brain is what brain do

Il cervello è quello che fa

Francesco Bricolo, M.D.

"Everyone thinks that brain science is really complicated. It's not. I can explain it in one simple sentence: The brain becomes what the brain does."

Megan Gunnar, Ph.D.

Regents Professor and Distinguished McKnight University Professor, Institute of Child Development, University of Minnesota

“We now know through science that the first three years of life is the most critical time period. It is the time period when the brain develops at a greater rate than any time during the course of a person’s life….but by age 10 your brain is cooked and there’s nothing much you can do.”

Rob Reiner, National Governor’s Association Speech Feb ‘97

BRAIN MATURATION IN 5 POINTS

1° TIMING

Brain maturation continues into the twenties

2° DIRECTION

First primitive, after new

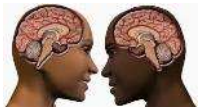
3° EVENTS

The three major events of brain maturations

4° RULES

Golden rule: use it or lose it

5° GENDER



Female mature earlier than male

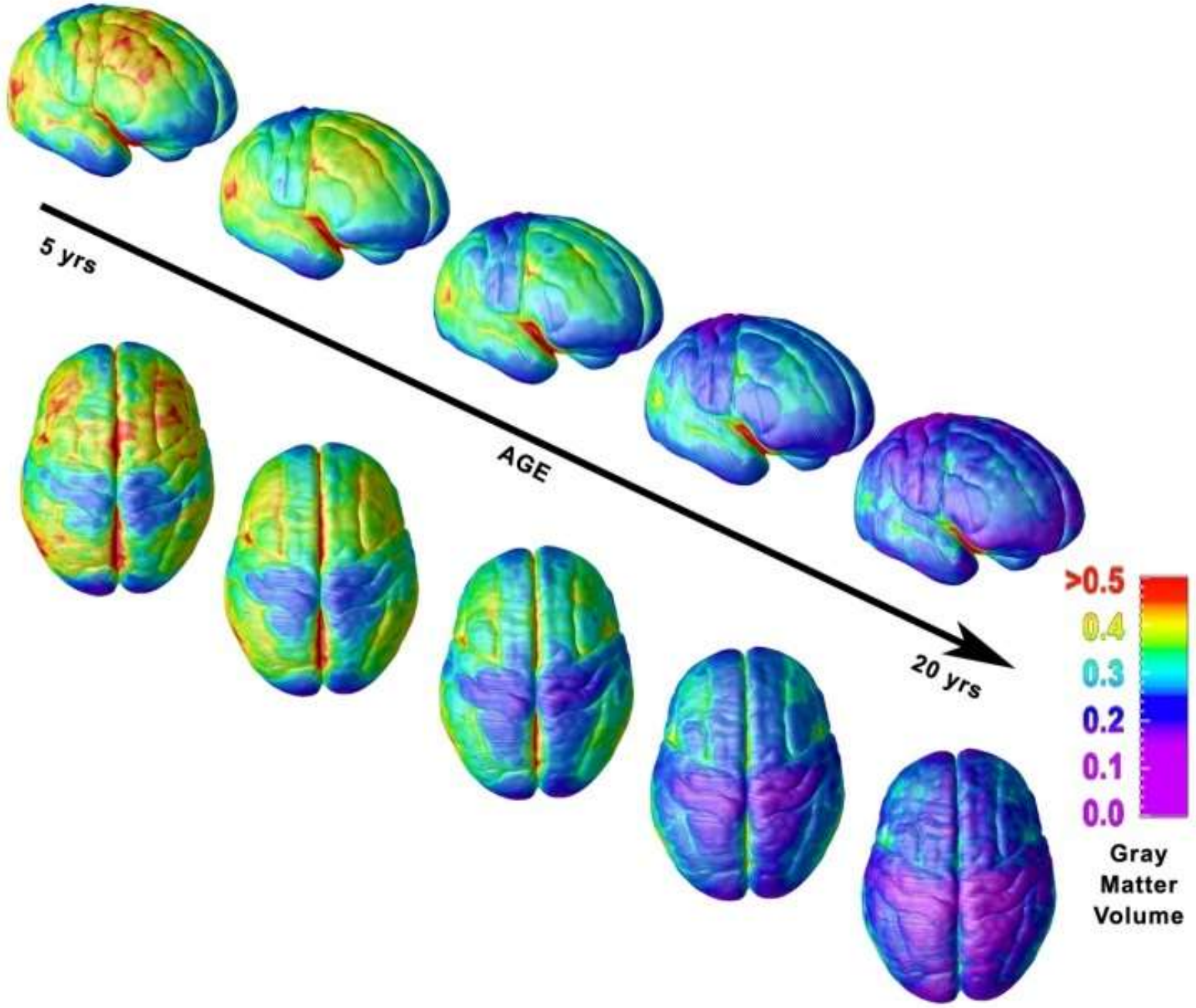
1° TIMING

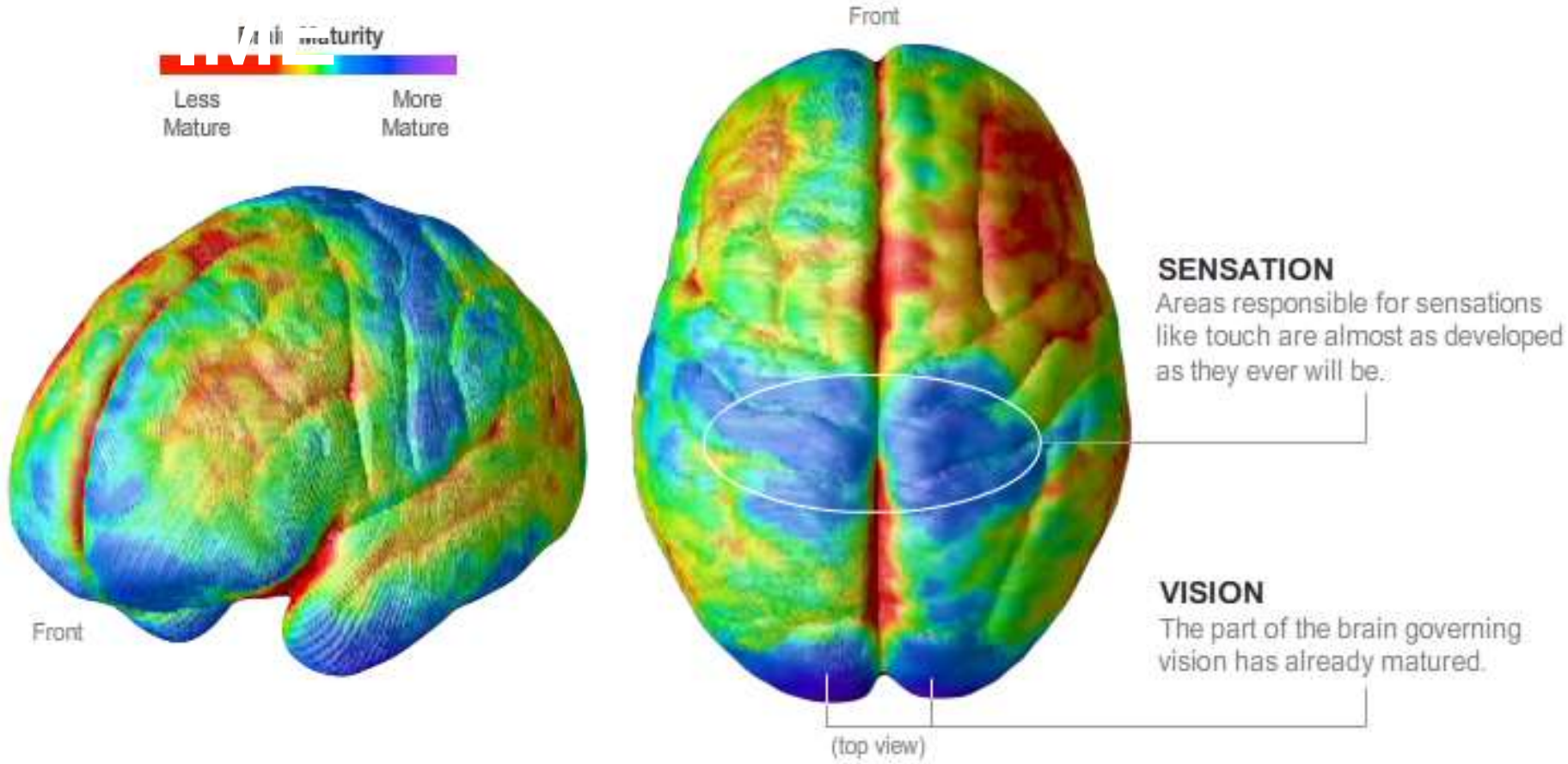
Brain maturation continues into the twenties

