Brain Change: Habits, Routines, and Environnent Matter!

Casey Humphrey, OTD, MHA, OTR/L, CBIS, CDRS
Cassie Ginn, OTD, MS, OTR/L, CBIS
Eastern Kentucky University

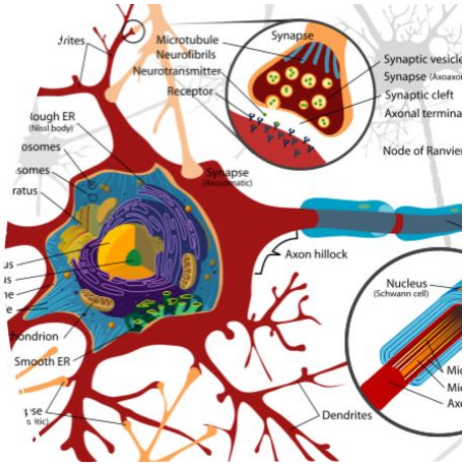
Learning Objectives

By the end of this session, attendees will be able to:

1. **Define Neuroplasticity**
2. **Describe basic neurological concepts that support neuroplasticy**
3. **Explain how incorporation of habits and routines support the neuroplastic process**
4. **Identify environmental supports that facilitate positive neuroplastic changes**

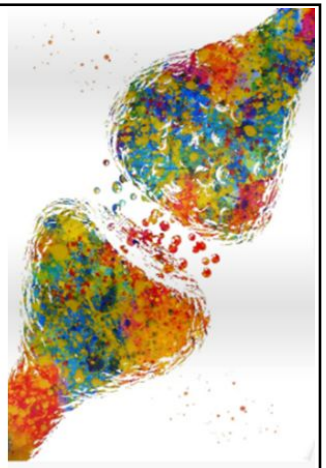
What We Know About the Brain

- The brain weighs about 3 pounds
- 78% H20, 10% fat, 8% protein, 1% carbs, 1% salt, 2% other constituents
- The neuron is the main cell in the brain that helps with your brains function
  - Dendrite
  - Axon
  - Cell body
- ~ 86 billion neurons



How The Brain Communicates

- The neurons form synapses (synaptogenesis) where information is passed from one neuron to another
  - Neurotransmitters are sent and received at synapses (electrochemical messages)
  - 100 trillion synapses (1,000 trillion synapses by some estimates) in the brain
- These synapses form networks



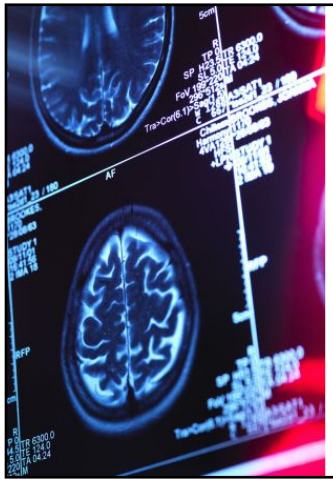
The brain's ability to reorganize itself by forming new neural connections

(Medicine Net, 2016)

What We Know About Neuroplastic Changes

- Appear to occur quickly with physical impairments
- We may think a person is experiencing neuroplastic changes when they are really using dynamic networks
- Sometimes when doing a new skill, we simply recruit existing neural maps
- Cortical Reorganization
  - Neuronal networks are affected by a stimulus or lack of stimulus, meaning we need enriched environments!

(Doll, 2015c)



10 Common Neuromyths

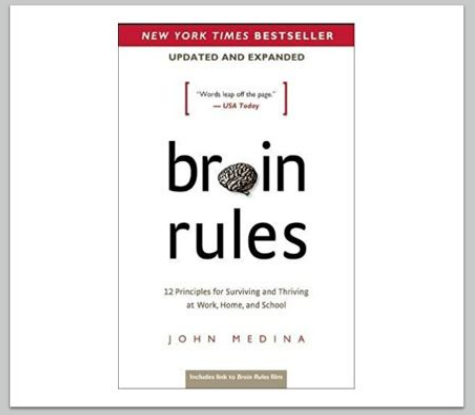
1. You only use 10 percent of your brain
2. You are born with all the brain cells you will ever have
3. The brain is hard wired
4. A brain injury is always permanent
5. Its all downhill after 40 (or 50 or 60 or 70)
6. Listening to Mozart makes you smarter
7. A person's personality displays a right brain or left-brain dominance
8. Creative people are naturally "right brained"
9. People learn better when the teaching is matched to their learning style
10. You can learn through subliminal messages

Habits, Routines and Environment Matter!

