



Applied Neural Science in L&D

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UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
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Faculty and Neuroscience
Management Committee



How Does the Brain Work? - Human Cognition

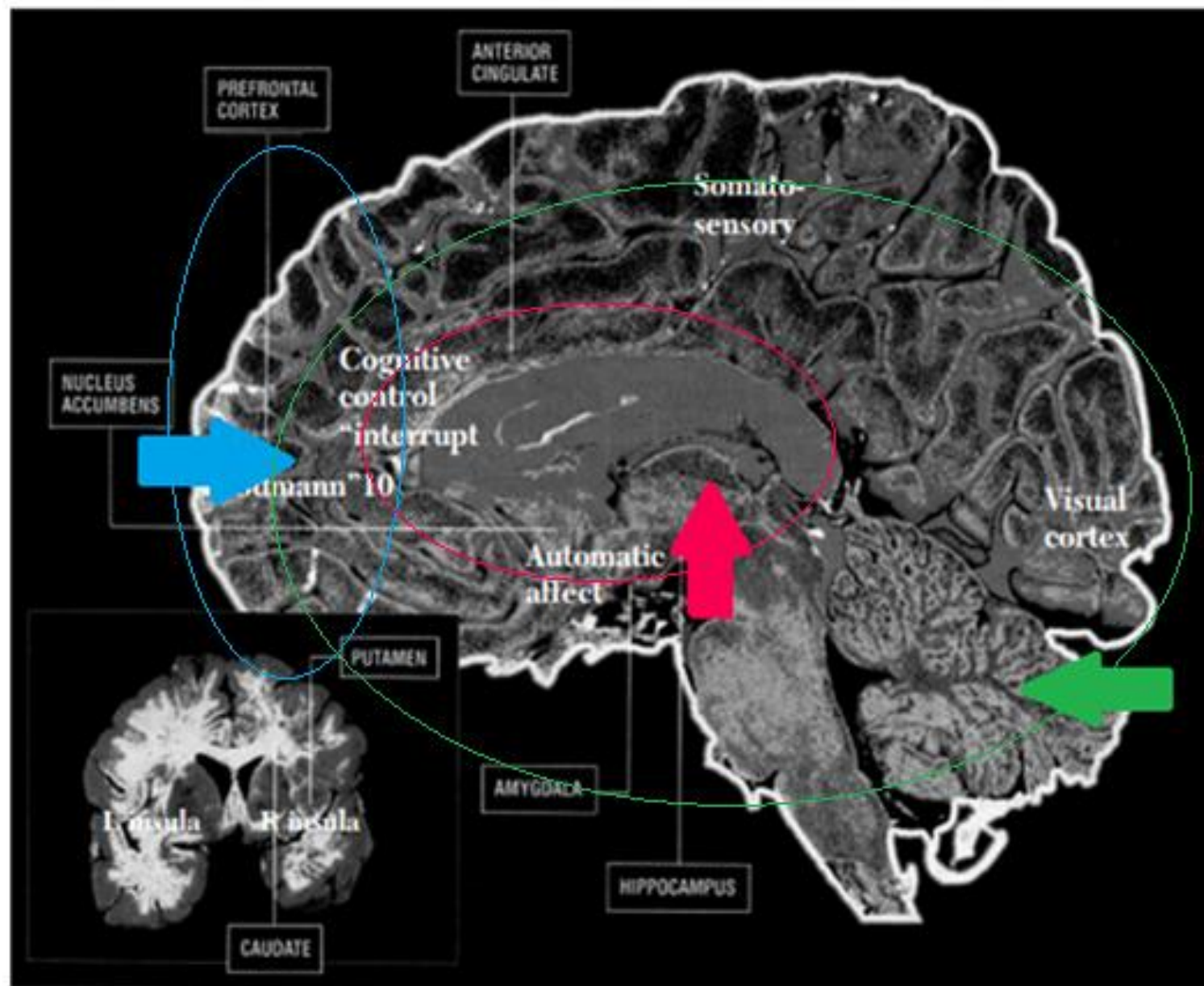
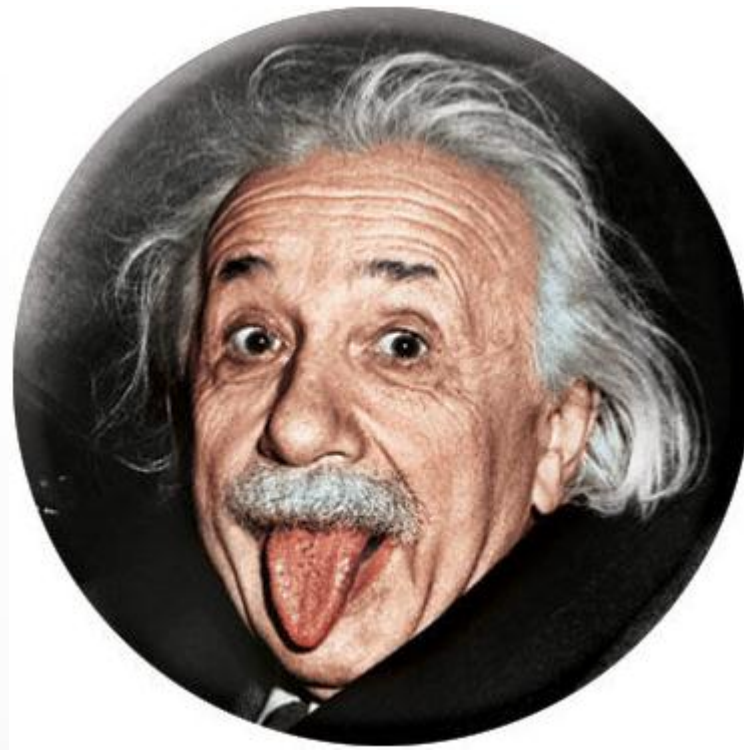


Figure 1. The human brain with some economically relevant areas marked.

Left brain

I am the left brain.
I am a scientist. A mathematician.
I love the familiar. I categorize. I am accurate. Linear.
Analytical. Strategic. I am practical.
Always in control. A master of words and language.
Realistic. I calculate equations and play with numbers.
I am order. I am logic.
I know exactly who I am.





