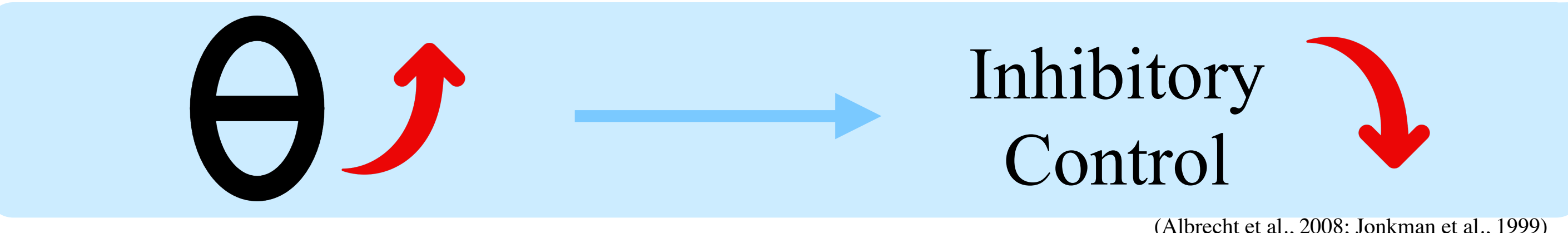
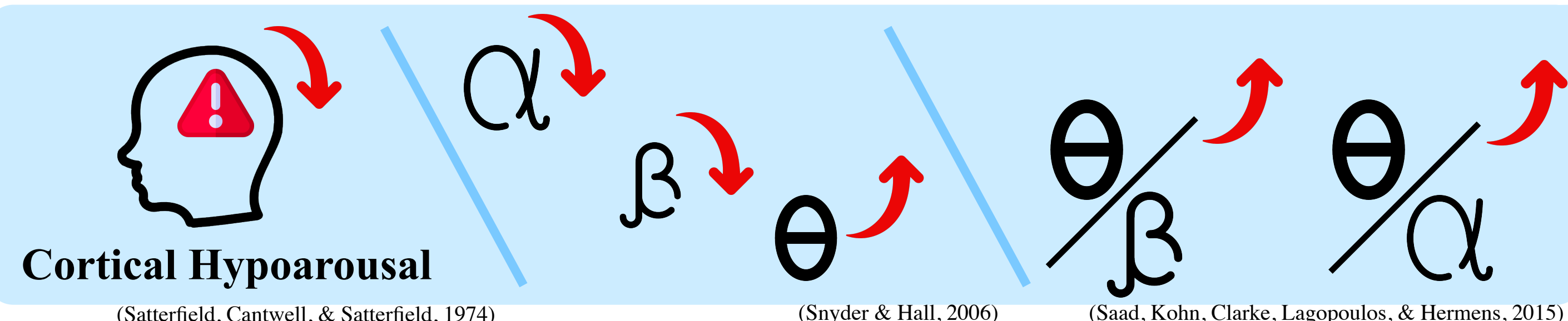


Introduction

What is ADHD ?

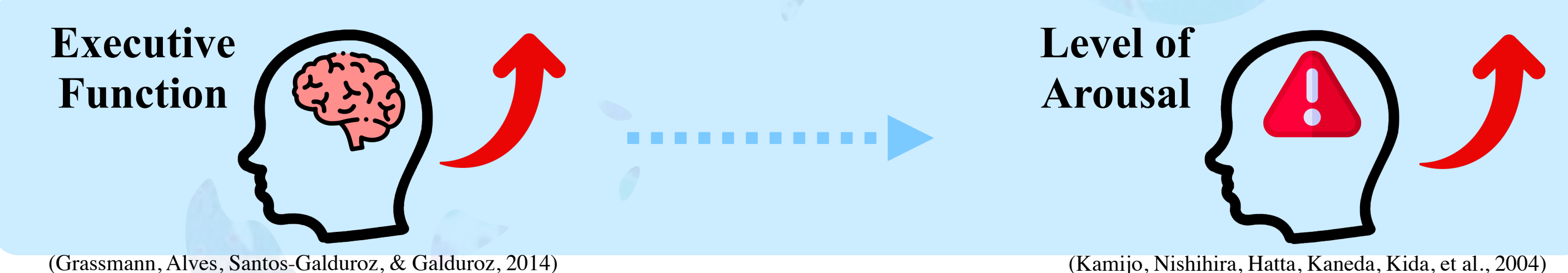
ADHD is a dysfunction characterized with childhood onset by symptoms of **inattention** and/or **hyperactivity** and **impulsivity**.
(American Psychiatric Association, 2013)

Brain state characterize by an individual with ADHD



Increased theta and decreased alpha or beta, or increased theta/alpha power ratio or theta/beta power ratio is related to the cortical hypoarousal and deficit of inhibitory control in ADHD children.

