Insomnia Disorder and Sleep State Misperception: Electrophysiological and Behavioral Correlates

E. Fasiello (1,2); A. Galbiati (1,3); M. Gorgoni (2); M. Sforza (3); F. Berra (1,3); S. Scarpelli (2); V. Alfonsi (2); L. Annarumma (4); F. Casoni (3); M. Zucconi (3); V. Castronovo (3); L. Ferini-Strambi (1,3); L. De Gennaro (2,4)

(1)Vita-Salute San Raffaele University, Faculty of Psychology, Milan, Italy; (2) Sapienza University of Rome, Department of Psychology, Rome, Italy; (3) San Raffaele Scientific Institute, Department of Clinical Neurosciences and Department of Neurology, Sleep Disorders Center, Milan, Italy; (4) IRCCS Fondazione Santa Lucia, Body and Action Lab, Rome, Italy

INTRODUCTION

Insomnia Disorder (ID) is described as a subjective sleep disorder defined by diurnal and nocturnal symptoms [1]. A crucial ID feature is the Sleep State Misperception (SSM): the tendency of ID patients to underestimate sleep periods and overestimate wake periods during the night, causing a mismatch between objective and subjective sleep indices [2]. The present study aims to explore electrophysiological and behavioral aspects that characterize SSM in ID, providing a unitary framework that explains this fascinating phenomenon.

METHOD

Twenty IDs (mean age 43.5±12.7; 7M /13F) and 20 Healthy Controls (HC; mean age 41.0±11.5; 8M/12F) underwent a night of PSG (19 EEG cortical channels). Upon awakening, self-reported parameters were collected using sleep diaries to assess two indices of SSM: 1) Sleep Latency misperception (SLm) evaluating SSM during the Sleep Onset (SO); and Total Sleep Time misperception (TSTm) considering the SSM during the total sleep. Moreover, the morning following the PSG recording, all participants completed a Time Estimation Abilities (TEAs) task.

RESULTS

The mixed-ANOVA analysis showed an effect of the ID diagnosis on the task performances [$F_{(3, 21)}=2.03$, $p=.004$, $\eta2=.008$], revealing that ID patients made higher errors in TEAs compared to HCs.

Electrophysiological results indicated a strong and significant association between the SSM degree and the Delta/Beta ratio index during the SO and NREM sleep in all-scalp derivations in both groups. Specifically, the higher SLm during the SO, and the higher TSTm during NREM sleep, were related to lower levels of Delta/Beta ratio index (Figure 1 and 2).
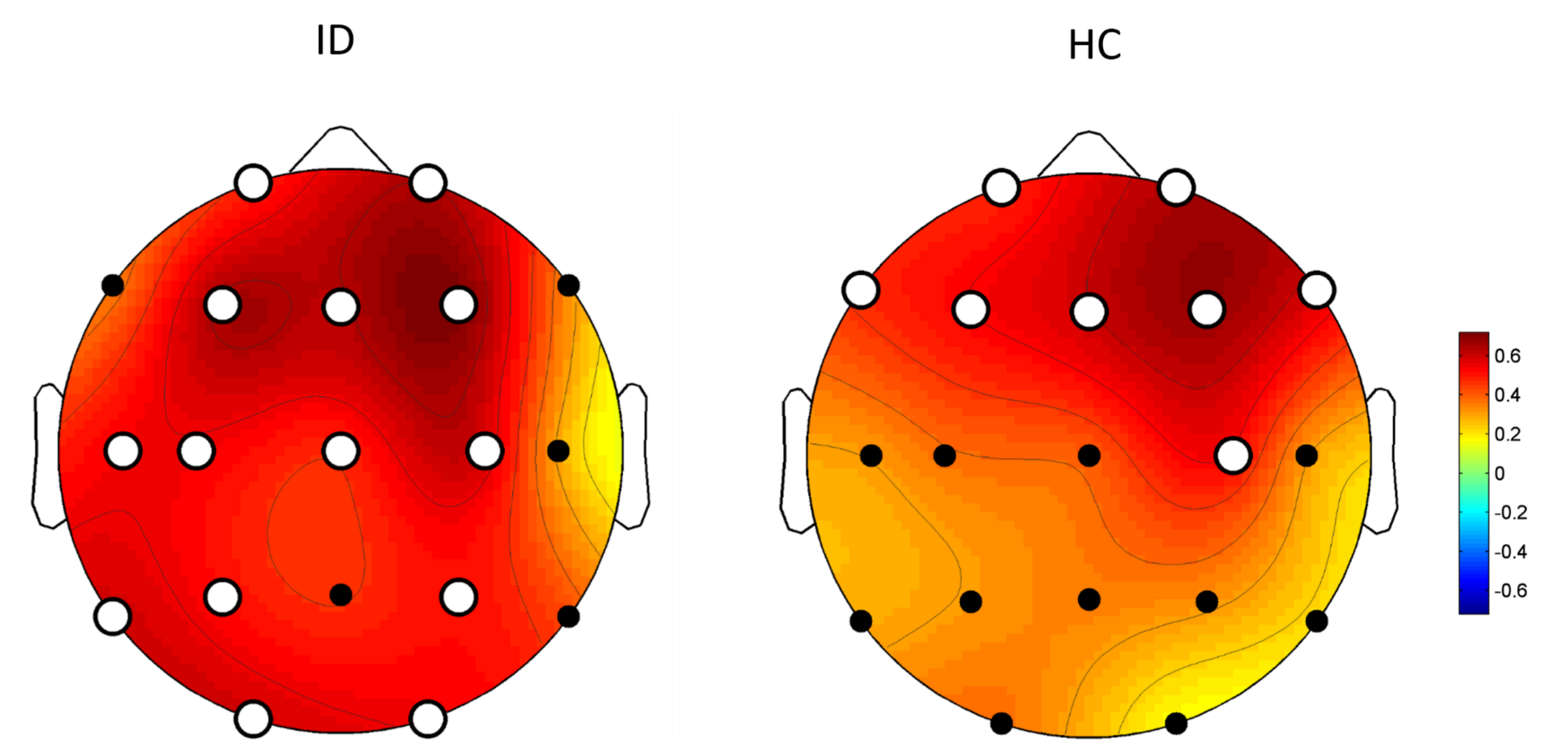

