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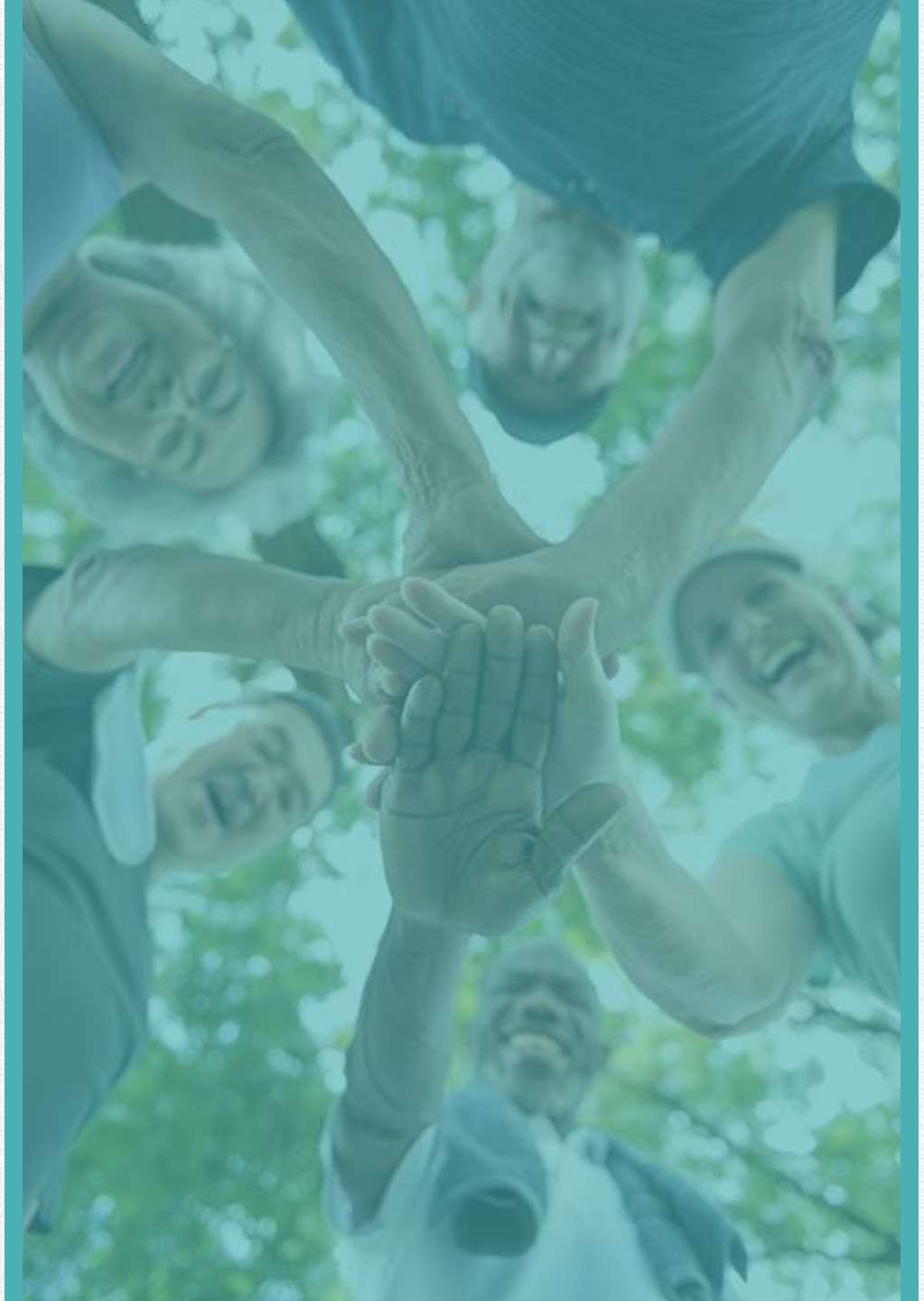
Your brain on exercise (and other healthy behaviors)

