Electric brain: neurophysiological correlates of pragmatics in schizophrenia

DISCOURSE IN PSYCHOSIS
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Background & Objective

People with schizophrenia display pronounced cognitive and linguistic-communicative deficits, especially in pragmatics, which is a sophisticated communicative ability that allows to appropriately use and interpret language in a wide range of contexts and situations.

Pragmatic impairments are not satisfactorily addressed by available treatments and contribute to the functional disability

The identification of reliable and easy-to-implement markers is crucial

EEG biomarkers have possible diagnostic value and are linked to specific cognitive processes, but are understudied

We aim to systematically characterize a **"neuropsychophysiological"** profile in schizophrenia

Methods

People with SCZ (N=56)	
Age	38.93 (± 12.90)
Years of Education	11.98 (± 2.74)
Sex (M/F)	49:7
Duration of Illness	17.02 (± 11.71)

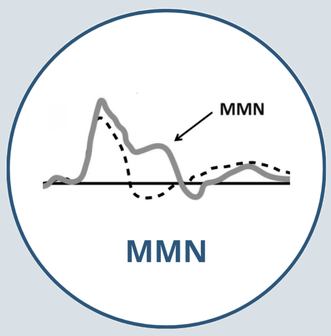
Assessment	
Pragmatics	APACS (Arcara and Bambini, 2016)
Psychopathology	PANSS (Key et al., 1987)

EEG Recording	
Mismatch negativity (MMN)	Resting state (5 min)

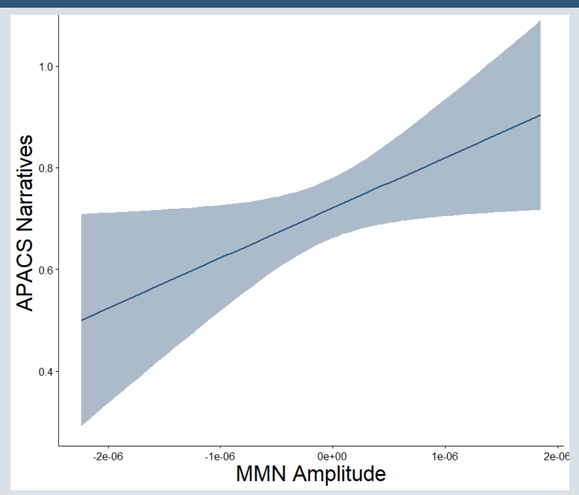
Data Analysis

EEG data were obtained from a 128-channels EEG, and pre-processed in order to obtain indexes for: 1) **MMN amplitude**; 2) **alpha activity indexes** (center frequency, amplitude); 3) **aperiodic activity indexes** (offset, exponent).
To characterize the EEG-based neural correlates of pragmatics in schizophrenia, we run several Pearson correlation analyses between EEG measures and performance in linguistic tasks, as well as psychopathology. The p was set at 0.05, given the explorative nature of the analyses. Analyses were run using Brainstorm (Tadel et al., 2011), MatLab (MathWorks, 2022), RStudio (PBC, 2022) and SPSS (IBM, 2022). ERP data export for MMN data was performed the erpR (Arcara & Petrova, 2014).

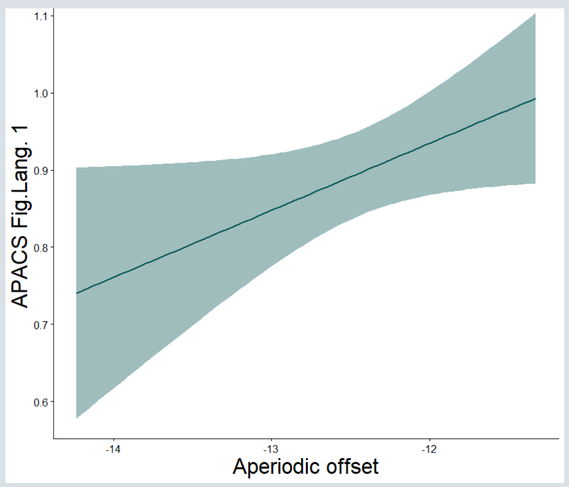
Results



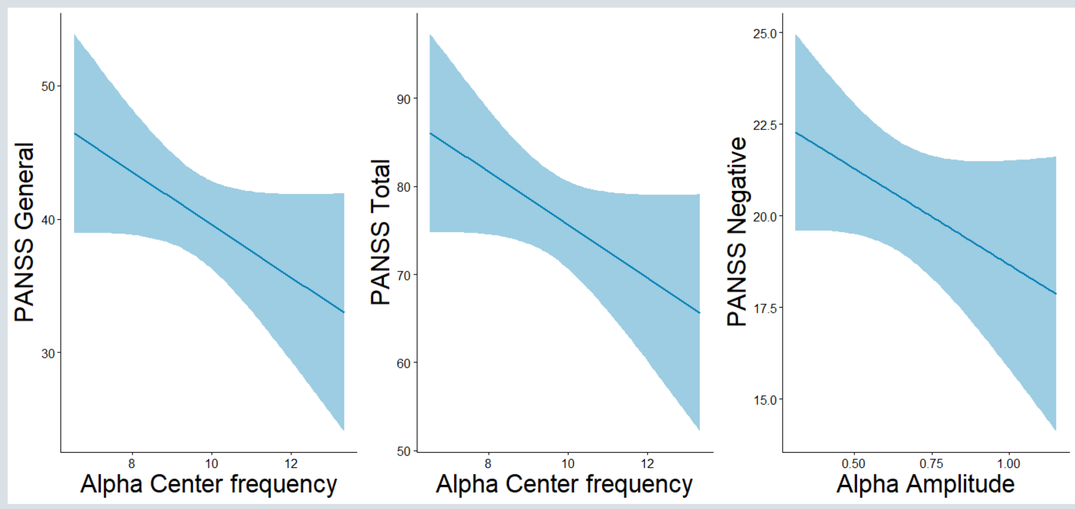
MMN peak = 232 ms



Offset (shift on vertical axis) -12.3 (± 0.74)



Center frequency (frequency of the peak) = 9.56 Hz (± 3.78)
Amplitude (distance from centre line) = 0.64 (± 0.18)



Conclusions

- Relationship between **MMN** and pragmatic abilities (in line with the only available study in the literature)
- Reduced **alpha** peak (in line with a cut-off of 10.2 Hz by Coppola and Chassy, 1986) related with the severity of symptoms (especially negative symptoms), but not with pragmatics
- First results on the association between **aperiodic activity** and pragmatics in schizophrenia
- Results corroborate the view of the brain as a prediction machine, in which alterations in neural synchronization result in difficulties in prediction and coping with unexpected stimuli (i.e., pragmatic language)

EEG indexes in schizophrenia are possible markers of the core deficits characterizing the disorder, including pragmatic alterations

The identification of neural correlates as new targets for treatment may allow the development of combined rehabilitative interventions (e.g. Cognitive Remediation + neurofeedback), thus overcoming functional disability, reducing the costs associated with the illness

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Bambini et al. (2016). *The communicative impairment as a core feature of schizophrenia: Frequency of pragmatic deficit, cognitive substrates, and relation with quality of life*. Compr. Psychiatry ; Molina et al. (2020). Memantine Effects on Electroencephalographic Measures of Putative Excitatory/Inhibitory Balance in Schizophrenia. Biological Psychiatry: Cognitive Neuroscience and Neuroimaging; Lee et al. (2014). Mismatch negativity is a stronger indicator of functional outcomes than neurocognition or theory of mind in patients with schizophrenia. Progress in Neuro-Psychopharmacology and Biological Psychiatry,