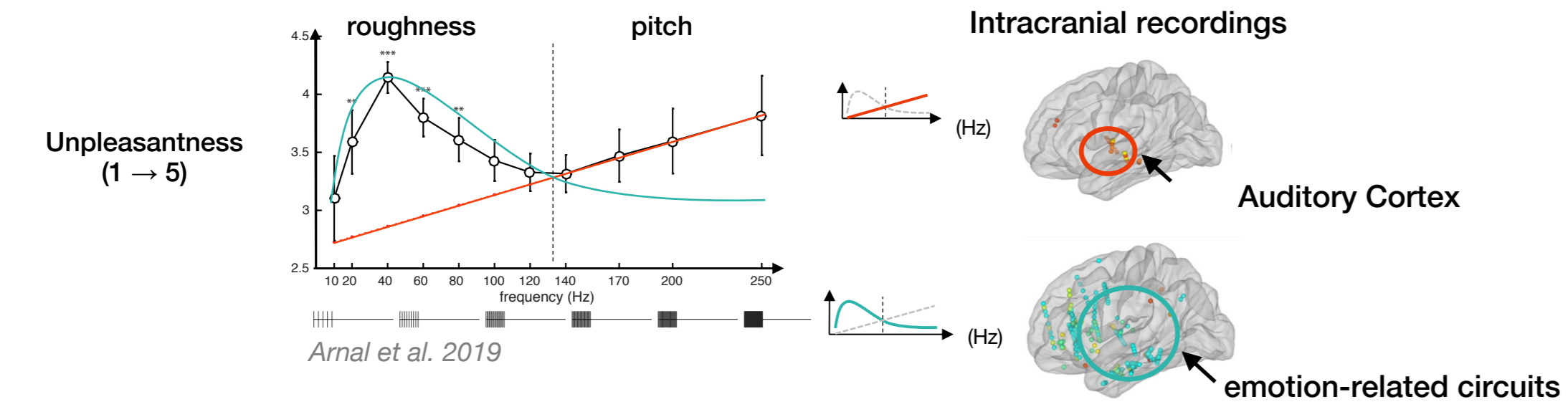


TINNITUS AND HYPERACUSIS

INTRODUCTION

- In humans, sounds aversiveness follows a non-linear profile and is maximal for amplitude modulated sounds between 30 Hertz(Hz) and 150 Hz, a range known as « roughness ».
- Subjective aversiveness is not only explained by responses in the classical auditory system but target regions situated in deep temporal and limbic structures involved in emotional processing.
- Emotional and behavioral responses to aversive sounds vary significantly among individuals, as sensitivity to acoustic frequencies differs.
- These variations are often influenced by psychoaffective traits, such as anxiety which can alter auditory perception.
- Tinnitus is frequently associated with atypical response or hypersensitivity to sounds.
- We aim to explore the variability in non-linear responses to aversive sounds in both neurotypical individuals and those with tinnitus, focusing on psycho-affective factors like anxiety and autistic traits and physiological responses. It remains unclear whether sound intensity, neuroaffective, and biological factors influence these responses and whether tinnitus could serve as a model for sound hypersensitivity.



