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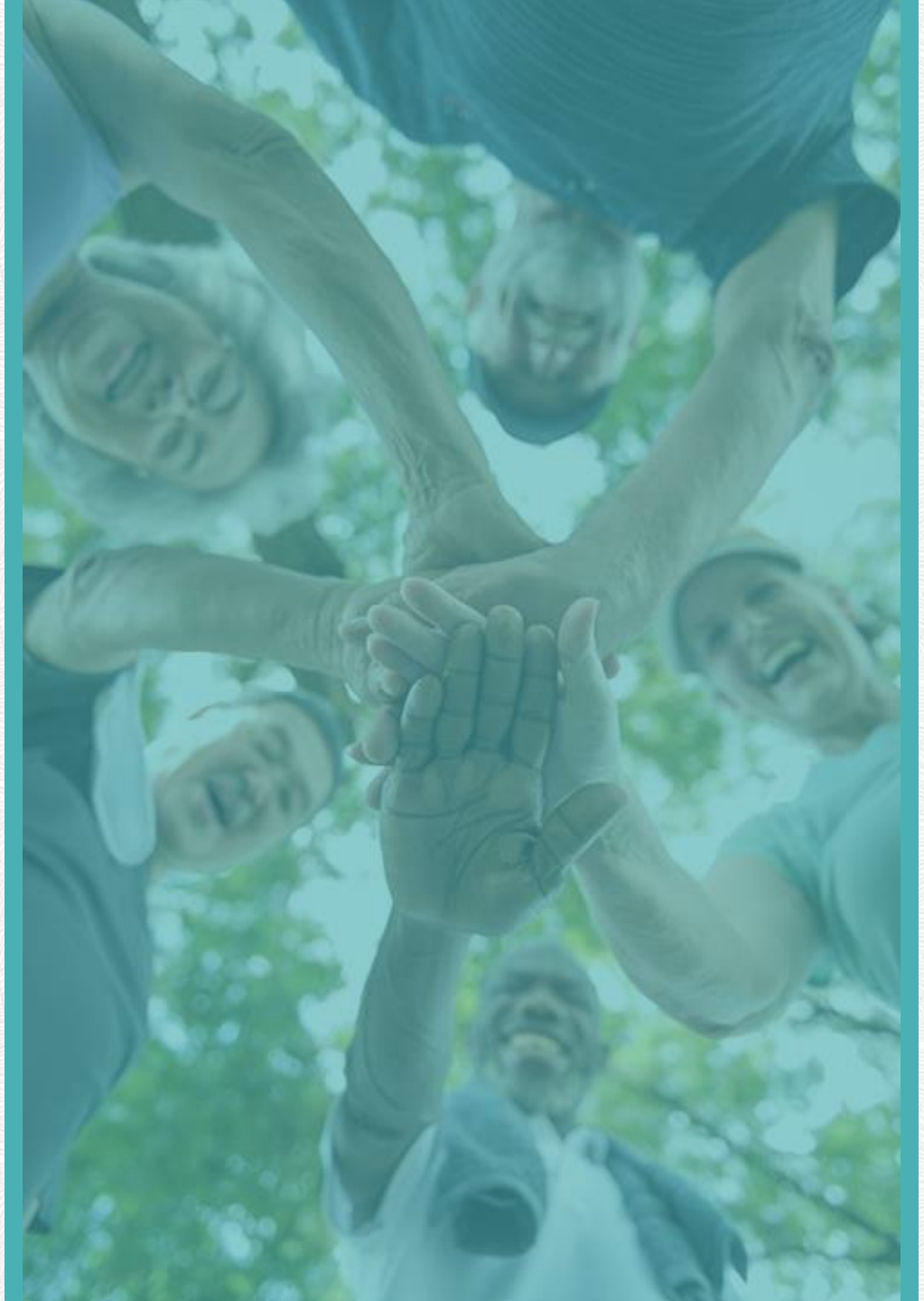
Training the Brain: New Approaches in Brain Health

