

# NEUROPLASTICITY and INNOVATION

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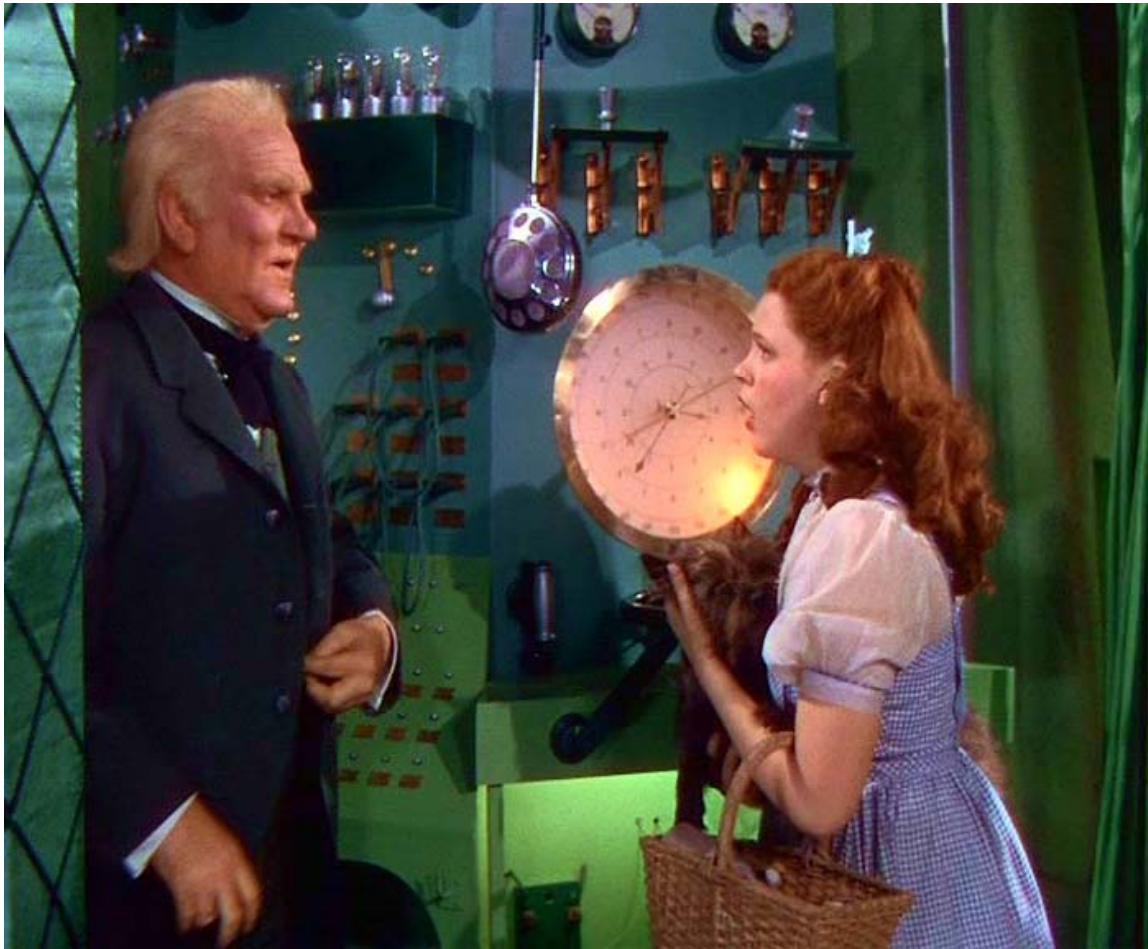
# DISCLOSURE

ALL MATERIAL IS FROM OPEN  
SOURCES

ALL OPINIONS ARE MINE

US ARMY IS NOT RESPONSIBLE FOR  
THE MATERIAL OR OPINIONS  
PRESENTED

# WIZARD OF OZ



# FOLLOW THE YELLOW BRICK ROAD

- CHANCE FAVORS THE PREPARED MIND. LOUIS PASTEUR (1822-1895)
- MANY OF LIFE'S FAILURES ARE PEOPLE WHO DID NOT REALIZE HOW CLOSE THEY WERE TO SUCCESS WHEN THEY GAVE UP. I START WHERE THE LAST MAN LEFT OFF. THOMAS EDISON (1847-1931)

