
A COLLABORATIVE ONLINE EVENT
PUSHING THE BOUNDARIES OF ACHIEVEMENT
A SERIES ON THE LATEST EVOLUTION OF APPLIED NEUROSCIENCE

ELITE PERFORMANCE SOLUTIONS

Thank you for joining us today, along with our international partners

LEARNFAST

STRONGER BRAINS
For better lives

BRAINMAPS 大脑地图 英文口语阅读

BRAINFIT

Your Panelists

Alex Kitzes Ph.D.
Clinical Psychologist & Co-Founder of Stronger Brains Inc, USA

Cheryl Chia
Physiotherapist & Founder of Singapore-based BrainFit

Dave Stanley
Director of Learning Ecosystems at LearnFast Australia

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Your Presenter | Steve Miller, PhD

Steve works as an applied neuroscientist and technology executive with more than 25 years of industry experience.

Dr. Miller authored or co-authored more than 100 publications including numerous multi-site research studies, commercial software programs and U.S. Patents. A majority of his patents have been licensed, brought to commercial practice, and in 2000 he was a co-recipient of the Thomas Alva Edison Patent Award in Medicine for this work.

As a business executive, he is a passionate collaborator with broad business experience in technology transfer and translational research.

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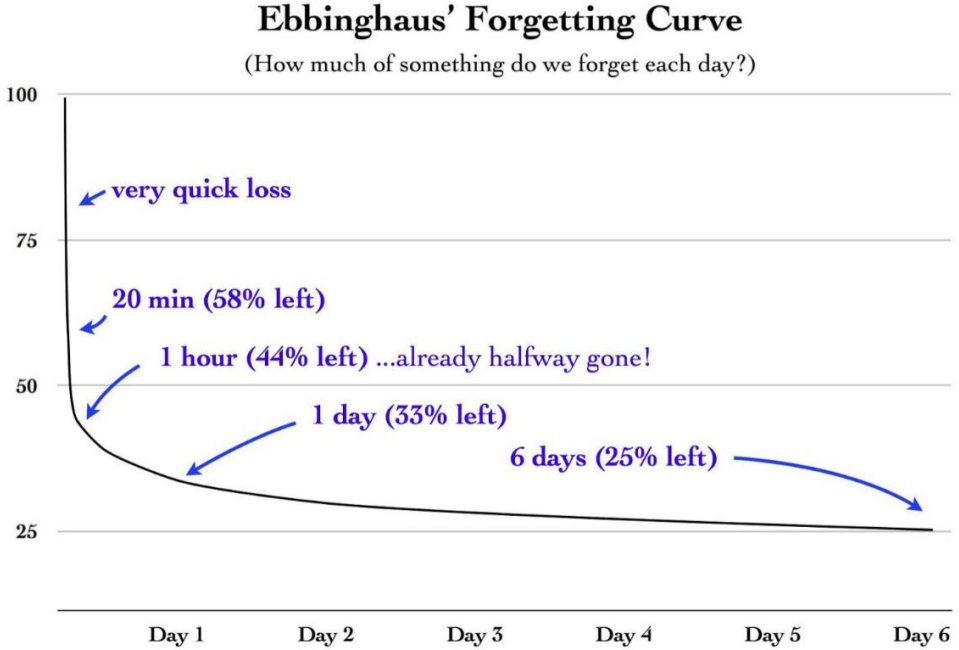
Elite Learning: Some Best Practices in Attention & Memory

Steve Miller, PhD

Things you can do to enhance learning

- Nutrition
- Exercise
- Sleep
- Engaged Learning - Today's Topic

Study Tip 1: Memory & Forgetting



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Spacing Effects for Studying