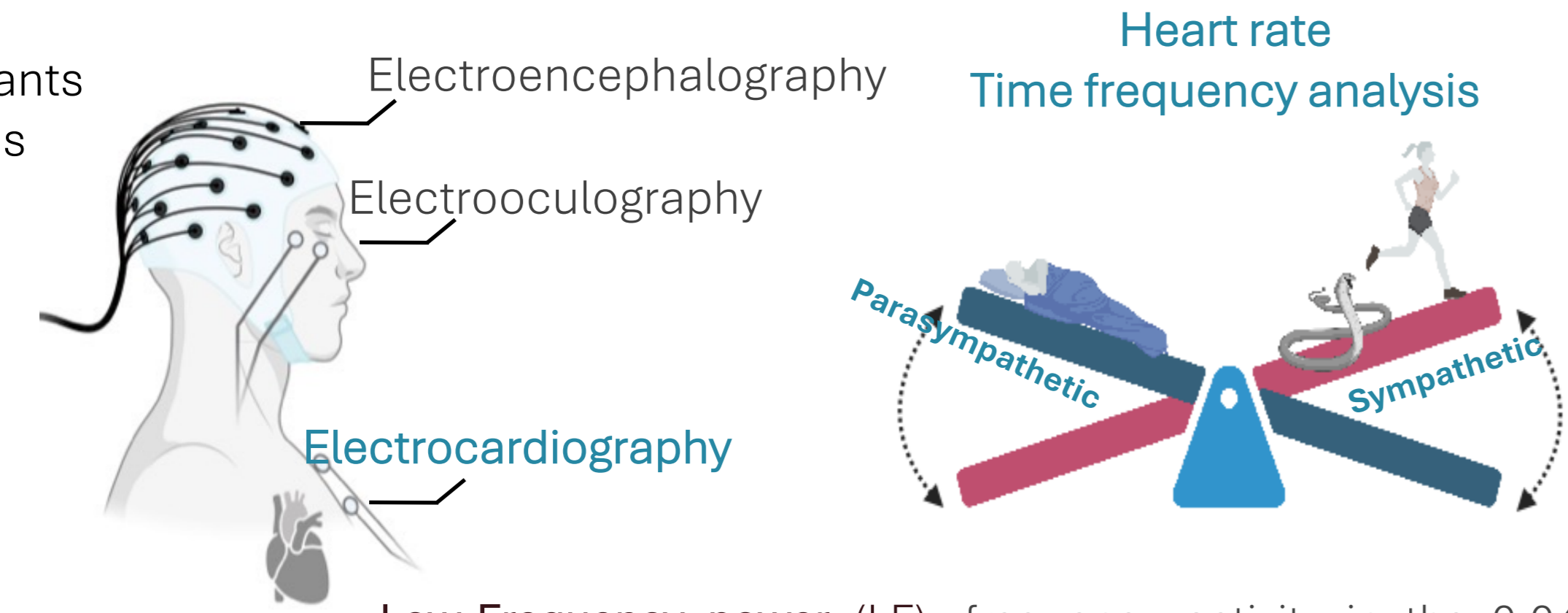
AIMS

- Exploring the variability of affective and physiological responses to aversive sounds in tinnitus vs controls.
- Investigating how psychoaffective traits might affect the processing of emotional responses to aversive stimuli.
- Exploring whether individuals with tinnitus exhibit altered autonomic responses.

MATERIAL AND METHODS

Who ?
15 normal hearing participants
15 somatosensorial tinnitus

Task