Presented by Amy Kelley
for
Catholic Charities Hawai'i
Saturday, May 24, 2025



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CATHOLIC CHARITIES HAWAIʻI
CIRCLE OF CARE FOR DEMENTIA

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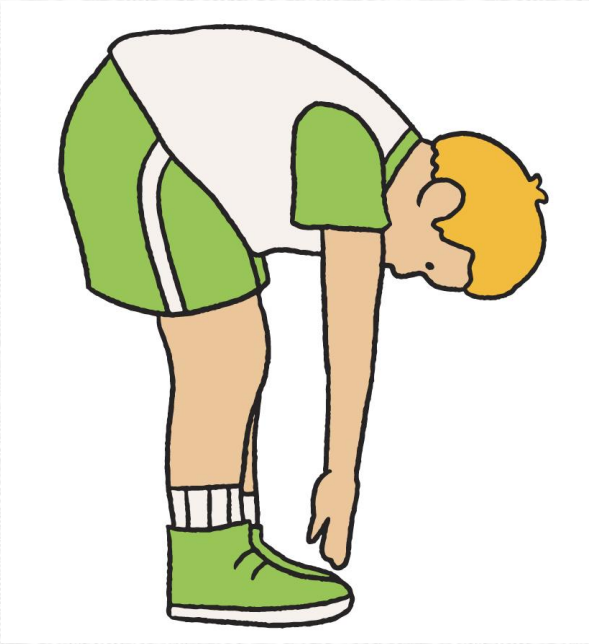
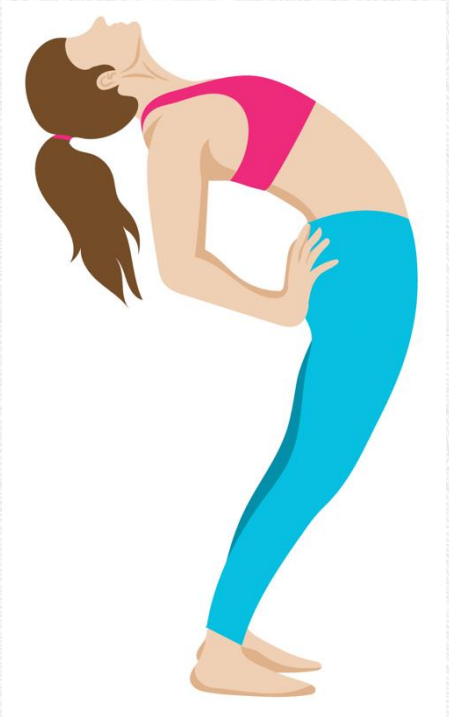
These caregiver workshops are made possible by the Elderly Affairs Division of the City & County of Honolulu through Federal Older Americans Act funding.

Warm up – spinal mobility



Forward fold – only go as far as comfortable (no need to touch your toes)



Back extension

Side flexion – be sure to do both sides!

Rotation – both directions

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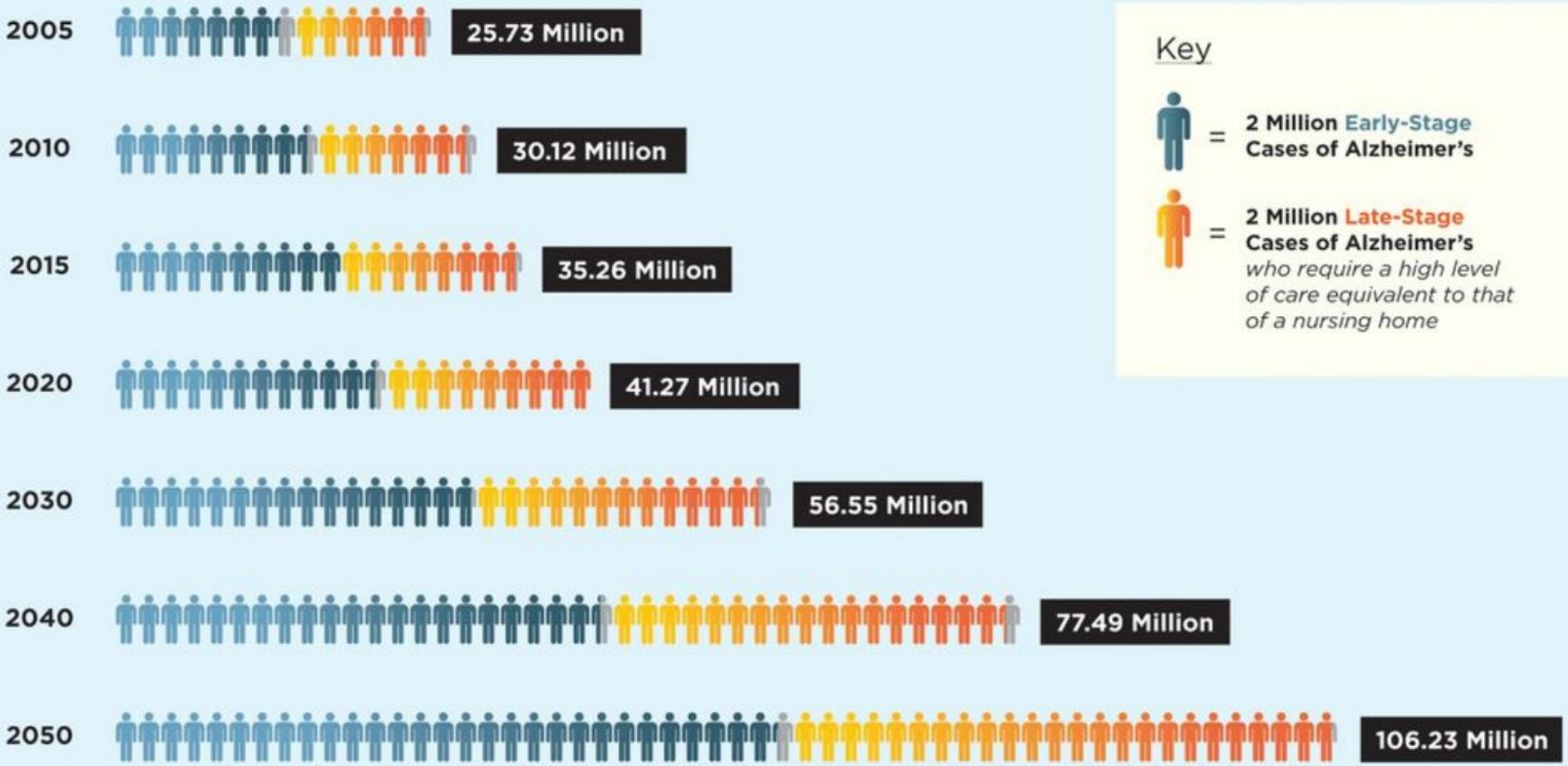
WORLDWIDE PROJECTIONS OF ALZHEIMER'S PREVALENCE