Brain Rules

12 Principles for Surviving and Thriving at Work, Home, and School

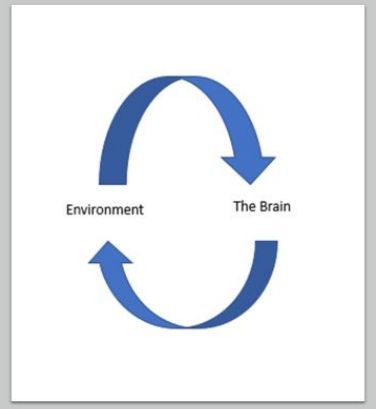
John Medina



Feedback Loop Between the Brain & The Environment

- Feedback Loop
  - The brain and interactions with the environment influence one another
  - You want adapt your environment
  - **Healthy Habits Make Strong Neuronal Connections:**

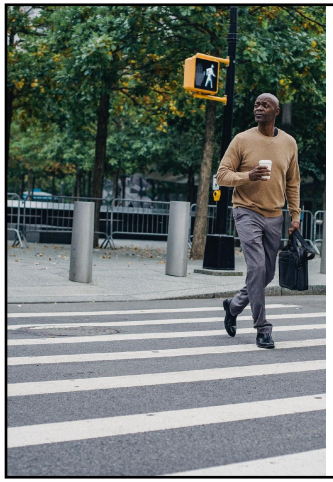
(Doll, 2015)



Habits: Exercise

- Exercise is correlated to elevated cognitive performance
  - Long-term memory, Attention, Problem Solving, Reasoning
- Exercise increases blood flow to the brain
- Exercise decreases the risk for general dementia and Alzheimer's
- Lowers levels of stress hormones (cortisol), and there are higher levels of dopamine
- Regular exercise may help ease depression and anxiety

(Medina, 2014, p.35)



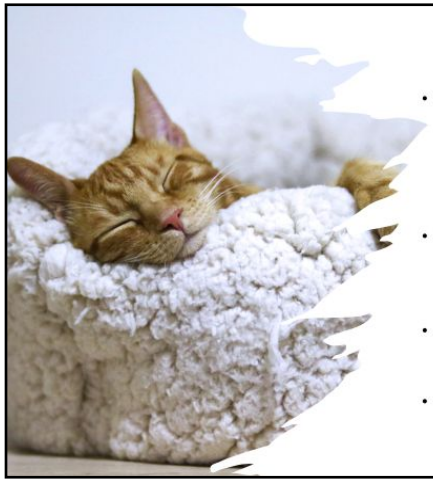
What is the Best Exercise

- There isn't one!
- Choose exercise(s) that you enjoy
- Walking may be the most underrated exercise
- Resistance (Strength) training has much research to support the benefits: A combination of various muscle contractions (isometric, isotonic, concentric and eccentric) all promote strength gains
- Focus on performance-based goals (function)

Exercise

Treatment Implications

- Determine an appropriate exercise program
- Create the habit of exercise through a daily routine
- Group exercise opportunities
- Community supports and resources
- A little goes a long way



Habits: Sleep

- **Sleep Loss= Brain Drain**
  - "Sleep Well, Think Well"
  - Good sleep improves learning and exercise performance
  - Poor sleep= increased production of cortisol (stress hormone) throughout the day
- **Nap Zone=Fatal**
  - Poorer attention, increased accidents during midafternoon "nap zone"
  - Embrace the need to nap!
- **Are you a Lark or a hummingbird?**
  - Try to prioritize productive and creative tasks during your most productive hours
- **Generalizations don't work**
  - Not everyone needs 8 hours of sleep, pay attention to the numbers that disrupt normal function

Sleep

Treatment Implications

- Facilitate healthy sleep habits and routines.
- Modify the environment to promote sleep.
- Embrace a healthy sleep schedule including naps.
- Provide interventions at the client's most productive time frames.
- Assess sleep - how much sleep is most beneficial for the specific client.

Habits/Environment: Stress

*Stress serves as the body's defense system.

*Chronic stress deregulates a system built to deal with short-term responses.

*Cortisol produced from chronic stress can damage the cell of the hippocampus, impacting memory and learning.

*Emotional stress has been shown to impact the ability to learn and work productivity.

(Medina, 2014, p.81)

Stress

Treatment Implications

- Reflect on the level of stress that our interactions cause for our clients.
- Implement a healthy exercise routine.
- Utilize mindfulness and meditation as an intervention tool.
- Consider how the treatment environment is impacting stress.
  - Sensory
  - Other clients
  - Tone of voice
- Set realistic and appropriate goals.

Environment: Attention and Memory

*Our brains don't pay attention to boring things.

*The brain cannot multitask.

*Emotional arousal helps the brain learn.