How Einstein's Brain Is Different Than Yours?

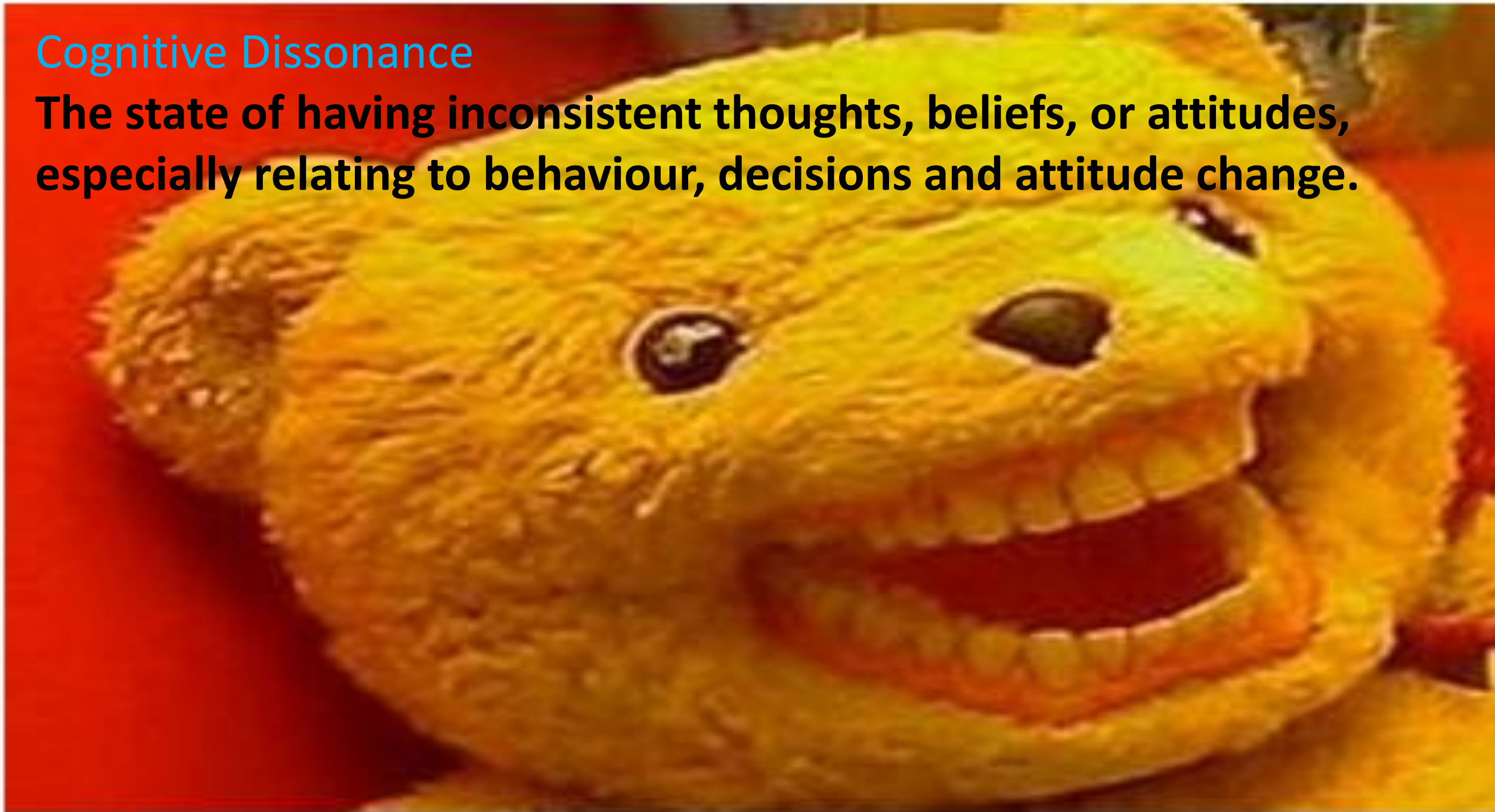


Cognitive Dissonance



Cognitive Dissonance

The state of having inconsistent thoughts, beliefs, or attitudes, especially relating to behaviour, decisions and attitude change.







EEG powered by BCLAB | SIFT 0:12 / 1:14



Content:

- **Intro:** Executive Function for increased neuro-cognitive resilient performance

a) Healthy Resilience and Emotional Intelligence (EQ)

1. **Functional fitness** - Resilience
2. **Functional conditioning** – Empathy Bias (EQ)
3. **Fit for task** – b)

b) Executive Functions and Fluid Intelligence (IQ)

1. **Improved neurological fluidity** – applied mindfulness
2. **Neuroeconomics** - Neuroplasticity WM (Working Memory Filters)
3. **Cognitive performance** - improved problem solving (IQ)

c) Applied Neural and Cognitive Technology

1. **OmegaWave** - Measured readiness, *neural science and cardiography* (EKG / MRI/ EEG / HRV)
2. **Dual-n-Back** – empirical techniques that increase IQ / WM
3. **tDCS/TMS** - Transcranial direct current neurostimulation





Total Cost = R110.00

The Bat costs R100.00 more
than the Ball

How much does the ball cost?

Neuroeconomics



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BMW CEO Harald Krueger collapses on stage at motor show



a) **Healthy Resilience and Emotional Intelligence (EQ)**

Resilience to stress related pathology

insomnia, anxiety, cardiac disease, fibromyalgia, etc

Resilience Includes:

- **Functional Health**
- **Stress control (allostatic loading)**
- **Exercise**
- **Nutrition**
- **Sleep Hygiene**
- **Social & Emotional Intelligence**

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Executive Functions of Health and Peak Performance Learning

*In terms of playing ability there is **nothing** between number one and one hundred.*

*... Who is **mentally stronger**?*

*... Who is going to **fight the hardest** in the big points?*

... This determines who is champion.

– **Novak Djokovic, Wimbledon 2015**

How to applied neural science to transform your role?



