



Translating Research to Improve Our Everyday Lives

Dr. Anna MacKay-Brandt
Neuropsychologist – NKI Rockland Investigator

Large studies (of 500 or 1000+ people) are necessary to understand complex relationships and how they work in general, but we are also interested in how that knowledge translates to one person (N of 1).

How do we translate research based on groups of people to practical advice for one person?



Science-based Recommendations
from the National Institute of Aging

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How do we translate research based on groups of people to practical advice for one person?

Making healthy choices may reduce your risk of dementia

Control high blood pressure

Sleep

Be physically active

Keep your mind engaged

Stay connected with social activities

Address physical and mental health problems

Understand how medicines can affect the brain

Don't yet know for certain what, if anything, can prevent dementia, there may be steps you can take to help reduce your risk.

Be physically active

Connect with family and friends

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Be physical!

Taking care of your physical health may also help your cognitive health. You can:

- Get **recommended health screenings**.
- Manage chronic health problems, such as high blood pressure (more below), **diabetes**, **depression**, and **high cholesterol**.
- **Talk with your health care provider** about the **medicines** you take and possible side effects on **memory**, sleep, and brain function.
- Treat age-related sensory conditions such as hearing or vision loss.
- Reduce risk for **falls** and other accidents that could lead to brain injuries.
- Limit **use of alcohol**; note that some medicines can be dangerous when **mixed with alcohol**.
- **Quit smoking** if you currently smoke. Avoid other nicotine products such as chewing tobacco.
- Be mindful of your diet. Choose foods that are nutritionally dense, low in animal fats, and high in vitamins and fiber.
- Get enough **sleep**, generally seven to nine hours each night.

...yet know for certain what, g, can prevent dementia, may be steps you can take to reduce your risk.

Connect with family and friends

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Be physically active. ...also help your cognitive health. You

Many health conditions affect the brain and pose risks to cognitive function. These conditions include:

- **Stroke** — can damage blood vessels in the brain and increase risk for vascular dementia.
- **Depression** — can lead to confusion or attention problems and has been linked to dementia.
- **Delirium** — shows up as a sudden state of confusion, often during a hospital stay, and is frequently followed by cognitive decline or impairment.

Control high blood pressure

- **Quit smoking** if you currently smoke, including as chewing tobacco.
- Be mindful of your diet. Choose foods that are nutritious, low in animal fats, and high in vitamins and fiber.
- Get enough **sleep**, generally seven to nine hours each night.

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Be physically active... also help your cognitive health. You

Many health conditions affect the brain and pose risks to cognitive function. These conditions include:

- Some medicines and **combinations of medicines** can cause confusion, memory loss, hallucinations, and delusions in older adults.
- Medicines can also interact with food, dietary supplements, alcohol, and other substances. Some of these interactions can affect how your brain functions. Drugs that can impair older adults' cognition include:
 - Antihistamines for allergy relief
 - Sleep aids
 - Antipsychotics
 - Muscle relaxants
 - Drugs that treat urinary incontinence
 - Medications for relief of cramps in the stomach, intestines, and bladder

• Be mindful of animal fats, and high in vitamins
• Get enough **sleep**, generally seven to nine hours each night

Science-based Recommendations
from the National Institute of Aging

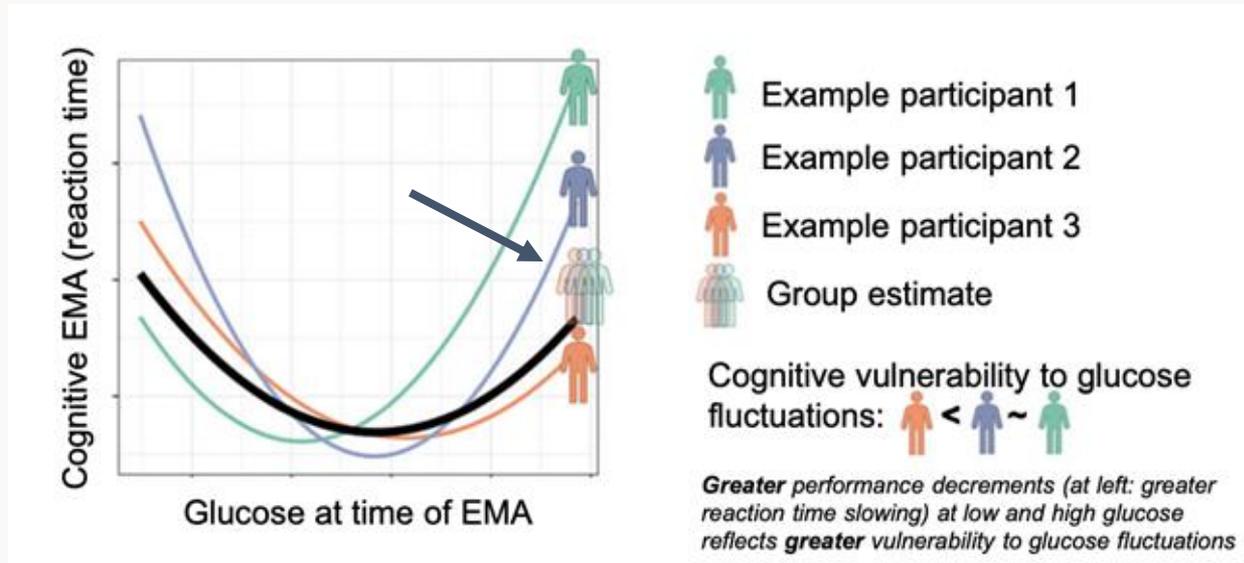
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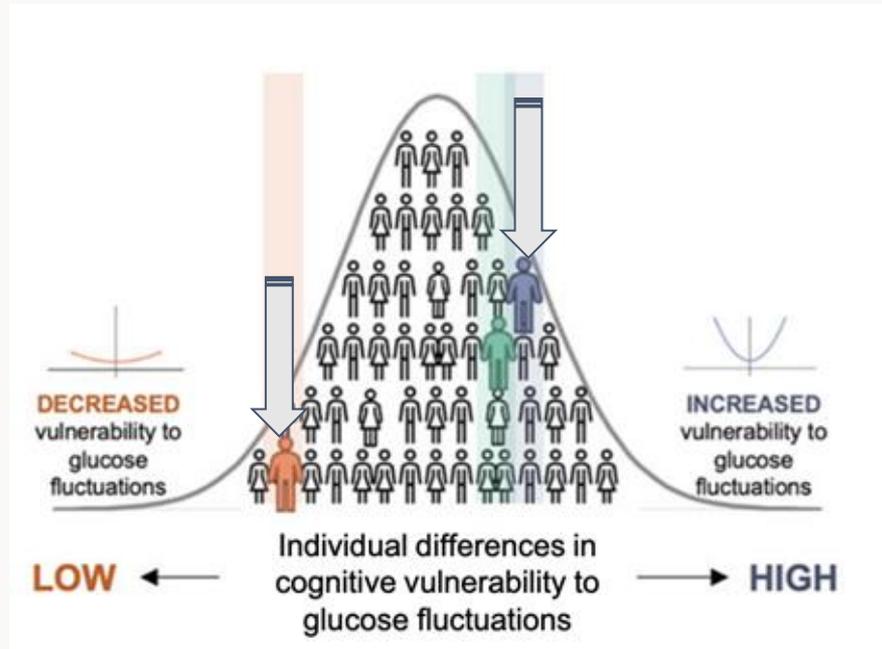
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Understanding the Group vs an Individual : Diabetes



