

# What is Neurofeedback?

Focusing on the EEG one.



# The 'Wiki' Definition

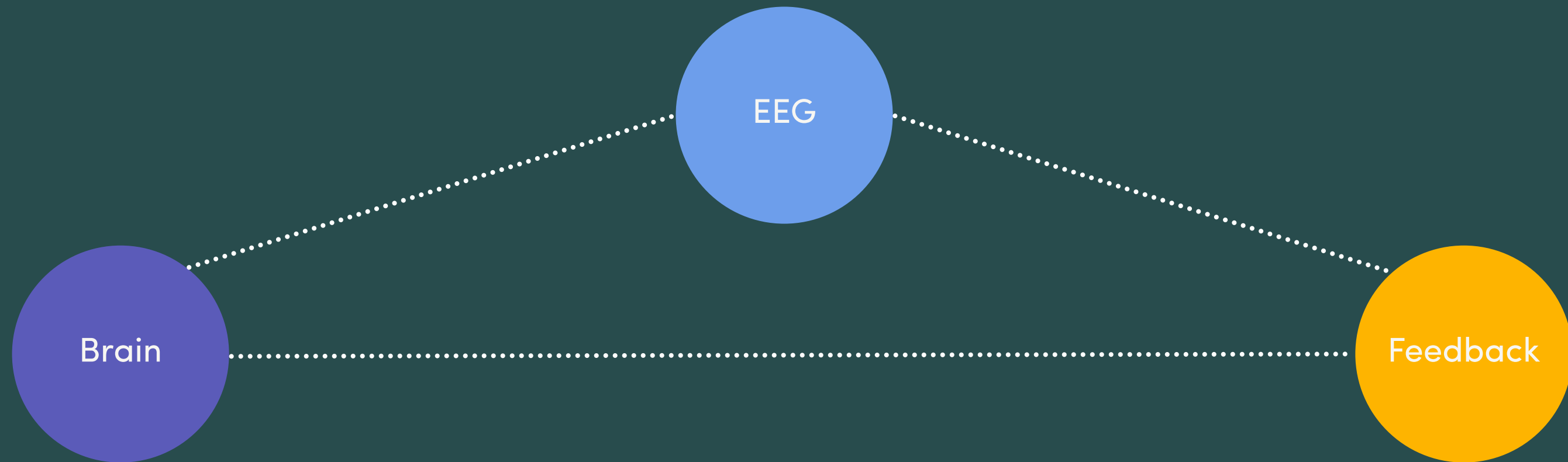
“Neurofeedback (NFB), also called neurotherapy or neurobiofeedback, is a type of biofeedback that uses real-time displays of brain activity—most commonly electroencephalography (EEG), to teach self-regulation of brain function.”

# What Does It Mean?

Translate brainwaves to visual/auditory feedback to improve a certain brain function.



