

Brain Injury Association of New Hampshire

2026 Brain Injury & Stroke Conference

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WHAT IS BRAIN HEALTH AND HOW DOES IT RELATE TO NEUROPLASTICITY?

Presented by:

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Disclosures

- **Financial:** I am a paid employee at Northeastern University & Spaulding Rehabilitation Hospital, both in Boston, MA
- **Non-Financial:** None

LEARNER OUTCOMES

The participant will:

- **...define 'brain health' & 'neuroplasticity'.**
- **...describe three brain health pillars & three principles of neuroplasticity.**
- **...identify three strategies to address challenges to targeting modifiable brain health pillars or principles of neuroplasticity.**

Brain Health

<https://www.alzheimersresearchuk.org/brain-health/take-our-quiz/>

What Is 'Brain Health'?

“Brain health is the state of brain functioning across cognitive, sensory, social-emotional, behavioral, and motor domains, allowing a person to realize their full potential over the life course, irrespective of the presence or absence of disorders.”

**Optimizing brain health across the life course: WHO position paper.
Geneva: World Health Organization; 2022.**

What Is 'Brain Health'? (WHO cont'd)

“...Different determinants related to physical health, healthy environments, safety & security, life-long learning and social connection as well as access to quality services influence the way our brains develop, adapt, & respond to stress & adversity.”

**Optimizing brain health across the life course: WHO position paper.
Geneva: World Health Organization; 2022.**

What is 'Brain Health'?

“Brain health refers to how well a person’s brain functions across several areas”:

- *Cognitive health* — how well you think, learn, & remember
- *Motor function* — how well you make & control movements, including balance
- *Emotional function* — how well you interpret & respond to emotions (pleasant & unpleasant)
- *Tactile function* — how well you feel & respond to sensations of touch, including pressure, pain, & temperature
- *Sensory function* — how well you see, hear, taste, & detect odors

What Is 'Brain Health' (NIH NIA cont'd)

“...Brain health can be affected by age-related changes in the brain, injuries such as stroke or traumatic brain injury; mood disorders such as depression, substance use disorder, or addiction; & diseases such as Alzheimer’s & related dementias.”

NIH National Institute on Aging (NIA)

NIH NIA (cont'd)

What is brain health?

Brain health refers to how well a person's brain functions across several areas.

Motor function
Controlling movements and balance

Sensory function
Seeing, hearing, tasting, and smelling

Tactile function
Feeling and responding to sensations of touch, including pressure, pain, and temperature

Cognitive health
Thinking, learning, and remembering

Emotional function
Interpreting and responding to emotions



Learn more about keeping your brain healthy as you age: www.nia.nih.gov/brain-health.

Brain Health

HAPPENS THROUGHOUT LIFE BECAUSE OF:

NATURE



DEVELOPMENT

&

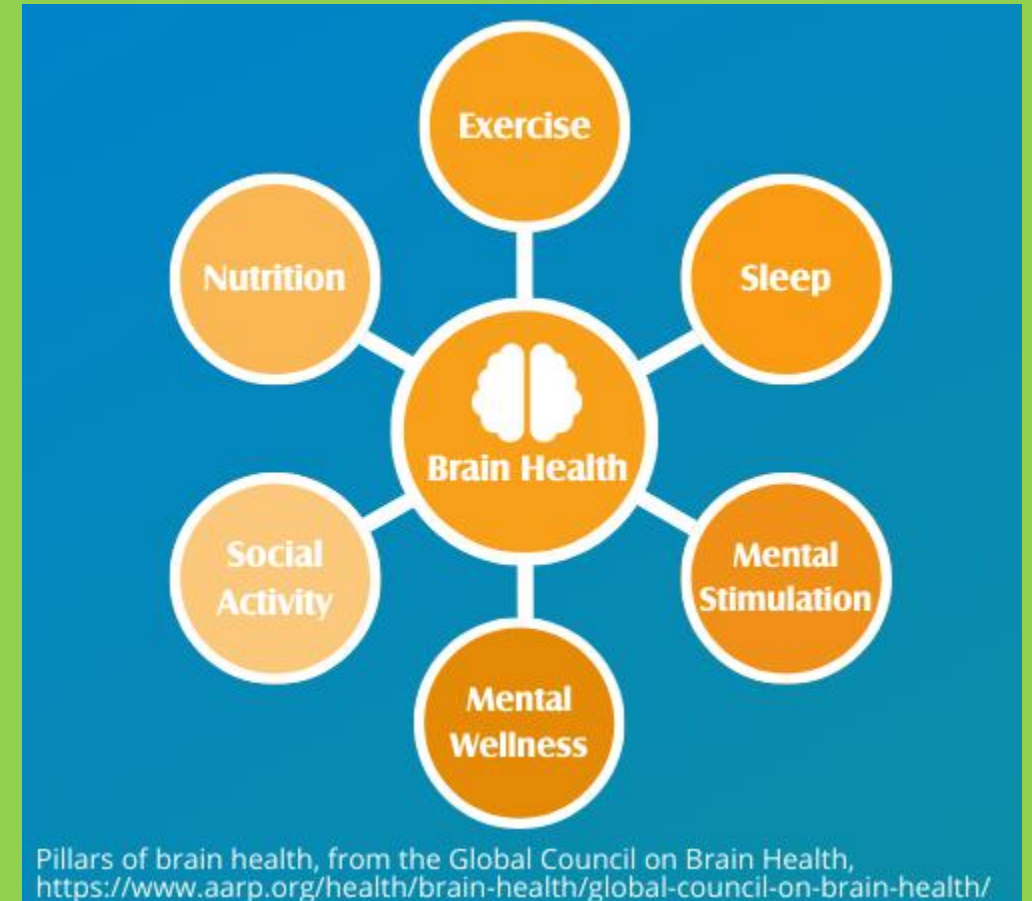
NUTURE



EXPERIENCE

Six Pillars of Brain Health

- **Stress Management**
- **Healthy Eating**
- **Restorative Sleep**
- **Regular Physical Stimulation/Exercise**
- **Regular Cognitive Stimulation/Exercise**
- **Social Interaction**



Impact of Brain Pillars

- **Increases cognitive reserve/Slows down normal brain health deterioration**
- **Helps prevent Alzheimer's disease & other dementias**
- **Maintains/Improves function & quality of life**

The earlier in life the pillars are utilized, the better the benefits!



Which brain health pillar is easiest for you to practice & why?

Which brain health pillar is most challenging for you to you & why?

Neuroplasticity

**THE ABILITY OF THE BRAIN
TO ORGANIZE/RE-ORGANIZE ITSELF THROUGHOUT
LIFE**

(structurally & functionally)

Neuroplasticity

“...the ability of the brain to modify, strengthen, and create, as well as eliminate, synaptic connections in response to stimuli and life events.”

Konorski, 1948

Neuroplasticity

“If you are driving from here to Milwaukee and the main bridge goes out, first you are paralyzed. Then, you take old secondary roads through the farmland. Then, you use these roads more; you find shorter paths to use to get where you want to go, and you start to get there faster...”

Paul Bach-y-Rita, 1934-2006

Neuroplasticity Facilitates Lifelong Brain Health

- Growth in Neural Connections
- Pruning of Neural Connections
- Loss of Neural Connections