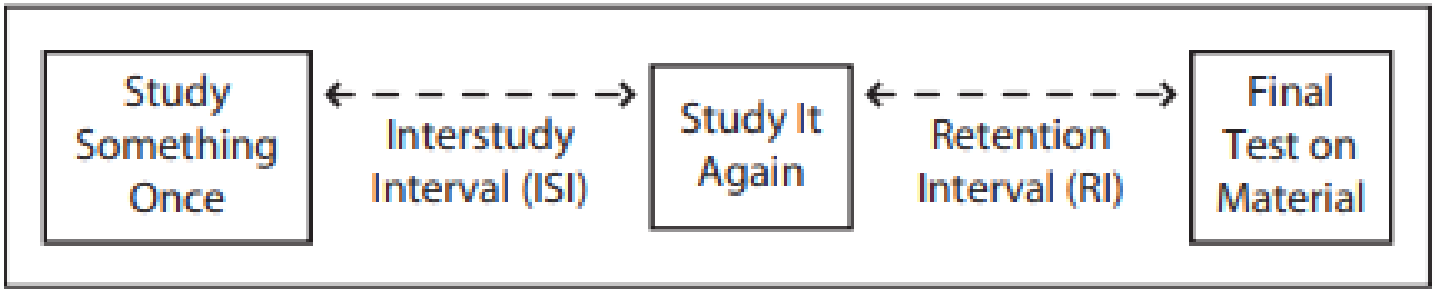
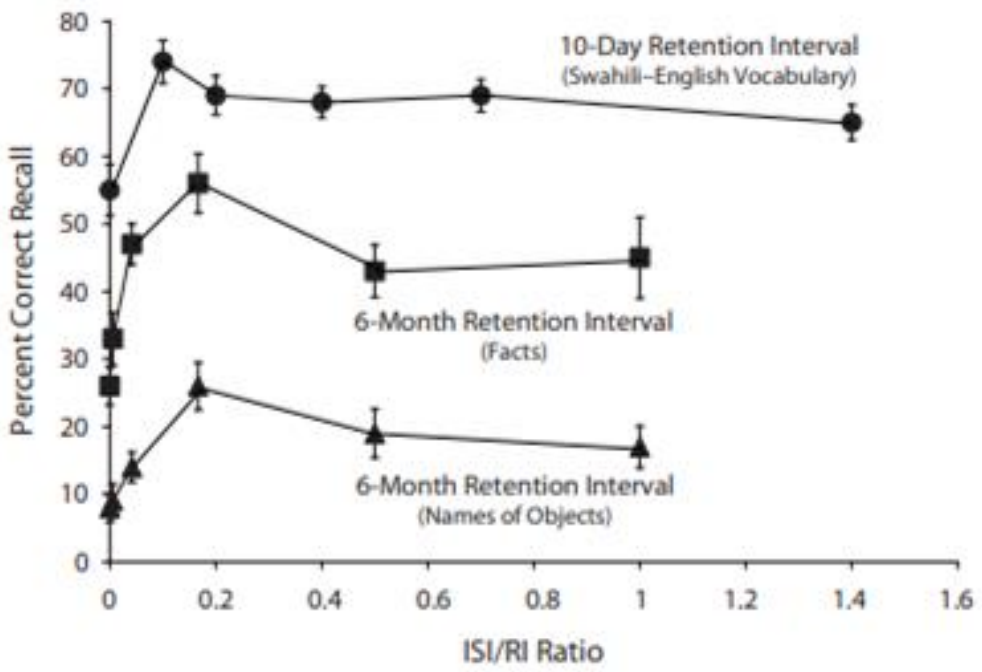


Figure 1. The basic design of a spacing experiment. Subjects have two opportunities to learn the same material, separated by an ISI. After an RI that is measured from the second learning episode, a final test is given. A spacing experiment most typically has one RI and several values of ISI.

Pashler, et al., 2007 Psychonomic Bulletin & Review

Too little spacing is worse than too large of spacing



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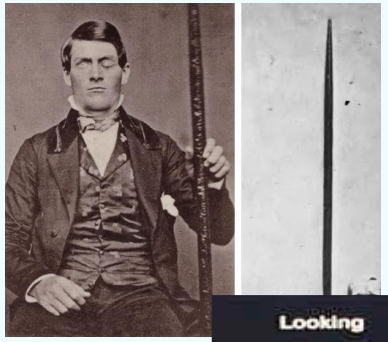
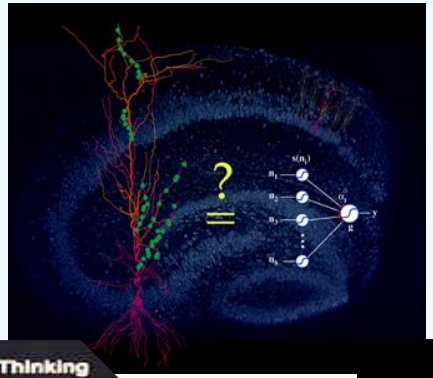
Exercise + Study + Nap was the winner

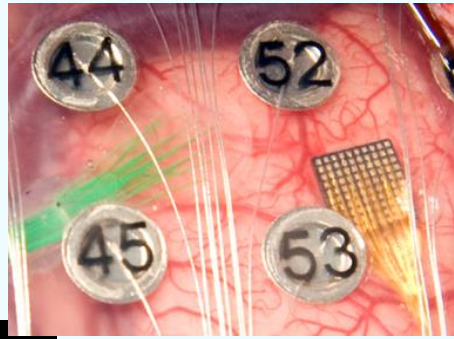
Using New Tools to Enhance Engagement

A Brief History of Neuroscience

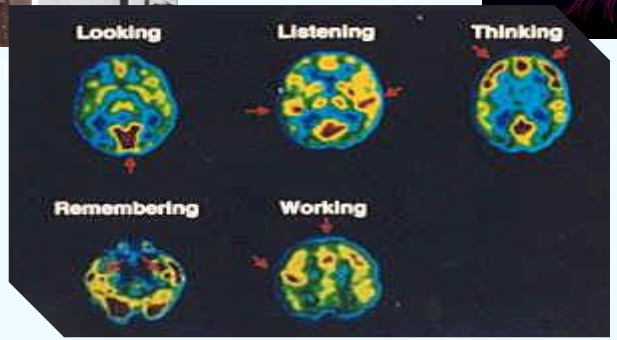


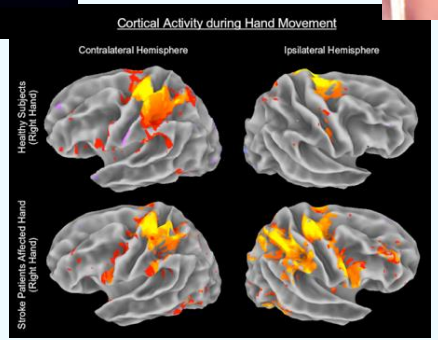
Functional Magn





Electrocorticography (eCOG)