Presented By: Amy Kelley, MSc, CPT

With thanks to Ryan Glatt at Pacific Neuroscience Institute



Section 1

Brain Health - Basics

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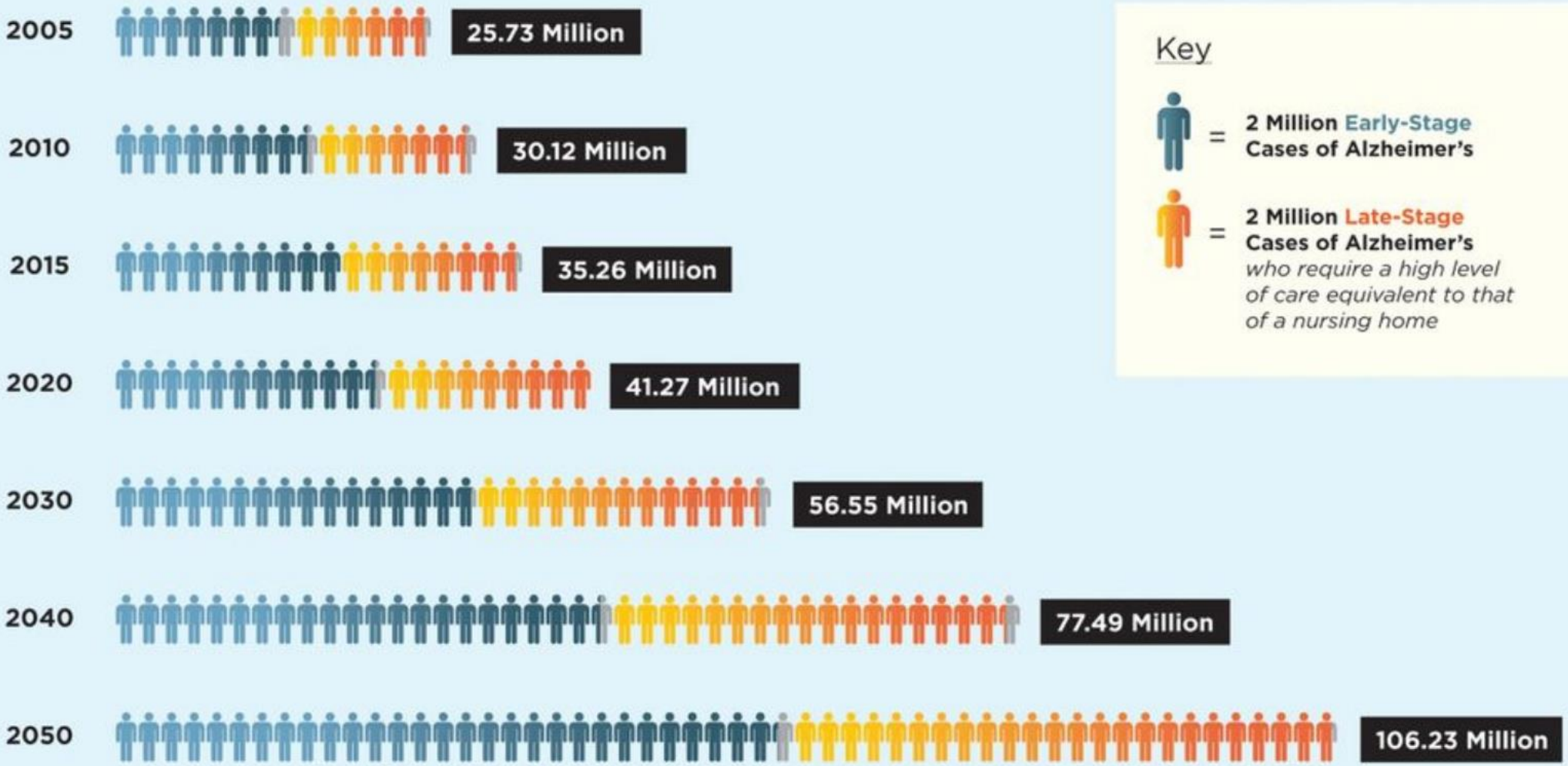
WORLDWIDE PROJECTIONS OF ALZHEIMER'S PREVALENCE

FOR THE YEARS 2005–2050, BY STAGE OF DISEASE (IN MILLIONS)



*Adapted from "Forecasting the global burden of Alzheimer's disease," by Ron Brookmeyer, Elizabeth Johnson, Kathryn Ziegler-Graham, and H. Michael Arrighi, 2007, Alzheimer's & Dementia, volume 3, p. 189. Copyright 2007 by The Alzheimer's Association.