# Let's Break It Into Components



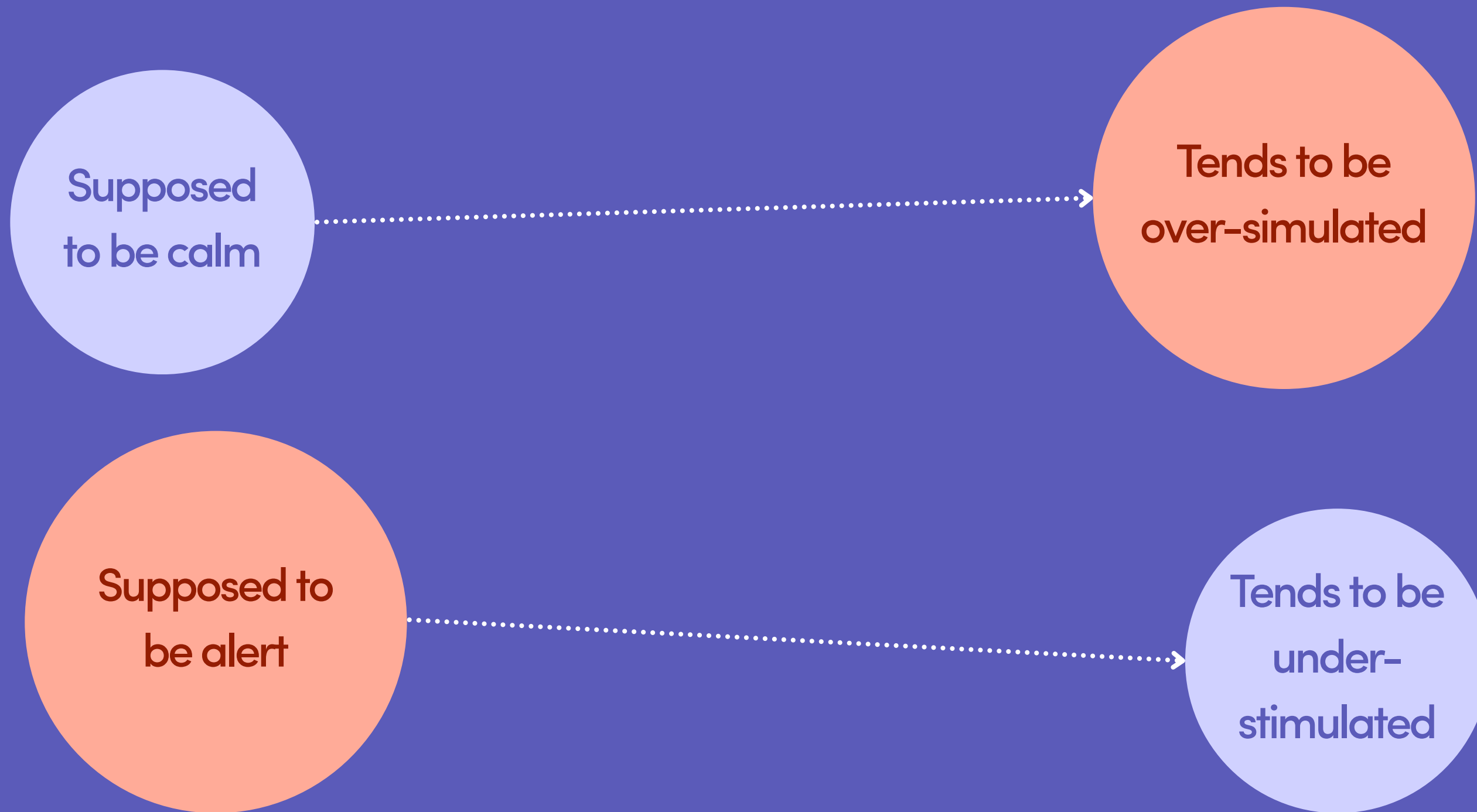
# Brain.

Sometimes, it does not function as well as it is able to.

It's called a 'dys-regulated' brain.



# Dysregulated Brain



Sometimes the brain **corrects** itself.

When it

*doesn't,*

dysregulation becomes the

*'new normal.'*

# Good News!

It can be re-trained!



# EEG

EEG is the method in which brain electrical activity is monitored.



EEG readings can be used to confirm or *rule out* various conditions such as:

Memory  
problems

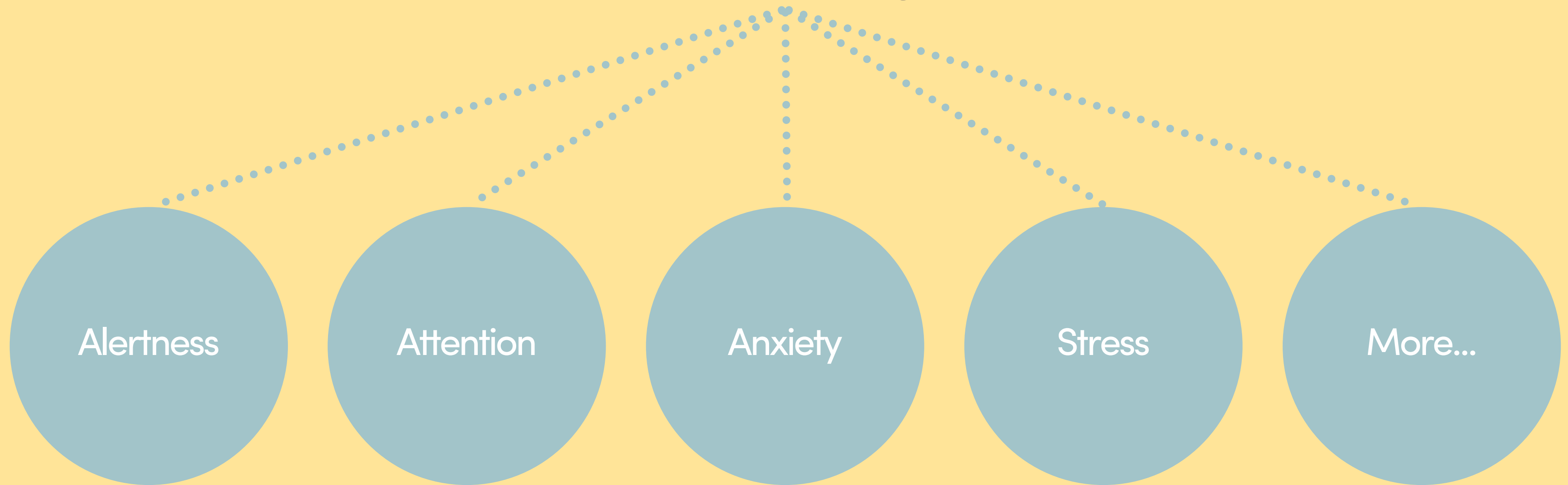
Stroke

Seizure  
disorders

Head injury

Sleep  
disorders

# Mental states can also be detected using EEG:



# Risks?

There are none! It just monitors the electrical activity in the brain.

Doesn't send anything.

How can EEG be used  
as part of a  
therapy/training?