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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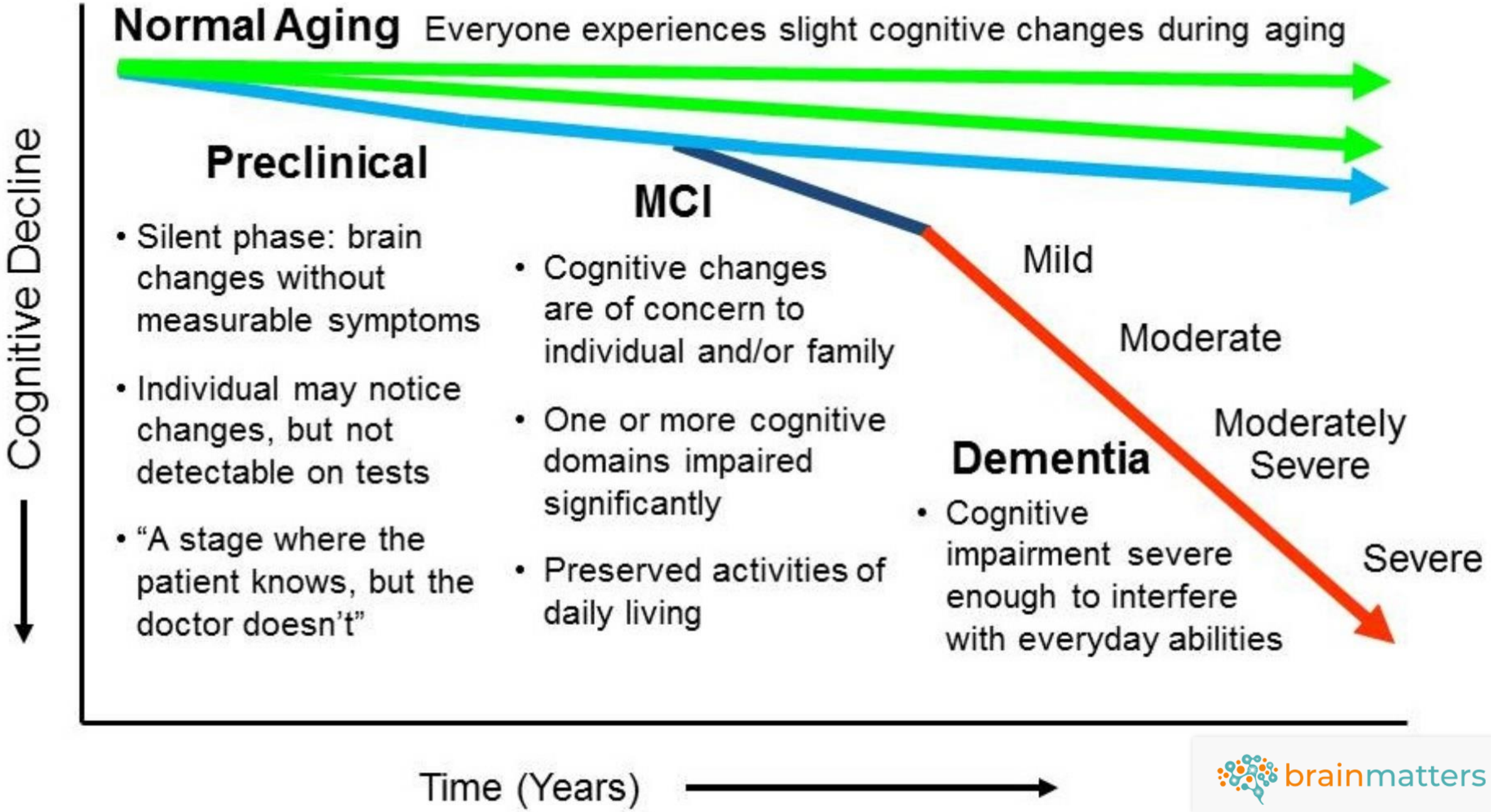
Normal Aging Everyone experiences slight cognitive changes during aging
Preclinical
• Silent phase: brain changes without measurable symptoms
• Individual may notice changes, but not detectable on tests
• "A stage where the patient knows, but the doctor doesn't"
MCI
• Cognitive changes are of concern 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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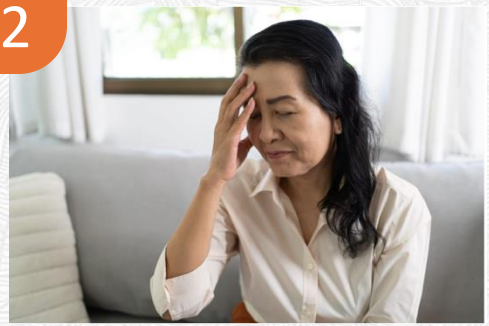
Factors that influence brain health