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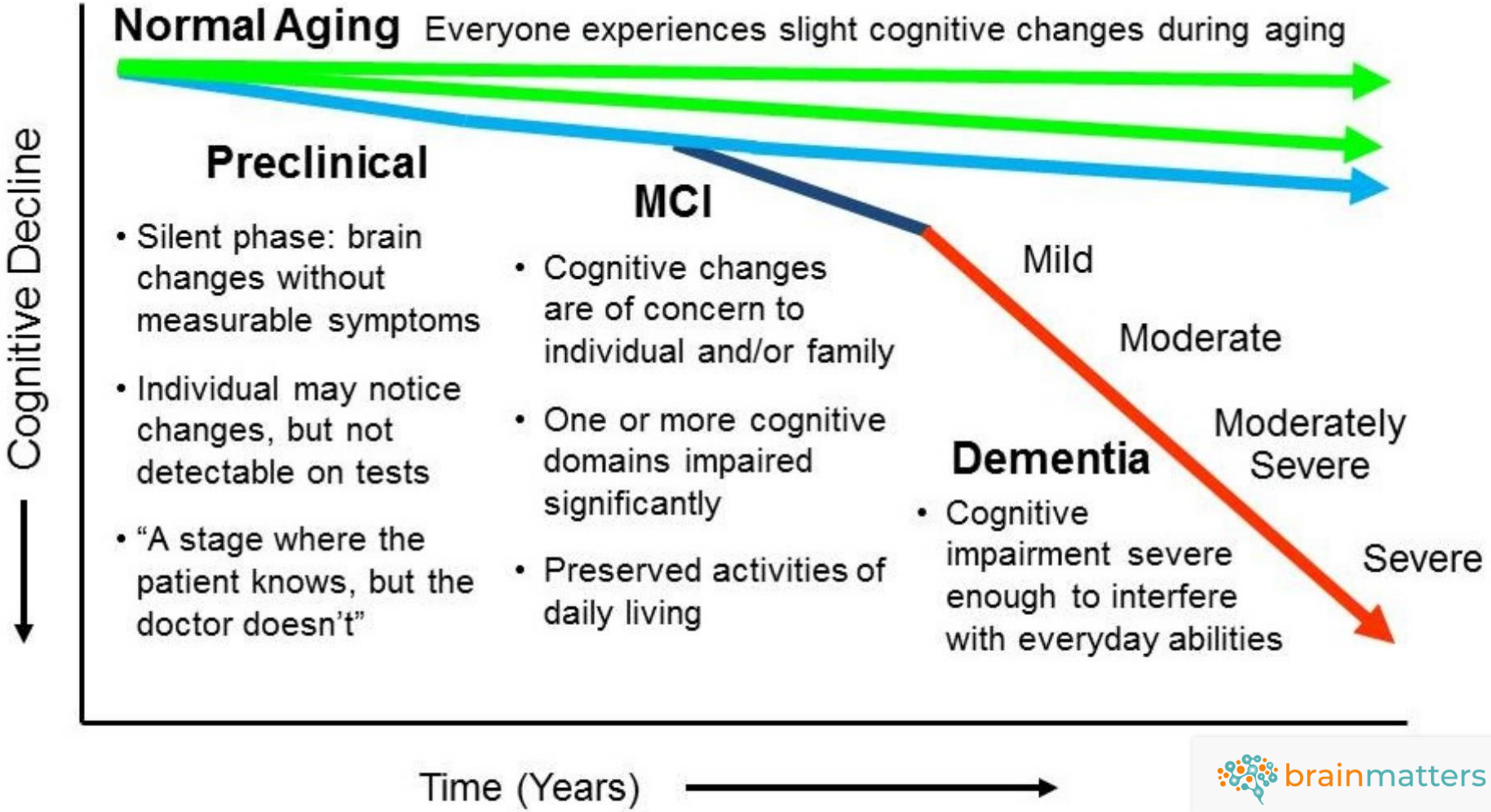
Normal Aging Everyone experiences slight cognitive changes during aging
Preclinical
• Silent phase: brain changes without measurable symptoms
• Individual may notice changes, but not detectable on tests
• "A stage where the patient knows, but the doctor doesn't"
MCI
• Cognitive changes are of concern to individual and/or family
• One or more cognitive domains impaired significantly
• Preserved activities of daily living
Dementia
• Cognitive impairment severe enough to interfere with everyday abilities
Mild
Moderate
Moderately Severe
Severe
Cognitive Decline
Time (Years)
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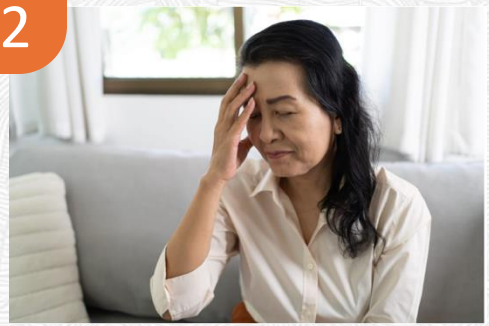
Six pillars of brain health