Not everyone gets the blues. Healthy brain maturation (shown in blue) takes real work – Experience and practice are necessary

Nitin Gogtay MD, Jay N. Giedd MD, Leslie Lusk BA, Kiralee M. Hayashi BS, Deanna Greenstein PhD, A. Catherine Vaituzis, David H. Herman BS, Tom F. Nugent III AB, Liv Clasen PhD, Arthur W. Toga PhD, Judith L. Rapoport MD, and Paul M. Thompson PhD: *Dynamic Mapping of Human Cortical Development during Childhood through Early Adulthood,* *Proceedings of the National Academy of Sciences*, 101(21):8174-8179, May 25 2004

IMAGING & MEANING



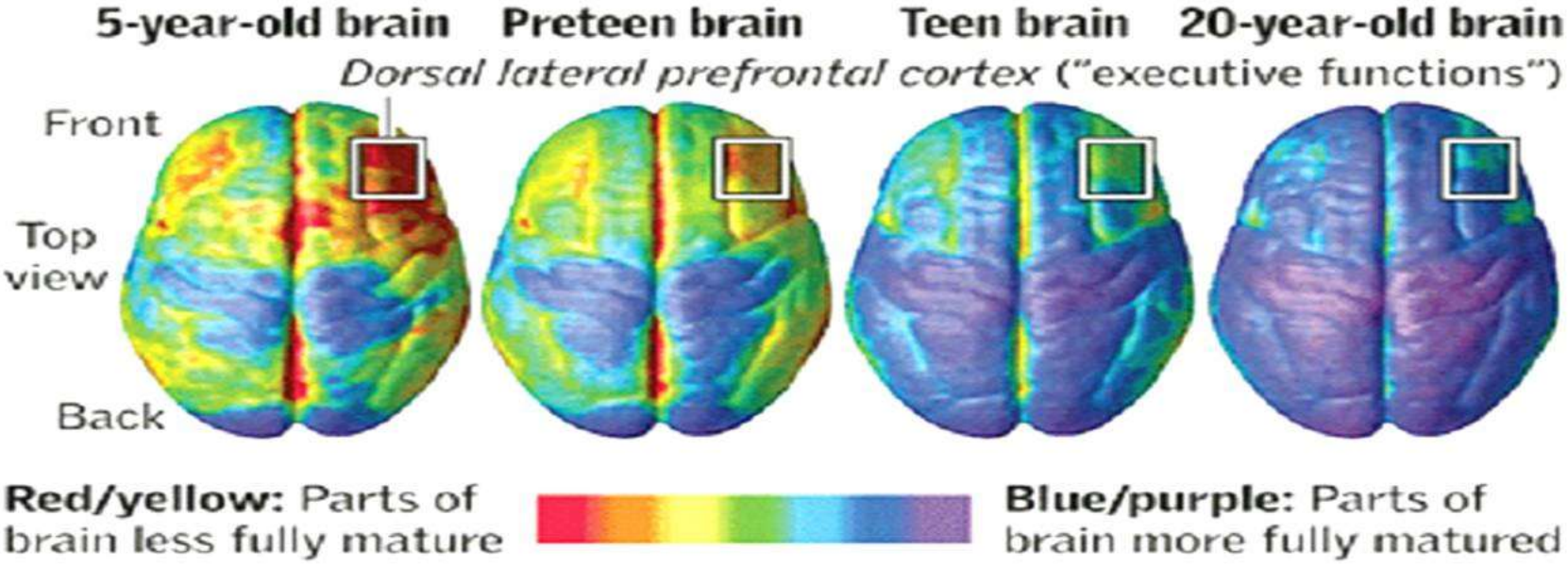

Maturity
Less Mature
More Mature
Front
Front
(top view)
SENSATION
Areas responsible for sensations like touch are almost as developed as they ever will be.
VISION
The part of the brain governing vision has already matured.