01

Staying Social

02



Managing Stress

03

Sleep

04

Eating Right

05

Cognitive Stimulation

06

Staying Active

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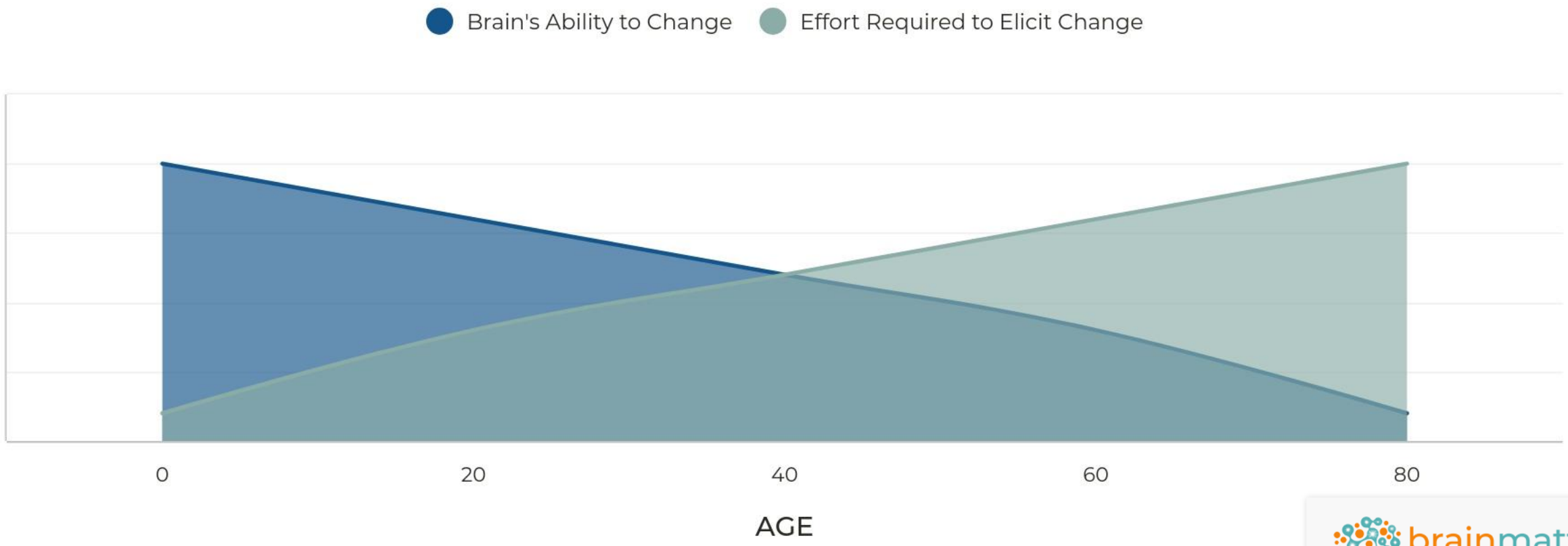
Neuroplasticity