01

Staying Social

02



Managing Stress

03

Sleep

04

Eating Right

05

Cognitive Stimulation

06

Staying Active

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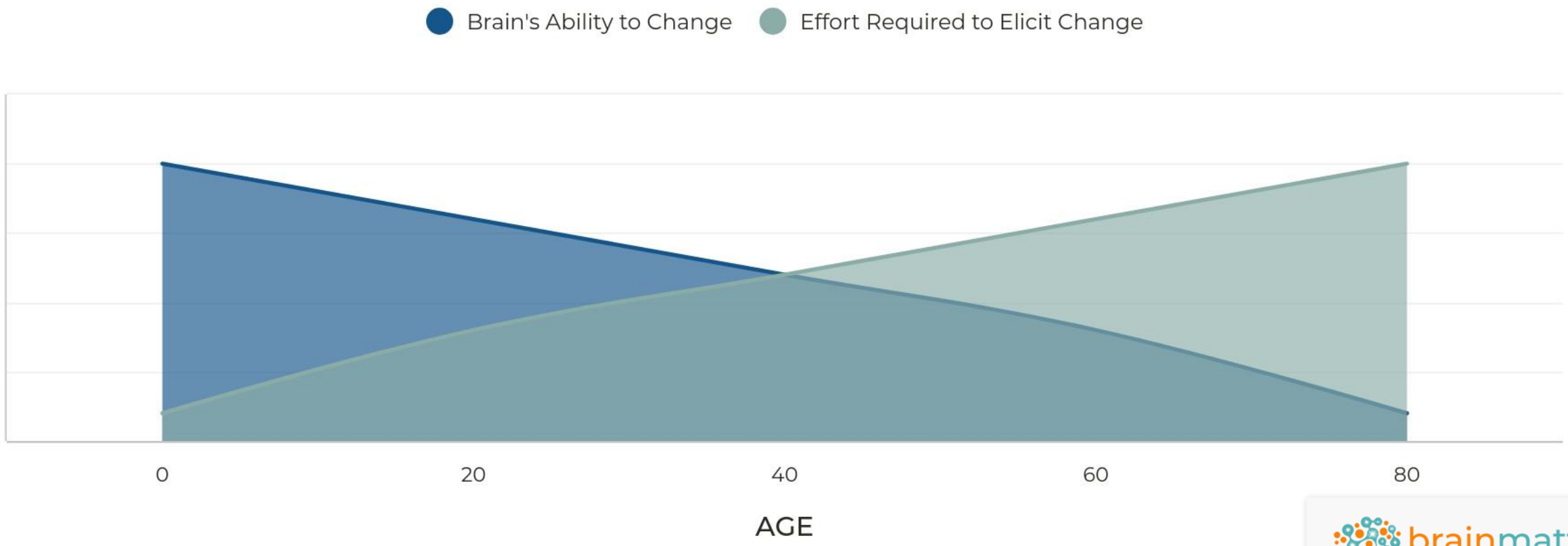
Neuroplasticity

