



**Neuro Café:  
15<sup>th</sup> September  
Neuroplasticity**

# Definitions

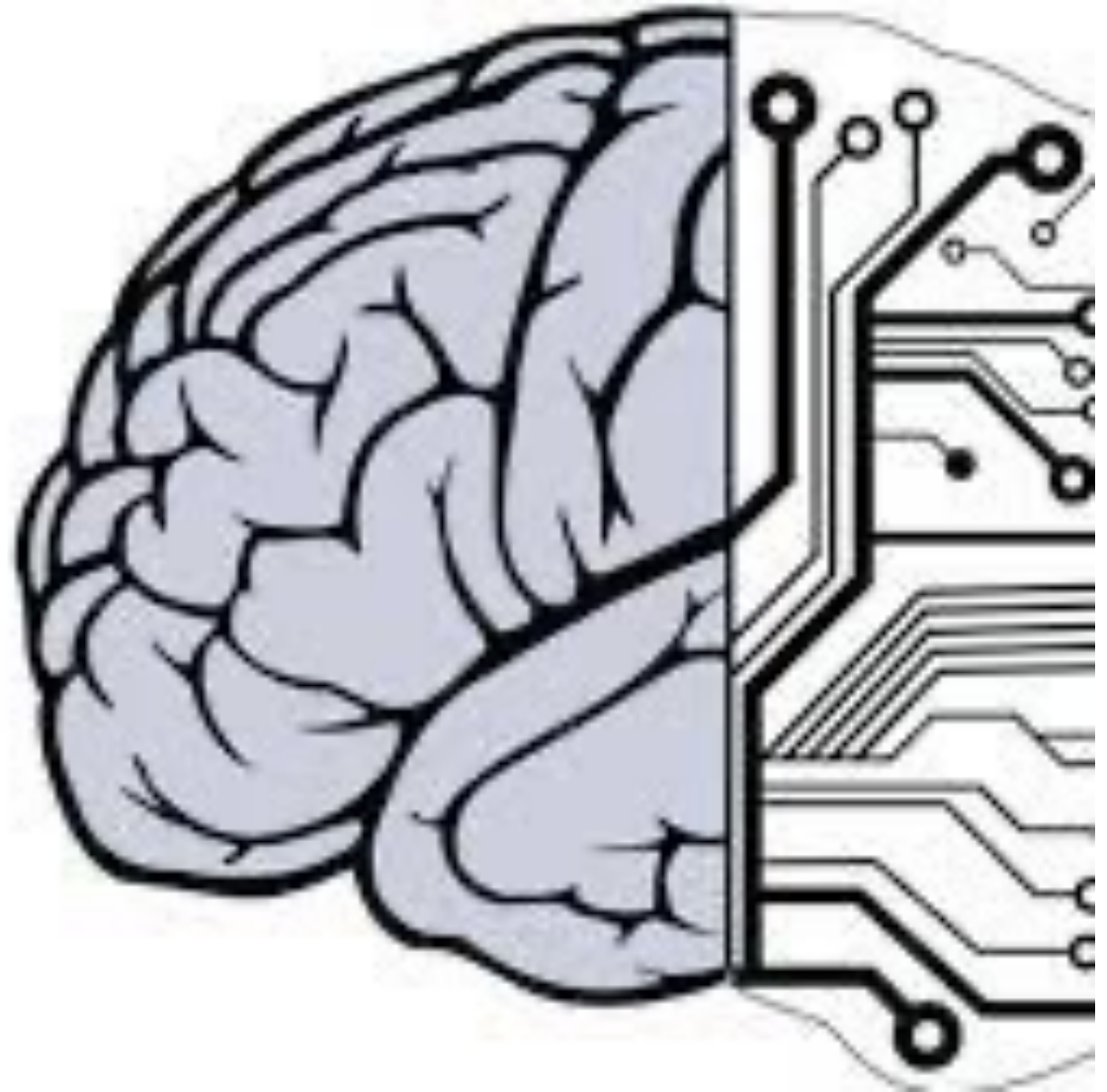
- A wide range of definitions exist in relation to the term neuroplasticity,
  - **'The ability of the brain to change in structure or function in response to experience'**
  - **'The capacity of the nervous system for adaptation or regeneration after trauma'**
  - **'The ability of the Central Nervous System to undergo structural and functional change in response to new experiences'.**