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

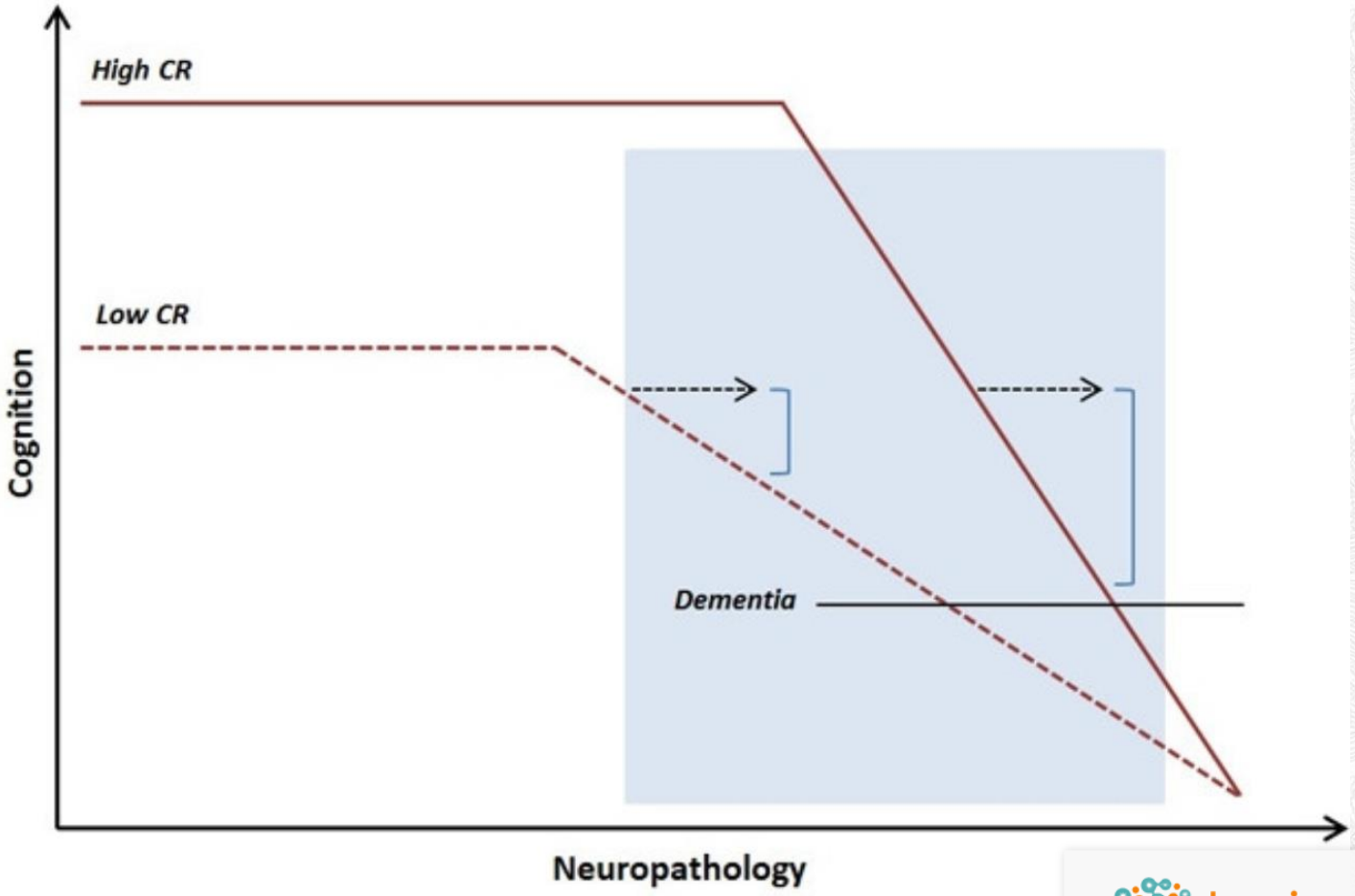
STRENGTHENED SYNAPSES

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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Tips for cognitive stimulation

- Often what is avoided is what is needed
- Too much of one activity may not be ideal; diversify!
- Cognitive stimulation should sometimes be difficult, challenging, complex, and/or novel
- The principle of ‘use it or lose it’ can apply
- Creating external accountability is helpful
- Doing something socially (group, class, partner)

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Can certain activities be selected by domain?

01 Attention

- Reading
- Entertainment, e.g. TV, movies, music
- Socializing
- Puzzles
- Meditation

02 Memory

- Learning a language
- Learning music
- Learning choreography

03 Executive Functioning

- Writing
- Art
- Complex games
- Sporting activities

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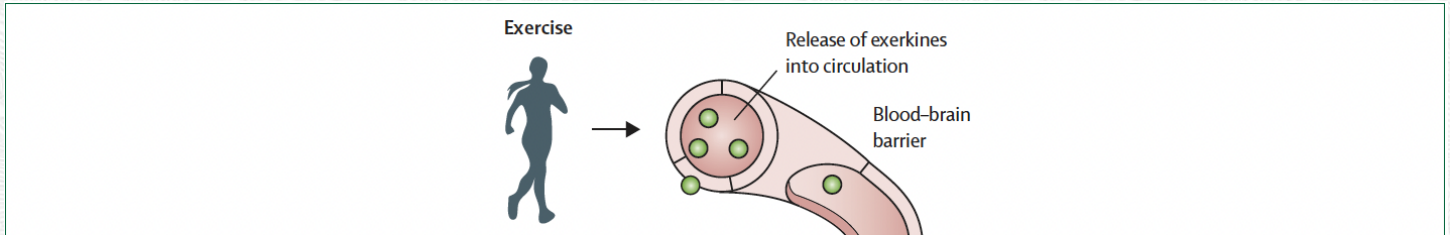
Brain Benefits of Exercise