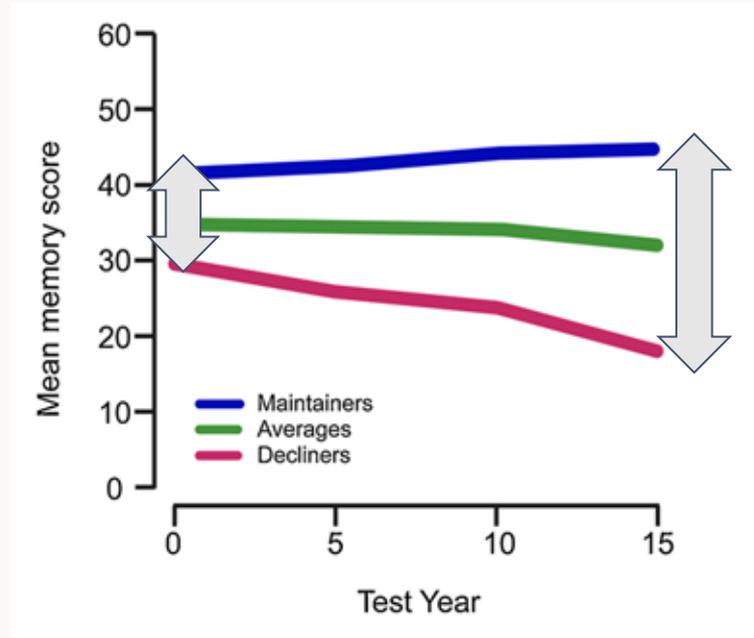
Hawks, Z.W., Beck, E.D., Jung, L. et al. Dynamic associations between glucose and ecological momentary cognition in Type 1 Diabetes. *npj Digit. Med.* 7, 59 (2024). <https://doi.org/10.1038/s41746-024-01036-5>

Understanding the Group vs an Individual: Diabetes



Hawks, Z.W., Beck, E.D., Jung, L. et al. Dynamic associations between glucose and ecological momentary cognition in Type 1 Diabetes. *npj Digit. Med.* 7, 59 (2024). <https://doi.org/10.1038/s41746-024-01036-5>

Individual Differences Grow As We Age

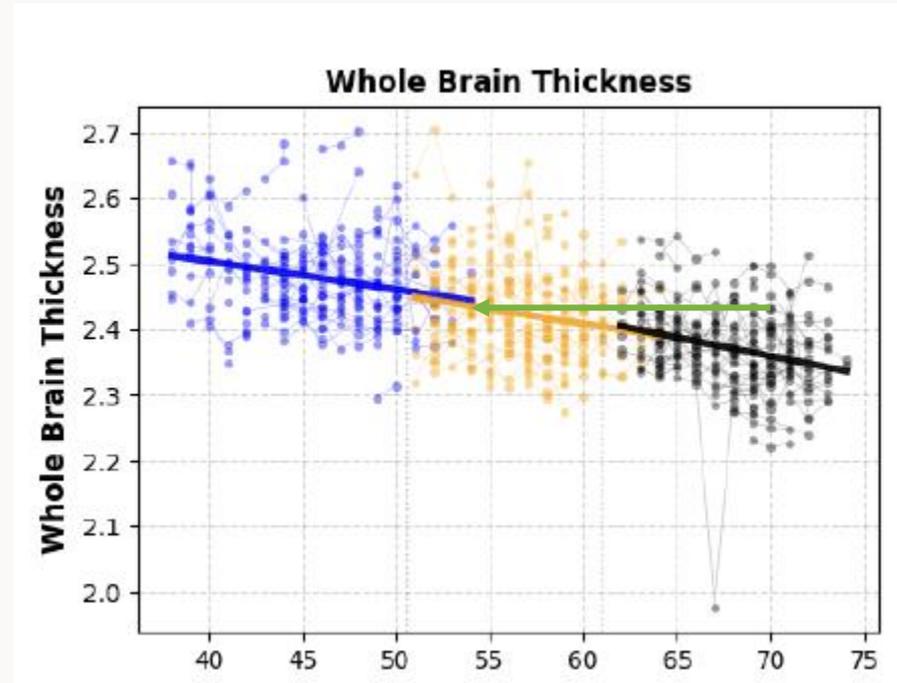


Nyberg L et al. (2020) Biological and environmental predictors of heterogeneity in neurocognitive ageing.

Ageing Res Rev 64:101184



Individual Differences Grow As We Age



Mackay-Brandt A, Gazes Y, Garcia-Barnett D, Grebe L, Ripley O, Gan KX *et al.* An open, longitudinal resource for mapping interindividual variation in the aging connectome. medRxiv. 2025; : 2025.10. 10.25337774.



Individual Differences Grow As We Age

MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.3 (Internat) vs. Version

Name: _____ Education: _____ Date of birth: _____
Sex: _____ DATE: _____

VISUOSPATIAL / EXECUTIVE Copy cylinder _____ Draw CLOCK (Ten past nine) _____

NAMING

MEMORY Read list of words, subject must repeat them. On 2 trials, item #10 is successful. On a recall after 5 minutes.

TRIAL	EGG	HAT	CHAIR	BLUE	No points
1st trial					
2nd trial					

ATTENTION Read list of digits (1 digit sec.) Subject has to repeat them in the forward order. Subject has to repeat them in the backward order.

Read list of letters. The subject must tap with his hand at each letter A. No point if B 2 times.

Serial 7 subtraction starting at 80

LANGUAGE Repeat: She heard her lawyer was the one to see after the accident. The little girls who were given too much candy got stomach aches.

