

Neurofeedback Beta Down-Training in Women with High State-Trait Anxiety: A Pilot Study

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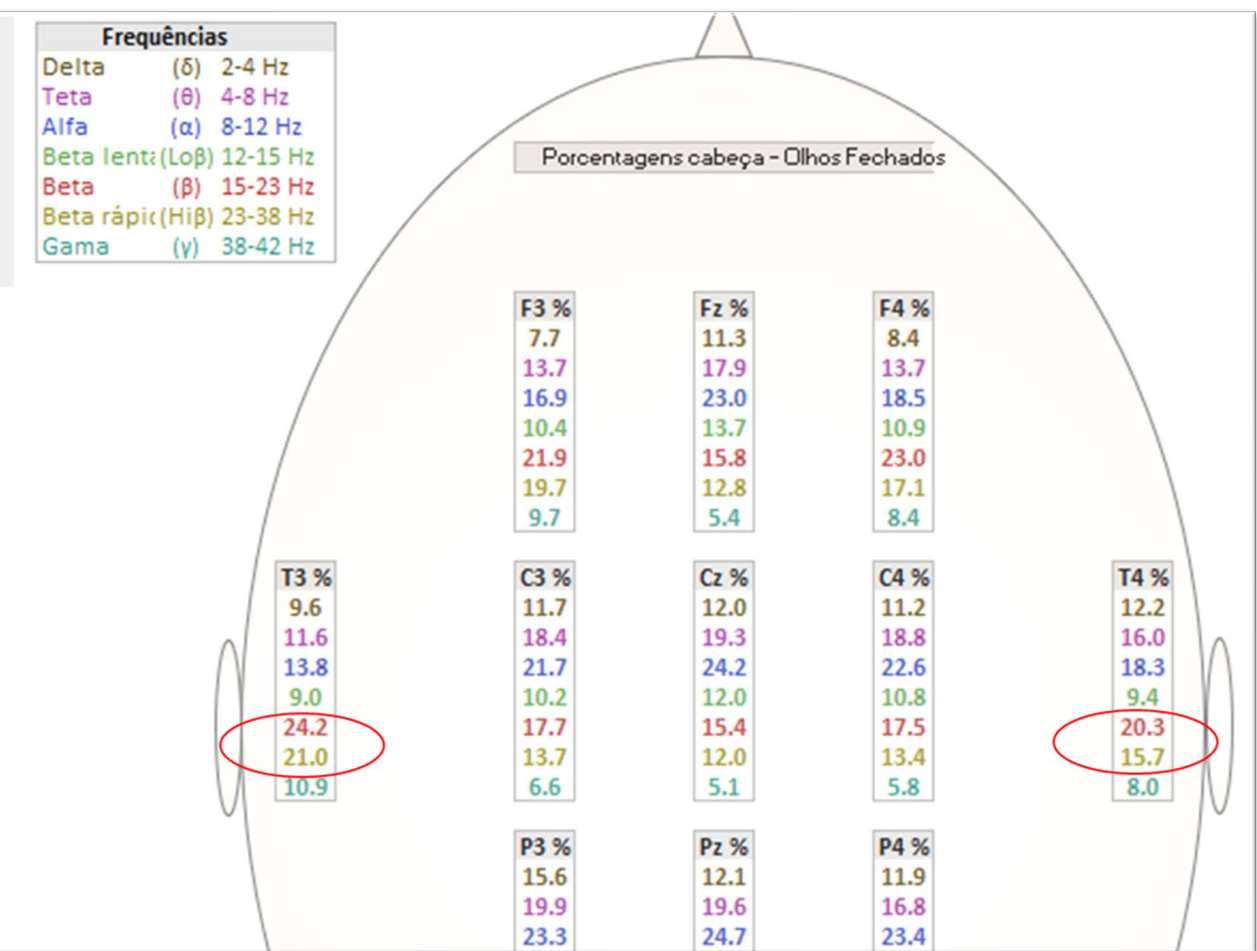
THEORETICAL BACKGROUND

According to the World Health Organization¹, **anxiety** and depression rank as the most prevalent mental disorders worldwide.