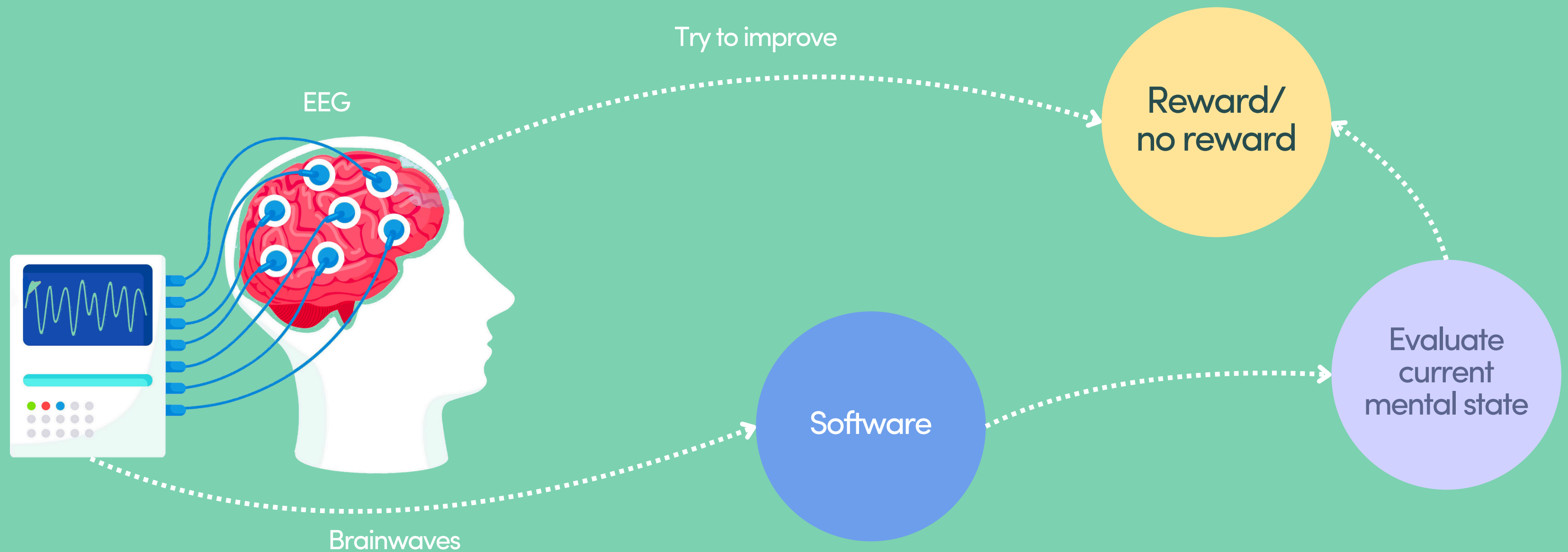


This is where the  
*feedback* comes in.

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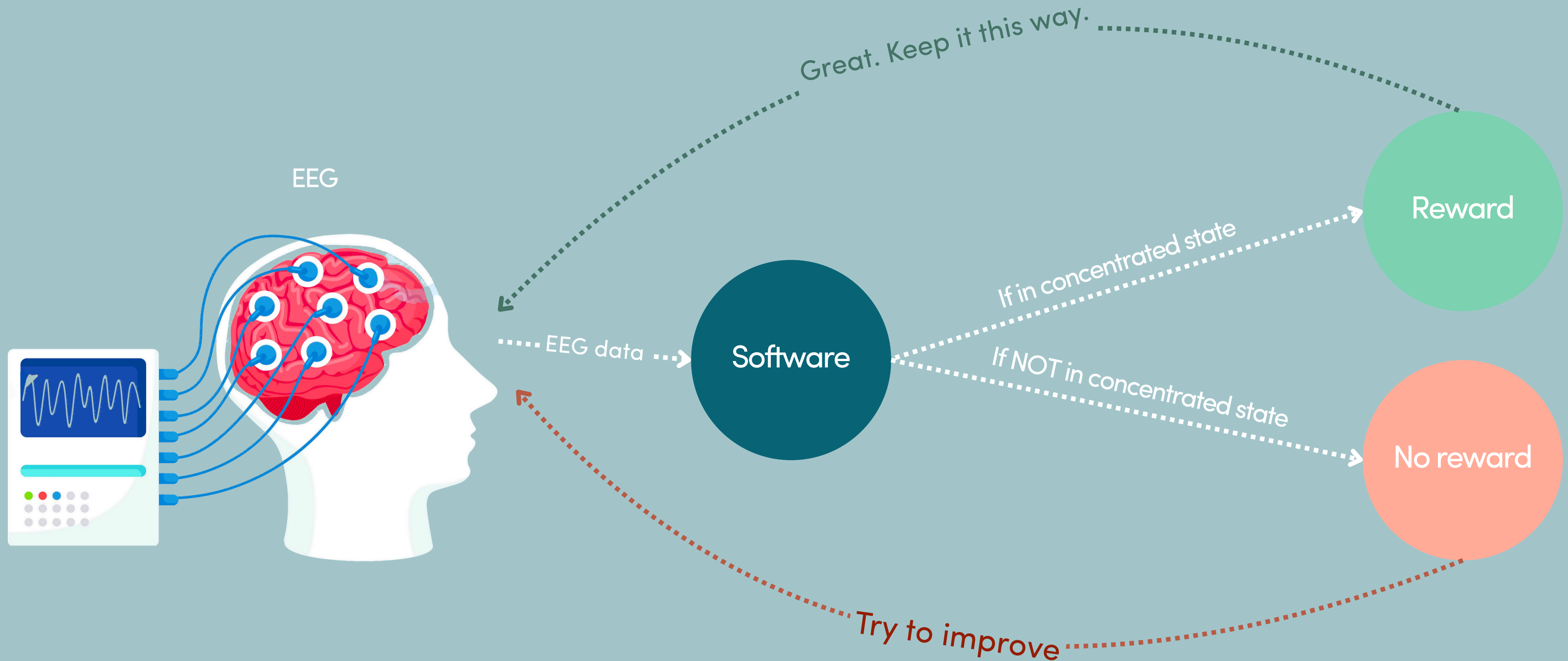
# Brainwaves are Translated to Feedback in Real Time

Users get feedback based on their current mental state and try to improve upon it instantly.



