Resting-state connectivity abnormalities in ultra-high risk subjects

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Background: The brain is continuously active, even under conditions that no particular activity is being performed, to prepare the central nervous system for the arrival of new internal or external stimuli. Previously, resting-state brain connectivity abnormalities have been reported in schizophrenia (SZ) through the EEG microstate resting-state technique (Lehmann et al., 2005) which comprises four canonical networks (A-phonological, B-visual, C-salience and D-attentional), however, little is known about this topic at early stages of the disease as the UHR syndrome (Fusar-Poli et al., 2013; Fig N°1).

Fig N°1. UHR syndrome

Fusar-Poli P., 2013

Fig N°2. Sociodemographic subjects's description

	UHR (n = 20)	Controls (n = 27)	
	Mean (SD)		p-value
Age (years)	19.7 (5.6)	18.0 (3.8)	n.s.
Education (years)	11.6 (3.2)	12.3 (3.3)	n.s.
	%		
Gender (male)	60%	52%	n.s.
Atypical antipsychotics	80%	--	--
	Mean (SD)		
* Chlorpromazine eq (mg)	98.7 (90.7)	--	--

Materials and Methods: A 64-channel EEG was performed in 20 UHR subjects and 27 matched controls (CNT) (Fig N°2) under resting conditions (2 minutes of eyes-open and 2 minutes of eyes-closed recording). Then, we pre-processed the records and performed the EEG microstate variable analysis (duration, coverage, occurrence, GEV and GFP) in an open source EEGLab toolbox for MATLAB (Poulsen et al., 2018). Finally, statistical comparisons were performed between groups to evaluate microstate differences.

Results and Conclusions: Obtained microstates were similar to those found in previous studies (Lehmann et al., 2005; Fig 3a). UHR subjects presented lower microstate D and higher microstate B coverage (%) compared to CNT ($p < 0.05$), suggesting an abnormal resting-state connectivity in attentional and visual areas which are consistent with previous clinical/cognitive and EEG alterations seen in SZ and the 22q11 syndrome (Tomescu et al., 2014; Fig 3b). No other EEG microstate statistics were found to be different between groups. These findings could represent a SZ trait marker with potential clinical utility due to its simple registration and analysis.

Fig N°3. Microstate analysis

References: (1) Lehmann D. et al. (2005): EEG microstate duration and syntax in acute, medication-naive, first-episode schizophrenia: a multi-center study. *Psychiatry Res.* 138(2): 141-56; (2) Fusar-Poli P. et al. (2013): The psychosis high-risk state: A comprehensive state-of-the-art review. *JAMA Psychiatry.* 70: 107-120.; (3) Poulsen AT. et al. (2018): Microstate EEGLab toolbox: An introductory guide. *bioRxiv* 289850; doi: <https://doi.org/10.1101/289850>; (4) Tomescu MI. et al. (2014): Deviant dynamics of EEG resting state pattern in 22q11.2 deletion syndrome adolescents: A vulnerability marker of schizophrenia?. *Schizophr Res.* 157: 175-181.

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