According to The Learning Curve model, there is a significant correlation between anxiety symptoms and high levels of beta and high-beta waves in the temporal lobes, known as the **Hot Temporals** brain pattern², where the relative power of beta waves exceeds 17% and high-beta waves exceed 10%.

Research Question

Could Neurofeedback influence anxiety as a personality trait by focusing on the modulation of hot temporal brain pattern?

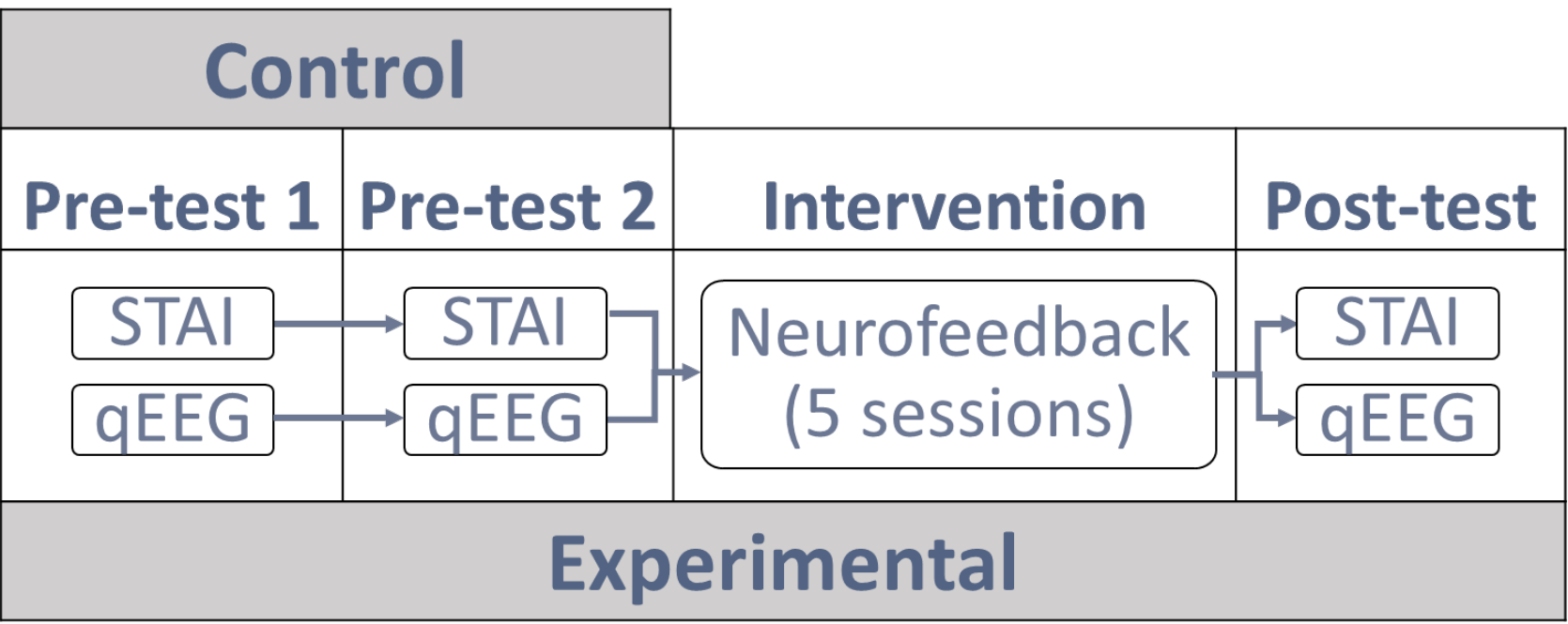


METHODS

Participants

- Within-subject design.
- Six right-handed female university students
- Age: 18 - 35 years old (mean age of 25.2 ± 4.9)
- Trait-A STAI score > 50 points
- Hot Temporals brain pattern

Experimental design



State-Trait Anxiety Inventory (STAI)

- State-A: how the person feels at that moment
- Trait-A: how the person generally feels



EEG recording

- BioExplorer software (CyverEvolution Inc.)
- Q-Wiz electroencephalograph (Pocket Neurobics), 4 simultaneous channels
- Sampling rate 512 Hz.
- Online band pass 0.2Hz - 60Hz.