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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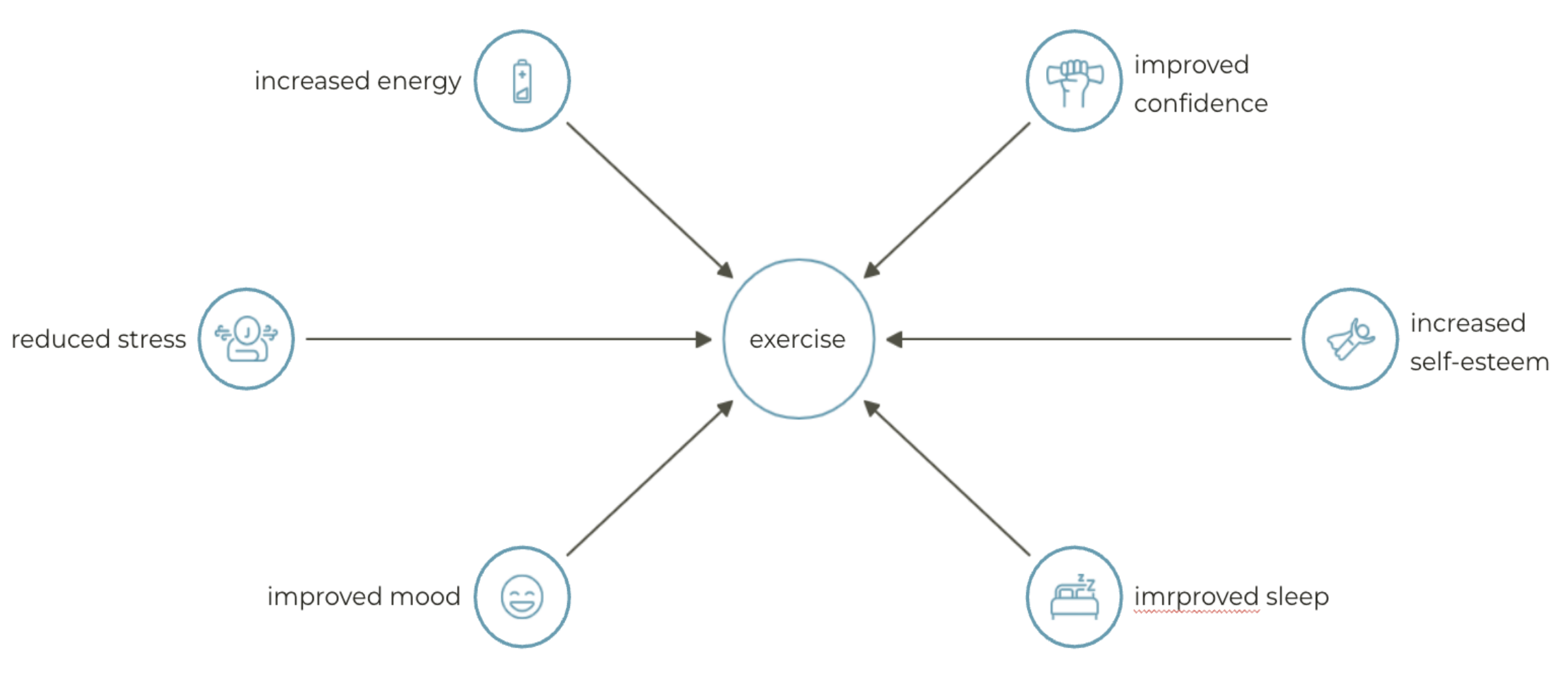
Exercise effects on mental health



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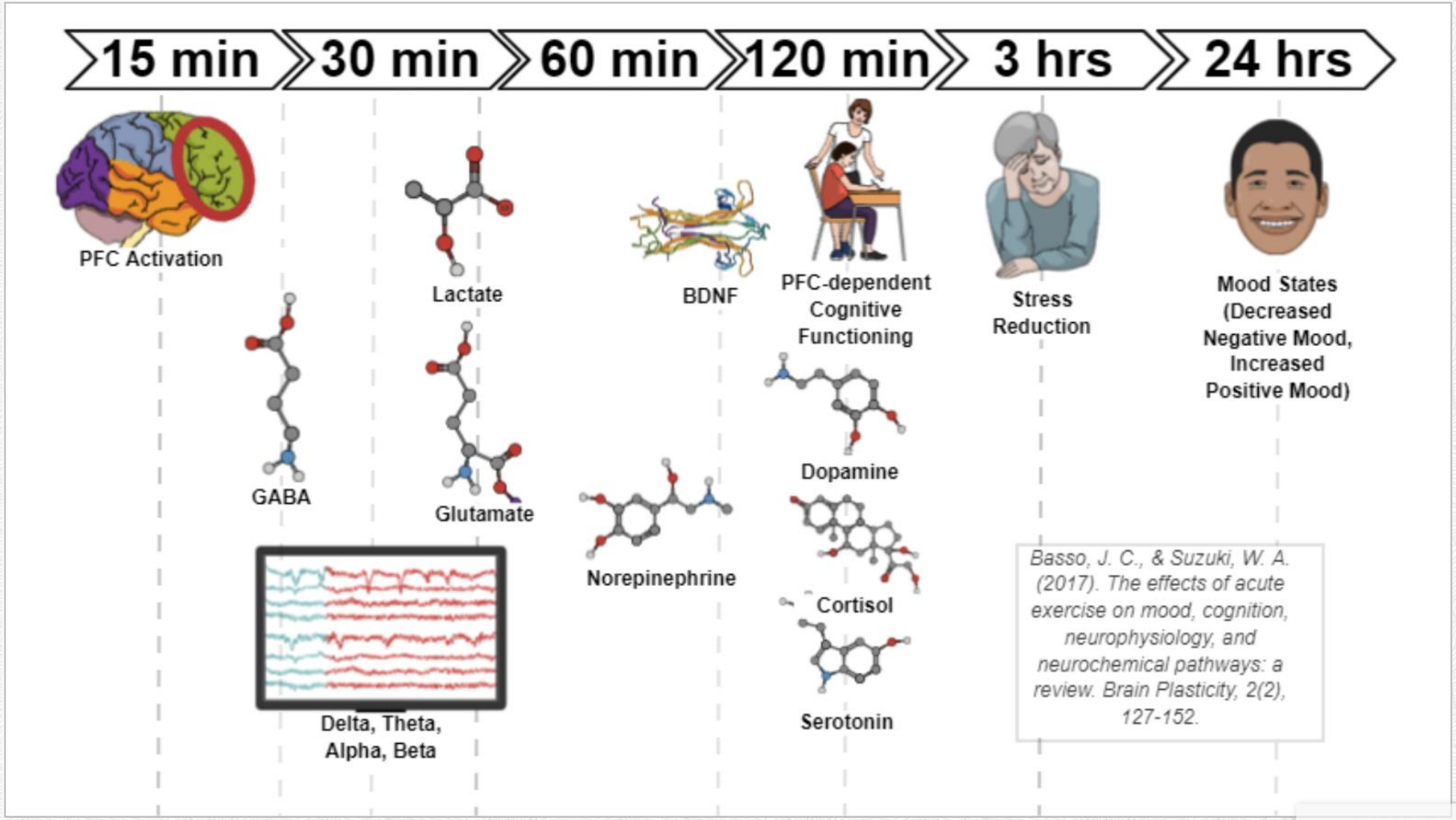
Exercise effects on mental health