Executive Functions of Health and Peak Performance Learning

Applied neural science transforms L&D by:

1. Empirically measuring behavior change
 2. Ensures learning performance is maximized
 3. Engages *executive functions* of ***action potential***
- Most brains come to work exhausted
 - ***'Brain-Skills' determine industry champions***



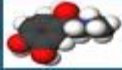
VW Diesel Emissions Scandal:

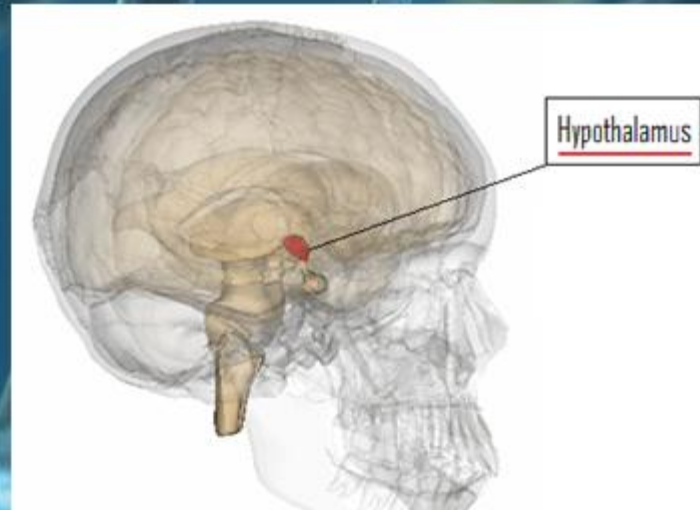
- Almost ½M cars recalled - \$18bn case in US
- CEO - Prof Winterkorn:
 - *“The irregularities found in VW diesel engines,*
 - *but **not** aware of any wrongdoing!!*
- THEN HE RESIGNS ?



1. FEAR RESPONSE: MAD

Creative taste for danger

- **ACTH (acetylcholine) Norepinephrine** 
- Acts on Hypothalamus
- The Mother Emotion
 - Fear
 - Concentration state
- Couldn't it be better? ...
- I see the light!
 - Epiphany
 - My God complex



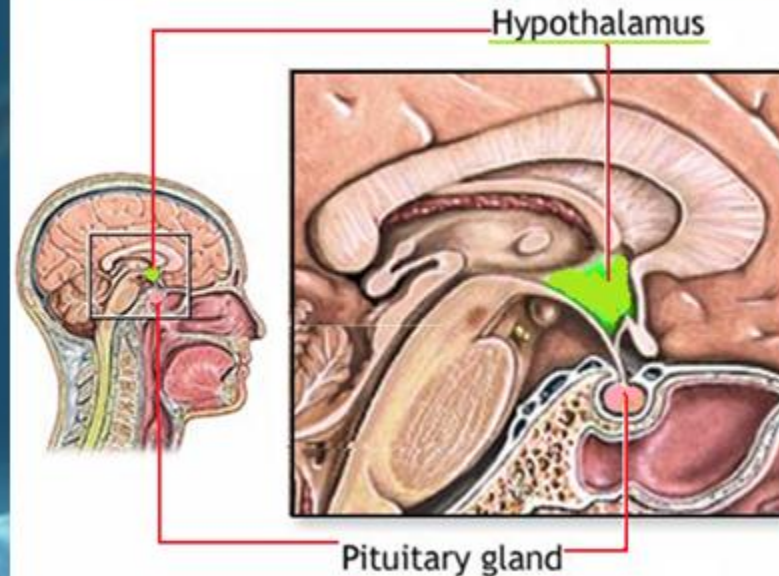
5. FUN RESPONSE: OK

- **Oxytocin**



Working Meaning

- “Love drug” Secreted from pituitary gland
 - Builds interpersonal relationships
 - Positive emotions infects others
- Work is it's own reward?
- What can be more fun?



2-9

Oh My! What is this?



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Search ID: Jmp080209

Every year or so, neurosurgeon Brian Baker liked to pull the same stupid gag on his colleagues.

2-9

Oh My! What is this? Why it must be the patients train of thought!



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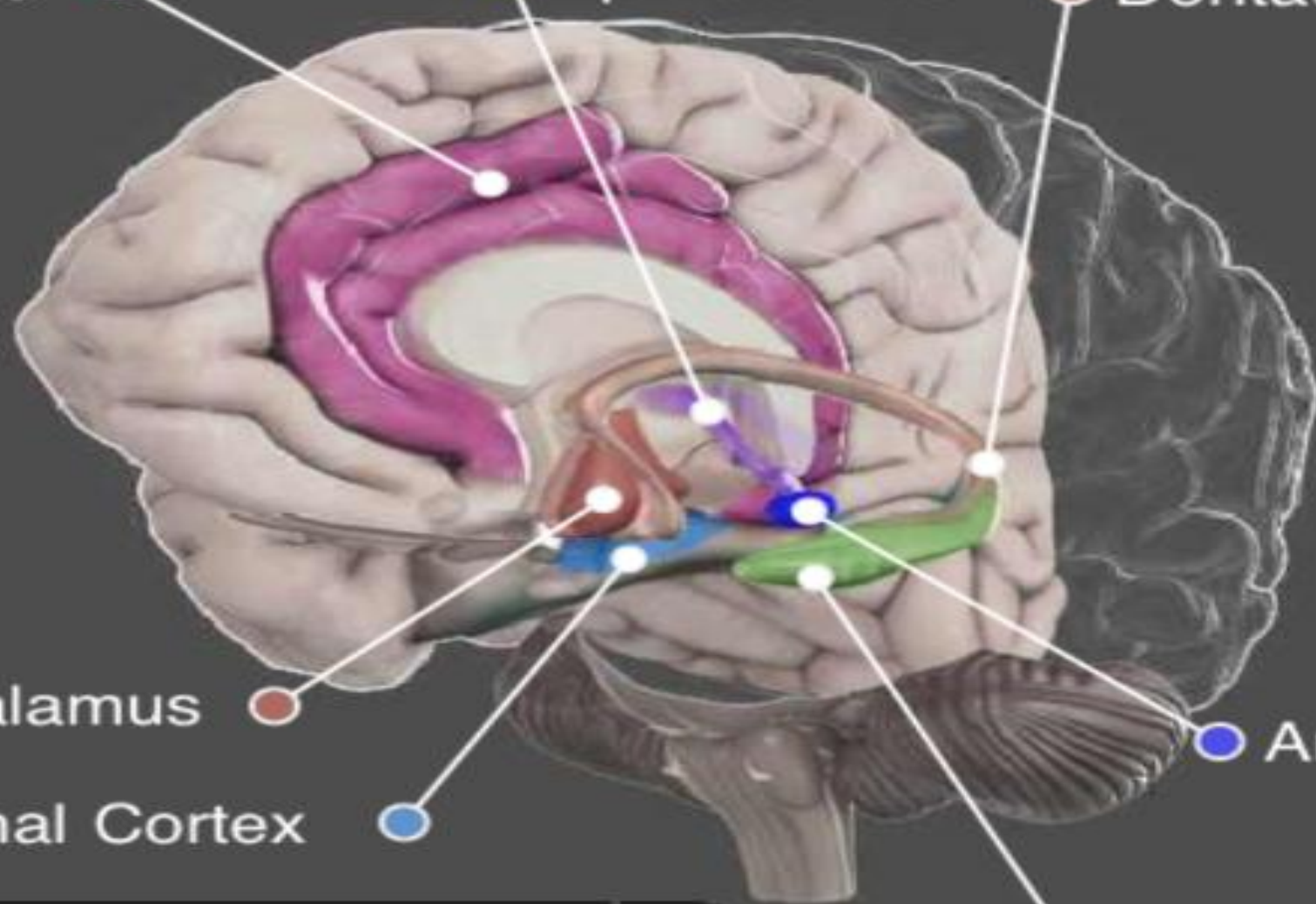
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Cingulate Gyrus

