Neural Differences in Hypoactive Sexual Desire Disorder: An ERP Microstate Study

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BACKGROUND

- **Hypoactive Sexual Desire Disorder** (HSDD) is the most common sexual dysfunction in women. It is characterized by persistent or recurrent reduction (or absence) of sexual thoughts and interest in sexual activity.[1]

- The top-down neurofunctional self-attention-model (SAM) of desire proposes that specific cognitive processes such as self-inspection interfere with sexual desire of HSDD patients prior to or during their sexual activities.[2]

- Neuroimaging research on HSDD patients shows stronger activation in their self-referencing neural network compared to the controls.[2]

PURPOSE

Limited studies have been done on identifying neural differences between pre- and post-menopausal HSDD patients. Therefore, we aim to investigate the menopause-dependent differences in the spatio-temporal dynamics of female HSDD by combining a behavioral desire decision task with electrical neuroimaging based microstate analysis.
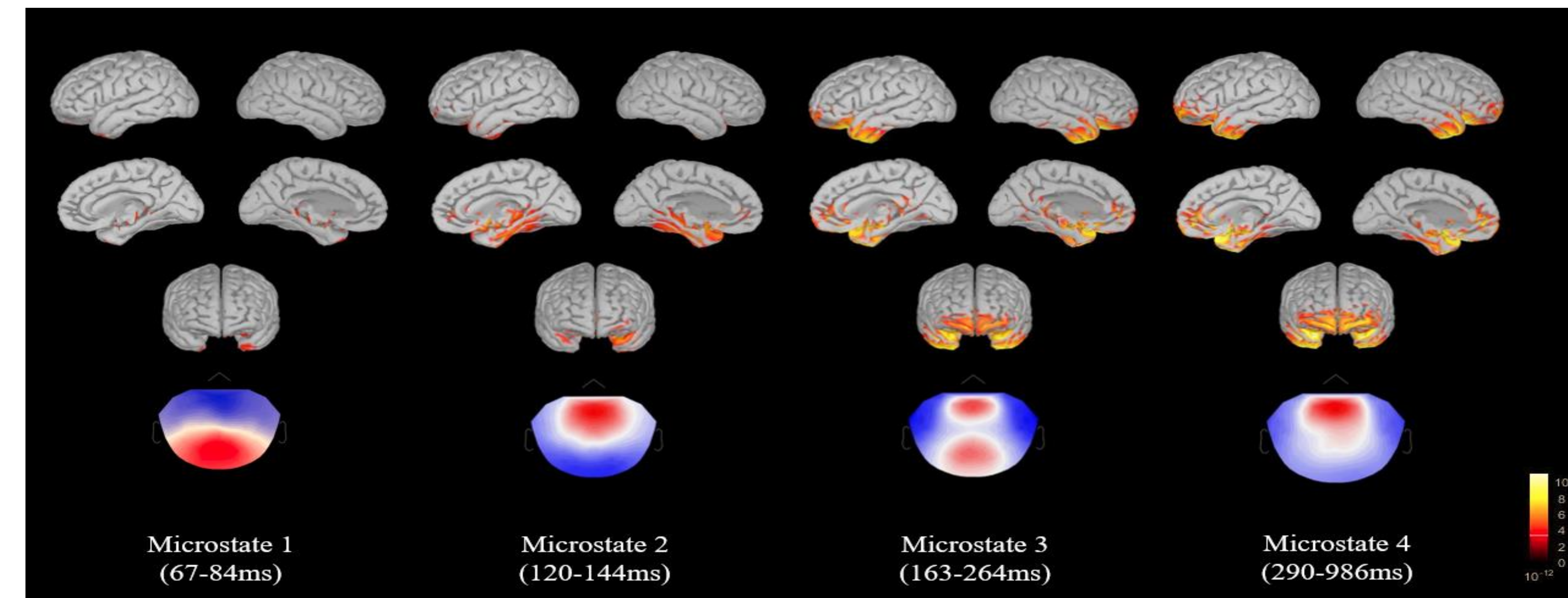
METHODS

- **Participants:** 20 pre-menopausal (PREM) and 10 post-menopausal (POSTM) female patients who met the DSM-IV TR criteria for HSDD[3] were given a series of stimuli and were asked to choose if they felt desire for the image (Desire Intention Task; DIT)

- **Data Collection:** Electroencephalogram (EEG) was recorded with a 128 AgCl carbon-fiber coated electrodes. Behavioral ERP responses were recorded with E-Prime software (Psychology Software Tools Inc., Sharpsburg, PA, USA)

- **Data Analysis:** EEG were preprocessed and manually examined for artifacts in the EEGLAB software (version 13.1.1; Arnauld Delorme and Scott Makeig, UCSD). Microstates were measured by between-group analysis of PREM and POSTM using Chicago Electrical Neuroimaging Analysis (CENA) via Brainstorm in MATLAB.

RESULTS

1. Spatio-temporal Imaging and Evoked Brain Microstate: Microstates were measured with their activations maximally thresholded to 11×10^{-12} pA/m. The between-group analysis of PREM and POSTM revealed two common microstates (State 1 and 2) and three discrete microstates (PREM, State 3 and 4; POSTM, State 4).