What will happen after an acute exercise ?



The purpose of this study is to investigate the dose-response of aerobic exercise on resting-state EEG by examining the theta/alpha, theta/beta power ratio in children with ADHD.

The study hypothesize that moderate and high intensity of aerobic exercise would induce lower theta/alpha or theta/beta power ratio.

Results

Theta/Alpha Power Ratio

Significant time × region interaction ($F_{2, 54} = 3.97, p = .025$) :

- Post-test theta/alpha power ratio was smaller than pre-test only at Pz ($t_{27} > 3.0, p < .01$)

Significant session × region interaction ($F_{2, 54} = 19.81, p < .001$) :

- **High intensity exercise** showed the **highest theta/alpha** power ratio at Fz.
- Moderate intensity exercise showed a smaller theta / alpha power than low intensity exercise at Pz.

Theta / Beta Power Ratio

Significant session × time × region interaction ($F_{4, 108} = 2.88, p = .048$) :

Time effect at **central region** ($F_{1, 27} = 16.98, p < .001$)

- Post-test showed a **smaller theta/beta** power ratio than the pre-test.

Session × time interaction ($F_{2, 54} = 8.13, p = .002$) at **parietal region**

- Post-test theta/beta power ratio was smaller than the pre-test only for the **high intensity exercise**.
- **High intensity exercise** (mean = 2.33, SD = 0.93) had a **smaller theta/beta** power ratio compared to low intensity (mean = 2.49, SD = 0.11) following post-test ($t_{27} > 5.85, p < .001$).