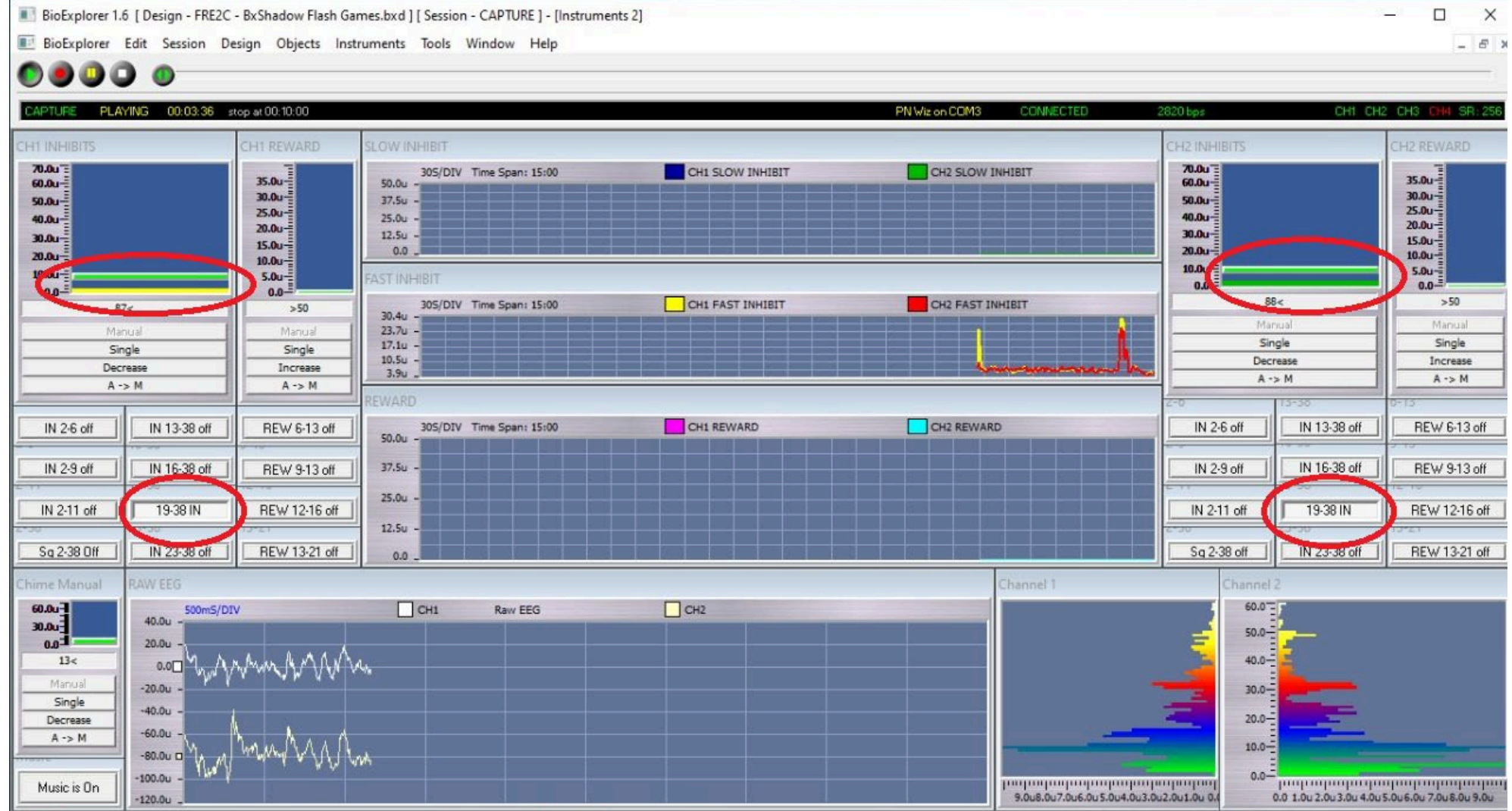
EEG processing:

- TRAINER'S QEEG (TQ-7) software (BrainTrainer)
- One minute, rest eyes closed
- 12 measured points (Fz, Pz, Cz, Oz, F3, F4, P3, P4, T3, T4 C3 and C4)
- Reference electrode on mastoid bones

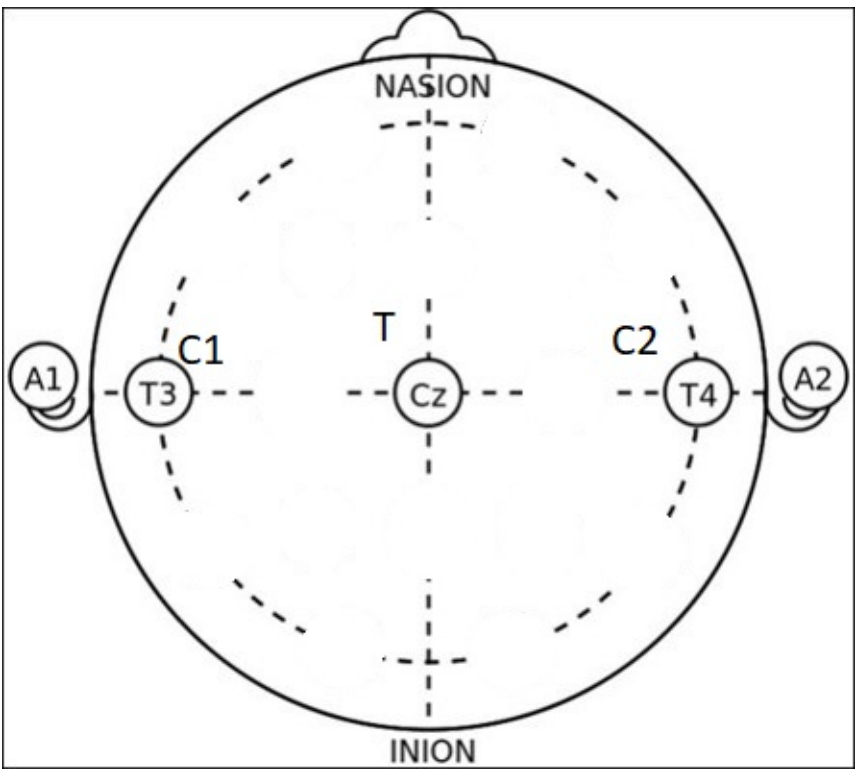
Intervention

- Five Neurofeedback sessions
- high-beta down-training (19-38Hz)
- 30 min. for session
- 3 sessions for week

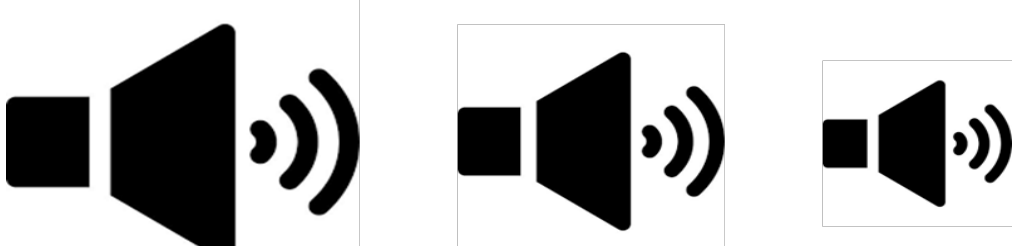
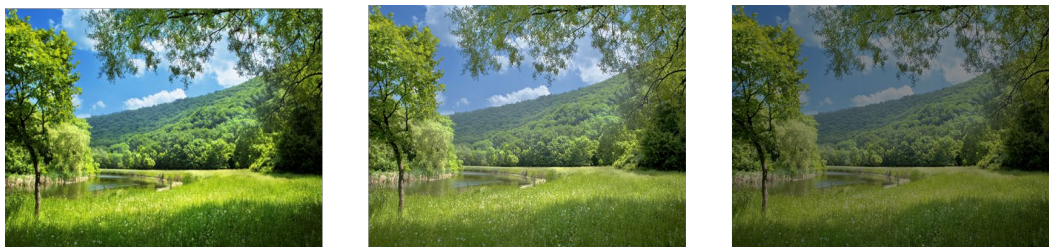
Neurofeedback Protocol