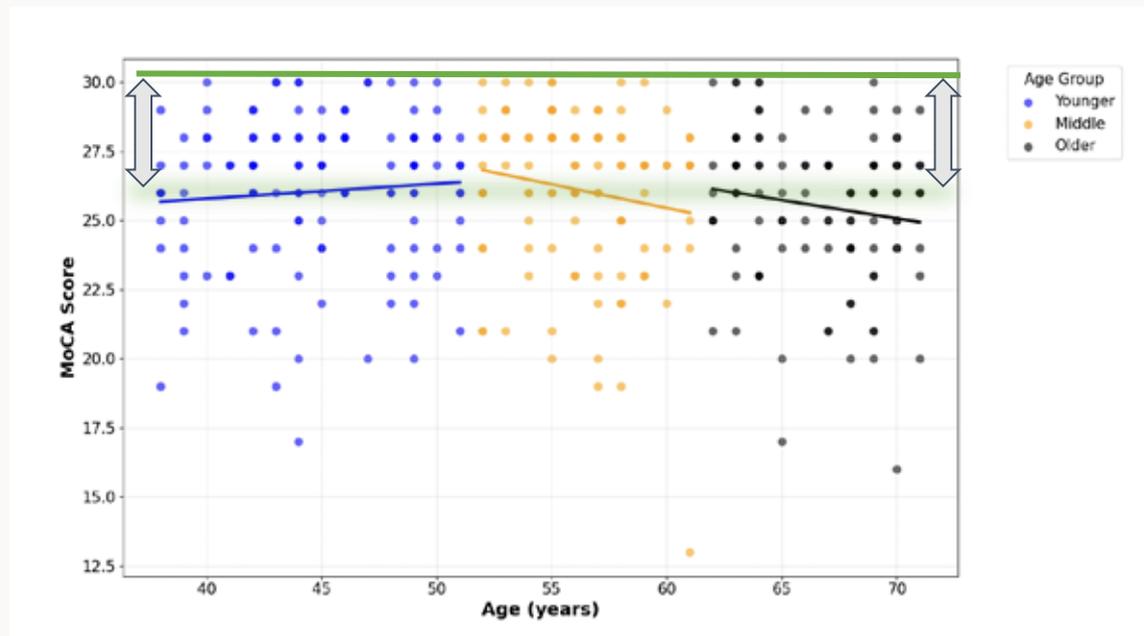
ABSTRACTION Similarity between e.g. banana - orange - fruit eye - ear trumpet - gram

DELAYED RECALL How to recall words with NO EYE

Optional

ORIENTATION

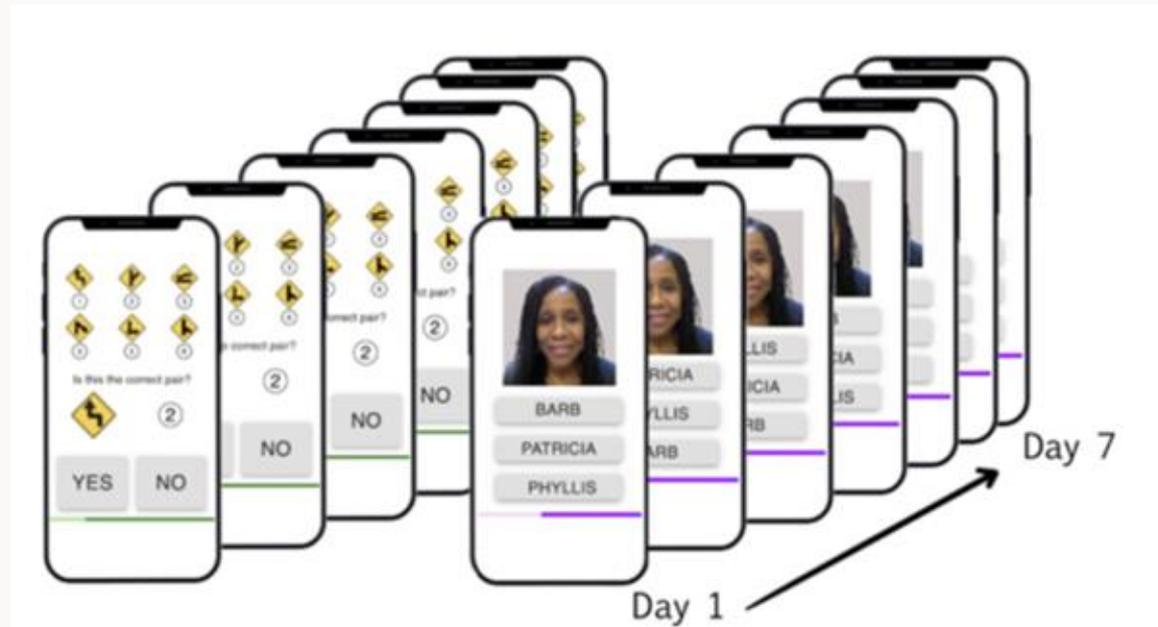
Assessed by: Z. Nasreddine MD, N. Phillips PhD, H. Chertkow MD
© Z.Nasreddine MD www.mocatest.org Normal < 28 / 30
Revised by: _____



Mackay-Brandt A, Gazes Y, Garcia-Barnett D, Grebe L, Ripley O, Gan KX *et al.* An open, longitudinal resource for mapping interindividual variation in the aging connectome. medRxiv. 2025; : 2025.10. 10.25337774.