the brain's ability to change



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NEUROGENESIS

Continuous generation of new neurons in certain brain regions

NEW SYNAPSES

New skills and experiences create new neural connections

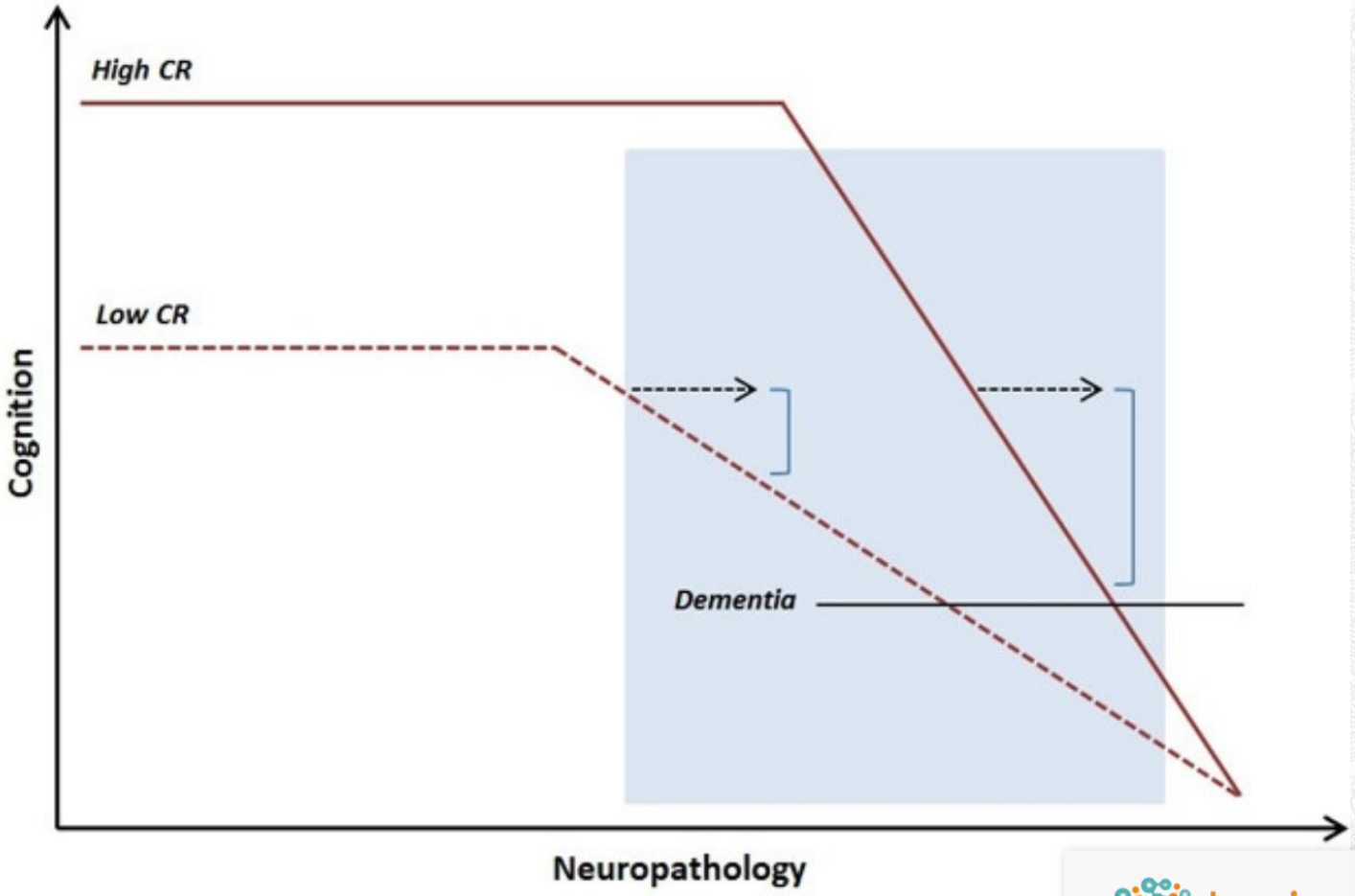
STRENGTHENED SYNAPSES

Repetition and practice strengthens neural connections

WEAKENED SYNAPSES

Connections in the brain that aren't used become weak

Cognitive Reserve



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What should cognitive stimulation include?

Novelty

Enjoyment

Variety

Socialize It!

Accountability

Cognitive Demands

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Section 2

Exercise & Dual-Tasking

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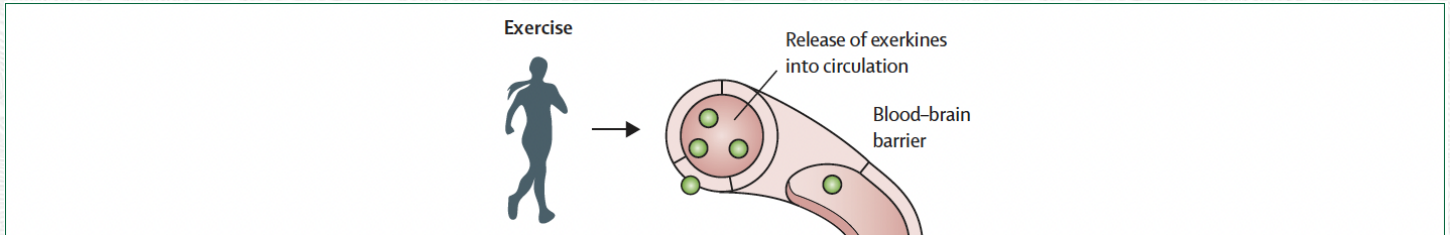
Brain Benefits of Exercise



Mediators		Sources: Platelets	Sources: Skeletal muscle (myokines)	Sources: Liver (hepatokines)	Sources: Adipose tissue (adipokines)	Changes following exercise: Brain	Effects on brain: Neurogenesis	Effects on brain: Synaptic plasticity	Effects on brain: Angiogenesis	Effects on brain: Learning and memory
Proteins	BDNF	✓	✓	✓	✓	↑	✓	✓		✓
	PF4	✓				↑	✓	✓		✓
	FNDC5 or irisin		✓			↑	✓	✓	✓	✓
	IL-6		✓			↑	✓	✓	✓	✓
	Apelin		✓		✓	↑				
	CTSB		✓			↑	✓			✓
	VEGF	✓	✓			↑	✓	✓	✓	✓
	IGF-1	✓	✓	✓		↑	✓	✓	✓	✓
	FGF21		✓	✓	✓	↑		✓		✓
	GPLD1			✓		—	✓			✓
	Adiponectin				✓	↑	✓	✓		✓
Metabolites	Lactate		✓			↑	✓	✓	✓	✓
	BHB			✓		↑				
	KYNA		✓	✓		—				
	NAD⁺		✓	✓	✓	↑	✓	✓	✓	✓

”...strong evidence connects exercise to improved cognitive outcomes and healthy brain aging, which should be emphasized in public policies and incorporated into global physical activity guidelines.”

- The Lancet, 2025.