Epithalamus

Dentate Gyrus



Hypothalamus

Entorhinal Cortex

Amygdala

Hippocampus

◀ Limbic System ▶



Amos Tversky



Daniel Kahneman

Cognitive Bias

social biases



memory biases



decision-making biases



probability /belief biases



social biases

Forer effect / Barnum effect

The tendency to give high accuracy ratings to descriptions of their personality that supposedly are tailored specifically for them, but are in fact vague and general enough to apply to a wide range of people. For example, horoscopes.



Ingroup bias

The tendency for people to give preferential treatment to others they perceive to be members of their own groups.



Self-fulfilling prophecy

The tendency to engage in behaviors that elicit results which will (consciously or not) confirm existing attitudes.



Halo effect

The tendency for a person's positive or negative traits to "spill over" from one area of their personality to another in others' perceptions of them (see also physical attractiveness stereotype).



Ultimate attribution error

Similar to the fundamental attribution error, in this error a person is likely to make an internal attribution to an entire group instead of the individuals within the group.



False consensus effect

The tendency for people to overestimate the degree to which others agree with them.



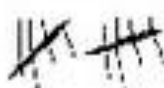
Self-serving bias / Behavioral confirmation effect

The tendency to claim more responsibility for successes than failures. It may also manifest itself as a tendency for people to evaluate ambiguous information in a way beneficial to their interests (see also group-serving bias).



Notational bias

A form of cultural bias in which the notational conventions of recording data biases the appearance of that data based (or away from) the system upon which the notational scheme is based.



Egocentric bias

Occurs when people claim more responsibility for themselves for the results of a joint action than an outside observer would.



Just-world phenomenon

The tendency for people to believe that the world is just and therefore people "get what they deserve."



Dunning-Kruger / Superiority Bias

Overestimating one's desirable qualities, and underestimating undesirable qualities, relative to other people. Also known as Superiority bias (also known as "Lake Wobegon effect", "better-than-average effect", "superiority bias", or Dunning-Kruger effect).



System justification effect / Status Quo Bias

The tendency to defend and bolster the status quo. Existing social, economic, and political arrangements tend to be preferred, and alternatives disparaged, sometimes even at the expense of individual and collective self-interest. (See also status quo bias.)



Illusion of asymmetric insight

People perceive their knowledge of their peers to surpass their peers' knowledge of them.



Illusion of transparency

People overestimate others' ability to know them, and they also overestimate their ability to know others.



Herd instinct

Common tendency to adopt the opinions and follow the behaviors of the majority to feel safer and to avoid conflict.



Fundamental attribution error / Actor-observer bias

The tendency for people to over-emphasize personalty-based explanations for behaviors observed in others while under-emphasizing the role and power of situational influences on the same behavior (see also actor-observer bias, group attribution error, positivity effect, and negativity effect).



Projection bias

The tendency to unconsciously assume that others share the same or similar thoughts, beliefs, values, or positions.



Outgroup homogeneity bias

Individuals see members of their own group as being relatively more varied than members of other groups.



Trait ascription bias

The tendency for people to view themselves as relatively variable in terms of personality, behavior and mood while viewing others as much more predictable.



The hard-easy bias

Overconfidence in easy situations
and under confidence
in difficult situations.

Work on weakness and capabilities



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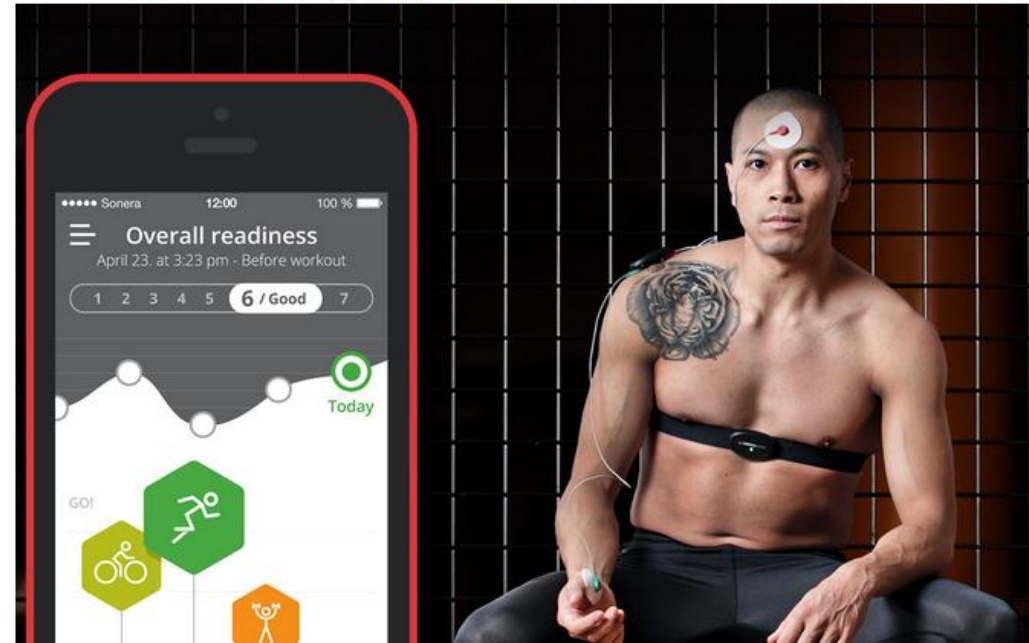
OmegaWave