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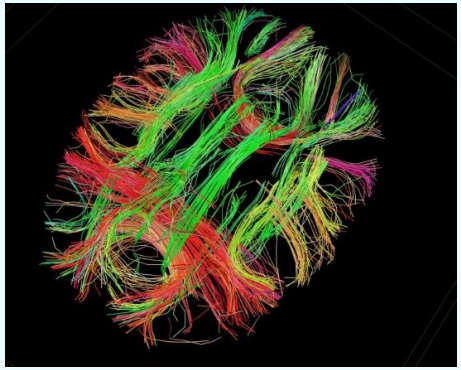
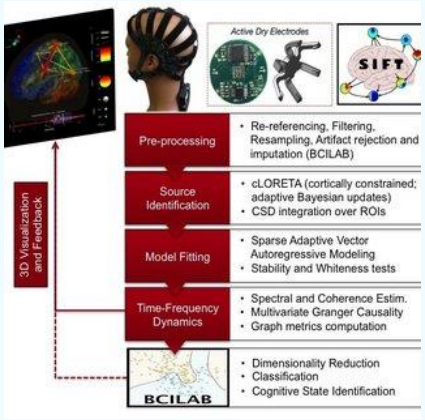
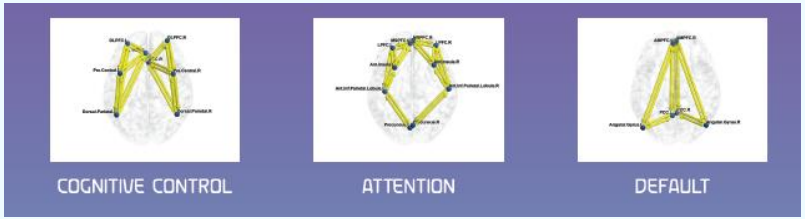
A Brief History of Neuroscience CONTINUED





Electroencephalography (EEG)

Magnetic Resonance Imaging (MRI)



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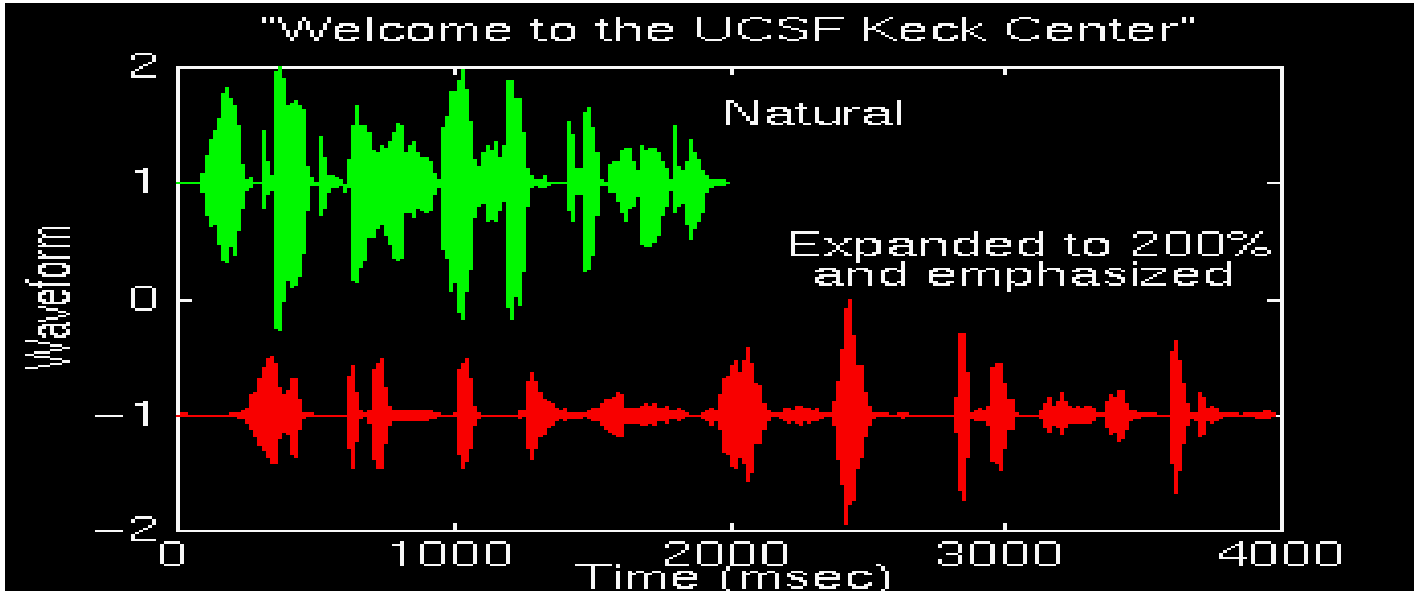
More Precise and Accurate Control of Oral Language building FFWD Language