4 years old

IMAGING & MEANING

Judgment last to develop

The area of the brain that controls "executive functions" — including weighing long-term consequences and controlling impulses — is among the last to fully mature. Brain development from childhood to adulthood:

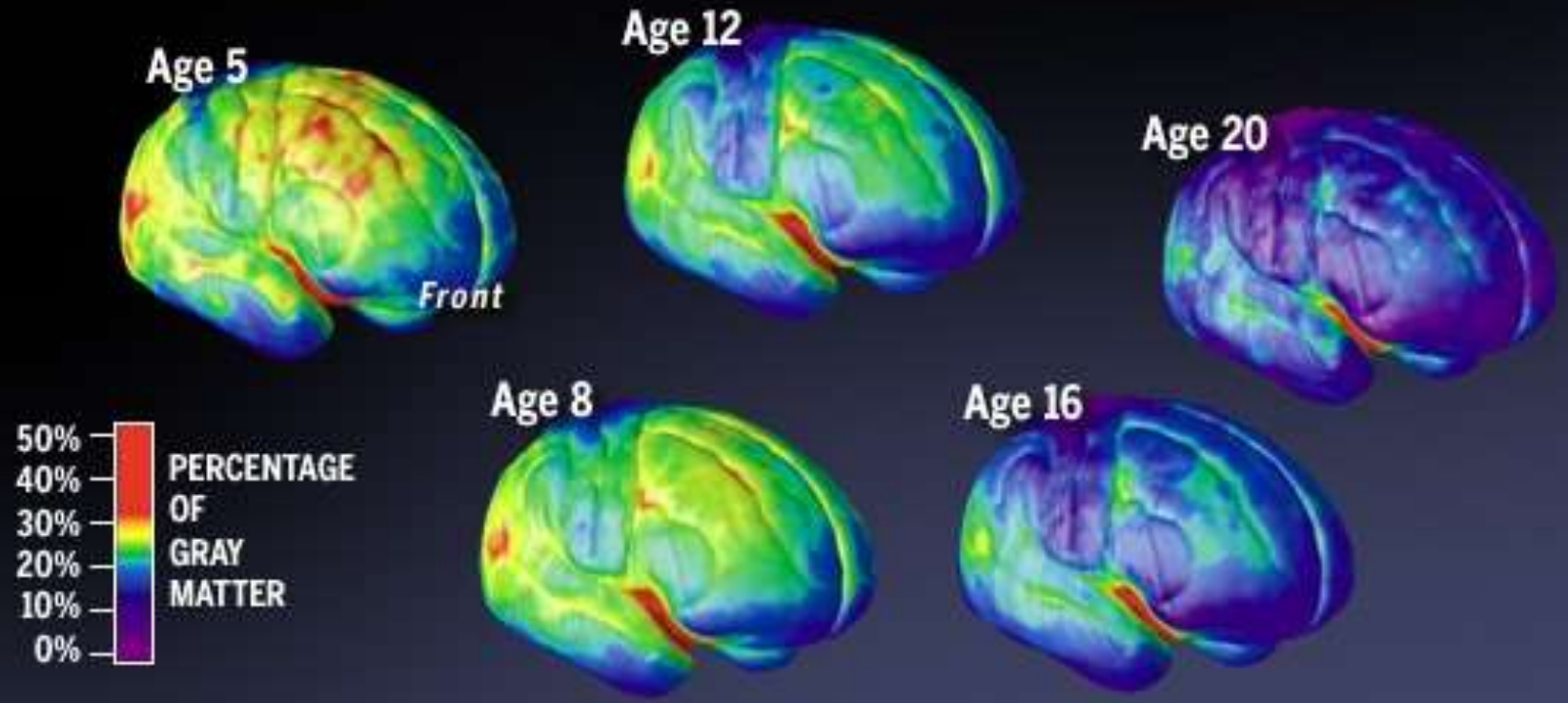


Sources: National Institute of Mental Health; Paul Thompson, Ph.D., UCLA Laboratory of Neuro Imaging

Thomas McKay | The Denver Post

Time-Lapse Brain

■ Gray matter wanes as the brain matures. Here 15 years of brain development are compressed into five images, showing a shift from red (least mature) to blue.