# CULT FOLLOWING TO MASS MARKET



# 50 YEARS OF PROGRESS

- 1960
- JOGGING
- CULT FOLLOWING
- OREGON
- 2010
- TRIATHELETE
- MARATHONS AND IRONMAN COMPETITIONS
- NATIONAL HEALTH MAINTENANCE



# 50 YEARS OF PROGRESS



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- 1960
- COMPUTER PROGRAMERS AND ENGINEERS
- CULT FOLLOWING
- MIT, STANFORD
- 2010
- APPS FOR IPAD AND IPHONE
- TECH INDUSTRY
- WORLD WIDE WEB



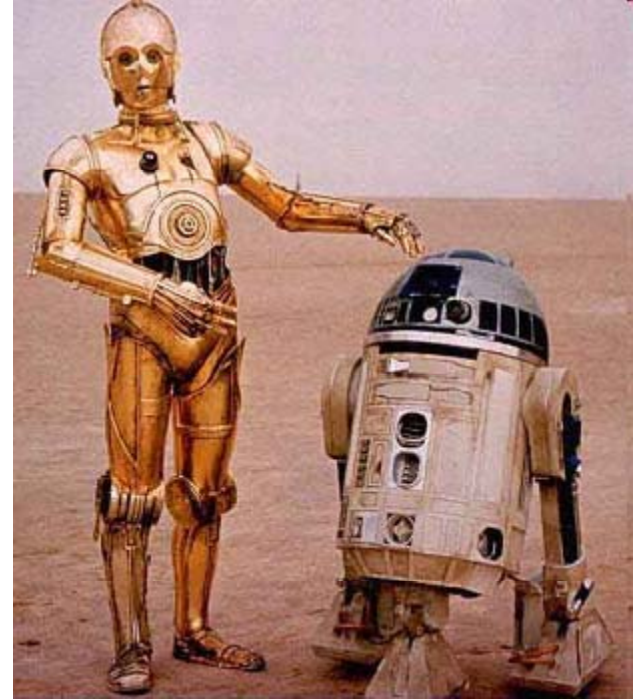
# HISTORY



# 50 YEARS IN THE FUTURE

- 2010
- VIRTUAL INTELLIGENCE
- CULT FOLLOWING
- CAL TECH, MIT
- 2060
- SMART MACHINES
- CULTURAL REVOLUTION
- ROBOTS REPLACE HUMANS AT WORK