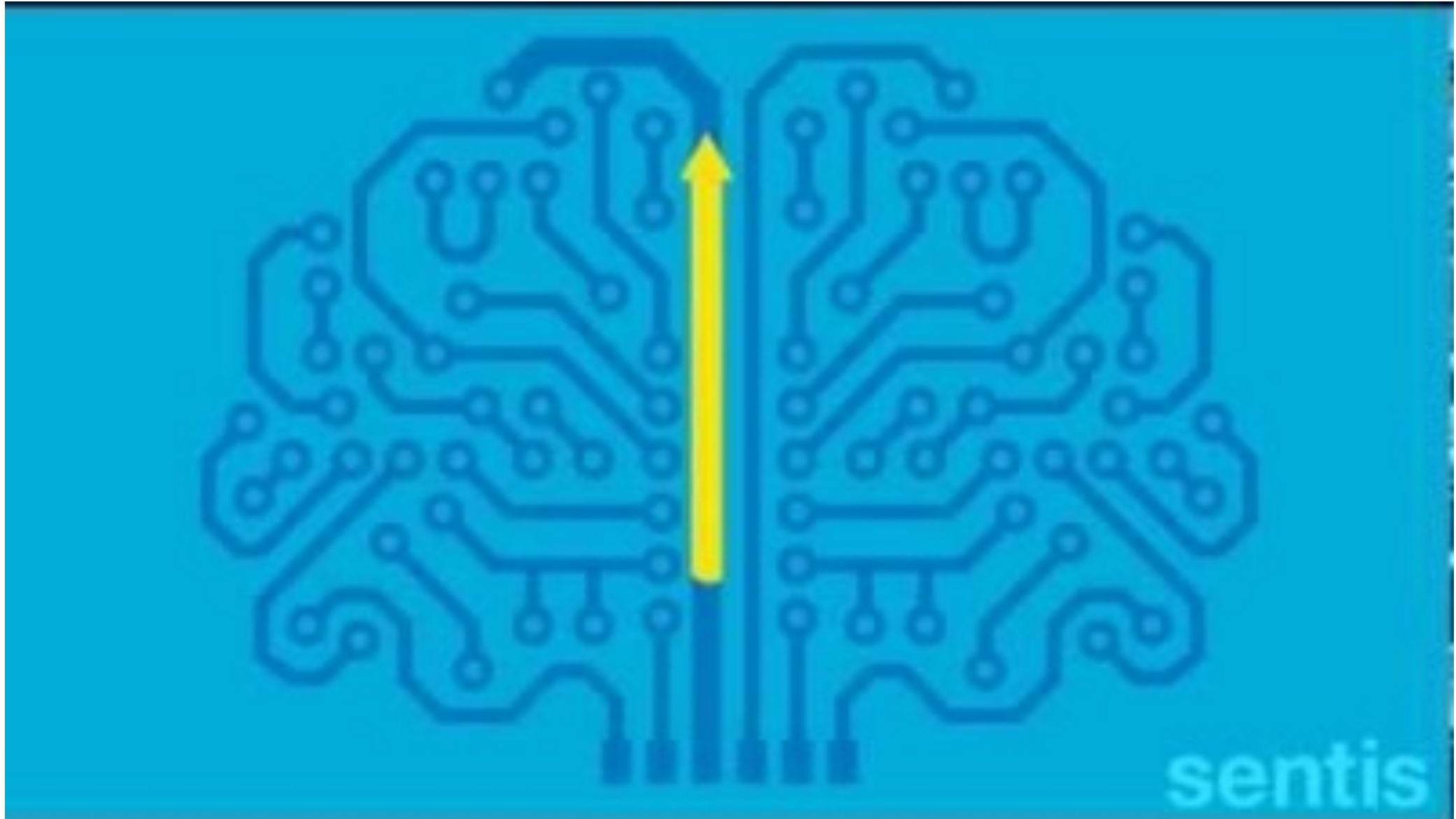


# Brains vs computers

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- Our brains are truly extraordinary; unlike computers, which are built to certain specifications and receive software updates periodically, our brains can actually receive hardware updates in addition to software updates. Different pathways form and fall dormant, are created and are discarded, according to our experiences.
- When we learn something new, we create new connections between our neurons. We rewire our brains to adapt to new circumstances. This happens on a daily basis, but it's also something that we can encourage and stimulate.





