

INTRODUCTION

Patients with schizophrenia (SC) show differences in oscillations compared to healthy controls (HC) in EEG signal. These differences are presented during resting state and during tasks. This project is focussed on differences during resting state. The underlying method to use for the purpose of the project will be a frequency-band-analysis. Delta and theta oscillations for example are increased during rest in schizophrenia compared to controls (Bates et al., 2009). Patients with schizophrenia also show abnormalities in gamma oscillations, but the results vary across different stimulations and tasks (Light et al., 2006; Moran et al., 2011). Additionally, during rest alpha and beta seem to show a reduced activation (Uhlhaas & Singer, 2010; Moran et al., 2011). These differences could be useful neurophysiological markers which might provide information about what are differences in neural processings between people with schizophrenia and healthy ones. After all, it should be possible to elaborate some special features of differences in various frequency-bands between schizophrenia patients and healthy controls.

MATERIAL AND METHODS

n = 14 patients with paranoid schizophrenia (7 males: 27.9 ± 3.3 years, 7 females: 28.3 ± 4.1 years) met ICD-10 criteria for paranoid schizophrenia (F20.0)
n = 14 healthy controls (7 males: 26.8 ± 2.9, 7 females: 28.7 ± 3.4 years)

INCLUSION CRITERIA: minimum age of 18, ICD-10 diagnosis F20.0, and medication washout period of a minimum of seven days

EXCLUSION CRITERIA: pregnancy, organic brain pathology, severe neurological diseases, presence of a general medical condition, and very early stage of schizophrenia

EEG data with permission used from: Olejarczyk, E. & Jernajczyk, W. (2017). Graph-based analysis of brain connectivity in schizophrenia. *PLoS ONE* 12(11).

- Recording: 15 minutes in resting-state, eye-closed
- Sampling frequency: 250 Hz
- 19 EEG channels

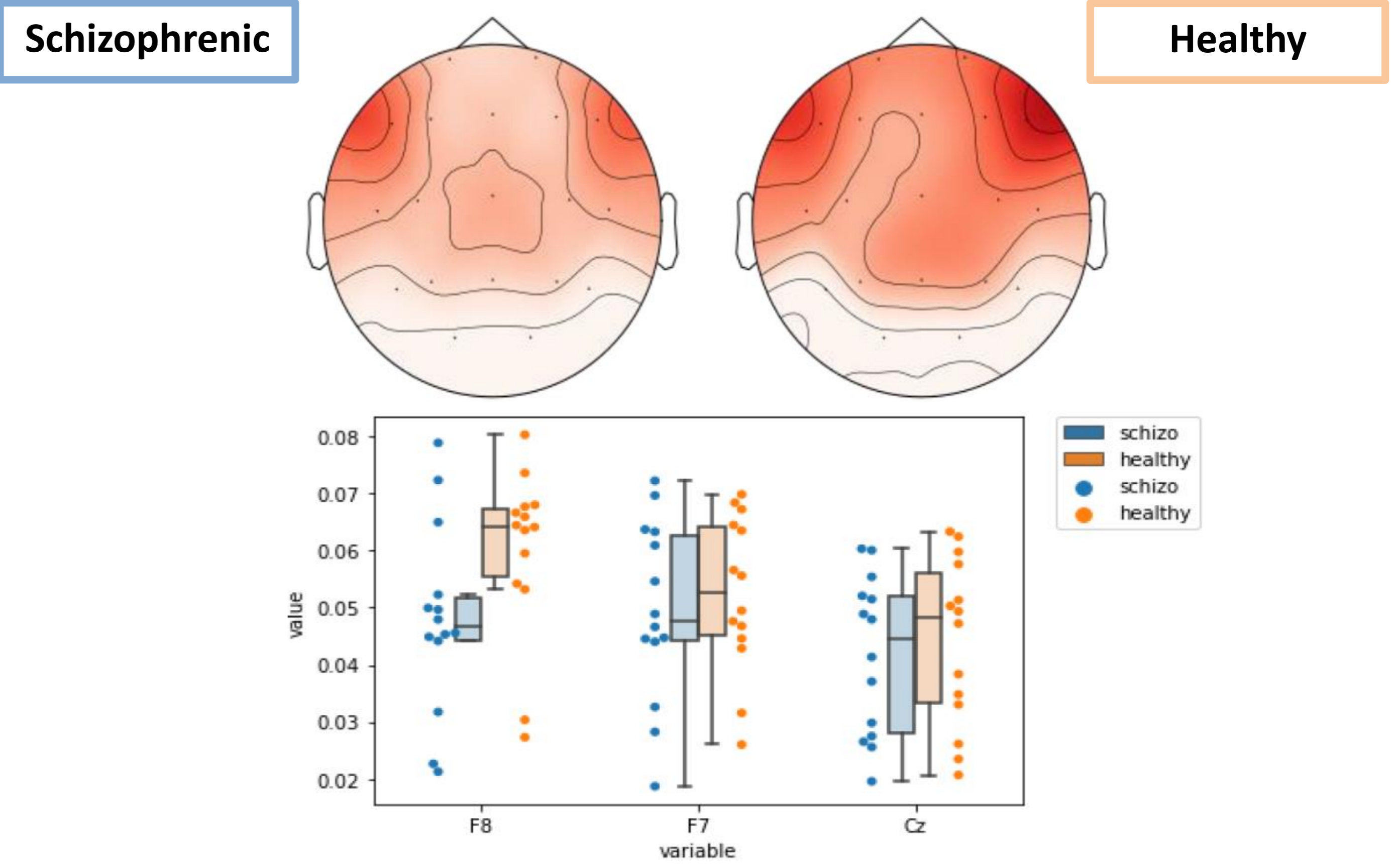
frequency-band-analysis with MNE python

	frequency	normal	pathological
Delta	1-4 Hz	Deep sleep	Brain lesion, epilepsy
Theta	4-9 Hz	Sleepiness	Inattention, daydreaming, fear, ADHD, brain lesion
Alpha	9-12 Hz	Meditation, relaxation	Depression, ADHD
Beta	12-30 Hz	Concentration, activity	Compulsion, sleeping disorder
Gamma	30-45 Hz	Consciousness, complex thoughts, neural link	