PRINCIPLES OF NEUROPLASTICITY

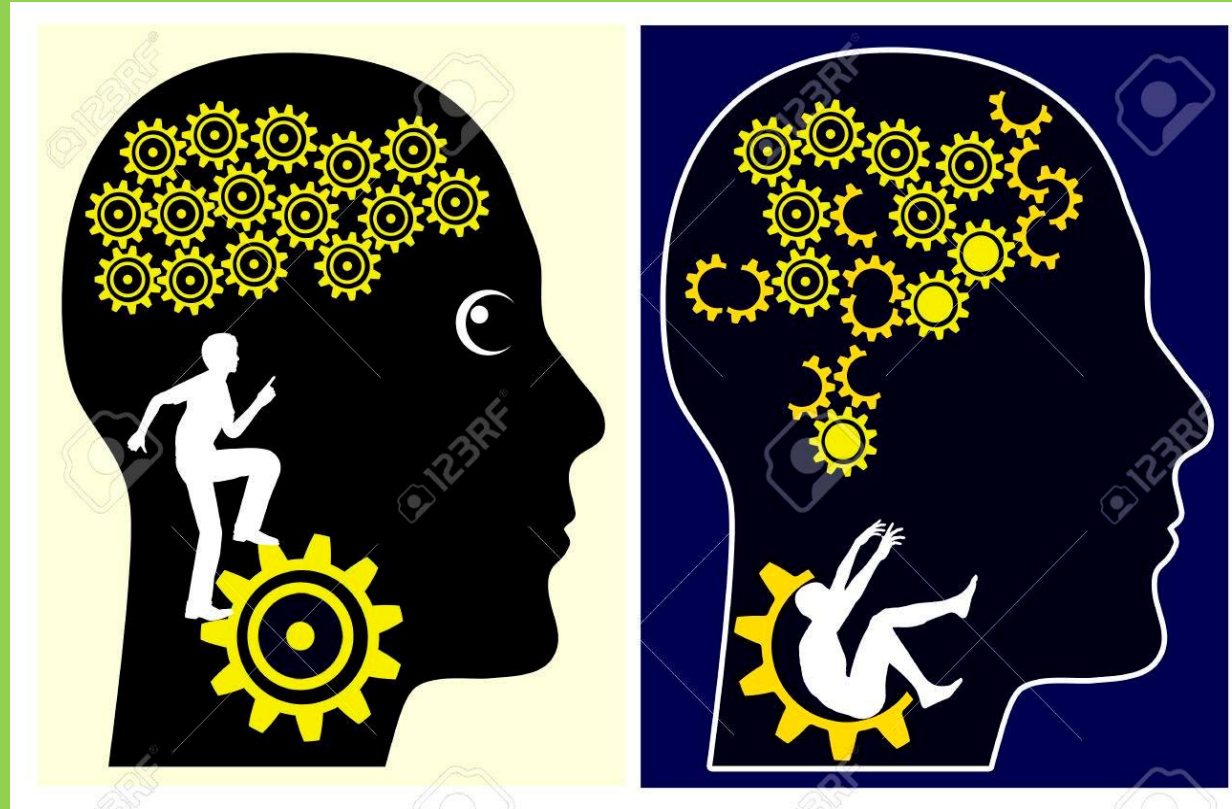
Kleim JA, Jones TA. Principles of Experience-Dependent Neural Plasticity: Implications for Rehabilitation after Brain Damage.

Journal of Speech, Language, and Hearing Research

2008; 51:S225-S239.