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Primary types of exercise

aerobic

Steady State

Interval

strength

Closed Skill Training

Open Skill (Functional) Training

motor/skill

Sports, Dance, Martial Arts

Mind-Body Exercise

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Brain Benefits of Exercise

PARIETAL LOBE

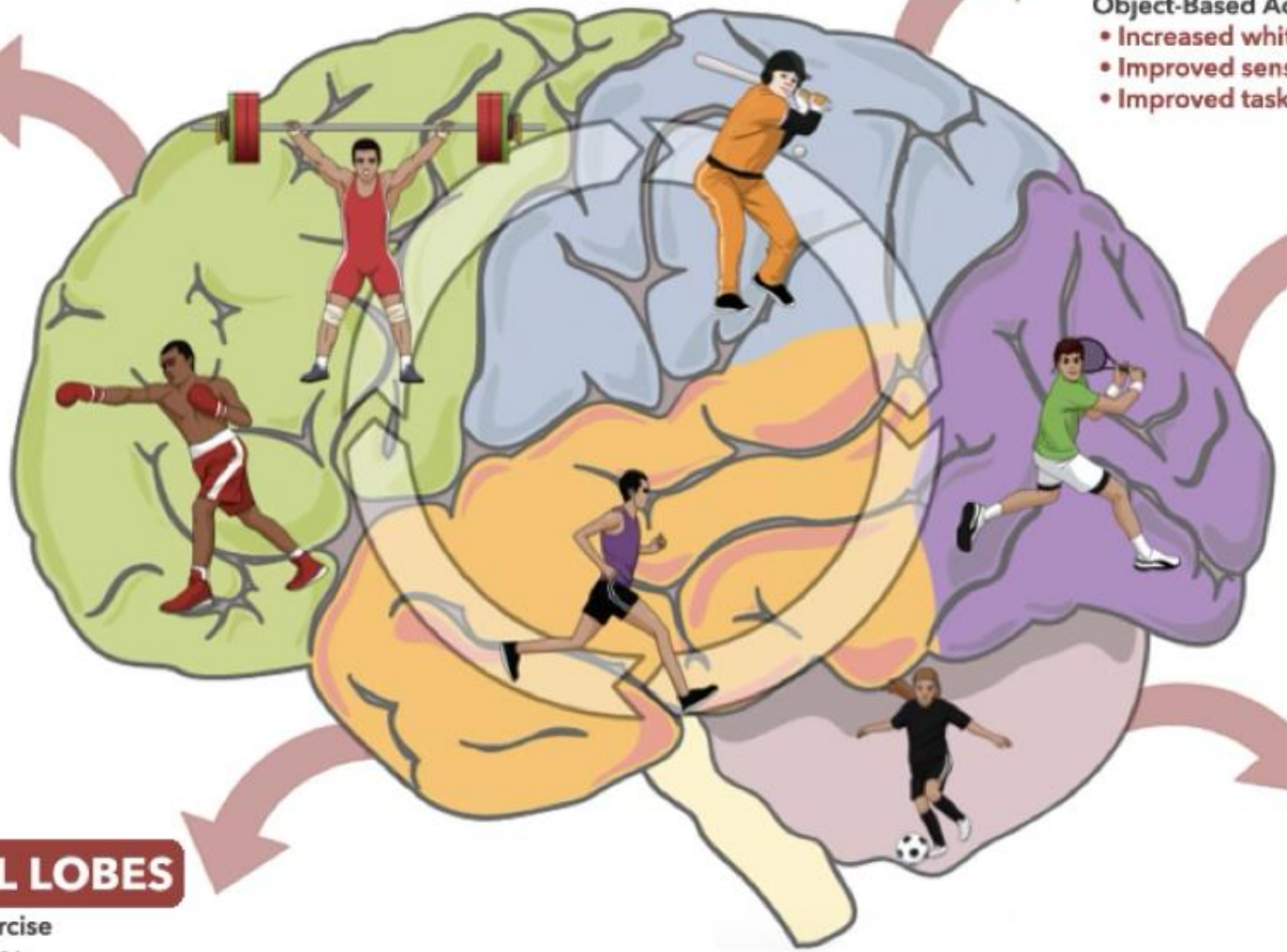
Sensory-Rich Activites
Visuo-spatial Demands
Object-Based Activities