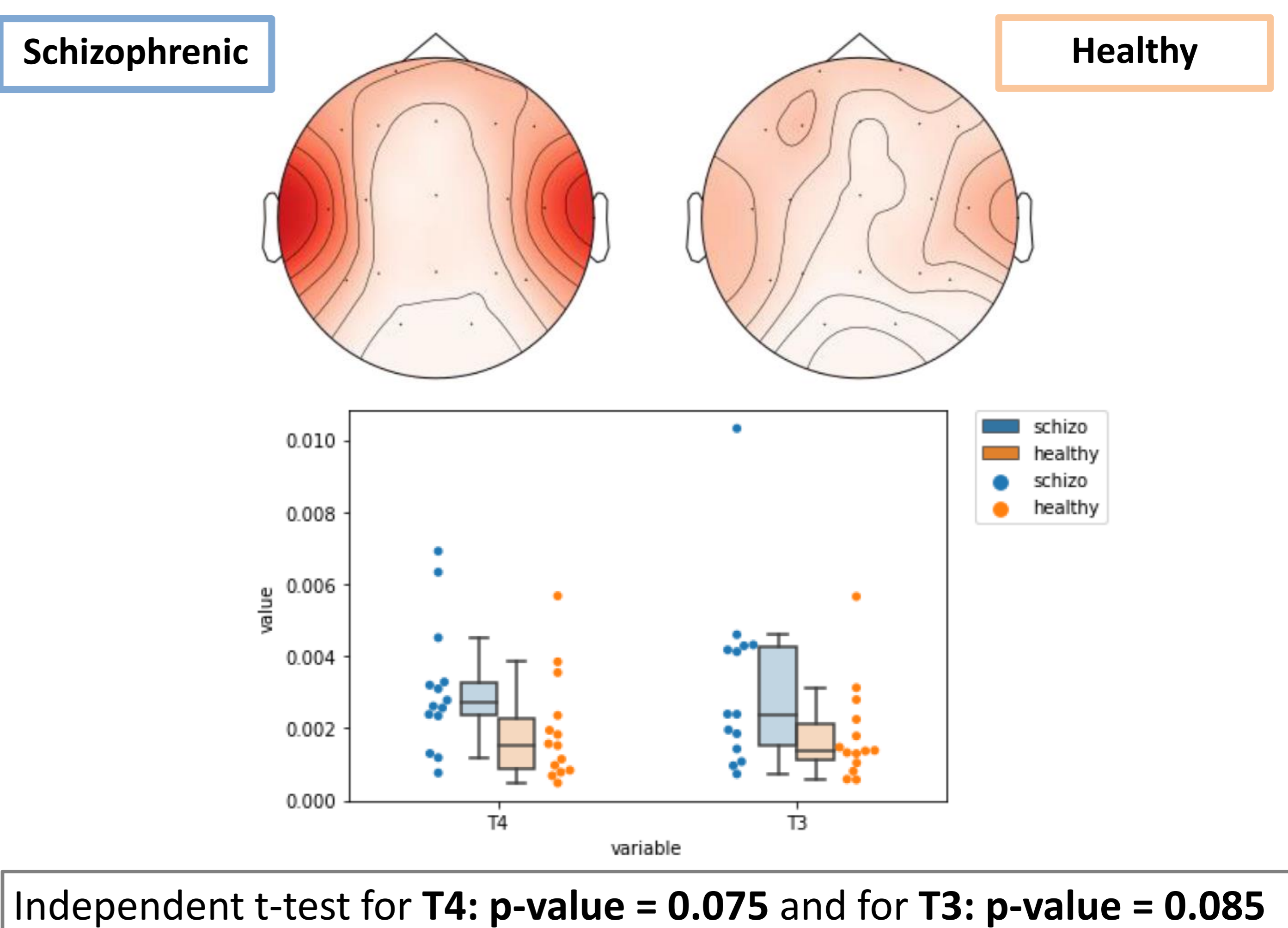
Figure 1: frequency bands in EEG

RESULTS

Average differences of **Delta frequency band** (with critical electrodes):



Average differences of **Gamma frequency band** (with critical electrodes):



DISCUSSION

The schizophrenic patients showed a nearly significant decreased delta activity and a tending reduced activity in theta band compared to HCs. These findings are in contrast to Bates et al. (2009), but could be due to the medication break and a deeper sleep during rest. Furthermore, the patients group showed more distributed and little decreased alpha activity. This could be explained by the appearance of negative symptoms in patients, also shown by Moran et al. (2011). Similarly as Moran et al. (2011), there is a slightly reduced beta activation in SCs but far from significance. This might be because of a reduced concentration capability, which is also detectable during rest. Last, the SCs showed almost significantly stronger gamma oscillations compared to HCs like the group of Basar-Eroglu et al. (2007). Higher gamma activation is shown because of cortical hyperexcitability, for example might be induced by hallucinations, general arousal and formal thinking disorder. Due to differences in the literature, further research is needed on differences in neural oscillations and a larger group with schizophrenic patients.

REFERENCES

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