Principle #1

USE IT OR LOSE IT



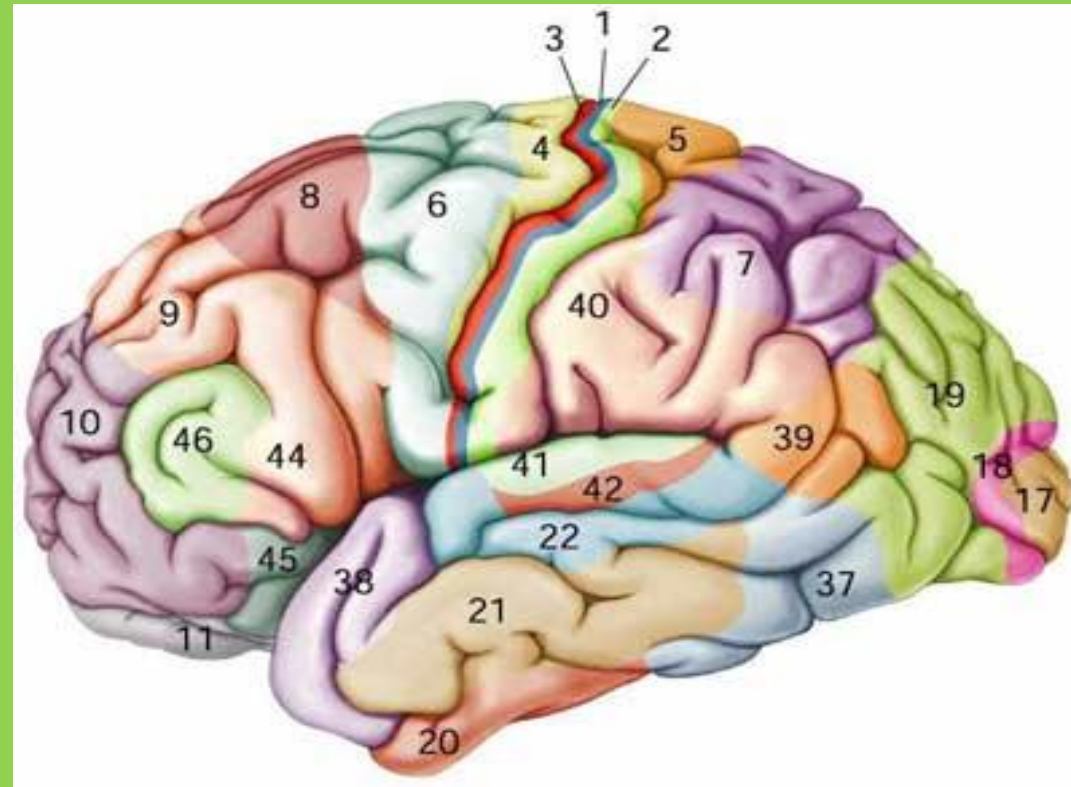
Principle #2

USE IT AND IMPROVE IT



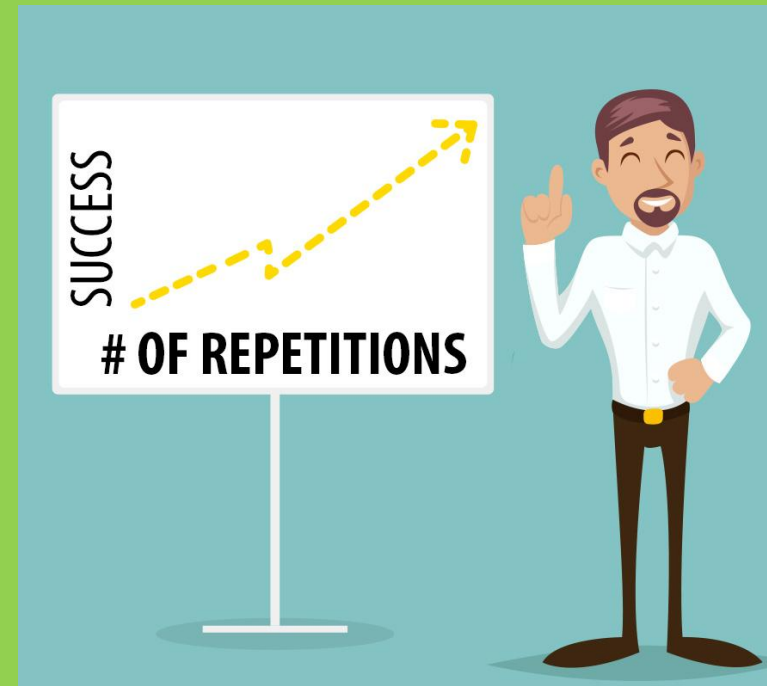
Principle #3

SPECIFICITY



Principle #4

REPETITION MATTERS



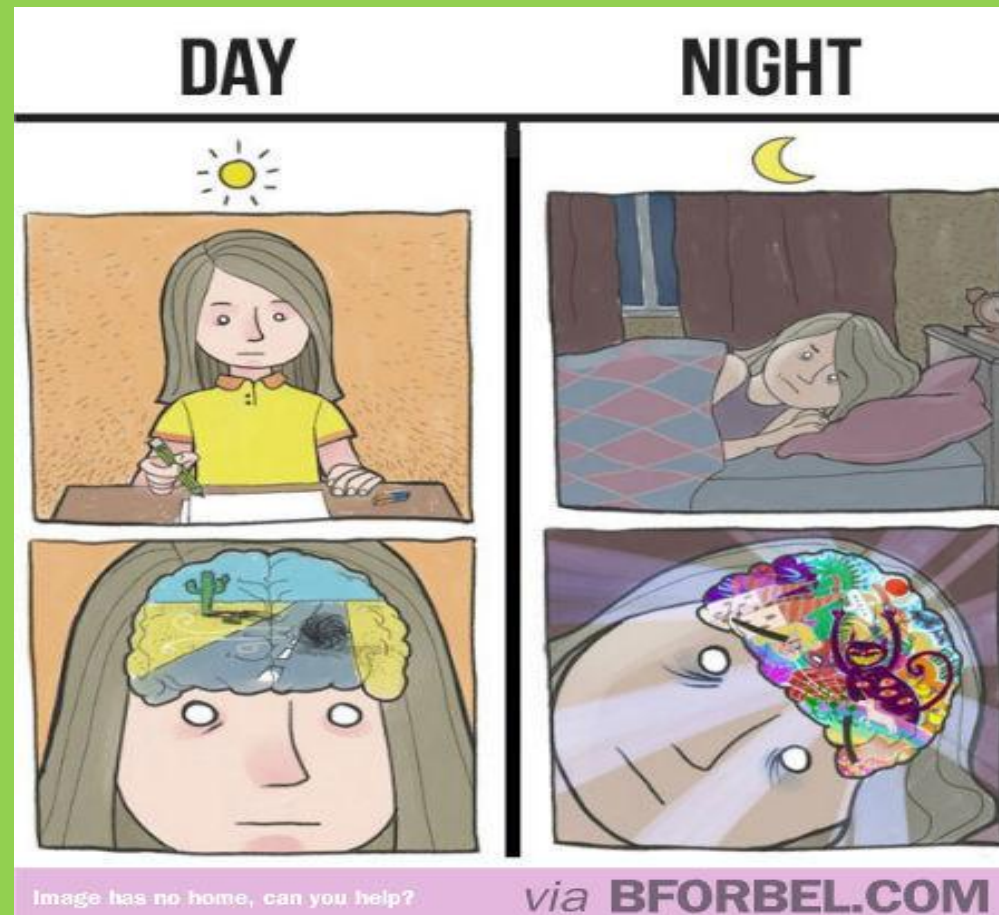
Principle #5

INTENSITY MATTERS



Principle #6

TIME MATTERS



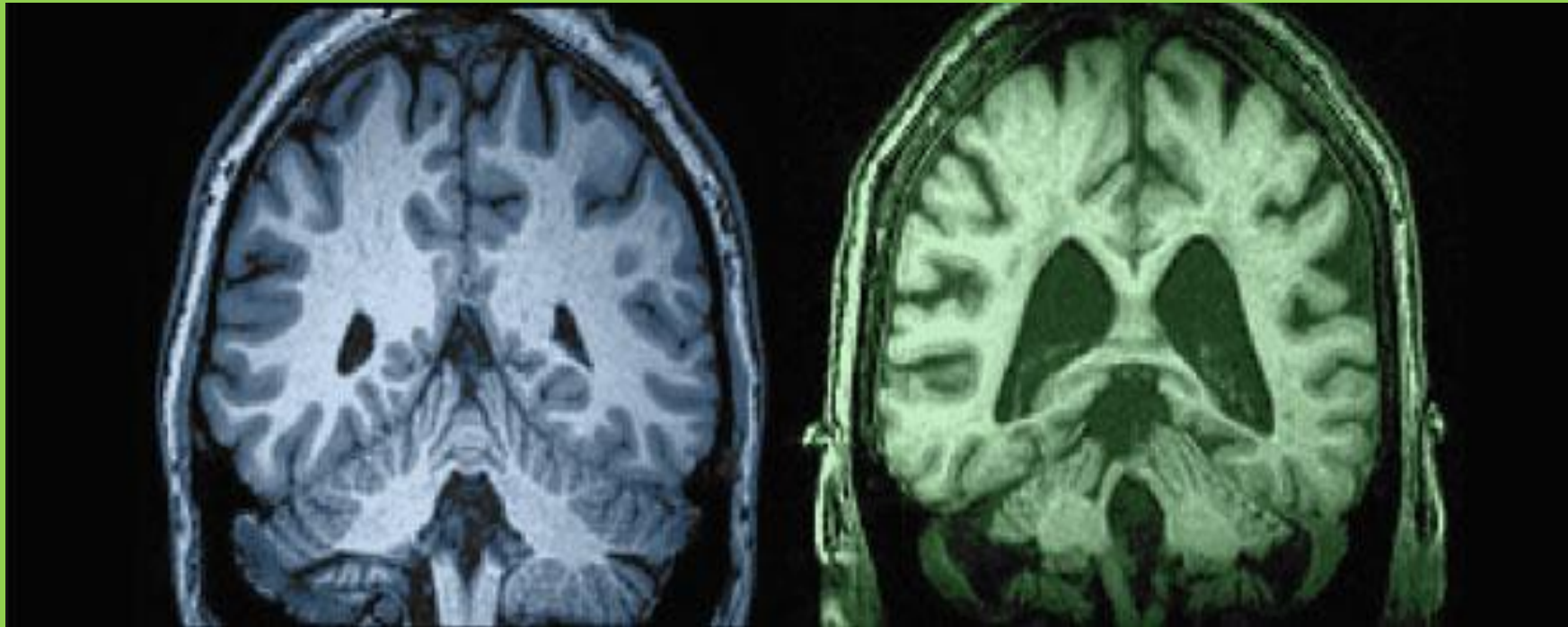
Principle #7

SALIENCE MATTERS

$$\text{Salience} = \text{Relevance} \times \text{Frequency}$$

Principle #8

AGE MATTERS



Principle #9

TRANSFERENCE



Principle #10

INTERFERENCE



Challenges to Brain Health & Neuroplasticity

- **Unmodifiable**
- **Modifiable**

Challenges to Brain Health & Neuroplasticity

UNMODIFIABLE CHALLENGES

- **Increasing Age**
- **Genetic Make-up/Mutations**
- **Family History**
- **'Race/Ethnicity (African-Americans & Hispanics compared to non-Hispanic whites)***
- **Diagnosed Chronic Medical Conditions/Co-Morbidities (e.g., diabetes, C-VD)**

Challenges to Brain Health & Neuroplasticity

MODIFIABLE CHALLENGES

- **Stress Level**
- **Eating & Drinking Habits**
- **Sleep (quality & amount)**
- **Physical Stimulation/Exercise Engagement (consistency/appropriateness)**
- **Cognitive Stimulation/Exercise Engagement (“ ”)**
- **Social Interaction (quality & frequency)**

Challenges to Brain Health & Neuroplasticity

Modifiable Challenges

- **Management of Diagnosed Medical Conditions/Co-Morbidities (e.g., hearing/visual acuity, meds, regular health-related follow-ups)**