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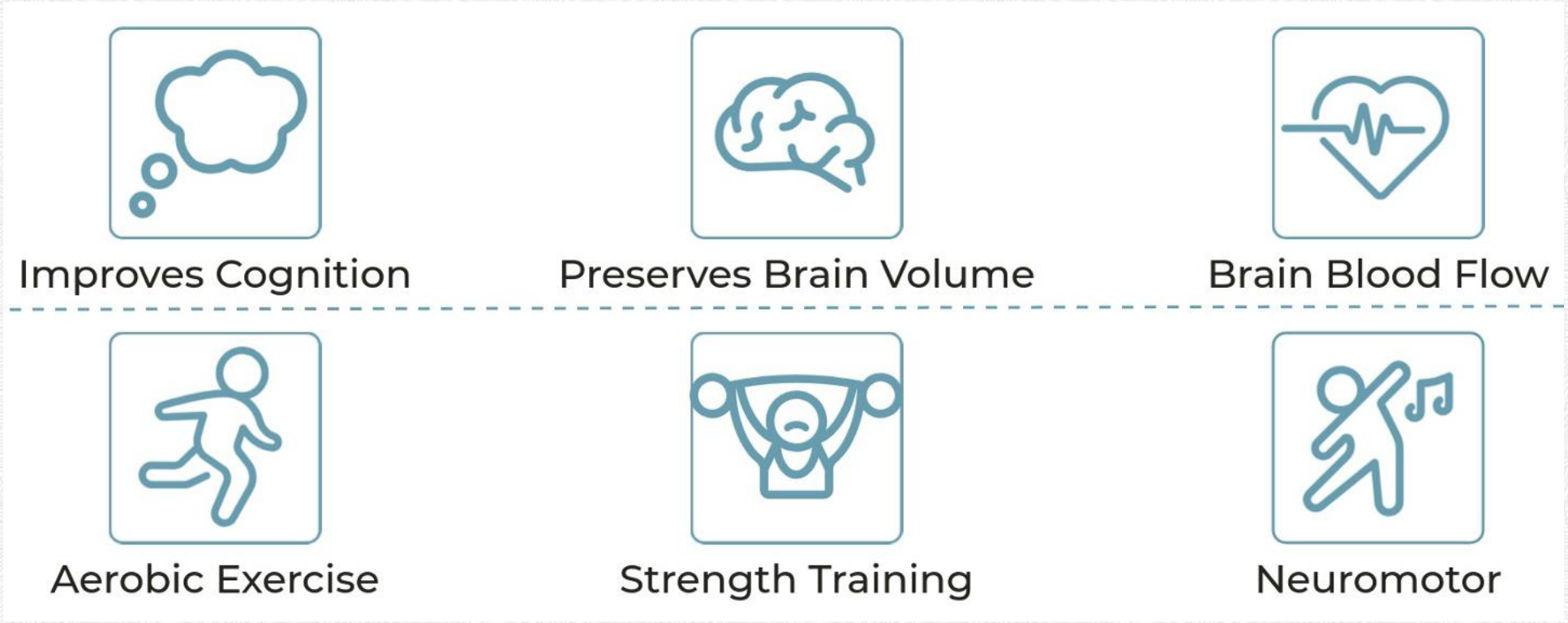
Brain Benefits of Exercise