- Measures electrocardiography (EKG), and brain wave (EEG) is tested and compared to determine an executive's current state of resilience and functional health.
- DC potentials of the brain are their Omega-potential.
- Measurement is called Omegametry
 - **Navy Seals, Pilots, Astronauts, Soccer, F1, Business L&D?**

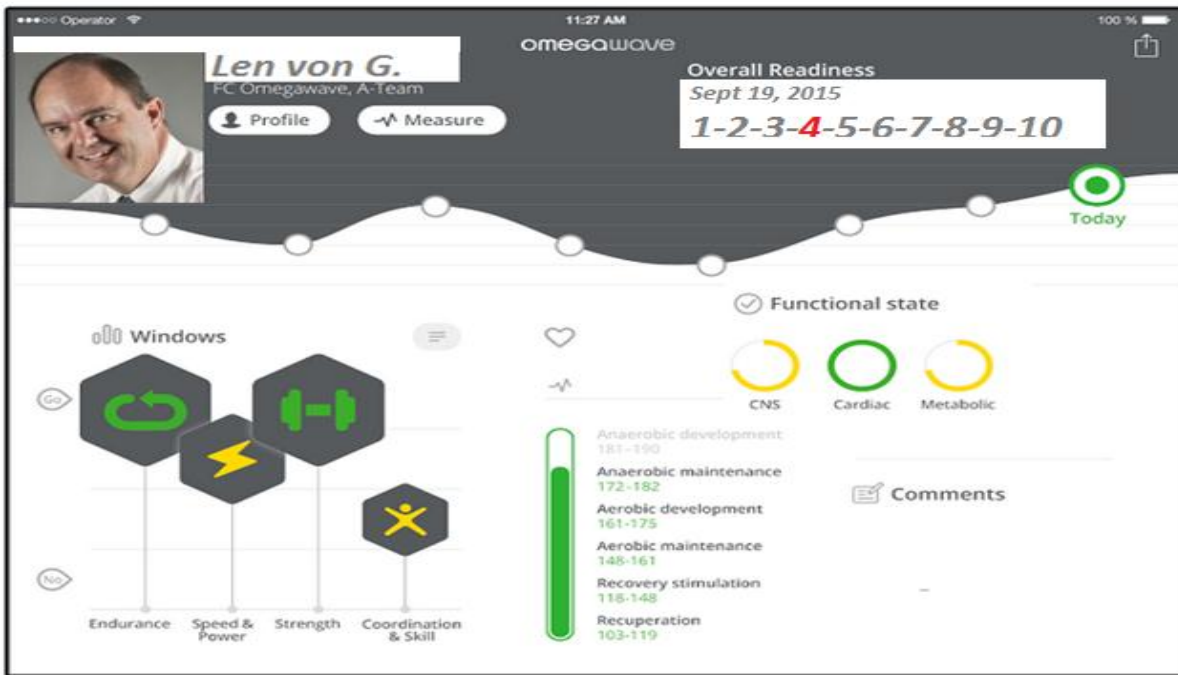


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Direct Current Potential of the Brain
Amplitude-Frequency Analysis of Electrocardiogram



OmegaWave



Functional state

Overall - The current functional state of determines the ability to effectively achieve their performance potential.

CNS - The level of activation and intensity of functioning at a specific moment in time.

Cardiac - The level of functioning and tension of the cardiac system at a specific moment in time.

Metabolic - The level of efficiency of the energy supply system at a particular time in response to training loads.






Dual N-Back - Brain game

Tyrske Educational

★★★★☆ 162

3+

Offers in-app purchases

 This app is compatible with all of your devices.