- **Environmental Access to Brain Pillar Resources (e.g., activity existence, transportation)**
- **Patient/Family Awareness of Brain Health Pillars & Neuroplasticity & Their Modifiability**

Challenges to Brain Health & Neuroplasticity



Other Modifiable Challenges??

Some Solutions for Modifiable Challenges to Brain Health & Neuroplasticity

- **Education regarding Brain Health Pillars & Neuroplasticity**
- **Stress: deep breathing, journaling meditation, mindfulness, time outs**
- **Nutrition: consultation, food diary, food pyramid, grocery list/meal planning, hydration, label reading, nutrition consult,**
- **Sleep: consistent sleep schedule (7-9 hrs/night), environmental manipulation (white noise, blackout shades, no electronics in bed)**

Some Solutions for Modifiable Challenges to Brain Health & Neuroplasticity (cont'd)

- **Physical Activity/Exercise:** id free/low-cost options; re consistency, routinely exercise at the same time every day (150 minutes - e.g., 30 minutes, 5 days a week), with others if possible; re appropriateness, *moderately* challenging AND enjoyable
- **Cognitive Activity/Exercise:** SAME AS ABOVE
- **Social Interaction (quality & frequency):** work to *identify/establish/maintain/expand* your network & stay connected with those you feel supported by & want to be supportive of – 2-way connections; find people with common interests, goals, & values

