Can you make yourself a better language learner?

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Likeable but wimpy protagonist

Mad Scientist

Far out science machine

Hero
What if you could train your brain?

Brain Training has all the hype of a Hollywood blockbuster.

Is it Fact or Fiction?
Research purpose

To develop a cognitive training program to improve the attention and memory functions that support the ability to deal with complex, ambiguous, and/or degraded language materials.

We call it the “Working Memory Workout”
What is Working Memory?

- The capacity-limited focus of attention, which is the small amount of information in immediate awareness.
- Recent memory that is now outside the focus of attention.
- Long-term memory that can be reactivated with retrieval cues.
- Control Processes that focus and divide attention.

Afterimages
- Visual: ~250 msec;
- Auditory: 250-2000 msec

Long-Term Memory
Attention is the spotlight of awareness

Attention is sometimes narrowly focused

(Rifle Scope)

Other times, attention is widely focused

(Radar Screen)
CASL’s attention & working memory training

Memory for target ID’s

Memory for patterns

Memory for target locations

Vigilance and controlled attention training
Training regimen

**Training Schedule**

20 – 30 minutes per day
4 – 5 days per week
4 – 6 weeks

Goal: 10 hours total
Proven results

Working Memory is important

- The ability to interpret complex, ambiguous, and degraded language materials is strongly correlated with working memory
- There is structural and functional overlap between brain regions for language processing and working memory

DLPFC in Language

- Information recharacterization
- Ambiguity resolution
- Linguistic organization
- Telling goal-oriented narratives

DLPFC in Memory

- Sustaining attention
- Self-control and inhibition
- Information manipulation
- Goal-directed behavior
Proven results

Working Memory can be improved

Computer-based cognitive training can lead to genuine improvement in certain aspects of Working Memory.
Proven results

Working Memory training transfers
The benefits of training generalize to untrained tasks, including tests of focused and divided attention and linguistic ambiguity resolution.

Before/After Training
Improvements in Selective Attention Ability

Before/After Training
Improvements in Information Management

Performance on Untrained Pre/Post-Tests
Proven results

Working Memory training transfers
The benefits of training generalize to untrained tasks, including tests of focused and divided attention and linguistic ambiguity resolution.

**Before/After Training Improvements in Information Recharacterization and Ambiguity Resolution**

Temporarily Ambiguous:

*While the thief hid the jewelry that was elegant* sparkled brightly.

- Ambiguous verb
- Readers temporarily misinterpret this phrase as the object of ‘hid’
- Disambiguating information

Unambiguous:

*The jewelry that was elegant sparkled brightly while the thief hid.*
Proven results

**Working Memory training benefits last**
Training-based improvements in working memory persist after the end of training
Current work

• Validate training results, and determine which tasks are most effective for training.

• Use neuroimaging (fMRI) and electrophysiological measures (EEG/ERP) to examine training-induced changes in the brain.

• Compare different versions of training protocol (varying difficulty and adaptivity) in order to maximize effectiveness.

• Develop web-based versions of training tasks, and demonstrate reliability, validity, and usability of these instruments.

• Cultivate the global professional: Improve language learning, “critical thinking,” and the ability to perform them on-the-job.
Training partners: *Epic validation of working memory training*

- DLIFLC
- NSA/CSS
- Army Forces Command
- US Air Force Academy
- Sandia National Labs
- Office of Naval Research
- 300th Military Intelligence Brigade & 341st Military Intelligence Battalion
Upcoming publication

To appear in 2013 from

An Integrative Approach to Cognitive and Working Memory Training: Perspectives from Psychology, Neuroscience, and Human Development
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