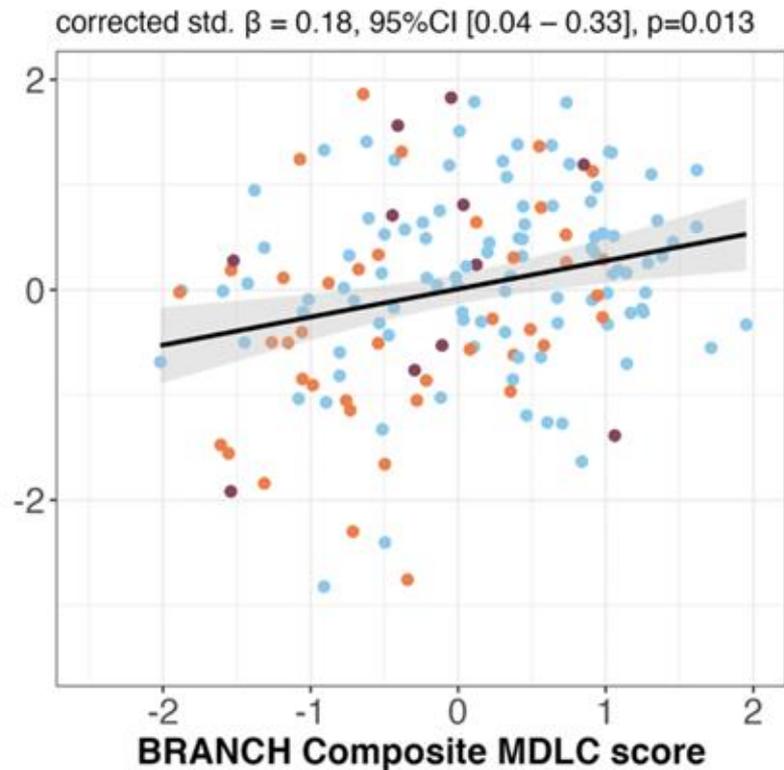
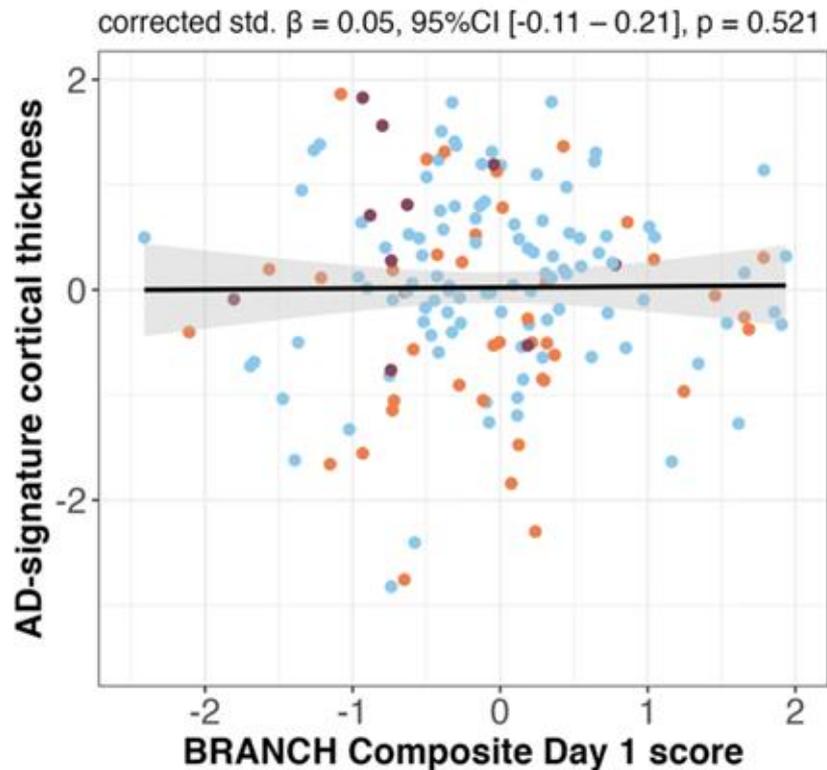
How do we know if there is a reason to be concerned?



Kate Papp – Harvard Alzheimer's Researcher Developed A New Way to Detect Risk of AD
BRANCH = Boston Remote Assessment of Neuro Cognitive Health

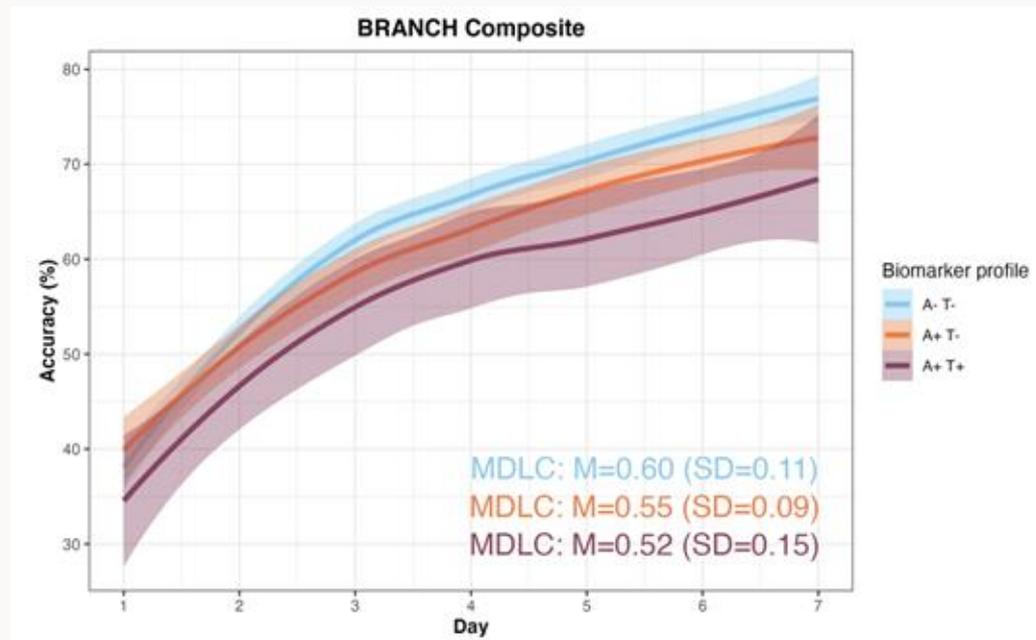


How do we know if there is a reason to be concerned?



Jutten, R.J., Soberanes, D., Molinare, C.P. et al. Detecting early cognitive deficits in preclinical Alzheimer's disease using a remote digital multi-day learning paradigm. *npj Digit. Med.* 8, 24 (2025). <https://doi.org/10.1038/s41746-024-01347-7>

How do we know if there is a reason to be concerned?