Installed

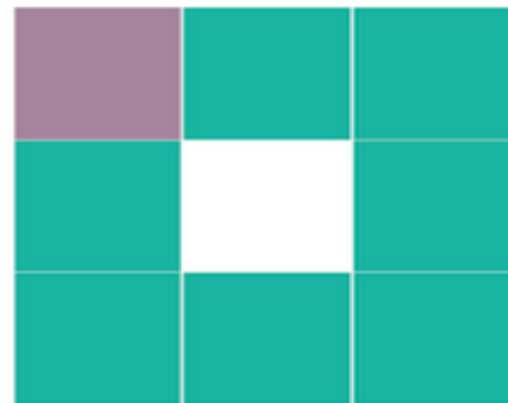
Start improving your IQ

N = 5

PLAYED 20 TIMES TODAY

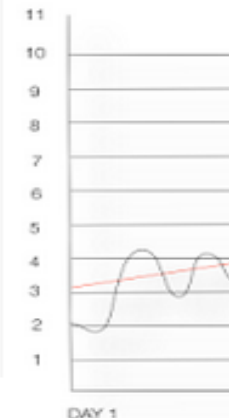


Scientifically proven method



Track y

N AVE

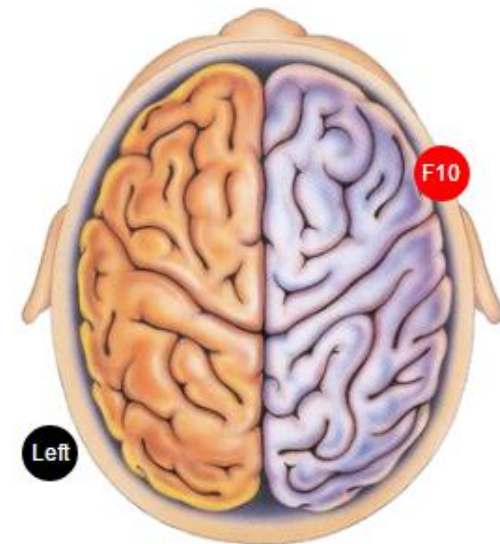
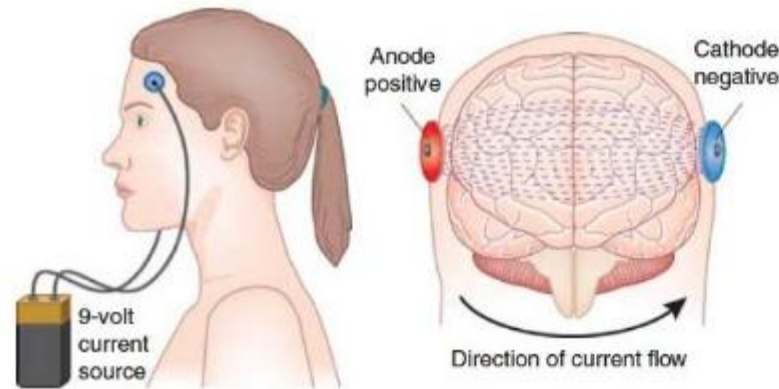


Improved Gf: fluid intelligence (IQ), executive processes, working memory. Jaeggi (pnas 2008)



tDCS/TMS:

- Transcranial direct current stimulation (tDCS) is a form of neurostimulation which uses constant, low current delivered to the brain via electrodes on the scalp.
 - increases cognitive performance
- US Military - DARPA (Defence Advanced Research Projects Agency) experimented by testing it on their
- **The results found were staggering, the snipers which were using the tDCS cut their learning curves in half!**



George MS, Aston-Jones G. Noninvasive techniques for probing neurocircuitry and treating illness: VNS, TMS, and tDCS. *Neuropsychopharmacology* 2010; 35: 301-316. Saete C, Tur Z, Paulus W, Antal A. Combining functional magnetic resonance imaging with tDCS. *Front Hum Neurosci* 2013; 7 (435): 1-7.

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Dual N-Back - Brain game

Tyrske Educational

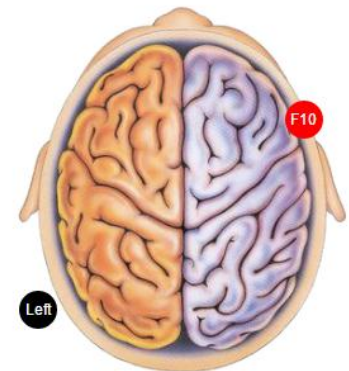
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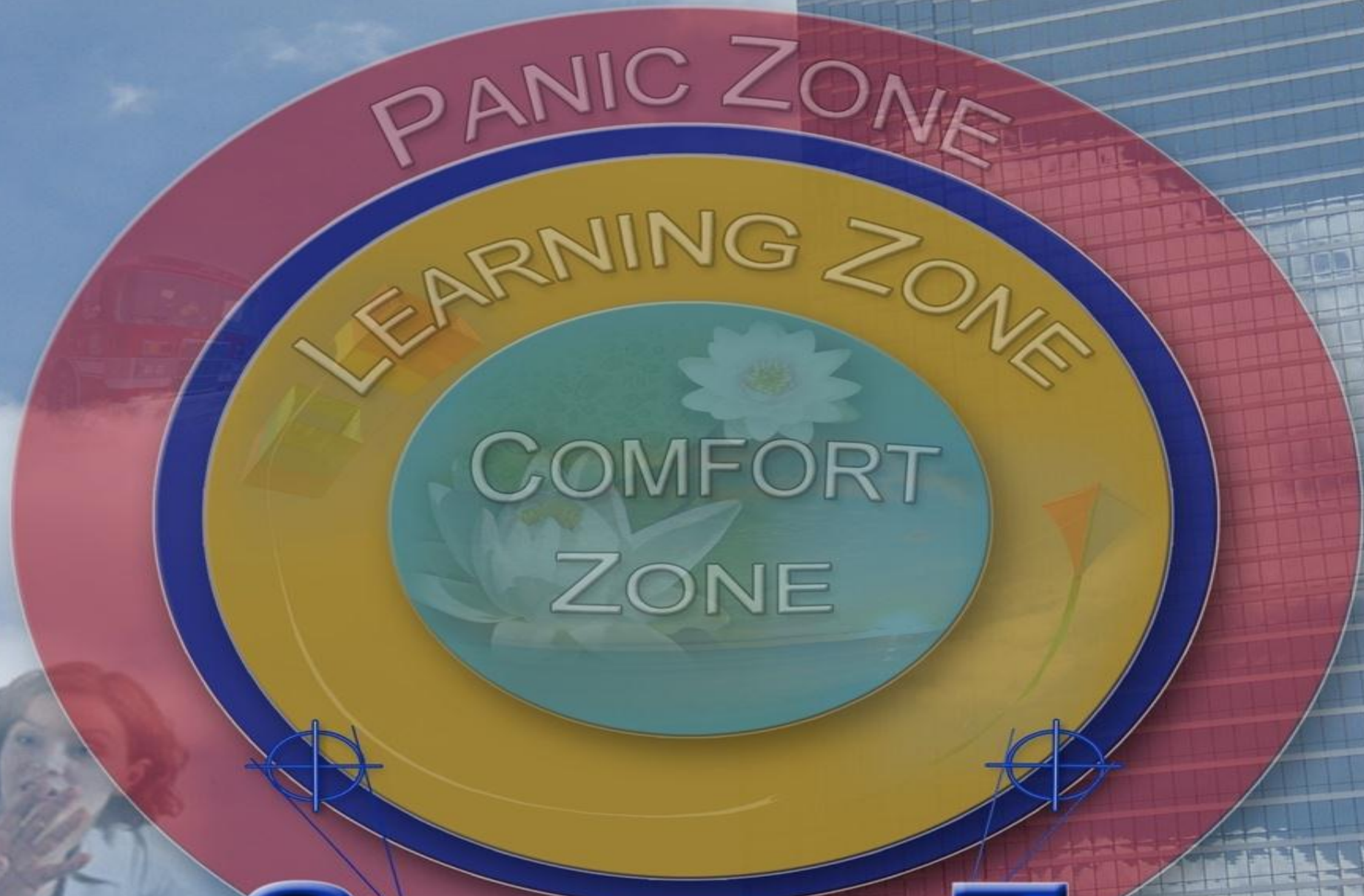


