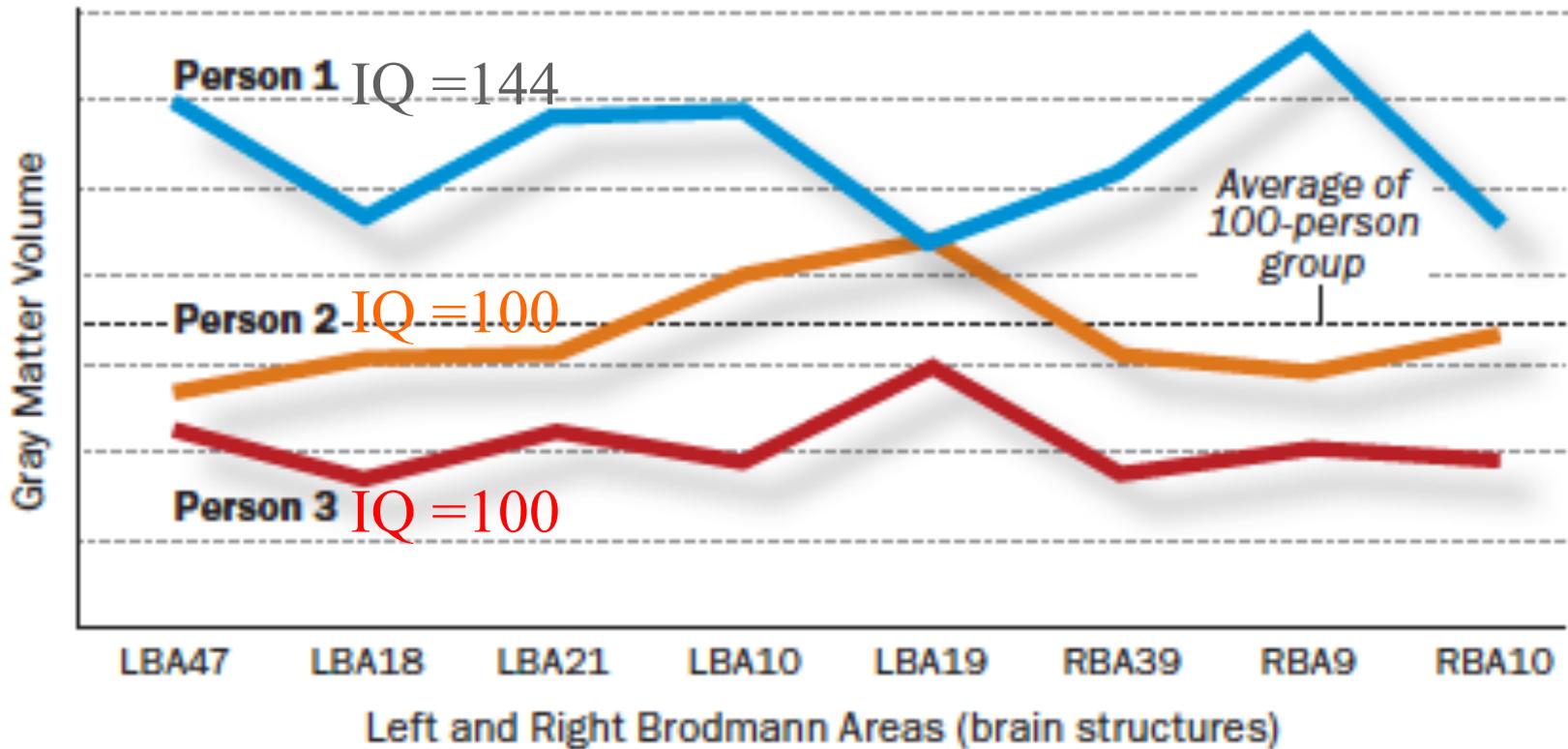


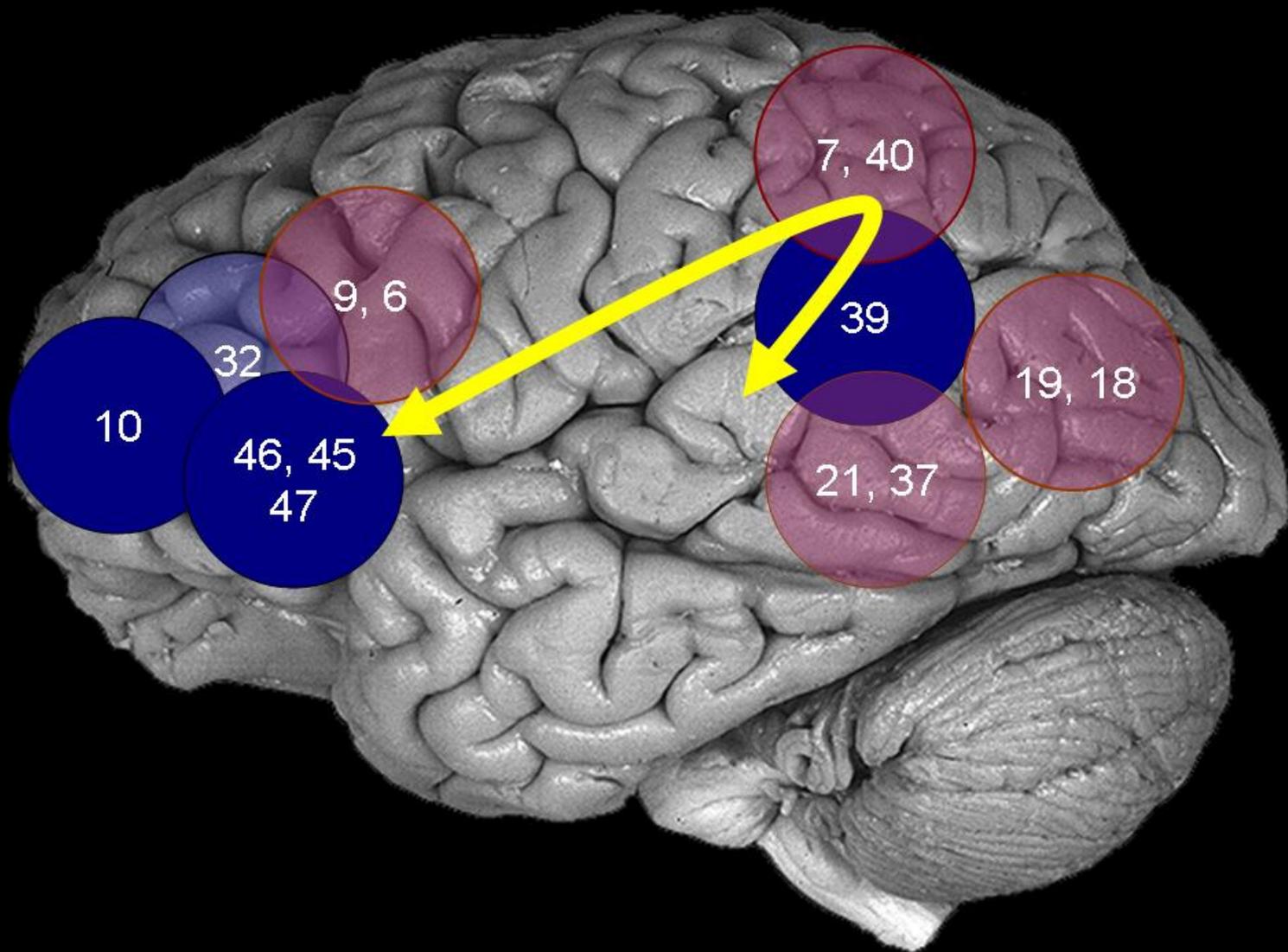
General Intelligence 136



LABEL: The top person's IQ is 144, the orange person is 100, the red person is also 100

How Brains Stack Up





END SESSION 3

Next time:

**How smart do you want to
be?**

www.richardhaier.com