2. For PREM (n=20): Two common and two discrete microstates were measured from EEG times series based on CENA. PREM had an additional microstate (State 4) compared to POSTM. Mean and standard deviation (SD) of graded field power (GFP)* of each microstate are listed below.

Microstate 1 (67-84ms) Microstate 2 (120-144ms) Microstate 3 (163-264ms) Microstate 4 (290-986ms)

GFP Microstate:	State 1	State 2	State 3	State 4
Mean (μV)	1.84	3.44	2.01	2.66
SD (μV)	0.10	0.39	0.18	0.27

3. For POSTM (n=10): Two common and one discrete microstates were measured by the method above.

Microstate 1 (71-87ms) Microstate 2 (128-151ms) Microstate 3 (171-986ms)
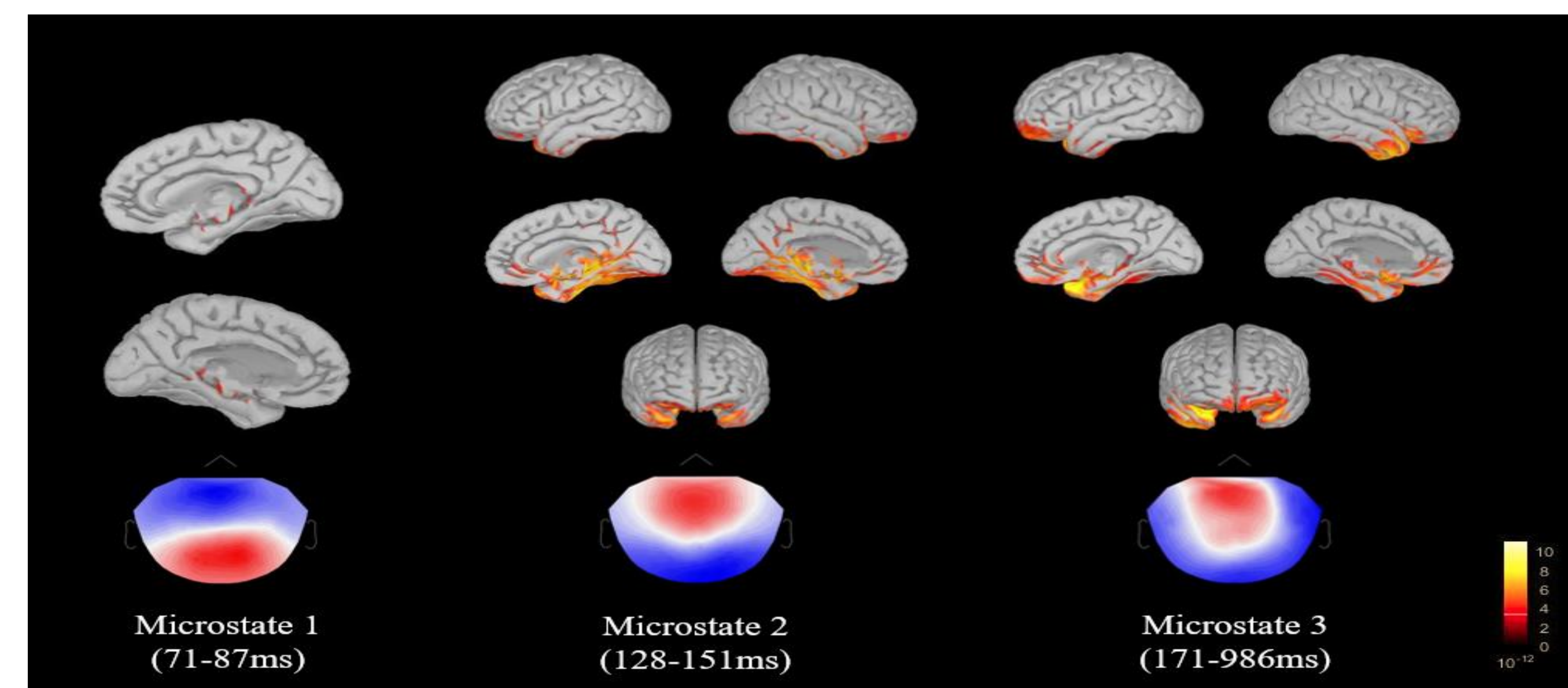
GFP Microstate:	State 1	State 2	State 3
Mean (μV)	1.84	3.44	2.35
SD (μV)	0.10	0.39	0.32

*In our study, GFP is calculated as to represent the peak amplitude intensity of a specific microstate.

METHODS – Continued

- **Data Analysis:** Activated brain regions of microstates were reconstructed into 3D spatiotemporal image by standardized low-resolution electromagnetic tomography (sLORETA) and further analyzed with power spectral analysis and Freesurfer's Desikan-Killiany atlas.

DISCUSSION

- Both groups showed higher activations in superior temporal gyrus (self-other mental association) and fusiform gyrus (face and body processing), consistent to the previous study.[4]

- Results show PREM has an additional microstate and is closely associated with prefrontal cortex and bilateral temporal lobes.

- Conversely, POSTM lacked extra microstate that is highly involved with prefrontal cortex and showed distributed activation across occipital, temporal, and parietal lobe.

- Therefore, our results suggest that PREM patients tend to overthink about their sexual desire and associated decisions more than POSTM.

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ACKNOWLEDGEMENTS