Setup for Neurofeedback



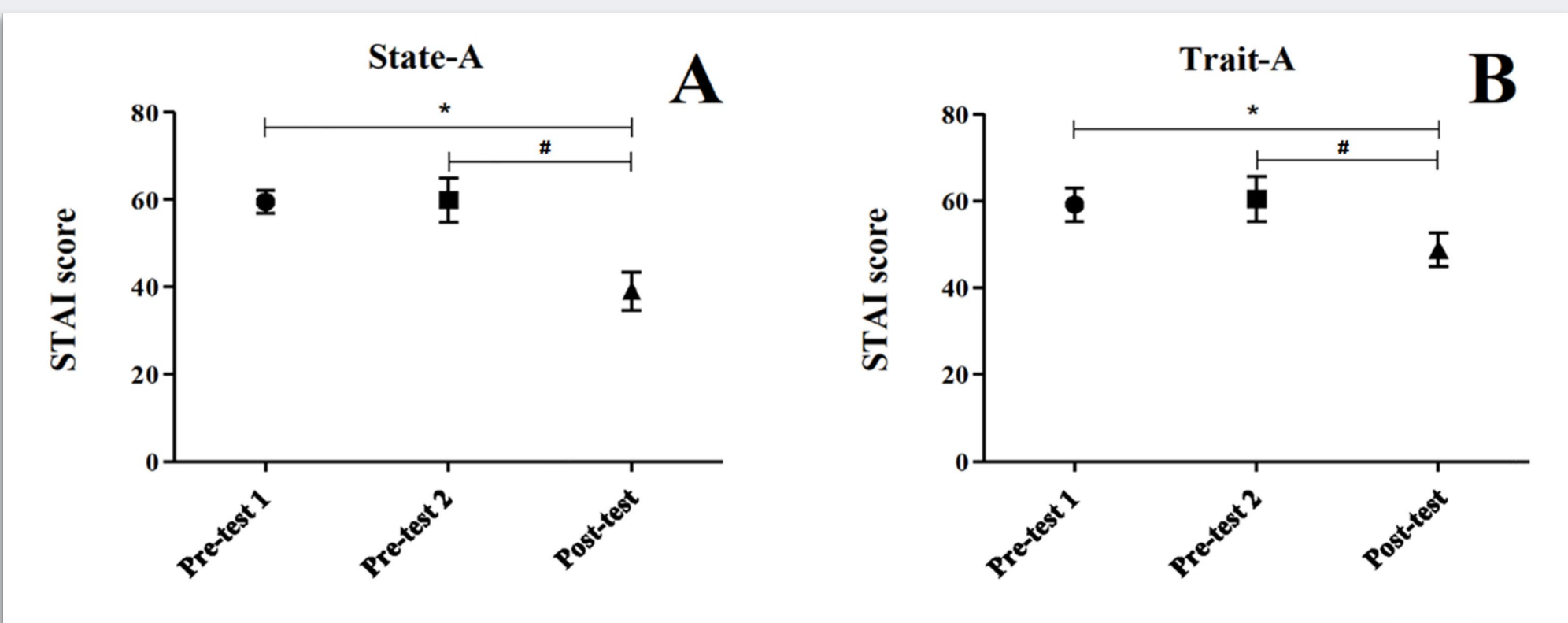
Audio-visual feedback



RESULTS

Behavioral Results

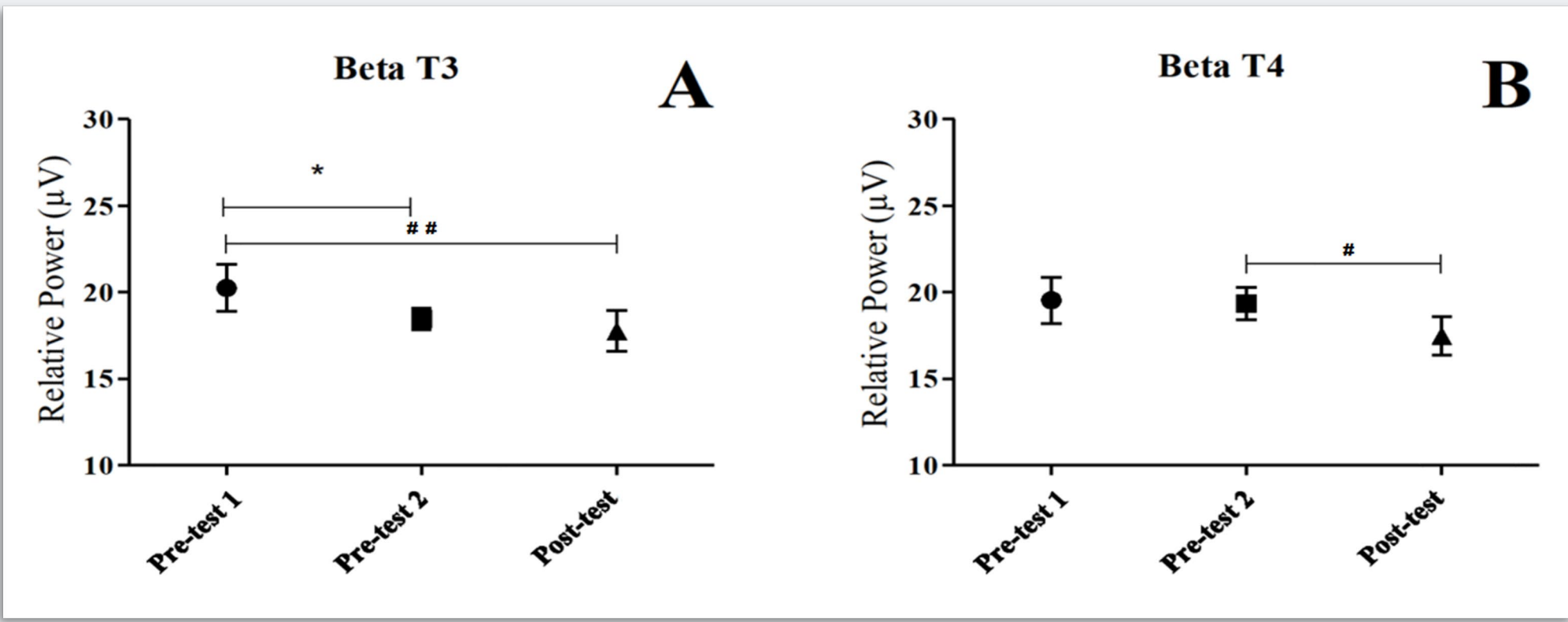
STAI scores Pre-test and Post-test phases



Reduction in State ($t = 3.154$, $p = 0.013$) and trait ($t = 2.488$, $p = 0.028$) values in STAI scores after the Neurofeedback intervention.