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Mathew Effects: Extra 10 minutes is 600K word exposures

Current Reading			Plus 10 Minutes per Day	
Percentile	Minutes per Day	Words per Year	Percent Increase	Words per Year
98	65.0	4,358,000	15%	5,028,000
90	21.1	1,823,000	47%	2,687,000
80	14.2	1,146,000	70%	1,953,000
70	9.6	622,000	104%	1,270,000
60	6.5	432,000	154%	1,097,000
50	4.6	282,000	217%	895,000
40	3.2	200,000	313%	825,000
30	1.8	106,000	556%	695,000
20	0.7	21,000	1429%	321,000
10	0.1	8,000	Approximately 300,000 words	
2	0	0	Approximately 300,000 words	

Cunningham & Stanovich. (1998) What reading does for the mind. *American Educator*, Spring/Summer, pp. 8-15. From Anderson,Wilson,& Fileding (1988). Growth in reading and how children spend their time outside of school.*RRQ,23*,285-303.

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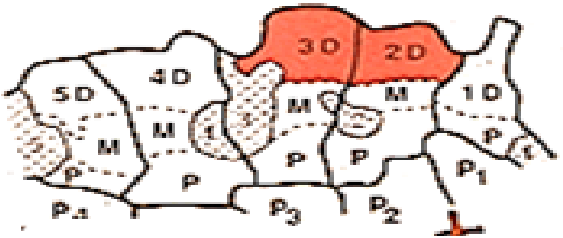
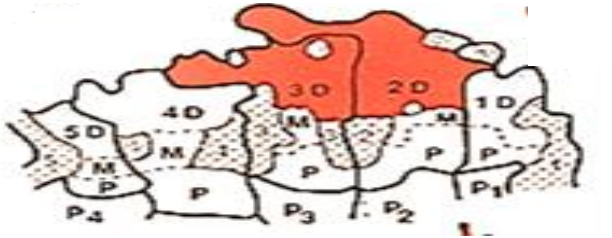
Brain Plasticity is Lifelong

Plasticity refers to the ability of the brain to change through experience and learning.



Behavioral Training



- Synchronous Neural Activity (Frequency)
- Competition for Neural Space (Adaptive)
- Discriminating Neural Activity (Simultaneous Development)
- Rewarded Neural Activity (Timely Motivation)

Jenkins et al (1990).

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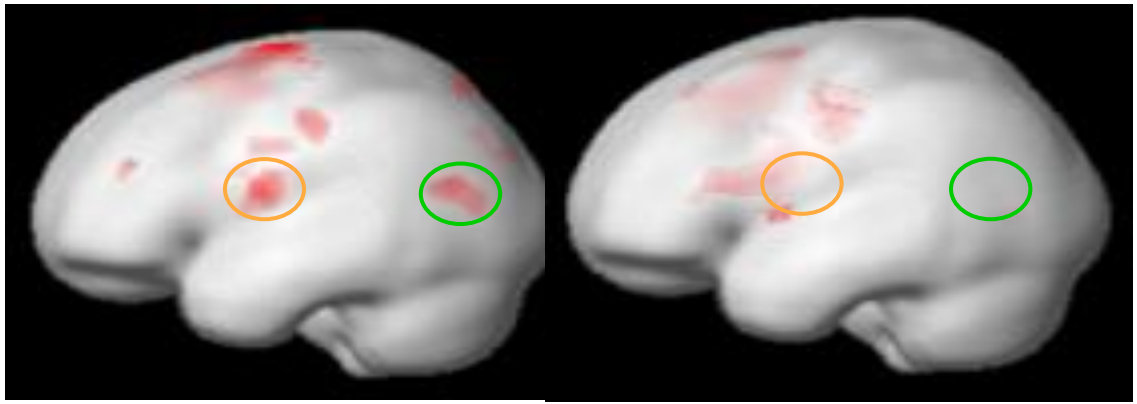
fMRI images of the Reading Brain

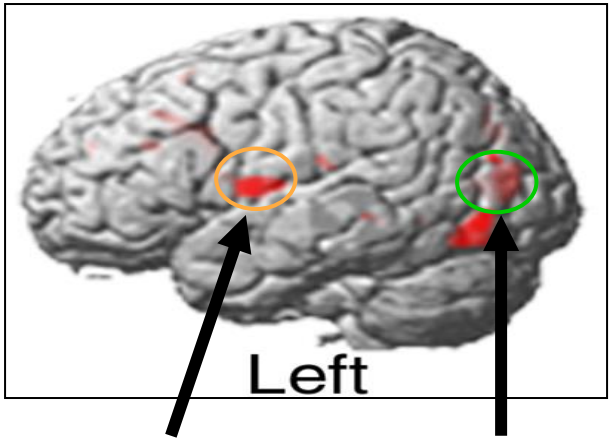
Stanford University Imaging Study: Brain processes are more “normalized” following intervention