In-the-zone

Sportsman of the Century

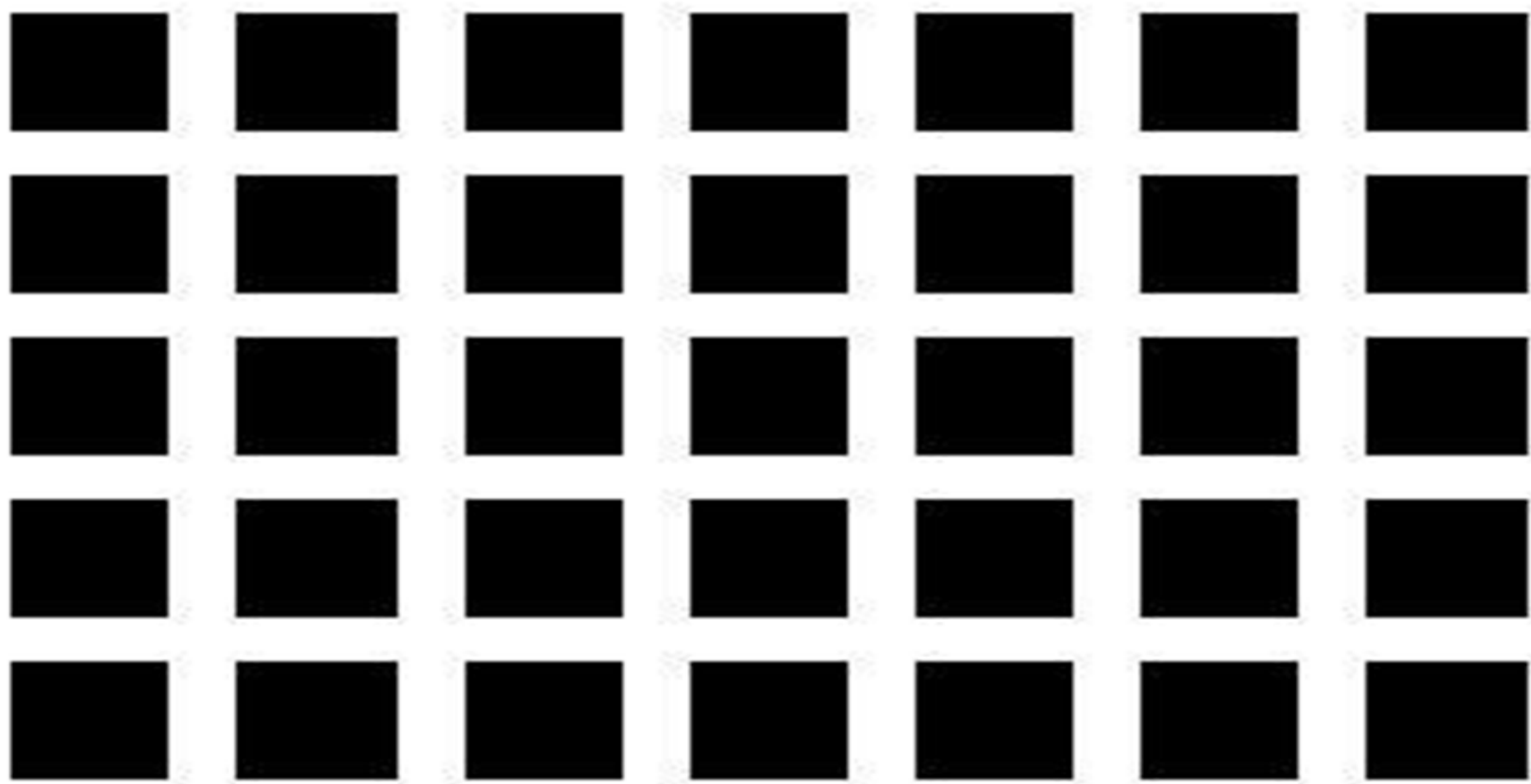
ALI





the **SHERPA ZONE**







Assess your
BRAIN

BUILD YOUR BRAIN
Neuro-Biofeedabck
Assessments
ID Potential Growth
Areas



Get your
PLAN

With Your Coach
a step by step
plan is crafted
in line with you
Goals and Neuro
Data



Build your
SKILLS

With Your Coach
You will grow your
strengths and limit
weaknesses



Measure your
PROGRESS

Simple & Easy to follow Plans that
include Practical & Practical Tools
Measure your Progress & ensure
Improvements with Neuro & Bio-
Feedback Data & Technology

The D-Scale 14

According to Dr. Denollet and his colleagues, this brief questionnaire accurately identifies individuals who are at risk for having a heart attack or dieing of heart disease e.g. stroke

Below are a number of statements that people often use to describe themselves. Read each one and circle the appropriate number next to that statement to indicate your answer. There are no right or wrong answers: Your own impression is the only thing that matters. **Please circle one of the numbers 0-4 for each of the questions below:**