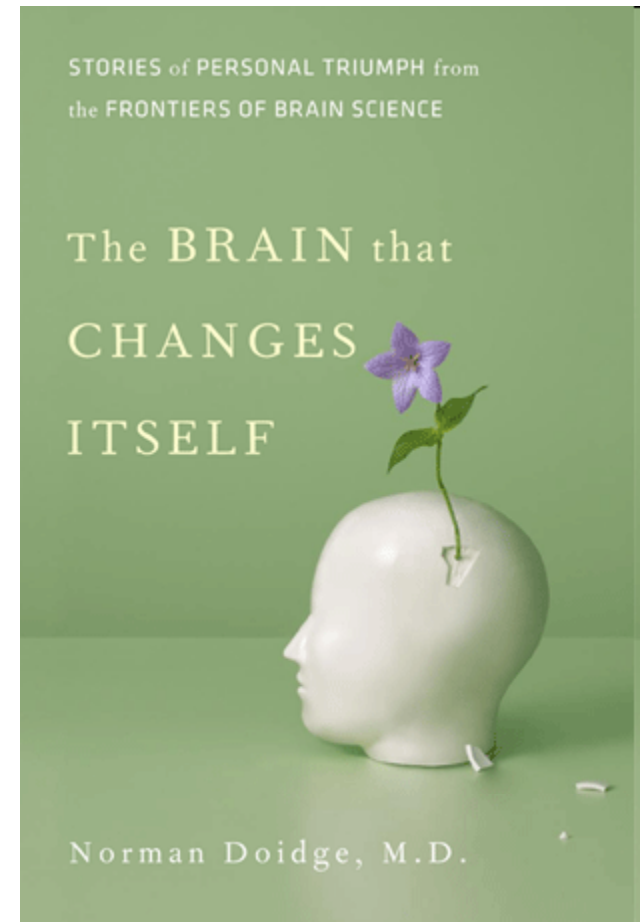
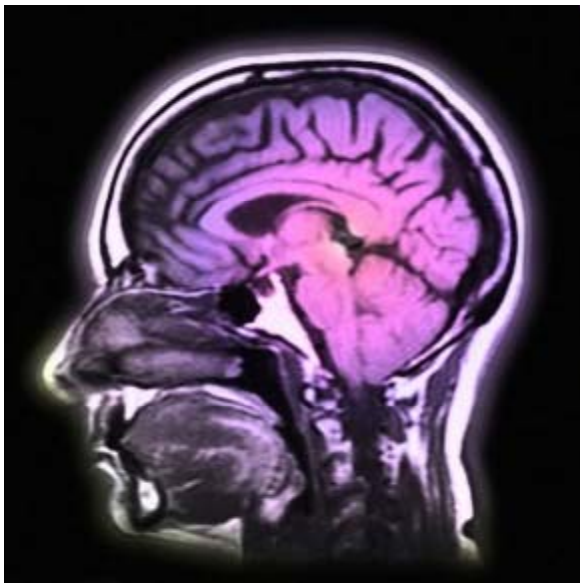
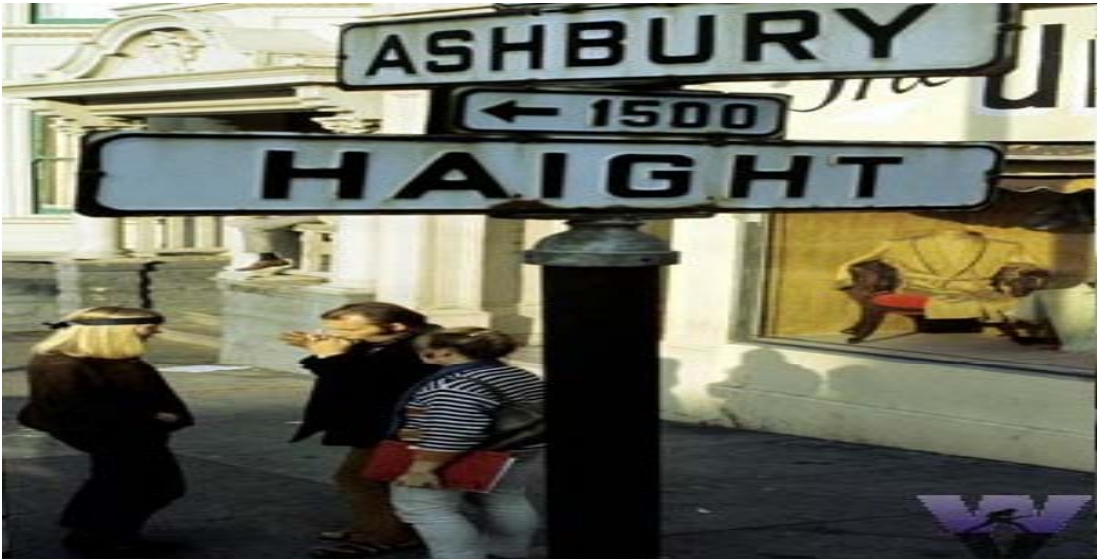
# HISTORY REPEATS ITSELF



# 50 YEARS IN THE FUTURE

- 2010
- BRAIN FITNESS
- CULT FOLLOWING
- SAN FRANCISCO
- 2060
- TARGETED LEARNING
- REVOLUTION IN EDUCATION
- NATIONAL UNIVERSITIES

# HISTORY REPEATS ITSELF



# NEUROPLASTICITY

- REFERS TO THE ABILITY OF THE HUMAN BRAIN TO CHANGE AS A RESULT OF ONE'S EXPERIENCE
- THE BRAIN IS "PLASTIC" AND "MALLEABLE"
- REPLACES THE CONCEPT OF THE BRAIN IS FIXED THROUGHTOUT ADULTHOOD, BOTH IN TERMS OF BRAIN FUNCTIONS AND NEURON NUMBERS