Normal

Struggling readers, before training

Following intervention





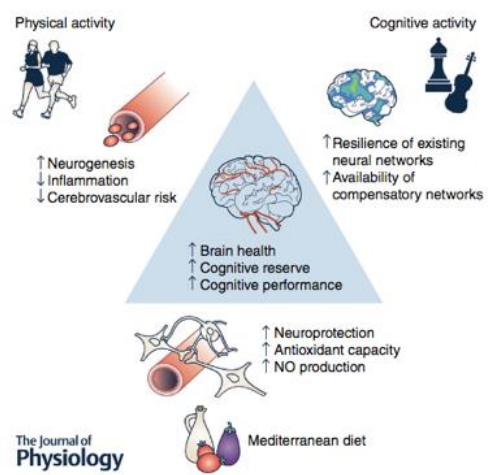
Temple et al., PNAS, 2000; 2003

Cortical areas critical for reading

The Good News
Exercise & Video Games (even in the elderly)

Promoting brain health through exercise and diet in older adults: a physiological perspective

Philippa A. Jackson[1], Vincent Pialoux[2], Dale Corbett[3,4], Lauren Drogos[5,6], Kirk I. Erickson[7], Gail A. Eskes[5,8] and Marc J. Poulin[5,6,9,10,11]



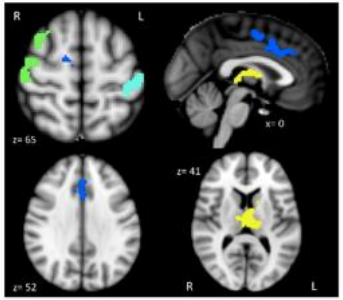
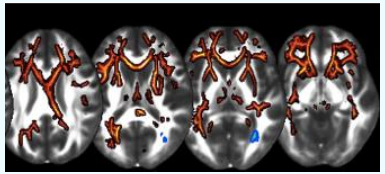


FIGURE 2 | Brain activation patterns associated with higher levels of cardiorespiratory fitness and dual-task processing. The brain figure shows the four clusters of activation anterior cingulate and supplementary motor cortex (ACC and SMA; blue), thalamus and basal ganglia (yellow), right motor/somatosensory cortex and middle frontal gyrus (MFG; green), and left somatosensory cortex (teal).



White matter microstructure mediates the relationship between cardiorespiratory fitness and spatial working memory in older adults☆

Lauren E. Oberlin [a,b,*], Timothy D. Verstynen [b,c], Agnieszka Z. Burzynska [d,g], Michelle W. Voss [e], Ruchika Shaurya Prakash [f], Laura Chaddock-Heyman [g], Chelsea Wong [g], Jason Fanning [h], Elizabeth Awick [h], Neha Gothe [i], Siobhan M. Phillips [j], Emily Mailey [k], Diane Ehlers [h], Erin Olson [l], Thomas Wojcicki [m], Edward McAuley [h], Arthur F. Kramer [g], Kirk I. Erickson [a,b]

ACTIVE study: Well-targeted brain training might significantly reduce dementia risk

By: SharpBrains

–An example of a speed-of-processing task. Courtesy of Posit Science

After 10 years, only the speed-of-processing training group showed a statistically significant impact on cognition. The researchers detected a 33 percent reduction (p=0.012) in risk of developing cognitive decline or dementia over those 10 years in those assigned to the speed training group. Participants who did the booster sessions – those who participated in 11 or more sessions of the computerized training – showed a 48 percent reduction in risk of developing cognitive decline or dementia over time. There was no significant difference in the other two training groups.

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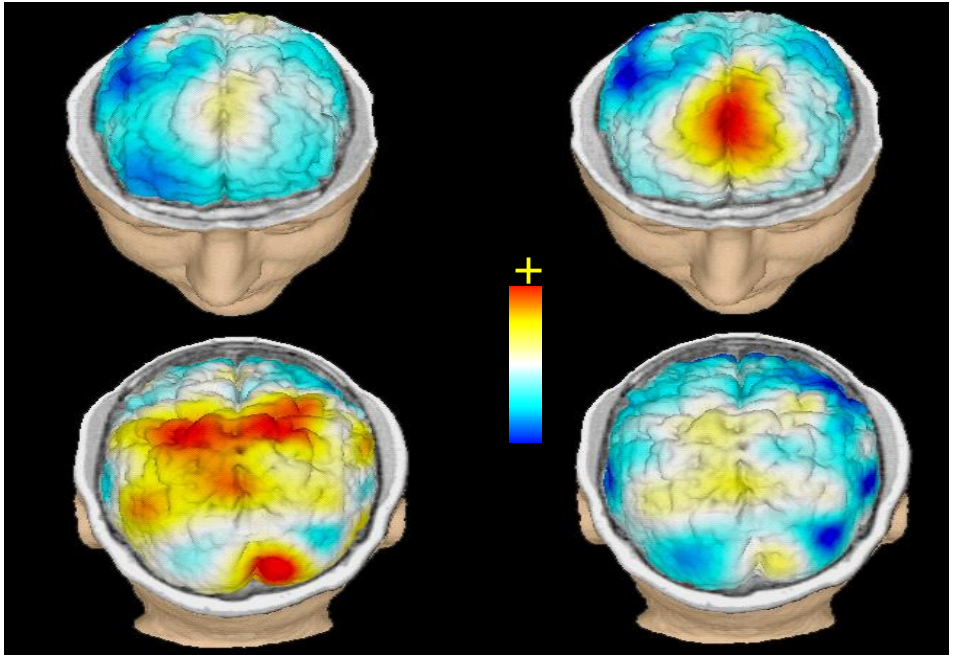
Brainwave Analysis
Relating EEG Parameters to Cognition



Theta 5-7Hz

Thousands of controlled laboratory experiments have shown that EEG rhythms systematically vary as a function of test condition.