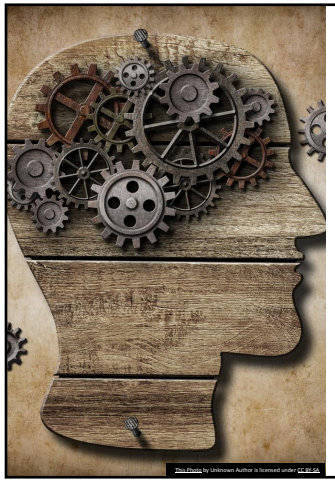
*Our brains check out after 10 minutes unless you pull them back with narratives and emotion rich events.

*Memory recall is improved when in the environment where it was first put into the brain.

*Working memory allows us to temporarily retain newly acquired information, but if we don't repeat it, it disappears.

*The way to make long-term memory more reliable is to incorporate new information gradually and repeat it in timed intervals.

(Medina, 2014, p.124 & 159)



Attention and Memory

Treatment Implications

- Focus on one thing at a time.
- Consider the length of time your client can attend.
- Practice in the natural context.
- Repetition is necessary. Medina suggests teaching in cycles throughout the day.
- Incorporate new information slowly and in small doses.
- Attempt to connect emotion to information.

Environment: Vision

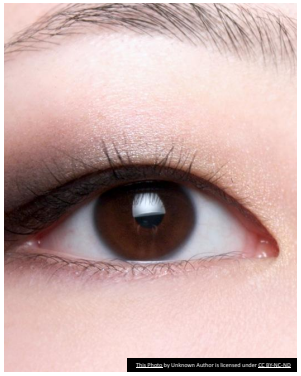
*Vision is our most dominant sense.

*We learn and remember best through vision, not through hearing or reading written words.

*Processing visual information is a highly complicated process, but it takes less effort to comprehend.

*We don't always process visual information 100% accurately.

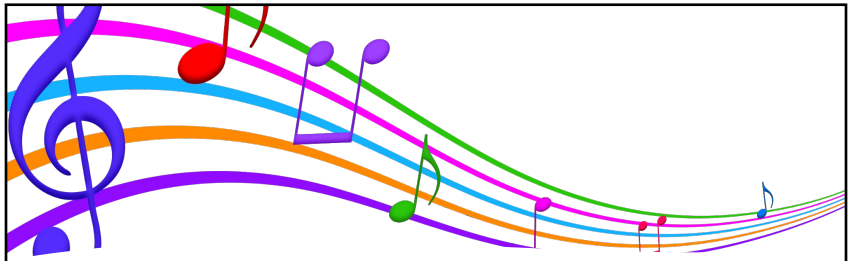
(Medina, 2014, p. 197)



Vision

Treatment Implications

- Communicate with pictures when possible.
- Color and animation assist with memory.
- Practice in a natural environment.
- Refrain from providing information that you want someone to remember in written or verbal format.
- Visual cues should be pictorial.



Environment: Music

*Music improves mood.

*Music increases dopamine. Dopamine is a neurotransmitter involved in memory formation.

*Music reduces stress.

*Music speeds recovery (ie: music therapy).

The Mind & Music

Music

Treatment Implications

- Utilize music for mood regulation.
- Incorporate music to support other important habits/routine (sleep, stress management, exercise).
- Create an environment that facilitates adaptive neuroplasticity through incorporating music.

Important Takeaways

*Neuroplastic changes are always occurring. Our focus must be facilitating adaptive changes versus maladaptive changes.

*Habits, routines, and environment are important when attempting to facilitate adaptive neuroplasticity.

*Utilizing supportive habits, routines, and environments as intervention strategies are necessary to enhance neuroplastic changes.

*A great article to demonstrate the benefits of routines written by an OT:

https://www.inverse.com/mind-body/routines-important

References

Doll, J. (2015)Why brains are unique- Context, culture, & media [PowerPoint Lecture]. Retrieved from https://www.blueline.instructure.com

Hines, D., York, K., & Kaul, E. (2020). Optimizing Compliance With Home Programming Through Neuroplasticity Education Among Parents of Children Receiving Outpatient OT. American Journal of Occupational Therapy, 74(4_Supplement_1), 7411505129p1-7411505129p1.

Medina, J (2014). Brain Rules (Updated and Expanded): 12 Principles for Surviving and Thriving at Work, Home, and School. Pear Press.

Tomaszczyk, J. C., Green, N. L., Frasca, D., Colella, B., Turner, G. R., Christensen, B. K., & Green, R. E. (2014). Negative neuroplasticity in chronic traumatic brain injury and implications for neurorehabilitation. Neuropsychology review, 24(4), 409-427.