# HOW NEUROPLASTICITY WORKS

- SYNAPTIC PRUNING-THE IDEA THAT INDIVIDUAL CONNECTIONS WITHIN THE BRAIN ARE CONSTANTLY BEING REMOVED OR CREATED, LARGELY DEPENDENT UPON HOW THEY ARE USED
- LEARNING MAY HAPPEN THROUGH CHANGE IN STRENGTH OF THE CONNECTIONS, BY ADDING OR REMOVING CONNECTIONS AND BY THE FORMATION OF NEW CELLS

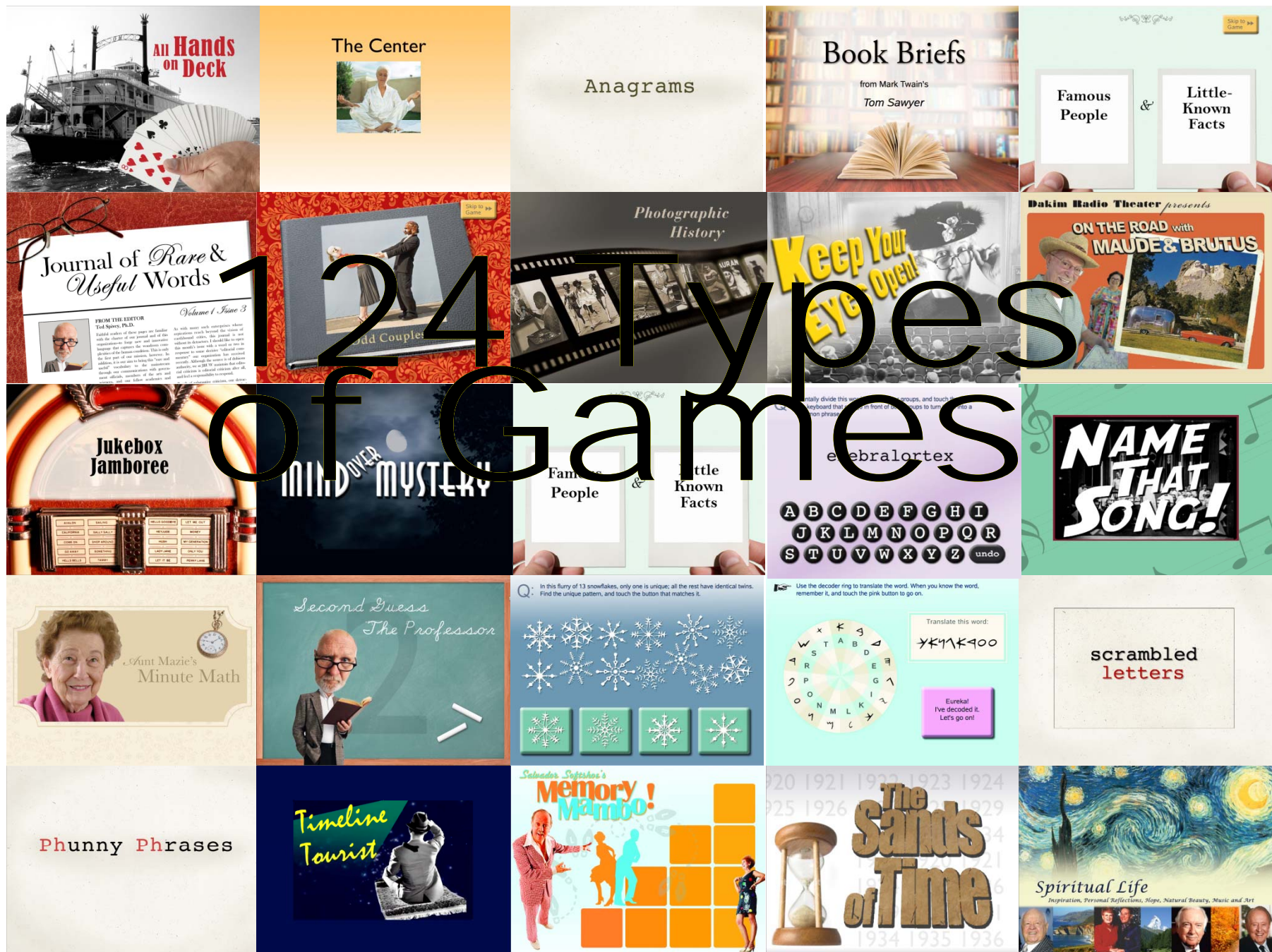


# EXAMPLES OF NEUROPLASTICITY





Press Here  
To Begin





# Dakim Exercises Based On Standardized Neurological Tests



## Domain: Short-Term Memory Standardized Neurological Test/Exercise

- *Wechsler Memory Scale*
- *Digit Forward Test*

- *Point Digit Span*
- *Letter Span*

- *Repeating Figures Test*

- *Picture Spanning of Behavioral Inhibition Test*

- *Wechsler Memory Scale - III Family Pictures*

- *Wechsler Memory Scale - III*
- *Hopkins Verbal Learning Test - Revised*

- *Four Unrelated Words*
- *Benson Sackville Memory Test*
- *Auditory-Verbal Learning Test*

- *Wechsler Memory Scale, Logical Memory*
- *Memory Assessment Series*

## Exercise Description

Recall a sequence of numbers

Subject is instructed to point out a number or letter sequence read by the examiner on a large card on which the numbers 1 through 9 appear sequentially

Cards containing geometric or irregular scenes are shown, with some repeating. Subject is asked to indicate which designs were seen previously.

Look at series of pictures carefully and both name and point out the "major items" in the pictures.

Recall words after incremental time delays

Examiner reads stories, asking subject for an immediate free recall of facts

## Dakim BrainFitness Exercise

- *Memory Match*

- *Memory Match*

- *Word Wager*

- *My Favorite Things*

- *What's Unique*

- *Odd Couples*

- *Famous People Little Known Facts*

- *Picture Pairs*

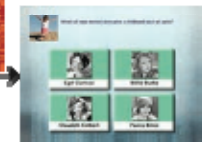
- *Make a Story*

- *Money's Face Finder*

- *Book Briefs*

- *Keep Your Eyes Open*

- *News Flash*



## Domain: Long-Term Memory Standardized Neurological Test/Exercise

- *Famous Events Test*

- *Famous Faces Test*
- *Presidents Test*