Alpha 8-10Hz

Spatial maps of EEG spectral power shown here reveal different levels of mental engagement when performing an easy laboratory test versus a difficult test.

“Disengaged” “Engaged”

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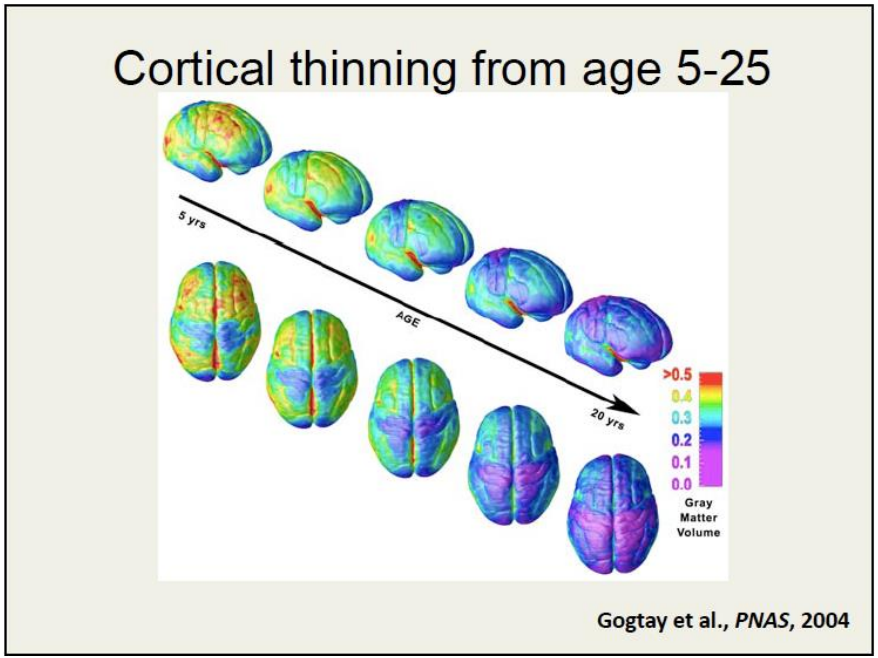
From a young age the ability to evaluate risk and reward as well as delay gratification are correlated with higher academic performance later in life.