« PREVIOUS

NEXT: Launch Flash Movie »

2° DIRECTION

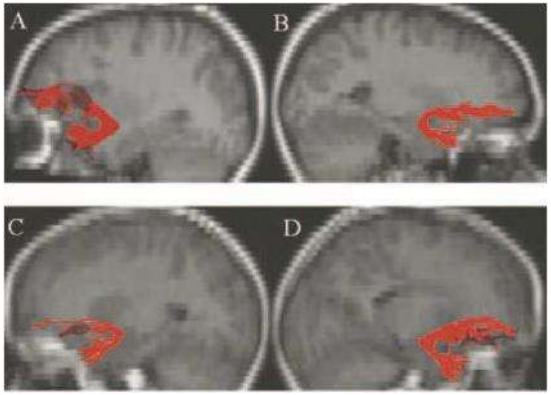
The most primitive parts of the brain mature first, and then the neocrtex.

3° EVENTS

Myelinization, simpathogenesis and pruning are the three major events of brain maturaion.

THE RULE

myelinization

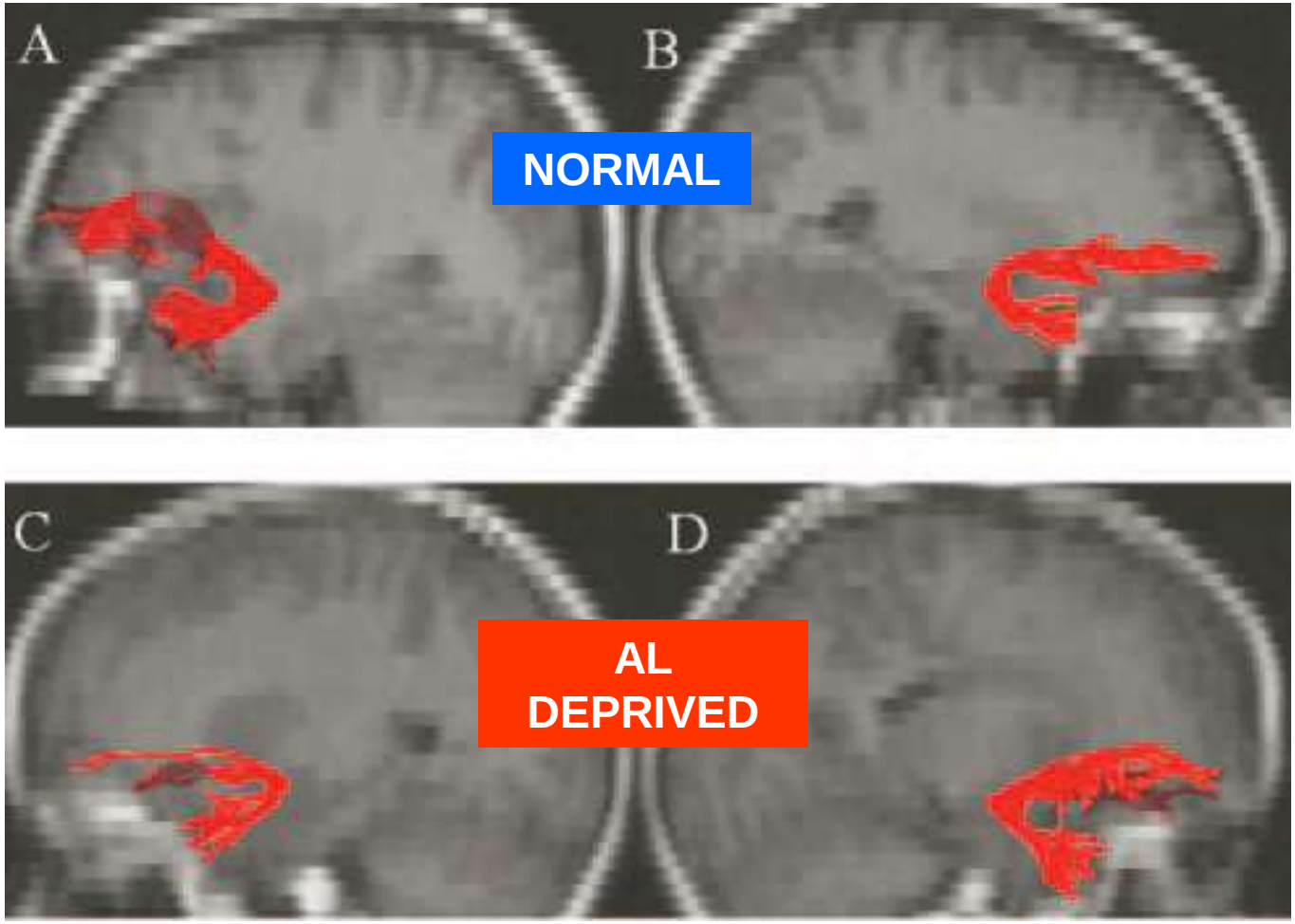


Eluvathingal TJ, Chugani HT, Behen ME, Juhász C, Muzik O, Maqbool M, Chugani DC, Makki M. Abnormal Brain Connectivity in Children After Early