Methods

Participants



28 ADHD children
(mean age = 10.54, SD age = 1.17)



No history of
brain injury



No medication prior to
testing for 24 hours

Exercise Manipulation Check



Polar HR
Monitor

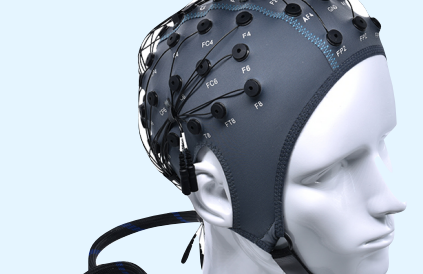


Rating of
Perceived Exertion



Heart Rate
Reserved

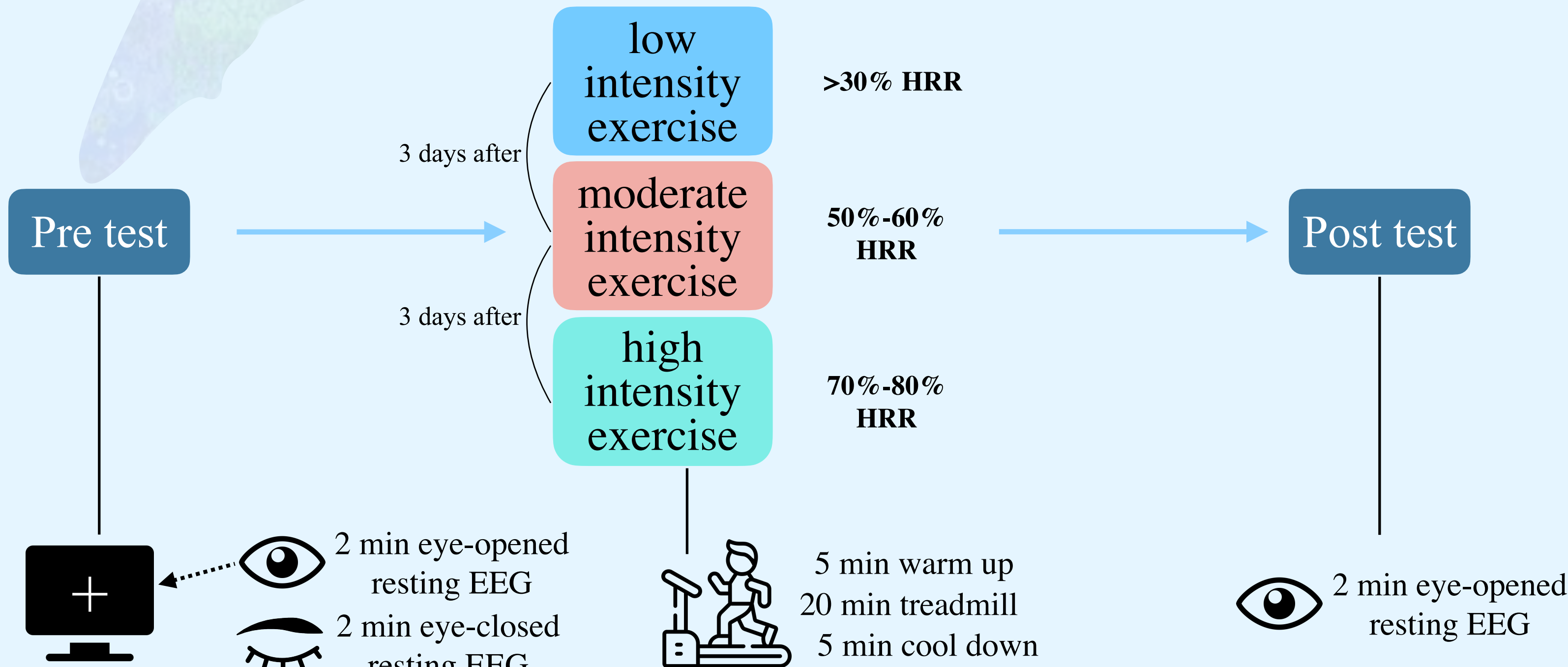
Electroencephalogram



32 channel
NeuroScan
Quick-Cap

Procedures

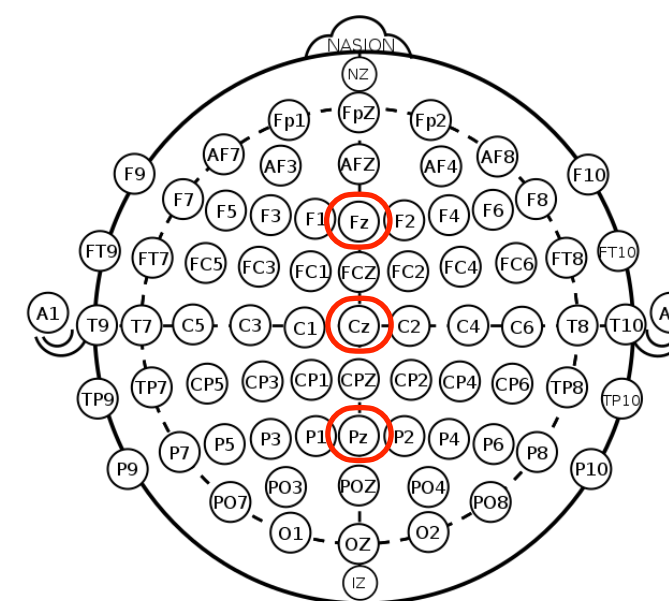
within-subject design



Statistical Analysis

Repeated -measures ANOVA

3 (Session: low, moderate, high exercise intensity) ×
2 (Time: pre-test vs. post-test) ×
3 (Region: Fz, Cz, Pz)



Discussion

This study focused on **different exercise intensities** on **cortical activation** in children with ADHD.

High intensity exercise had a lower theta/beta power ratio in the post-test than in the pre-test.

This study suggested that,

- **High intensity exercise** may induce the **optimal cortical activation** for children with ADHD to increase the level of arousal to compensate hypoarousal phenomenon.
- **High intensity exercise** may bring some benefits to children with ADHD, such as **better cognitive performance** or **better behavioral control**.
- With sufficient duration of acute exercise and regardless of exercise intensity can induce a smaller theta/alpha power ratio, **high intensity exercise** may improve the cortical function of children with ADHD effectively, and normalize cortical activity by **reducing theta/beta power ratio**.