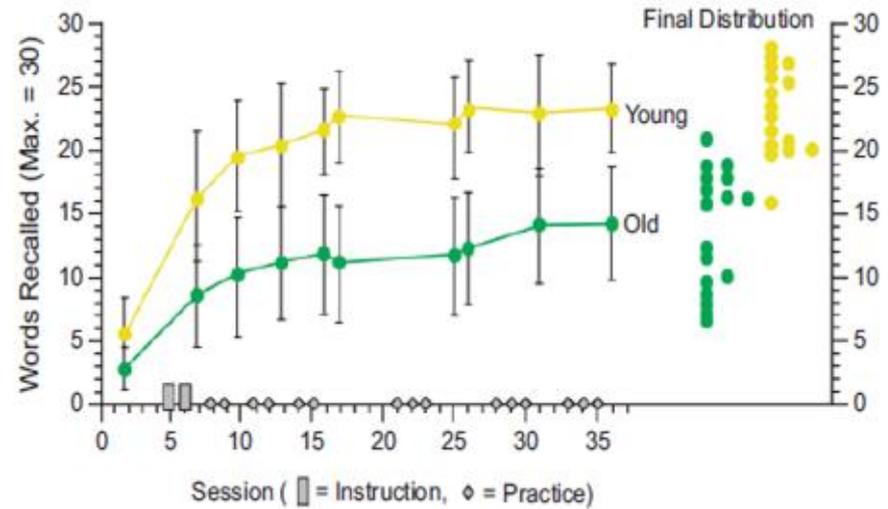
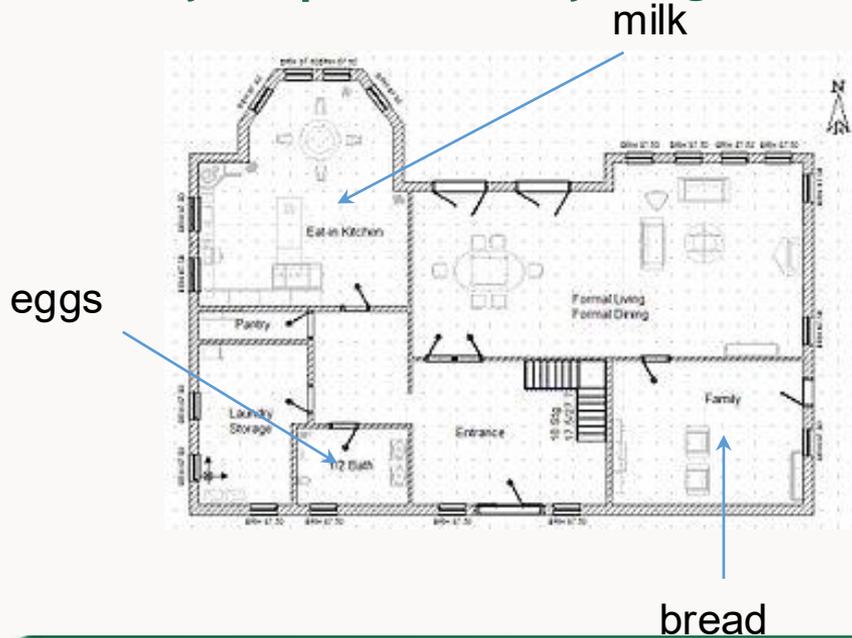
When you practice –
you get better.

If you don't, it's a red
flag.

Jutten, R.J., Soberanes, D., Molinare, C.P. et al. Detecting early cognitive deficits in preclinical Alzheimer's disease using a remote digital multi-day learning paradigm. *npj Digit. Med.* 8, 24 (2025). <https://doi.org/10.1038/s41746-024-01347-7>



Interventions to Maintain Brain Health and Cognitive Health: When you practice – you get better. If you don't, it's a red flag.

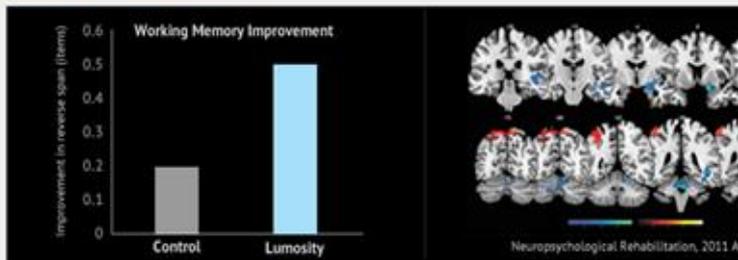


Method of loci training in young and older adults.
Baltes & Kliegl, Developmental Psychology 1992



Interventions that claimed to Maintain Brain Health and Cognitive Health. When you practice – you get better. If you don't, it's a red flag.

The Science Behind Lumosity



Experimentally tested & clinically proven

The results of training with Lumosity are measured experimentally in randomized controlled trials. A typical experiment begins by measuring each person's baseline abilities with tests of brain performance. After several weeks of training, each person is tested again to determine how much the Lumosity training has improved cognitive function.

Lumosity significantly improves short-term memory, JL Hardy et al. (2011). Enhancing attention and working memory with a web-based cognitive training program. *Mensa Research* 12(2):13-20.

fMRI shows how brain activity changes with Lumosity training. SR Kesler et al. (2011). Changes in frontal-parietal activation and cognitive performance following adaptive number sequence training: Preliminary results from a pilot study. *Neuropsychological Rehabilitation*, 21(4):400-410.



- Hardy: 14 training group, 9 wait list control group
- Kesler: 13 children with Turner syndrome, No



News & Events - Press Releases - Lumosity to Pay \$2 Million to Settle FTC Deceptive Advertising Charges for Its "Brain Training" Program

Lumosity to Pay \$2 Million to Settle FTC Deceptive Advertising Charges for Its "Brain Training" Program

Company Claimed Program Would Sharpen Performance in Everyday Life and Protect Against Cognitive Decline

FOR RELEASE

January 5, 2016

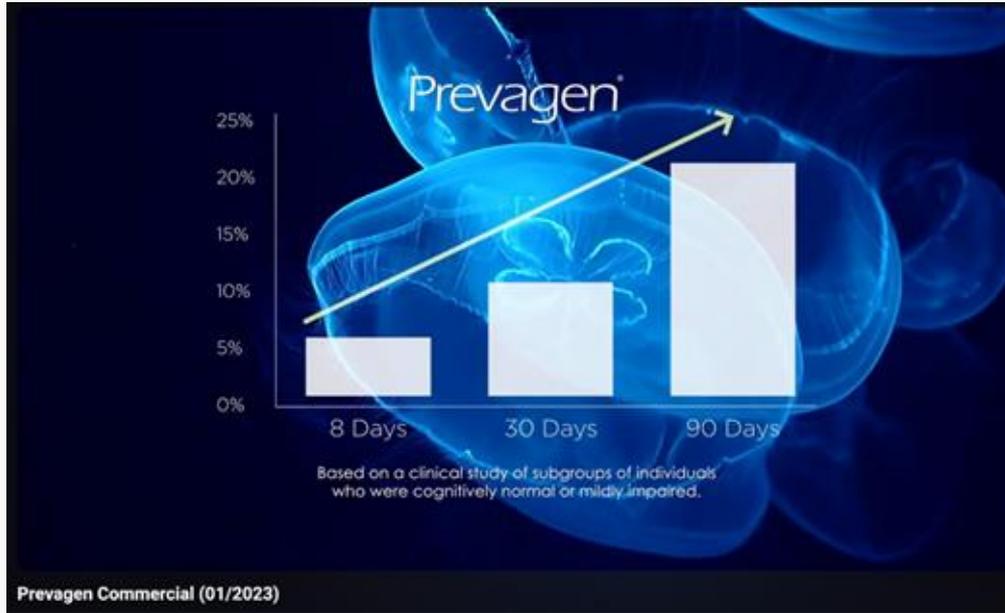
TAGS: Bureau of Consumer Protection | Consumer Protection | Advertising and Marketing | Health Claims | Online Advertising and Marketing

The creators and marketers of the Lumosity "brain training" program have agreed to settle Federal Trade Commission charges alleging that they deceived consumers with unfounded claims that Lumosity games can help users perform better at work and in school, and reduce or delay cognitive impairment associated with age and other serious health conditions.