## Domain: Visuospatial

- *Cognition of Figural Systems  
Subtest of the Structure of Intellect  
Learning Abilities Test*
- *Pair Cancellation Test*

- *Unusual Views of Pictured Objects  
Test*
- *Visual Object and Space Perception  
Battery*

- *Hidden Figures Test*

## Domain: Computation

- *Arithmetic Subtest of Wide Range  
Achievement Test*
- *Woodcock-Johnson III Tests of  
Achievement*

## Exercise Description

Identify the "true" event and, if correct, tell the decade in which it occurred from a list of 60 famous events from the 1830s to the 1970s randomly interspersed with 60 made-up events

Recall the names of people who achieved fame from black and white photographs

Identify figures rotated 90-180 degrees

Identify familiar objects under distorting conditions

Identify objects based on silhouette images

Identify hidden figures by marking the outline of the simple figure embedded in the more complex one

Examines wide array of arithmetic and calculation skills.

Test with a large proportion of problems at lower difficulty levels in addition to problems and concepts studied in advanced high school or college mathematics courses

## Custom BrainFitness Exercise

- *On This Day*
- *Historical Events*
- *Inventions and Discoveries*
- *Monuments and Landmarks*

- *Identify and Reward*
- *First Name Search*
- *Flashcard People*

- *What's Unique*
- *This End Up (in desc.)*

- *Figure Puzzles*
- *Mixing Silhouettes*

- *Hidden Figures*

- *Minute's Minute Math*
- *Calculation with Currency*
- *Traditional Game Calculation*
- *All Hands on Deck*
- *What Card am I?*
- *Time Zone Calculation*



## Domain: Language

### Standardized Neurological Test/Exercise

- *Wechsler Adult Intelligence Scale - III vocabulary and similarities tests*
- *Comprehensive Assessment of Spoken Language*
- *Wechsler proverb tests*
- *BRA Reading Index*
- *Word Finding Test*
- *Word Context Test*
- *Peabody Picture Vocabulary Test*
- *Word Similarity tests: semantic relations*
- *Galles-McGarrle Reading Tests: Comprehension*
- *Johns Hopkins University Dysgraphia Battery*