Subjective rating of click trains (10 Hz to 240 Hz) at 5 intensities (40, 50, 60, 65, 70 dB)



Questionnaires
-STAI-S (before and after exp)/STAI-T
-Autism Spectrum Quotient

- Low-Frequency power (LF): frequency activity in the 0.04 - 0.15Hz range > parasympathetic and sympathetic
- High-Frequency power (HF): frequency activity in the 0.15 - 0.40Hz range > parasympathetic mediated

RESULTS

Subjective aversion in tinnitus vs. controls

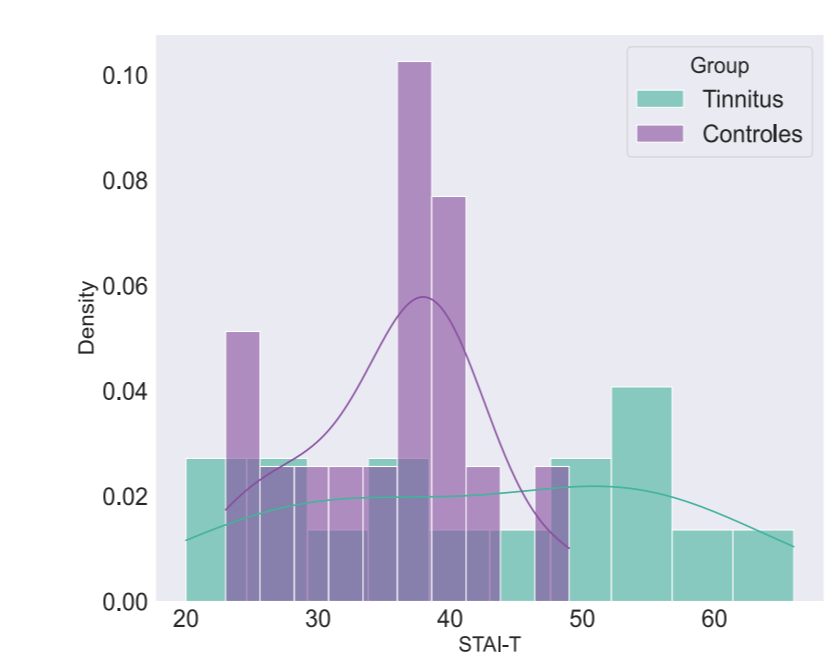
Aversion scores across frequencies and intensities