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Brain Benefits of Exercise

PARIETAL LOBE

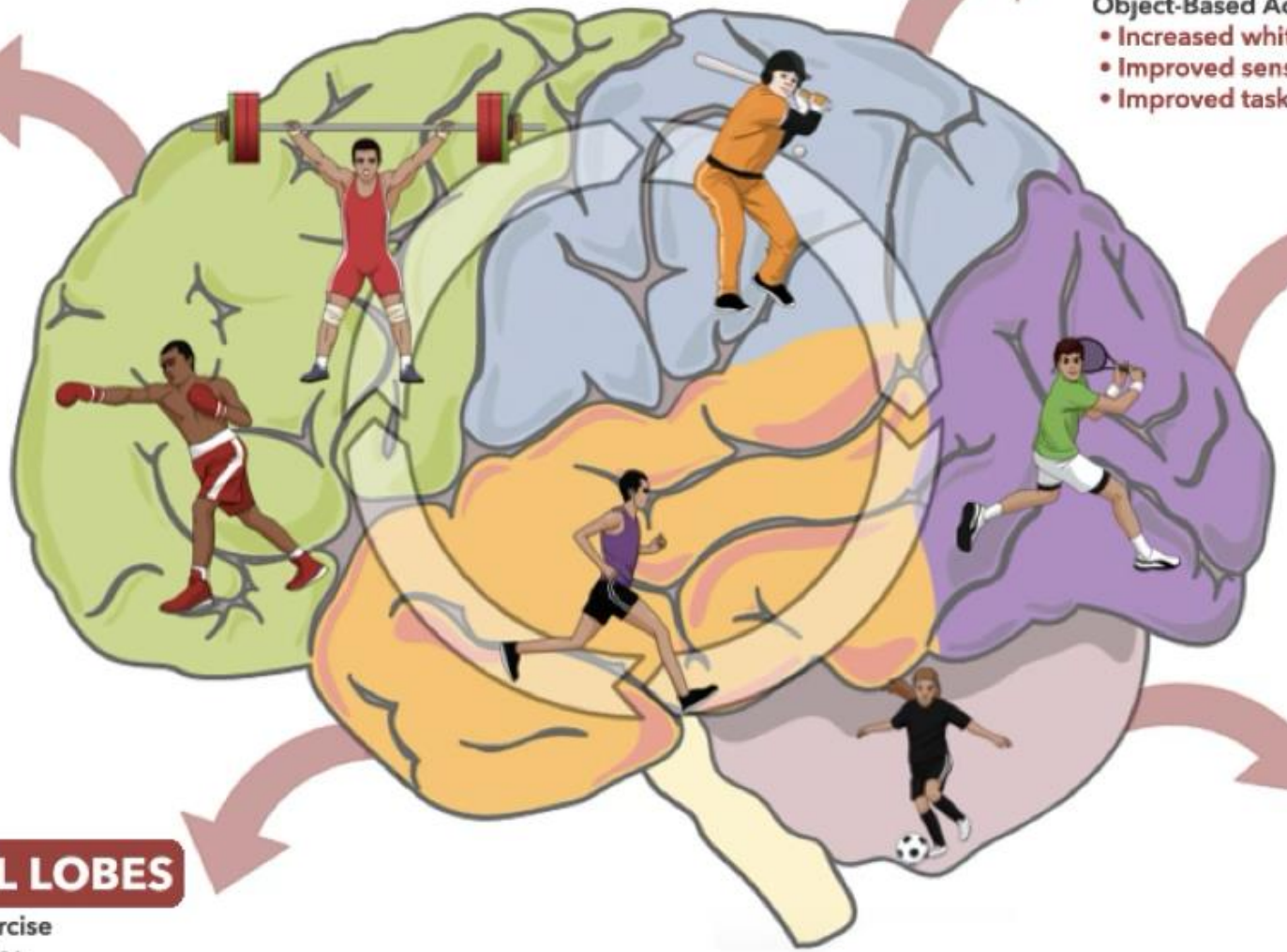
Sensory-Rich Activites
Visuo-spatial Demands
Object-Based Activities

- Increased white matter & volume
- Improved sensory network activity
- Improved task-switching abilities

FRONTAL LOBE

Cognitively-Demanding Activites
Open Skill Activities
Resistance Training
Mind-Body Exercise

- Increased Gray Matter
- Improved Executive Functions
- More Efficient Brain Activity



OCCIPITAL LOBE

Visuo-spatial Demands
Visual Attention Demands
Motor Control & Stimulation

- Increased white & gray matter
- Improved visual skills & attention
- Increased volume & function

CEREBELLUM

Coordinative Exercise
Skill & Motor Learning
Open Skills Activities

- Increased cerebellar volume & function
- Improved coordination & attention
- Higher nerve cell & blood vessel volume

TEMPORAL LOBES

Cardiovascular Exercise
Closed Skill Activities
Generalized Physical Activity

- Improved Learning & Memory
- Increased Neurogenesis
- Increased Hippocampal Volumes

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"Open Skill Exericse is more effective for improving some aspects of cognitive function compared with Closed Skill Exercise."

Gu, Q., Zou, L., Loprinzi, P. D., Quan, M., & Huang, T. (2019). Effects of open versus closed skill exercise on cognitive function: A systematic review. Frontiers in psychology, 10, 1707.

Open ⟷ Closed

Environment is constantly changing

Movements have to be continually adapted

Predominately externally paced

Stable & predictable environement

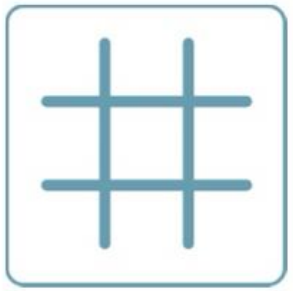
Movements have a clear beginning & end

Performer knows what to do & when

Dual-tasking in everyday life

- Performing two tasks at the same time (cognitive + motor)

Walking + Talking



Writing Phone # + Listening

Carrying + Walking + Searching

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Benefits of dual-task training