### Exercise Description

Provide a definition for each word in a list of words

Assessment of oral language skills

Translate a concrete statement into its abstract, metaphorical meaning

Multiple-choice reading test providing brief assessments of the levels of skill

Guess the meaning of a nonsense word based on the context in which the word was used in a sentence

Subject is asked to select a picture most like the stimulus word provided

Identify association between meanings of words

Measures ability to understand written passages

Oral spelling test

### Custom BrainFitness Exercise

- *Opposites*
- *Synonyms*
- *Idiosyncratic Words*
- *Idiosyncratic Sentences*
- *Idiosyncratic sayings*
- *Blankety-Blank*
- *The Journal of Rare and Useful Words*
- *Hidden Words*
- *Odd Couples*
- *Mind Over Mystery*
- *Book Briefs*
- *News Flash*
- *Anagrams*
- *Scrambled Letters*
- *Letter Zulu*



**Domain: Critical Thinking**  
**Standardized Neurological**  
**Test/Exercise**

- *Luria's Arrowsay Intellectual Investigation*
- *Wechsler Adult Intelligence Scale - II Digit Symbol-Coding*
- *Digit Symbol Substitution*
- *Symbol Digit Modalities Test*
- *Category Test (HCT)*
- *Object Sorting Test*

**Exercise**  
**Description**

Neurosensory and cognitive tests

A printed key of different nonsense symbols is paired with randomly assigned numbers from one to nine. The subject must fill in blank spaces with the symbol that is paired to the number above the blank space.

Figure out the principle factor presented in several item sets

Group familiar objects according to such principles as use, situation in which they are normally found, paleness, etc.

**Custom BrainFitness**  
**Exercise**

- *Photograms (in class)*
- *Mind Over Mystery*
- *Phoenician Decoder*
- *Vital Flares*
- *Animal Groups*
- *Sort It Out (in class)*
- *Situation Specific Actions and Objects*
- *Identizing*
- *Sort It Out (in class)*





# INNOVATION

- A PROCESS THAT RENEWS SOMETHING THAT EXISTS AND NOT THE INTRODUCTION OF SOMETHING NEW
- PEOPLE MUST CHANGE THE WAY THEY MAKE DECISIONS, CHOOSE TO DO THINGS DIFFERENTLY, AND MAKE CHOICES OUTSIDE OF THEIR NORM

# HOW INNOVATION WORKS

- INNOVATION CHANGES THE VALUES ONTO WHICH THE SYSTEM IS BASED
- ENGINEERS DEVELOP ROBOTS TO REPLACE HUMANS DOING PHYSICAL LABOR
- HUMANS USE NEUROPLASTICITY TO FURTHER BRAIN DEVELOPMENT TO ADAPT AND EVOLVE

# DARPA PROJECTS ASSUMPTIONS

- THE HUMAN IS BECOMING THE WEAKEST LINK
- SUSTAINING AND AUGMENTING HUMAN PERFORMANCE WILL HAVE SIGNIFICANT IMPACT ON MISSIONS AND SYSTEMS

# DARPA INNOVATIVE PROJECTS

- SILENT TALK-ALLOWS COMMUNICATION WITHOUT THE USE OF VOCALIZED SPEECH THROUGH ANALYSIS OF NEURAL SIGNALS
- SYNTHETIC TELEPATHY-WIRELESS TRANSMISSION OF DECODED THOUGHTS
- IMPLANTABLE MEMORY-ELIMINATES TRAINING

# IDEAS FOR DARPA

- 30 OR MORE PEOPLE MEET OVER SIX WEEKS
- DO NOT WORK FOR THE GOVERNMENT(PAID AS A CONSULTANT)
- ARE ASKED TO JOIN BY THEIR MEMBERS
- COLLECTIVELY CALLED JASON
- QUESTIONS ARE ASKED BY THE GOVERNMENT
- INDIVIDUALS CHOOSE TO WORK ON PROJECTS OF THEIR INTEREST

# DARPA PROJECTS

- 85% OF DARPA PROJECTS FAIL
- THE MORE CONVINCED THE GOVERNMENT IS OF RIGHTNESS OF ITS POLITICAL DECISIONS, THE MORE IT NEEDS TO HEAR THE ADVICE OF ITS SCIENTISTS