Note: this is what we observe, not limiting what can be…

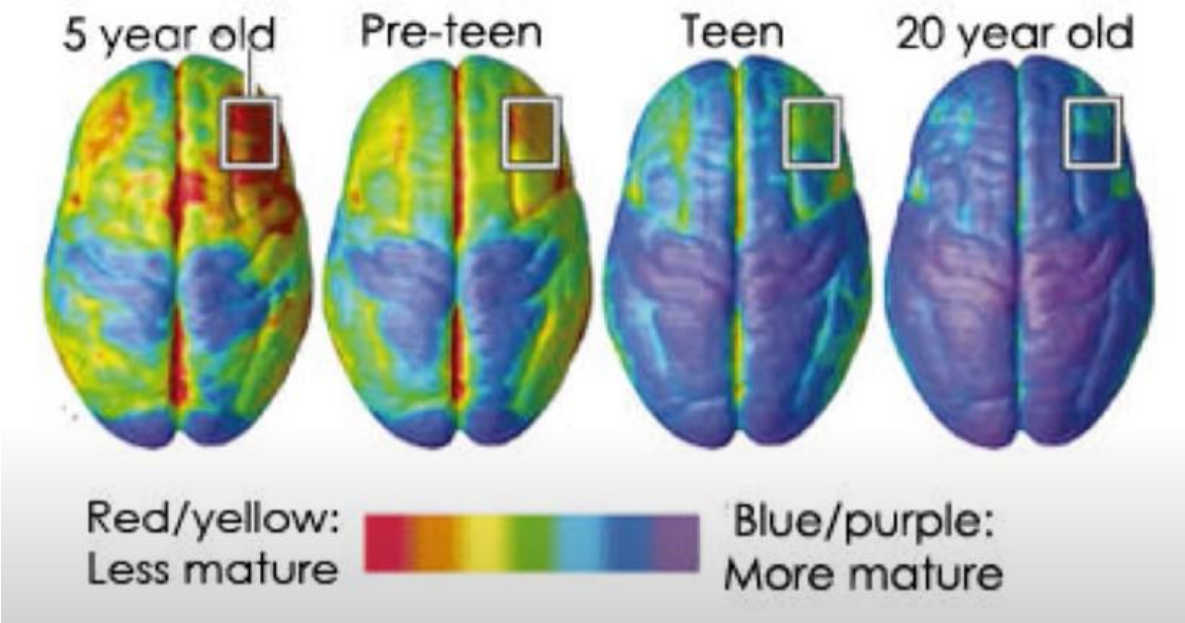
The Teenage Brain



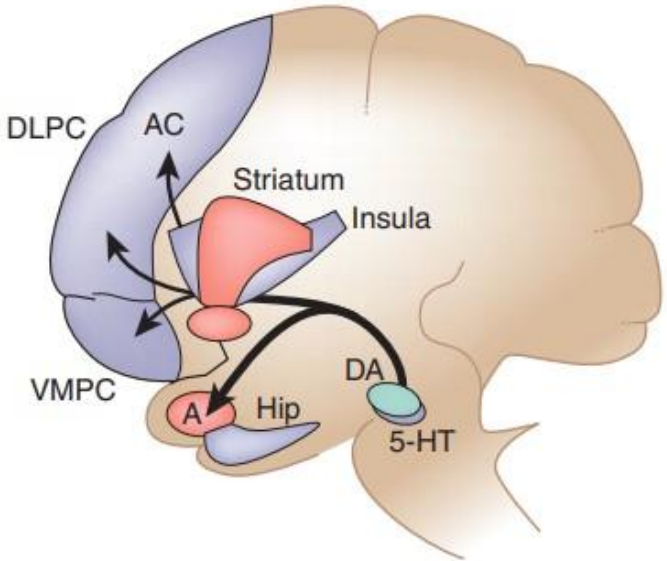
Most likely reflects

- reductions in gray matter *and*
- increases in white matter

Decision-Making System Development



Simplified Decision-Making Model



Accelerator is in Red
Brake System is in Purple

Issues of system coordination or balance create our challenges for attention and impulse control

Cognitive Monitoring & Feedback of Response Errors

Attention-Deficit/Hyperactivity Disorder

Attention-deficit/hyperactivity disorder (ADHD) is a disorder marked by an ongoing pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development.

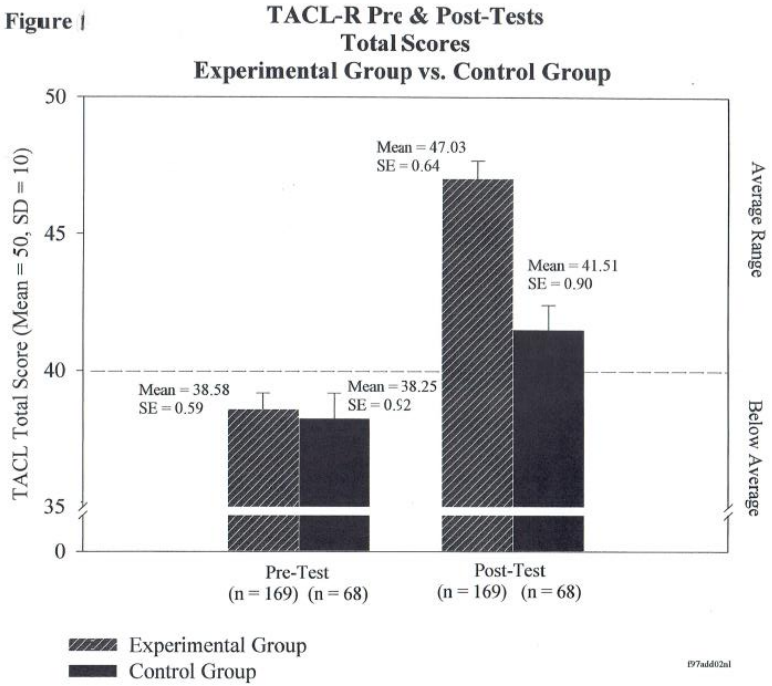
Inattention a person wanders off task, lacks persistence, has difficulty sustaining focus, and is disorganized; and these problems are not due to defiance or lack of comprehension.

Hyperactivity a person seems to move about constantly, including in situations in which it is not appropriate; or excessively fidgets, taps, or talks. In adults, it may be extreme restlessness or wearing others out with constant activity.

Impulsivity a person makes hasty actions that occur in the moment without first thinking about them and that may have a high potential for harm, or a desire for immediate rewards or inability to delay gratification. An impulsive person may be socially intrusive and excessively interrupt others or make important decisions without considering the long-term consequences.