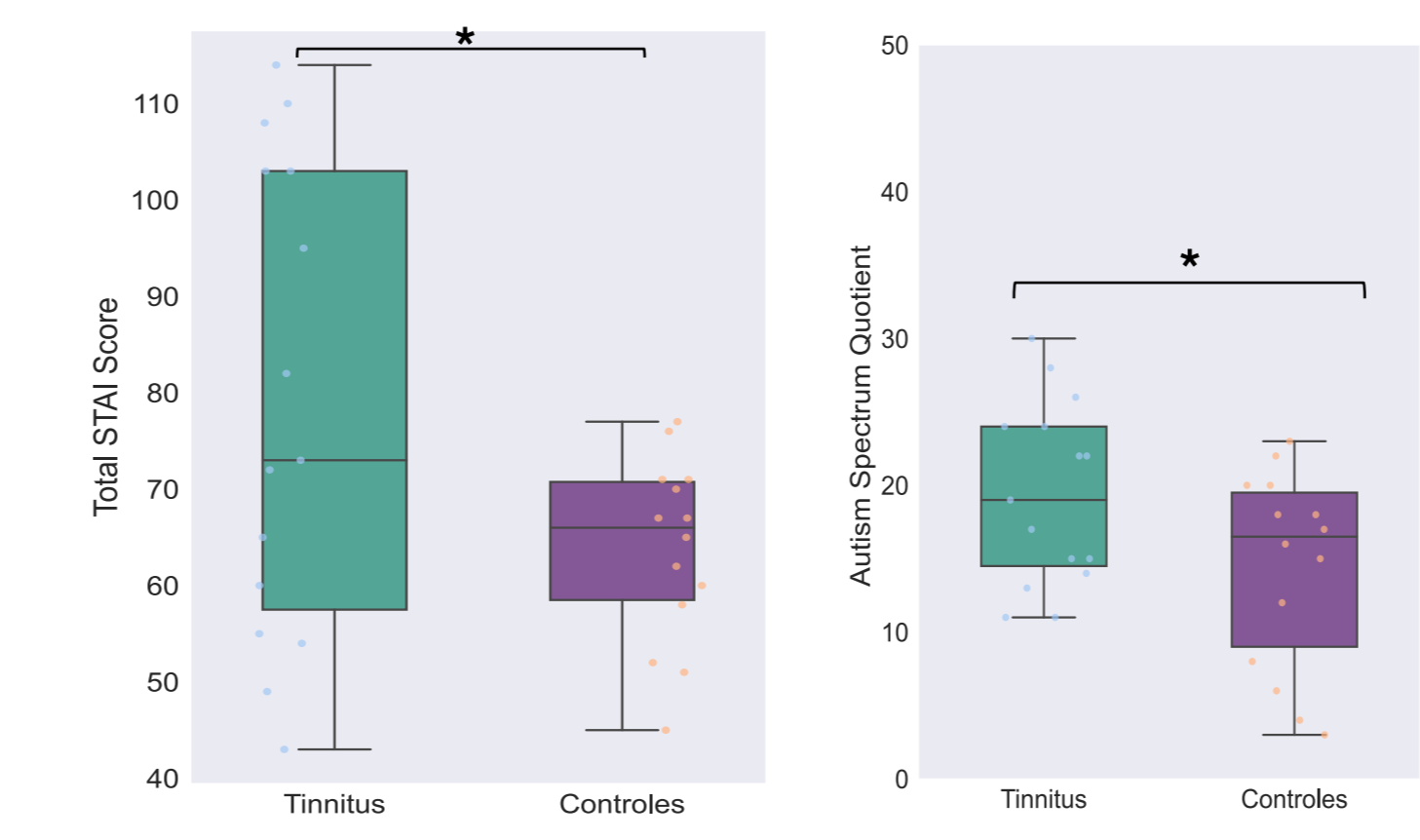
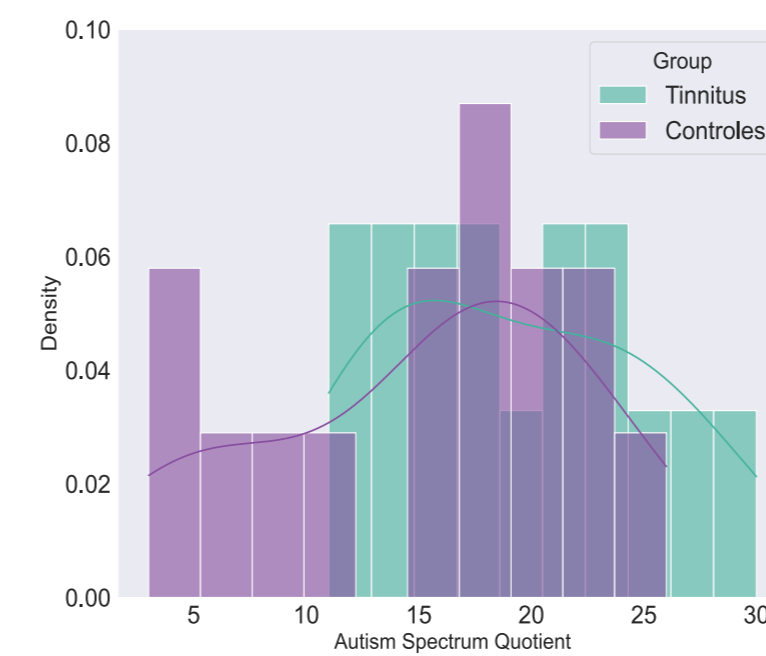
- Tinnitus and controls exhibit different sensitivity profile
- Unlike controls, tinnitus do not show linear aversion in the roughness range