# Example: Training for Attention

EEG helps in detecting alertness and attention in real time- each time the trainee is in a concentrated mental state, they get a reward. That's how the brain self-regulates.



# Rewards are the *Feedback* in Neurofeedback

Which means it can be in the form of a game.



For example, if we'd like to improve concentration ability then:

- When **concentrated**, the player's alien moves **faster**. **Otherwise**, it moves **slower**.
- The goal is to win the race against an opponent.
- This means the player will have to put in the effort of teaching the mind to concentrate through feedback.



This learning process eventually helps the brain improve **a certain** function.



# Neurofeedback can be used as therapy/training for:

Depression

Anxiety

ADHD

Memory  
Consolidation

Autism  
Spectrum  
Disorders

In a few words

# Repetition Makes a Habit!

Like Riding a Bike!

“

It's non-conscious learning, based on the feedback, that, with repetition, can be long-lasting.

*-Deborah Stokes, an Alexandria psychologist*

”


# How Can It Be Done?

Neurofeedback can be done in specialized clinics.



30-60  
minutes

Typical Session Time



\$50-\$130

Typical Session Cost

# Self-Regulation

Slowly, the brain learns to engage in a new way as feedback teaches it to *self-regulate* and correct a specific activity.

# Research

Impact of **neurofeedback on ADHD** has been studied the most among other NFB therapies.



Some researchers have **criticised** neurofeedback claiming it lacks strong scientific evidence, often asking for a double-blind randomized clinical trial to be conducted, however many ignore the fact that since early 2000's, many studies have been published showing varying results.

# 2009

102 children aged 8–12 with an ADHD diagnosis were randomly assigned in two groups– one group did 36 neurofeedback sessions, the other did 36 sessions of computerized attention skills training game.

## Findings

Improvements in the neurofeedback group were superior to the control group. The ratings indicated that “neurofeedback effects are substantial and of practical importance. Our results confirm findings of previous neurofeedback studies even under strict control conditions.” The researchers concluded the result “indicates clinical efficacy of neurofeedback in children with ADHD”.

# 2012

130 children diagnosed with ADHD aged 6-18 were randomly assigned into 3 groups – one received neurofeedback, one received medication (methylphenidate), one received both neurofeedback and medication.

## Findings

The researchers concluded “NF produced a significant improvement in the core symptoms of ADHD, which was equivalent to the effects produced by MPH(methylphenidate), based on parental reports. This supports the use of NF as an alternative therapy for children and adolescents with ADHD.”

# 2012

American Academy of Pediatrics rated neurofeedback as  
a **Level 1 “Best Support”** Intervention for ADHD.

The highest possible rating and at the same level as medication  
treatment and behavior therapy

# 2014

104 children were randomly assigned to receive NFB(neurofeedback), cognitive training or a control condition. They were also evaluated 6 months post-intervention.

## Findings

“Neurofeedback participants made more prompt and greater improvements in ADHD symptoms, which were sustained at the 6-month follow-up, than did CT participants or those in the control group. This finding suggests that neurofeedback is a promising attention training treatment for children with ADHD.”

# NOW

There's a five-year study funded with more than \$3m by NIH to explore the impact of neurofeedback on ADHD.

140 children between the ages of 7 and 10 who have ADHD to participate in a placebo-controlled double-blind randomized clinical trial by Ohio State University Wexner Medical Center.



**THE OHIO STATE UNIVERSITY**

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WEXNER MEDICAL CENTER

# Bottom Line



Like in any field, skepticism must be present.

Fortunately, neurofeedback has been helping the lives of many around the globe as it continues to grow thanks to a strong community and promising ongoing research.