01 Dual-tasking improves brain activity, **cognition**, and **blood flow** in the frontal lobe

02 Dual-tasking improves **cognition** more than **single-task** exercise

03 Dual-tasking cognitive benefits **last longer** & benefit **older adults**

04 **Enjoyment** and **adherence**

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Section 3

Case Studies

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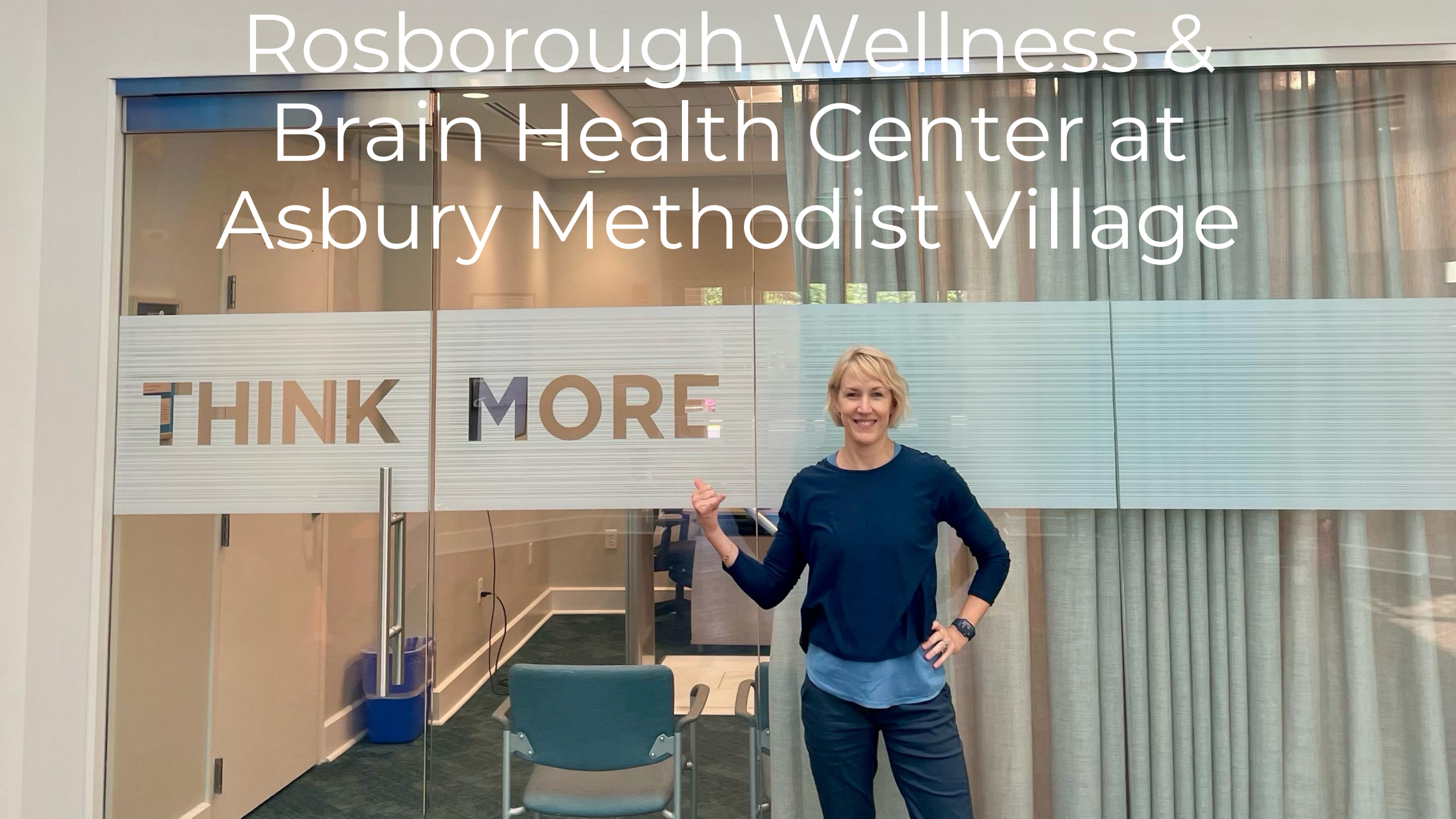
Rosborough Wellness & Brain Health Center at Asbury Methodist Village



Brain Gym

- Group exercise (dual-tasking)
- Rock Steady Boxing
- Climbing wall

Exergaming

Dividat Senso

SMARTfit

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Sample session structure

Equipment	Technique/Task(s)	Targeted cognitive domains	Target physical domains	Duration
CyberCycle	Collecting Coins	Visuospatial, Attention	Cardiovascular	8 min
SMARTFit	Matching Like Symbols while Marching in Place	Complex Attention, Working Memory	Cardiovascular	8 min
Dividat Senso	Steps on one of four targets at the right time at varying speeds	Task-switching, Reaction Time	Dynamic Balance	8 min
Jintronix	Skiing Downhill with Weight Shifting and Squatting	Attention, Inhibition	Strength	8 min
SMARTFit	Selecting the Correct Sequence of Numbers while Hurdle Stepping	Working Memory, Set-Shifting	Dynamic Balance	8 min
Resistance Training	Counting Backwards While Conducting Weighted Moves	Executive Functioning	Neuromuscular	8 min

- Source: Glatt, *et al.*

Dosage: 2x/week (30-60 min) for 12 weeks+

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HALE KŪ'IKE

The Standard In Memory Care

CELEBRATING 20 YEARS

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Adding dual-tasking to group exercise

Using technology to stimulate the brain

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Questions?

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amy@brainmattershawaii.com
www.brainmattershawaii.com

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