Psycho-affective traits in Tinnitus vs. Controls

Distribution of STAI-T (anxiety) scores

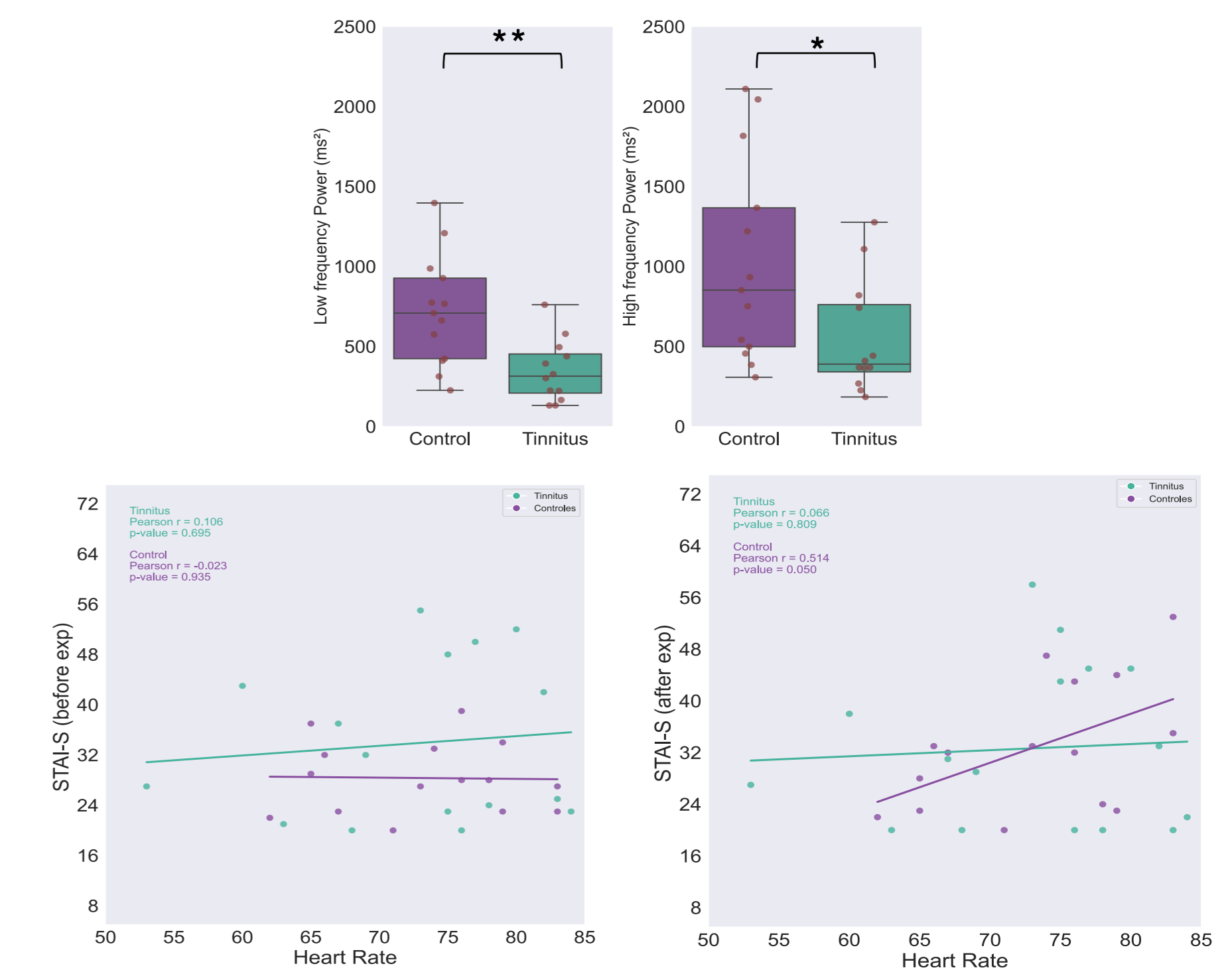


Distribution of Autism Spectrum Quotient



- Tinnitus exhibit higher anxiety and autistic traits than controls

Autonomous responses in tinnitus vs. controls



- Tinnitus participants exhibit significantly lower low and high frequency power than controls suggesting reduced sympathetic and parasympathetic responses to sounds.
- Tinnitus do not present a change in their cardiac activity/level of anxiety compared to control at the end of the experiment.

CONCLUSION

- Individuals with tinnitus exhibit reduced sensitivity to rough sounds as compared to controls. Tinnitus individuals show stronger anxiety and autistic scores. Psycho-affective endogenous traits may impair the aversive processing of emotional responses to sounds in tinnitus.
- Our results also suggest that tinnitus may reduce autonomic responses to sounds due to an imbalance in sympathetic and parasympathetic activity, potentially linked to heightened stress, and neuroaffectives traits (anxiety and autism).

REFERENCES AND SUPPORT

- Arnal, L. H., Flinker, A., Kleinschmidt, A., Giraud, A.-L. & Poeppel, D. Human screams occupy a privileged niche in the communication soundscape. *Curr. Biol.* CB 25, 2051–2056 (2015).
- Arnal, L. H., Kleinschmidt, A., Spinelli, L., Giraud, A.-L. & Mégevand, P. The rough sound of salience enhances aversion through neural synchronisation. *Nat. Commun.* 10, 3671 (2019).
- Betz, L. T., Muhlberger, A., Langguth, B., & Schecklmann, M.. Stress Reactivity in Chronic Tinnitus. *Sci Rep*, 7, 41521 (2017).