As part of the settlement, Lumos Labs, the company behind Lumosity, will pay \$2 million in redress and will notify subscribers of the FTC action and provide them with an easy way to cancel their auto-renewal to avoid future billing.

"Lumosity preyed on consumers' fears about age-related cognitive

Interventions *that claimed* to Maintain Brain Health and Cognitive Health. When you practice – you get better. If you don't, it's a red



- In December 2024, the FTC and the New York attorney general won their lawsuit against Prevacen's makers.
- A federal court ruled makers of the supplement are prohibited from making claims it improves memory or brain function.

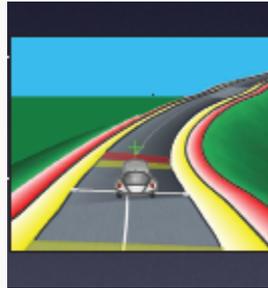
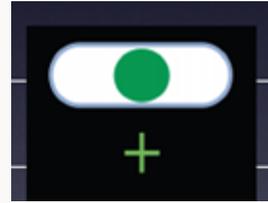
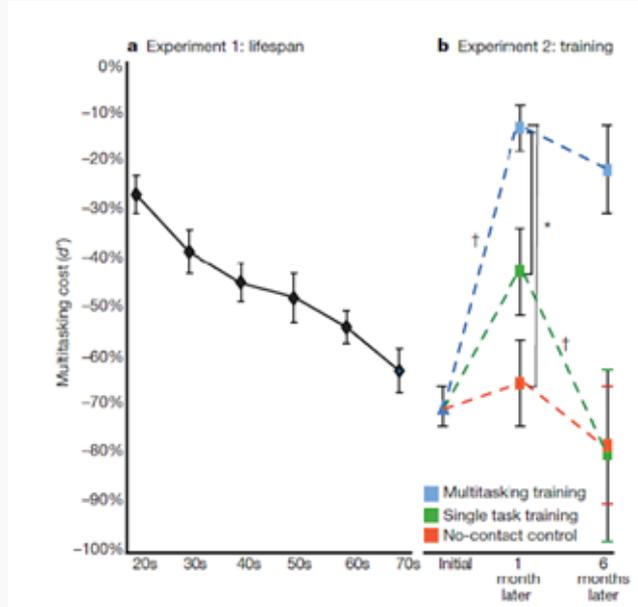


Any claim that just shows improvement over time with repeat testing needs to compare against a control - else it could just be practice effects.

Interventions With Scientifically Sound Evidence



Interventions to Maintain Brain Health and Cognitive Health: Multitask Training



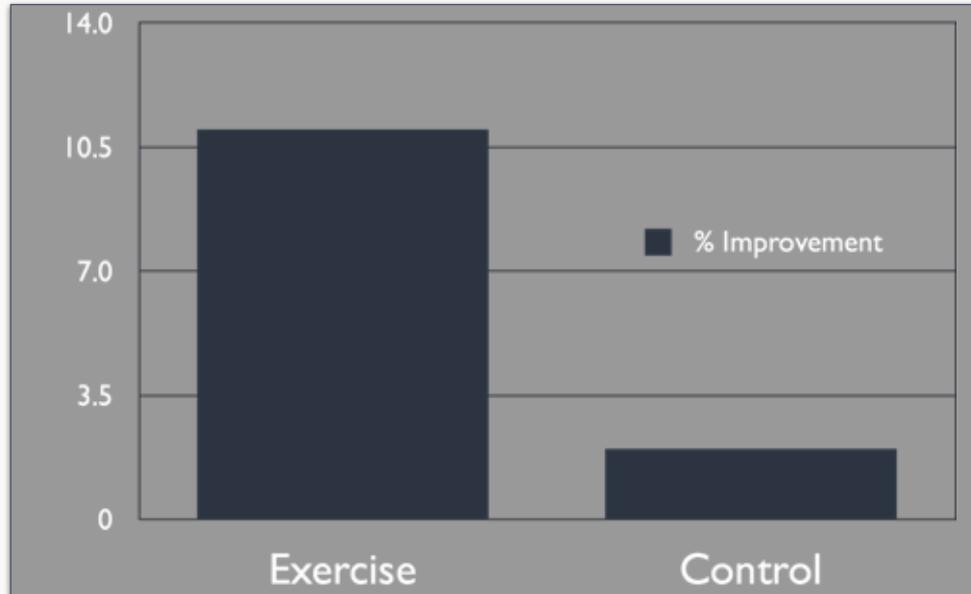
- 3 groups of adults 60-85 years old, participated in at home practice sessions for one month.
- Some practiced one task and some practiced balancing the two tasks.
- All people who practiced improved, but the multitaskers improved more and that benefit was still seen after 6 months.

JA Anguera *et al.* *Nature* **501**, 97-101 (2013) doi:10.1038/nature12486



Interventions to Maintain Brain Health and Cognitive Health:

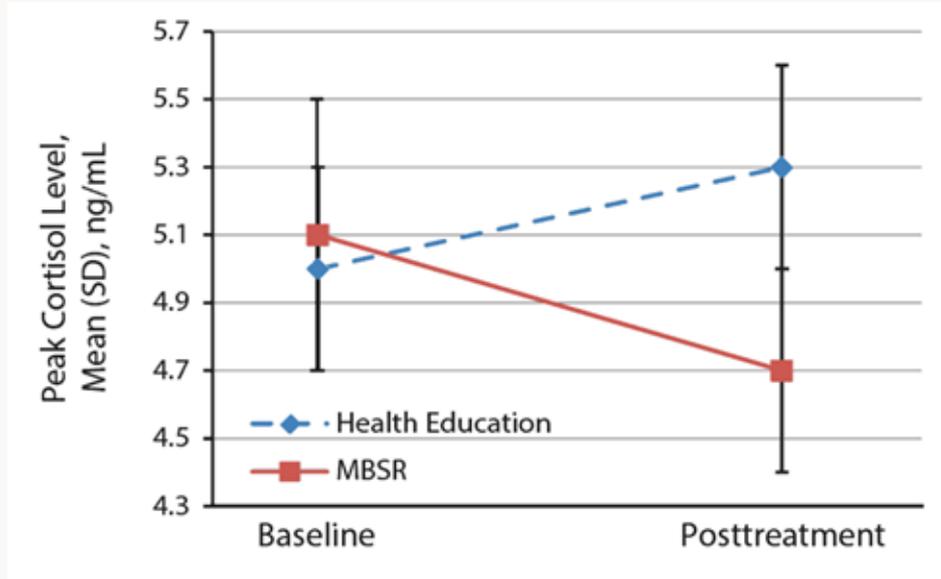
Exercise



- 2 groups of adults aged 55-79 participated in group exercise sessions,
- Stretching/toning and Walking. 3x per week for 6 months.
- Both showed improvement on a test of ability to ignore distracting information, but the exercise group improved a lot more.