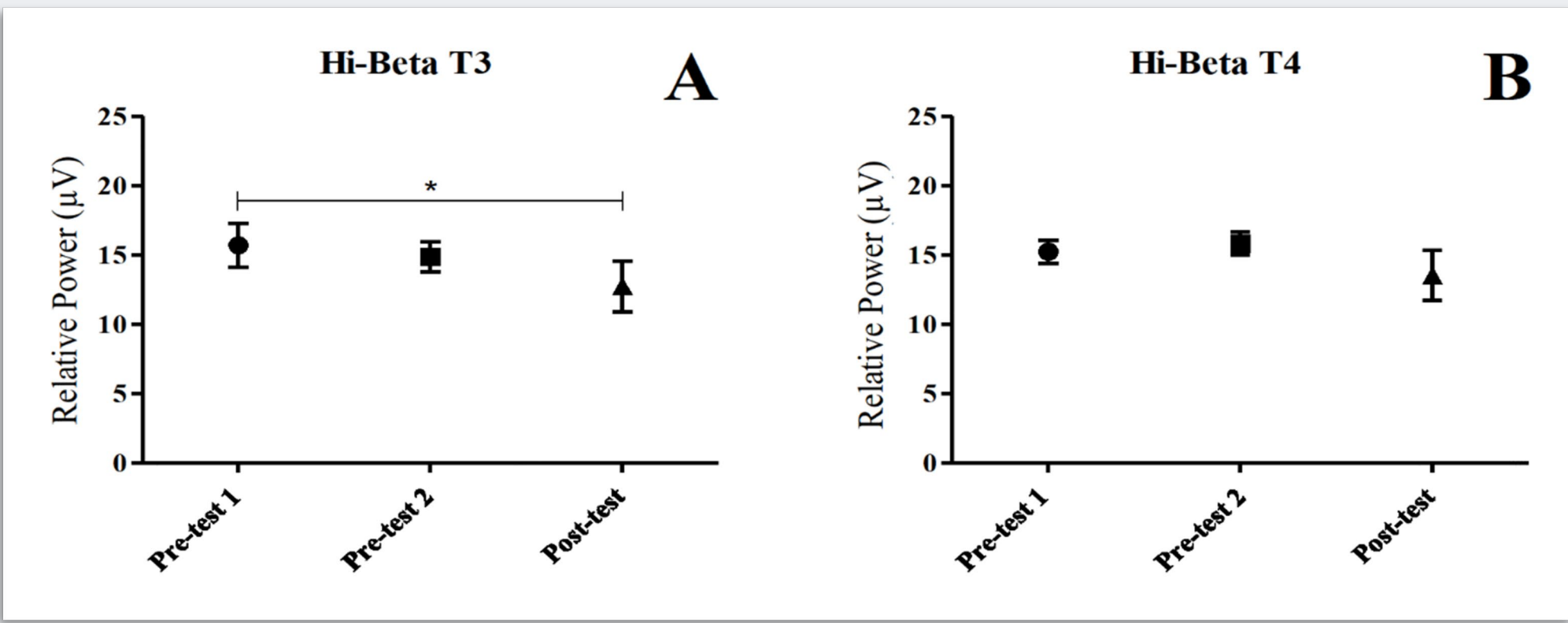
Electrophysiological Results

Beta (12-23Hz) relative power at T3 and T4



Decrease in the relative power of the beta frequency band within both T3 ($t = 4.070$, $p = 0.005$) and T4 ($t = 2.393$, $p = 0.031$)

High-beta (19-38Hz) relative power at T3 and T4



Reduction in the relative power of the high-beta band within T3 ($t = 2.215$, $p = 0.038$).

CONCLUSIONS

Targeted beta down-training was shown to be associated to effectively modulate beta brainwave patterns in individuals with high anxiety, leading to a reduction in symptomatology. These results contribute to the growing body of evidence supporting Neurofeedback as a non-invasive, personalized intervention for anxiety disorders.

FUTURE RESEARCH

Further research is necessary to replicate these findings in larger and more diverse samples for result generalizability. Additionally, investigating the long-term effects of Neurofeedback beta down-training on anxiety management and quality of life could provide valuable insights into the sustained benefits of this intervention.

REFERÊNCIAS

- ¹World Health Organization. (2017). Depression and other common mental disorders: global health estimates. World Health Organization. <https://apps.who.int/iris/handle/10665/254610>.
- ²Ribas, V., Ribas, R., Nóbrega, J., Nóbrega, M., Espécie, J. A. de A., Calafange, M., Calafange, C., & Martins, H. (2018). Pattern of anxiety, insecurity, fear, panic and/or phobia observed by quantitative electroencephalography (QEEG). Dementia & Neuropsychologia, 12(3), 264–271. <https://doi.org/10.1590/1980-57642018dn12-030007>