Severe Socioemotional Deprivation: A Diffusion Tensor Imaging Study. Pediatrics. 2006 Jun;117(6):2093-100.

simpathogenesis

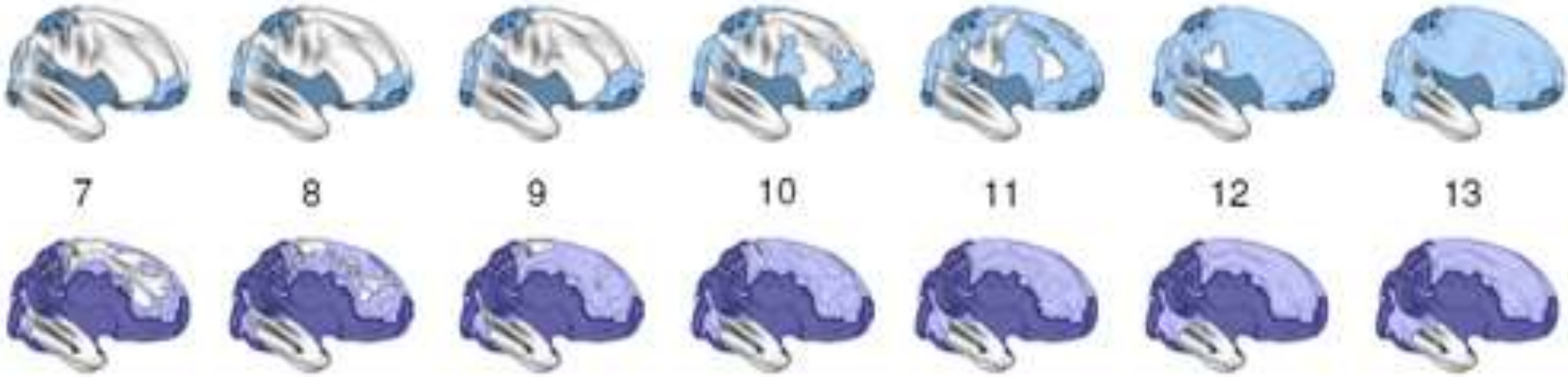
volume

WHEN THERE IS A PROBLEM



Left uncinate fasciculus

Eluvathingal TJ, Chugani HT, Behen ME, Juhász C, Muzik O, Maqbool M, Chugani DC, Makki M. Abnormal brain connectivity in children after early severe socioemotional deprivation: a diffusion tensor imaging study. Pediatrics. 2006 Jun;117(6):2093-100