S.J. Colcombe et al. Cardiovascular fitness, cortical plasticity, and aging, Proc. Natl. Acad. Sci. U.S.A. 101 (9) 3316-3321, <https://doi.org/10.1073/pnas.0400266101> (2004).

Interventions to Maintain Brain Health and Cognitive Health: Mindfulness Based Stress Reduction

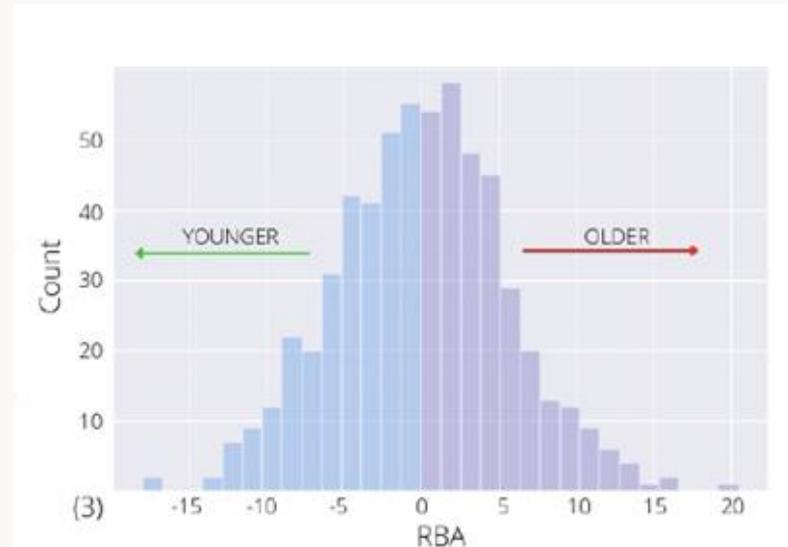
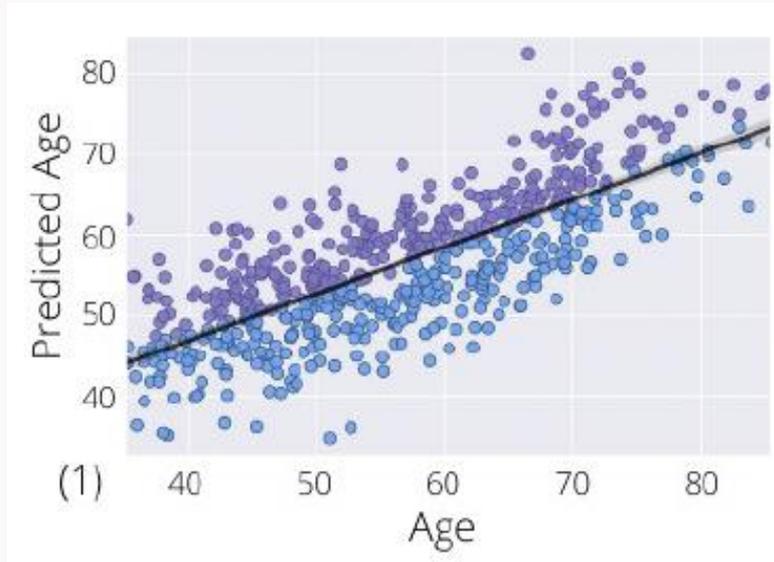


- 103 adults 65 or older with anxiety or depression and cognitive concerns were randomly assigned to mindfulness training or health education groups, 8 weeks, 2.5 hr session/week and daily home practice.
- Both groups improved, MBSR greater memory improvement and reduced anx, dep, worry symptoms

Wetherell JL, et al. (2017). Mindfulness-Based Stress Reduction for Older Adults With Stress Disorders and Neurocognitive Difficulties: A Randomized Controlled Trial. *J Clin Psychiatry*, 78(7).



Brain Health and Cognitive Health: Measures of Brain Health – Relative Brain Age

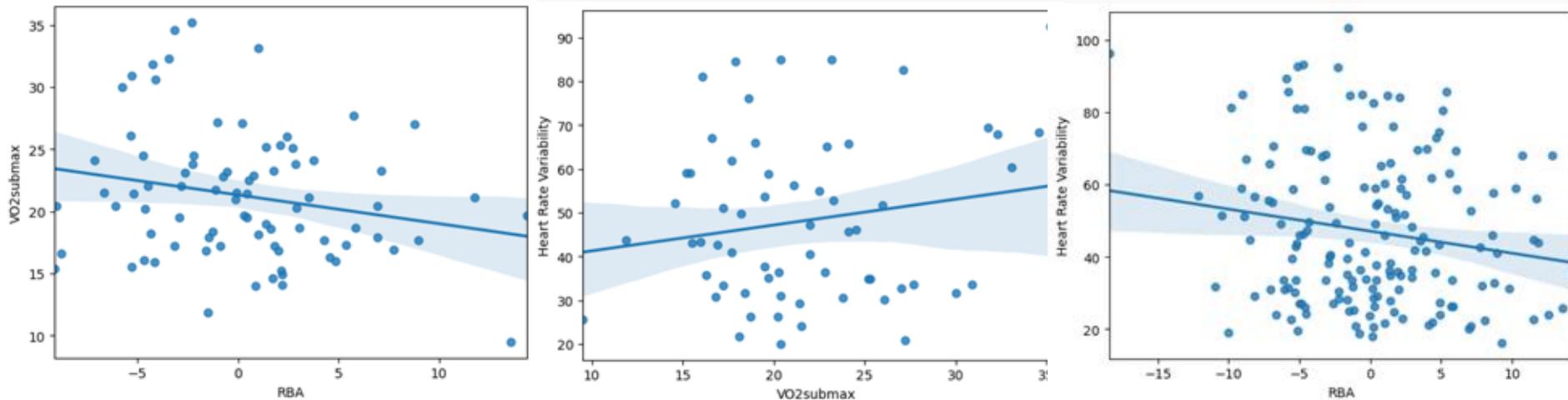


Gazes, MacKay-Brandt, Colcombe In preparation



Brain Health and Cognitive Health: Measures of Health

VO2max and Heart Rate Variability – Autonomic Function



Why is this important? the 'Window of Change'. Brain structure changes slowly over years and overall fitness - at least weeks and months, but HRV change can be seen over days and weeks.