- 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

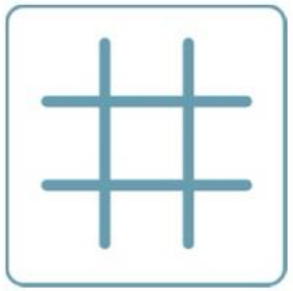
Movements have a clear beginning & end

Performer knows what to do & when

Dual-tasking in everyday life

- Performing two tasks at the same time (cognitive + motor). Different from multi-tasking!

Walking + Talking



Writing Phone # + Listening

Carrying + Walking + Searching

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Stroop effect

RED	YELLOW	BLUE	GREEN	BLACK
PINK	ORANGE	BROWN	GRAY	PURPLE
GREEN	GRAY	BLACK	BLUE	YELLOW
GRAY	BROWN	PINK	ORANGE	BLUE
YELLOW	RED	GREEN	BLACK	GRAY
BLACK	BROWN	PURPLE	ORANGE	PINK
PURPLE	BLACK	YELLOW	RED	GREEN
ORANGE	PINK	BROWN	GRAY	PURPLE

Stroop effect

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Benefits of dual-task training

Including exergaming, open skills, and neuromotor activities

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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Elements of a ‘brain-healthy’ exercise program

- Minimum of 150 minutes (2.5 hours) per week
- Multi-domain (aerobic + resistance + neuromotor)
- Incorporates low, moderate, and high intensities
- Incorporates open skill and cognitive demands
- Enjoyable activities that you are more likely to continue

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Summary

- Lifestyle interventions can reduce your risk for dementia and slow the progression of the disease
- Engage in 30 minutes of cognitive stimulation daily
- Exercise has positive effects on mood, cognition, and mental health
- 150 minutes of **moderate intensity** exercise per week
- A variety of activities is ideal

Resources

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amy@brainmattershawaii.com
www.brainmattershawaii.org

Resources

- Dual-task apps
  - Switched On
  - Clock Yourself (free)
  - Stroop Effect (free) – play while performing a physical task such as marching in place or balancing on one leg
- Music and movement
  - https://www.youtube.com/@beatitmusicandmovement7583
- YouTube for free Pilates, Yoga, Tai Chi and other classes

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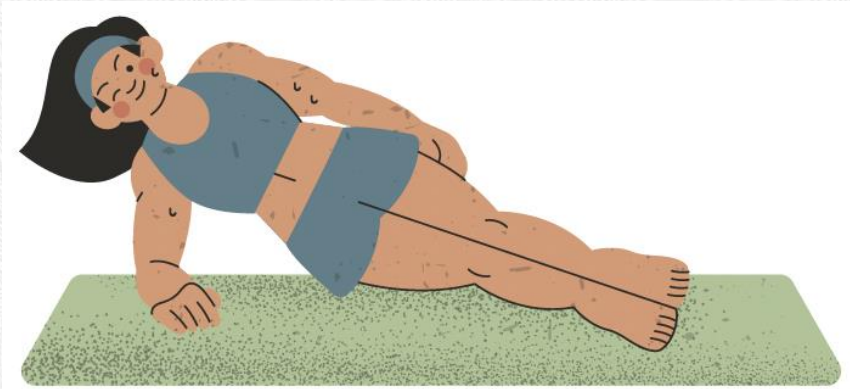
Core strengthening for a healthy back

Our core consists of the front, sides, and back of our torso. A strong, healthy back requires strengthening all sides!

Plank

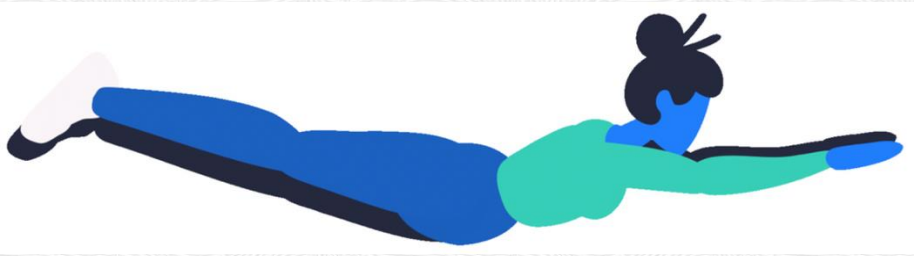
- Start on your knees if needed and work up to a full plank.
- Pull your belly button into your spine and hold for as long as able.
- Repeat 2-3x

Side plank



- Same instructions as for plank, but do both sides!

Superman



- Start face down and pull your belly button into your spine.
- Lift your arms and legs off the floor and hold for 1-2 seconds.
- Keep your gaze towards the floor.
- Repeat 5x

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Exercises to relieve back pain

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