# 10 principles of neuroplasticity & embedded into LEGS classes!

- **Use it or lose it:** The skills we don't practice often get weaker.
- **Use it and improve it:** The skills we practice get better.
- **Specificity:** We must skilfully practice the exact tasks we want to improve.
- **Repetition matters:** We must do a task over and over again once we've got it right to actually change the brain.
- **Intensity matters:** More repetitions in a shorter time are necessary for creating new connections.
- **Time matters:** Neuroplasticity is a process rather than a single event, with windows of opportunity opening for different skills at different times. In rehabilitation, starting earlier is usually better than starting later.
- **Salience matters:** To change the brain, the skill we're practicing must have some meaning, relevance, or importance to us.
- **Age matters:** Younger brains tend to change faster than older brains, but improvement is possible at any age.
- **Transference:** Practicing one skill can result in improvement of a related skill.
- **Interference:** Learning an "easier way" of doing something (i.e. a bad habit or compensation) may make it harder to learn the proper way.

(Kleim & Jones)

# 10 PRINCIPLES THAT DRIVE NEUROPLASTICITY

## What is Neuroplasticity?

The brain's ability to change, adapt, and regenerate following a neural injury such as after a stroke or a traumatic brain injury.

### AGE MATTERS

Younger brains adapt and change more easily

### INTENSITY

Need the right amount of physical activity to cause brain changes

### SALIENCE

Has to be motivating and important to that person

### TRANSFERENCE

If you practice something in a nearby area of the brain, it will transfer to other areas of the brain

### TIME MATTERS

Waiting too late to start the activity means a decreased capability to change



### REPETITION

You have to practice a lot of times to see neural changes

### INTERFERENCE

Sometimes new plasticity can be delayed

### SPECIFICITY



Plasticity is experience specific to the individual

### USE IT OR LOSE IT



Neural circuits not actively engaged will start to atrophy or degrade

USE IT  
AND  
IMPROVE IT



# Neuroplasticity @ work outside of “therapy”

- *Traveling*: exposes your brain to novel stimuli and new environments, opening up new pathways and activity in the brain;
- *Using mnemonic devices*: memory training can enhance connectivity in the prefrontal parietal network and prevent some age-related memory loss;
- *Learning a musical instrument*: may increase connectivity between brain regions and help form new neural networks;
- *Non-dominant hand exercises*: can form new neural pathways and strengthen the connectivity between neurons;
- *Reading fiction*: increases and enhances connectivity in the brain;
- *Expanding your vocabulary*: activates the visual and auditory processes as well as memory processing;
- *Creating artwork*: enhances the connectivity of the brain at rest
- *Dancing*: reduces the risk of Alzheimer’s and increases neural connectivity;
- *Sleeping*: encourages learning retention through the growth of the dendritic spines that act as connections between neurons and help transfer information across cells (Nguyen, 2016).

# Decompensation

- When recovery seems to go backwards
- When the brain 'rewires' itself, the new connections aren't always as strong as the original ones. Sometimes, if you are tired, unwell or under stress, the new connections in the healing brain can struggle to keep up.
- This can lead to problems reappearing or getting a bit worse. For example, at the end of a long day, someone might drag their leg more than usual, or slur their speech.
- This is known as decompensation. It can happen when your brain is working extra hard, and the signals inside the brain may be less strong.
- It's temporary, and you should find that things soon improve. If they don't, contact your therapist, stroke nurse or GP.

## Brain Garden

- The brain 'garden' never ceases being pruned and newly planted. It's an ongoing process of synaptic reformation and death – giving the brain it's ability to learn & remember to adapt to it's environment+ acquire new knowledge & learn from fresh experiences.



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# Old dogs can regularly learn new tricks of every conceivable kind !!