0=false	1=rather false	2=neutral	3=rather true	4=true
1) I make contact easily when I meet people				0 1 2 3 4
2) I often make a fuss about unimportant things				0 1 2 3 4
3) I often talk to strangers				0 1 2 3 4
4) I often feel unhappy				0 1 2 3 4
5) I am often irritated				0 1 2 3 4
6) I often feel inhibited in social interactions				0 1 2 3 4
7) I take a gloomy view of things				0 1 2 3 4
8) I find it hard to start a conversation				0 1 2 3 4
9) I am often in a bad mood				0 1 2 3 4
10) I am a closed kind of person				0 1 2 3 4
11) I would rather keep people at a distance				0 1 2 3 4
12) I often find myself worrying about something				0 1 2 3 4
13) I am often down in the dumps				0 1 2 3 4
14) When socializing, I don't find the right things to talk about				0 1 2 3 4
Add your answer to questions 1,2,3,4,5,6, & 7				Total =
e.g. 1) 3 2) 3 3) 3 4) 3 5) 3 6) 3 7) 3 Total = 21				
Add answer to questions 8,9,10,11,12,13 & 14				Total =

Scores:

If you score above a certain range on both scales you are classified with a type D personality and run serious risk of chronic cardiac related disease. Those who score above expected limits on both dimensions are classified as having a Type D Personality Type and are encouraged to consult your medical specialist and to attend a SelfWare consultation at no cost using OmegaWave and related technologies.

Your A.C.T.I.O.N Steps

- **Trigger yourself:**
 - *I tried my best to ...*
- **Neural Science Application:**
 - Leadership Development
 - Talent pipeline
 - Executive Coaching
 - Training programs
 - Blended Learning
 - Team Development
 - Executive Coach Certification
 - PhD Options
- Harvard research?



Understand how the brain works, how it impacts work and life.



Understand the science of brain fitness



Exercise



Healthy Nutrition



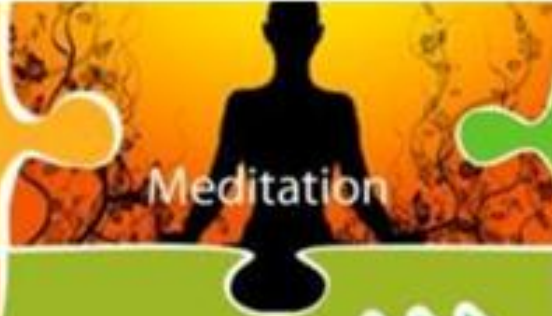
Mental Stimulation



Stress Management



Meditation



Reframing



Biofeedback



Cognitive Training



Self-Monitor



Prioritize Options



Develop, Implement and Iterate your Own Plan





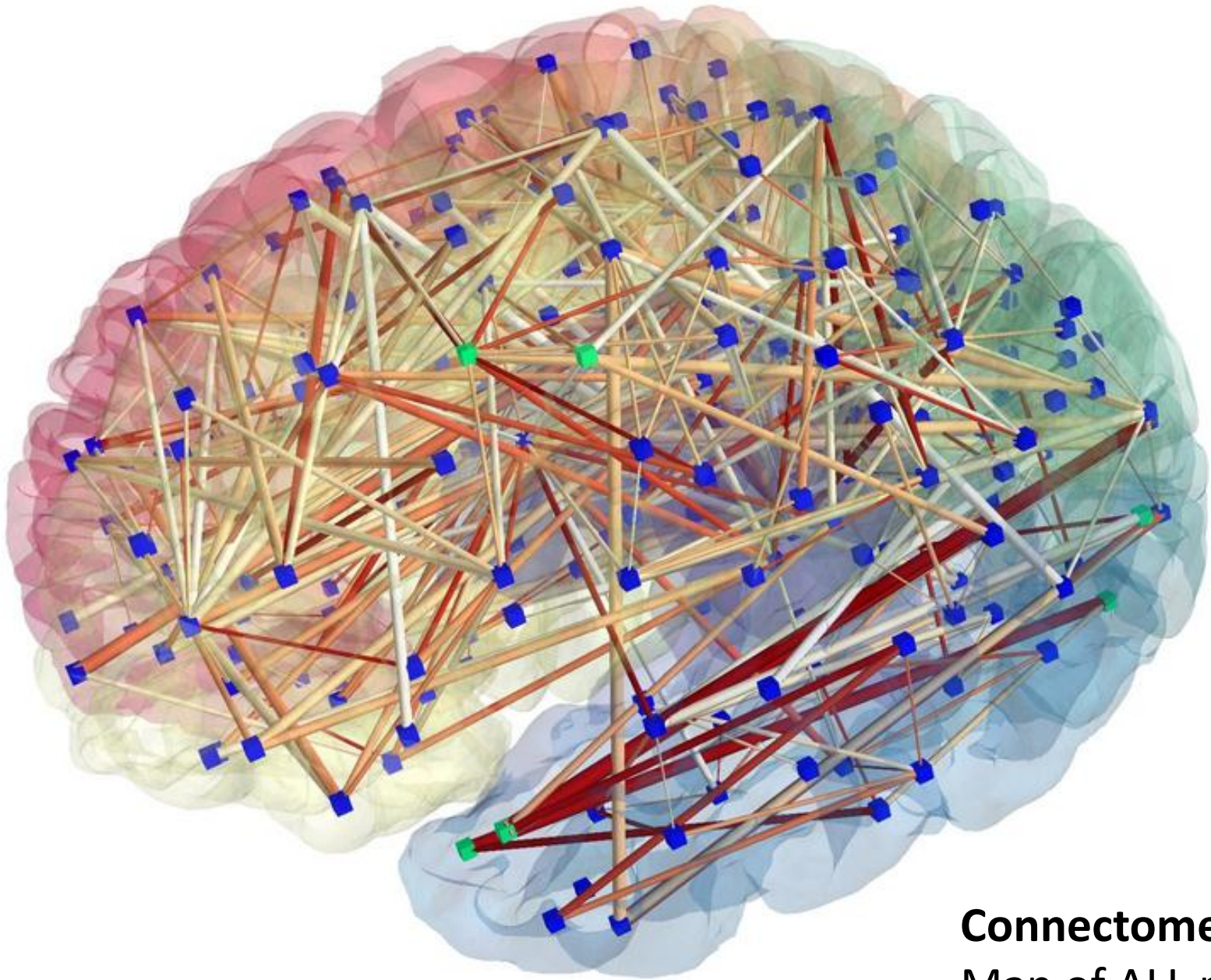












Connectome:
Map of ALL neural connections



What were the Key Points You Got, You Want, You Remember?