Source: nimh.nih.gov

FFWD Improved Language Listening Performance



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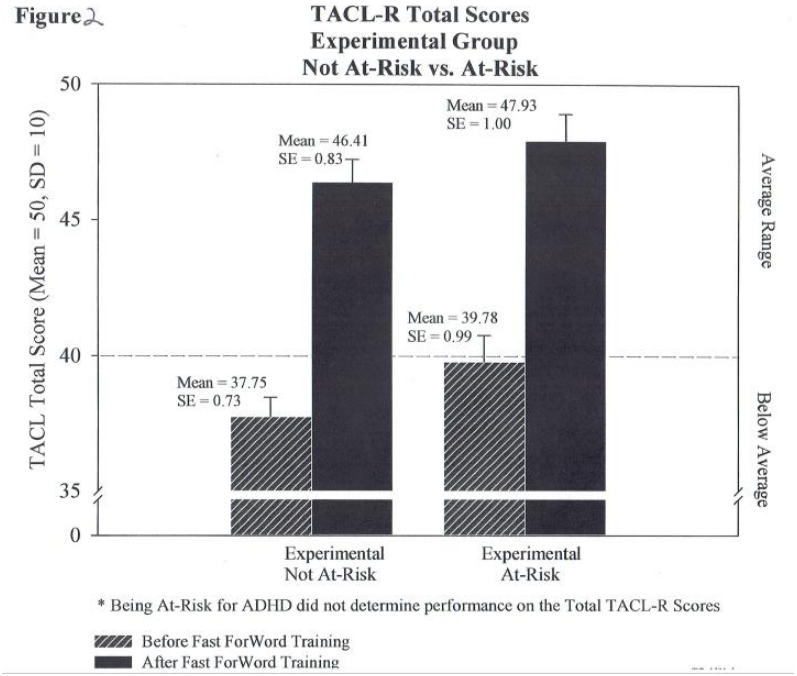
Gains Independent of ADHD Risk



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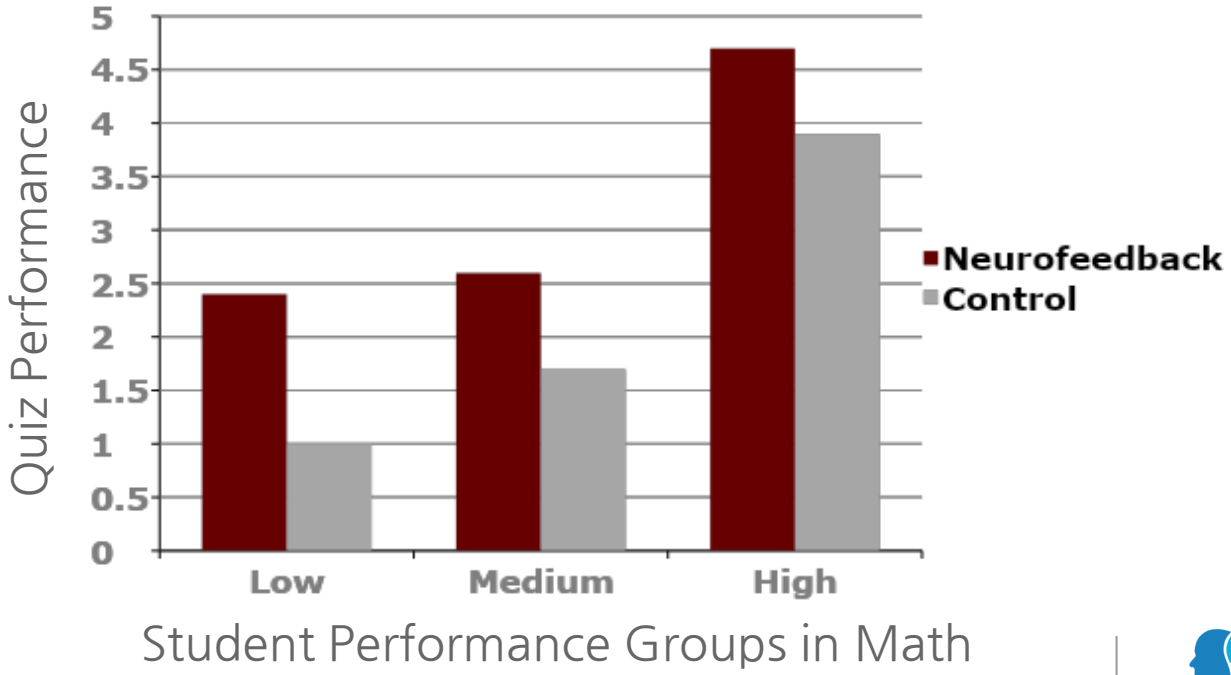
New Opportunities Due to Growth in Computing

- Breakthrough methodologies in neuroscience are only possible due to parallel advances in computing capacity and software tools and algorithms
- Millisecond timing analysis
- Millimeter source localization
- Advanced signal-processing and pattern-recognition algorithms

Feasibility Study: USA Public School

Evaluated an eLearning video solution using neuroscience to assess the perception and understanding for personalized learning.

Results - Feasibility Study



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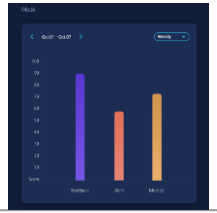
EPS-FOCUS (Training Attention while Learning)

Higher to Lower
Music, Social Studies,
Reading, Instrument

Better Performance
After Lunch



Better with
Incremental
Feedback

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Summary

- New opportunities exist for inducing, maintaining or reversing learning to achieve the desired outcomes.
- Neuroscience tools can facilitate learning in real-time in the classroom using learning content.
- Closed-Loop Learning: The neural circuits for memory, attention, processing and sequencing are continuously refined through learning and we can track and train them in real-time.

Panel Discussion & Questions

Elite Performance Solutions provides our software and services through our partners:

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For better lives

Thank you again for joining us!

Join us again February 24/25 for

Elite Performance Outside of the Classroom

with Tom Nugent III

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