Some Solutions for Modifiable Challenges to Brain Health & Neuroplasticity (cont'd)

- Regular health-related follow-ups (e.g., dental; hearing; meds)**
- Identification of available in-person brain health pillar opportunities (e.g., local community centers, libraries, neighborhood groups, parks, faith-based organizations, support groups, & transportation options)**
- Identification of available online & hybrid brain health pillar opportunities (e.g., podcasts, support groups, websites, YouTube videos)**



**Other Solutions for Modifiable Challenges
regarding Brain Pillars??**

Applying Principles of Neuroplasticity to the Cognitive Stimulation/Exercise Brain Pillar Across Levels of Care

- Individualized patient-centered care & development of therapeutic alliance
- SMART Goals developed by patient with support of clinician → specific, measurable, achievable, relevant, & time-bound
- Patient & Family education regarding the pillars of brain health
- Patient & Family education regarding neuroplasticity principles ‘Use It or Lose It,’ ‘Use It and Improve It,’ ‘Repetition & Intensity Matter’
- Cognitive activities/exercises that are *moderately challenging* & *enjoyable*

To be helpful, Cognitive Exercise needs to be:

- ‘Good’ challenge versus ‘Bad’ challenge
- Regular, Repetitive, Structured/Planned – minimally 5 days/week, 20-30 minutes per session
- Enjoyable!