Gazes, MacKay-Brandt, Colcombe In preparation



Interventions to Maintain Brain Health and Cognitive Health

Interventions: Exercise, Meditation, Multitasking, Socializing, Playing Music, Stimulant drugs...

N-of-1 Study Design

One Person, Multiple Crossovers, Personal Evidence

HRV and Cognitive Tests
Dynamic Outcomes

• Measure outcomes at each phase



Three Key Features

1

Repeated Crossovers

Alternate between treatment & control multiple times

3

Systematic Measurement

Track outcomes the same way throughout

2

Blinding (When Possible)

You don't know which phase you're in

"Does this work for ME?" — Personal evidence from your own data

Why This Matters

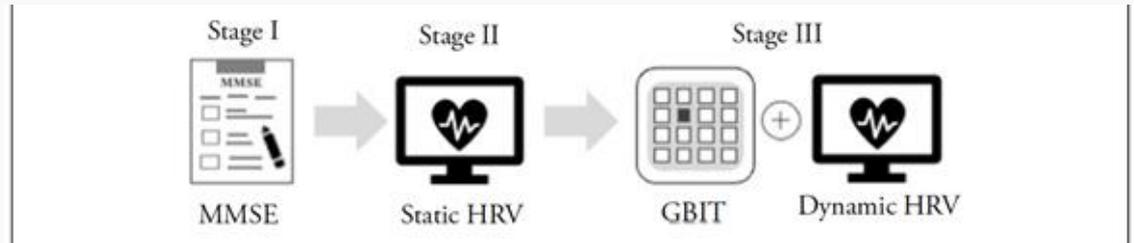


Brain Health and Cognitive Health – Autonomic Function and HRV



■ Predicting Cognitive Function Impairment through Game-based Intelligence Tests Combined with Heart Rate Variability in Older Adults

Authors: Mao, Tso-Yen ¹; Huang, Chun-Feng ¹; Chen, Chien-Ting ²; Lai, Ying-Ru ¹; Lee, Su-Shiang ¹;
Source: American Journal of Health Behavior, Volume 47, Number 4, August 2023, pp. 821-831(11)
Publisher: PNG Publications and Scientific Research Limited
DOI: <https://doi.org/10.5993/AJHB.47.4.17>



Dynamic changes in HRV while working on a cognitive test improves ability to detect cognitive function impairment.

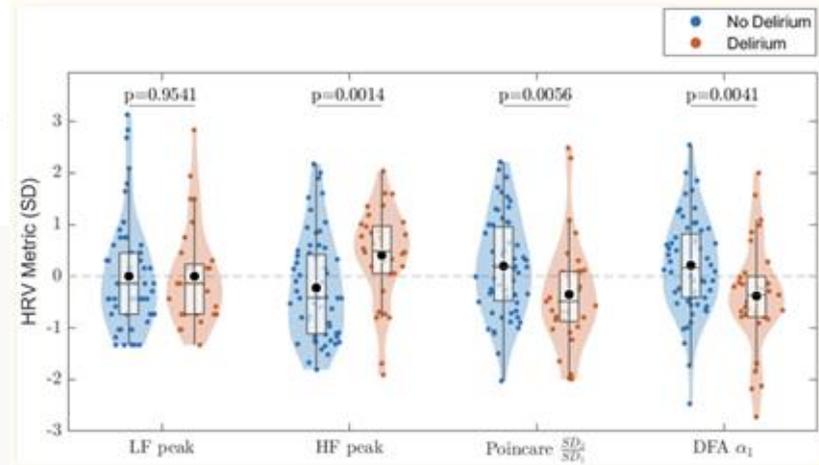
Brain Health and Cognitive Health – Autonomic Function and HRV



Ann Med Surg (Lond). 2021 Sep 13;70:102856. doi: [10.1016/j.amsu.2021.102856](https://doi.org/10.1016/j.amsu.2021.102856)

Preoperative heart rate variability analysis is as a potential simple and easy measure for predicting perioperative delirium in esophageal surgery

[Mayumi Echizen](#)^a, [Maiko Satomoto](#)^{b,*}, [Miho Miyajima](#)^c, [Yushi Adachi](#)^{d,e}, [Eisuke Matsushima](#)^c



More episodes of delirium over longer durations greatly increases risk for dementia.



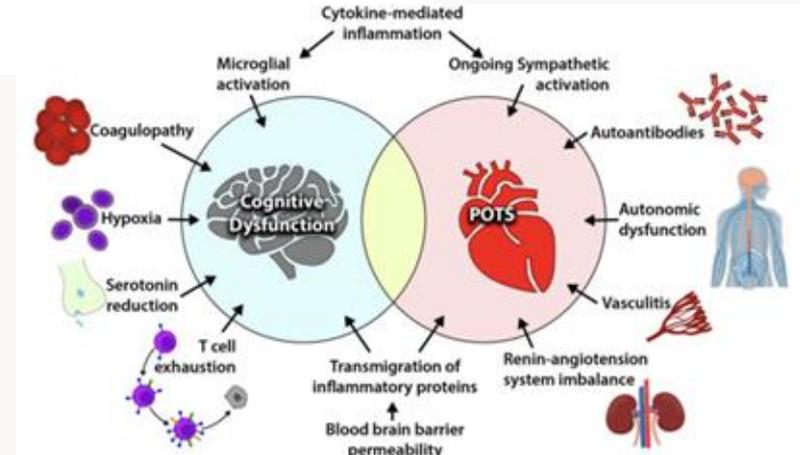
Brain Health and Cognitive Health – Autonomic Function and HRV

REVIEW · Volume 133, Issue 5, P522-530, November 2024

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Current concepts in long COVID-19 brain fog and postural orthostatic tachycardia syndrome

[Jinny Tavee, MD](#)  



The persistent symptoms of a past COVID infection includes brain fog and autonomic dysregulation.



Our Next Steps

Adult Lifespan Approach

We are focused on midlife through later adulthood. Understanding that our systems are ever changing and therefore positive impact can happen at any age.

Community-Based

We are focused on these connections in everyday life that benefits everyone, whether you have a diagnosis, you are at risk, or you are maintaining optimal health.

Open Science

We are committed to sharing our data, our tools, and our analysis approaches with the research community to continue to advance scientific discovery and progress towards the practical application of those advances.



Please consider joining us in our work by participating and telling others!





How you can partner with us

Help us connect
with others

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Participate !

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