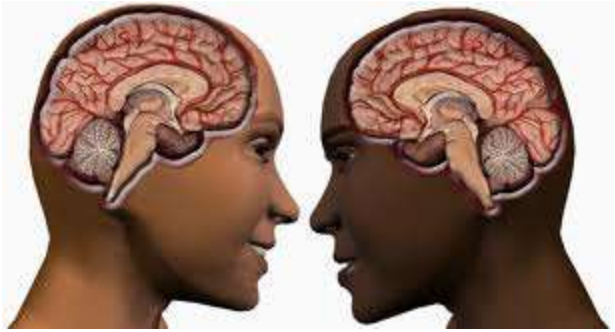
Typically developing controls

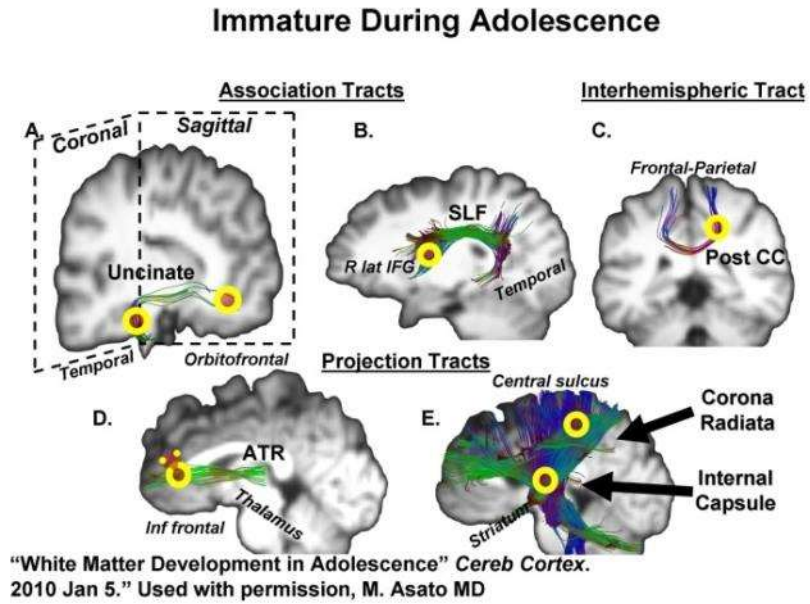
4° RULES

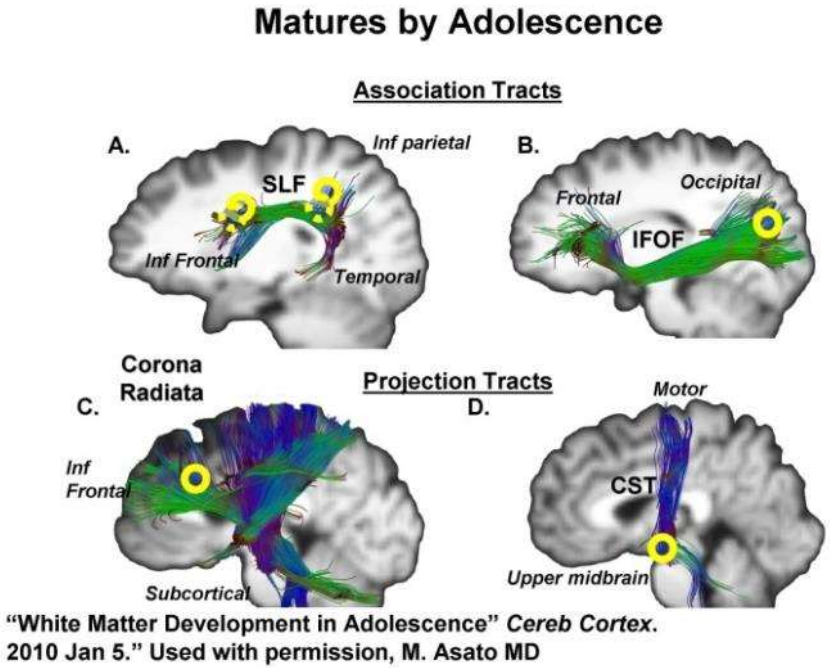
The golden rule is that neural network development is use-dependent.

5° GENDER

Female brains mature earlier than male brains.







Asato MR, Terwilliger R, Woo J, Luna B. White Matter Development in Adolescence: A DTI Study. Cereb Cortex. 2010 Jan 5.