When Cognitive Exercise doesn't go well, cue patient to...

- Be gentle with themselves
- Remind themselves why they're exercising their brain – what is their goal?
- Why do they think they “fell off the horse” & what should they do to get back on:
 - Are they bored doing the exercise activity? → ?raise the bar?
 - Is the activity too hard? → ?lower the bar?
 - Are they enjoying doing the exercise activity?
- Find someone to do the activity with

Word Associations – Critical Thinking Exercise

- Hairdryer
- Cleats
- Apple
- Radio
- Stethoscope
- Shovel
- Board
- Hammer

1. Teacher
2. Stylist
3. Cardiologist
4. Gardner
5. Surfer
6. Police Officer
7. Carpenter
8. Football Player

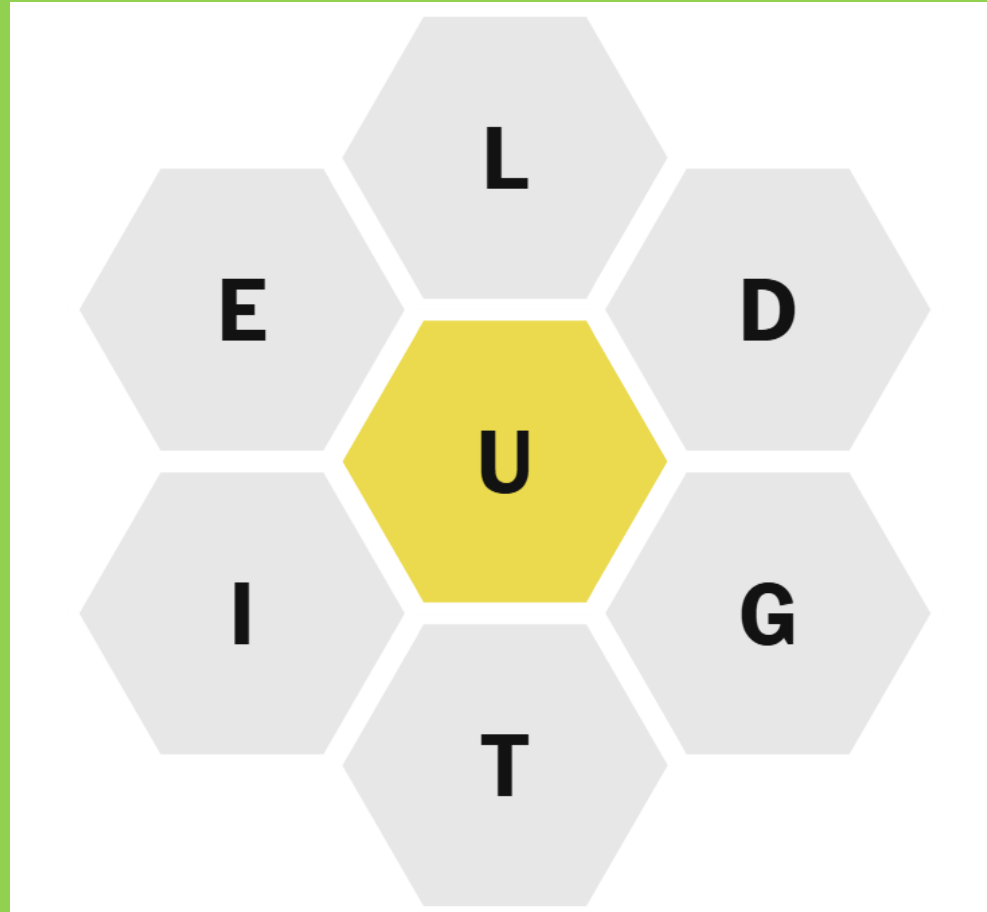
Word Recall – Memory Exercise

**What words and/or persons do you remember
that were on the list?**

Naming Words that Start with a Certain Letter

- **Movie:**
- **Candy:**
- **American City:**
- **Animal:**
- **Ice Cream Flavor:**

Create Words Using Only The Letters Here



In closing, we have:

- **...defined 'brain health' & 'neuroplasticity'.**
- **...described three brain health pillars & three principles of neuroplasticity.**
- **...identified three strategies to address challenges to targeting modifiable brain health pillars or principles of neuroplasticity.**



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