Figure 1. *Topographical distribution of correlation values (p<.05) between SLm index and Delta/Beta ratio during the SO. Values are expressed in terms of rho values: positive rho values indicate the presence of a positive correlation and vice versa. Correlations did not survive to False Discovery Rate (FDR) corrections.*
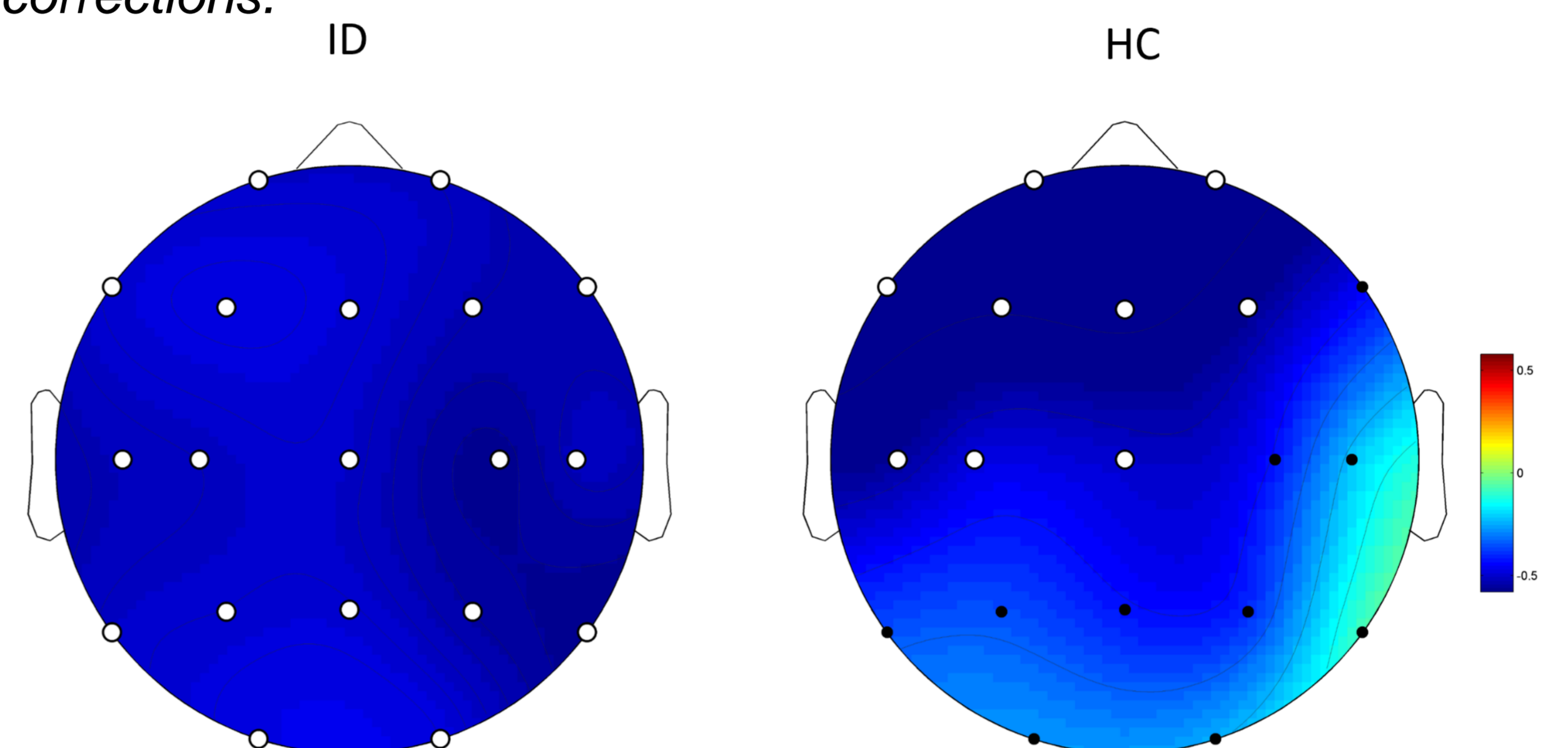

Figure 2. *Topographical distribution of correlation values between TSTm index and Delta/Beta ratio during NREM sleep. Values are expressed in terms of rho values: positive rho values indicate the presence of a positive correlation and vice versa. Alpha level was adjusted to .034 after FDR correction.*

CONCLUSION

The main results of the study is the significant and robust relationship between Delta/Beta ratio and indices of SSM. This finding highlights that the SSM in IDs and HCs is strongly related to the higher and diffuse cortical arousal levels. Moreover, ID patients showed impaired TEAs during the wake reporting higher error rates than HC.

The present study delineated the coexistence of electrophysiological and behavioral factors underlying the SSM in ID.

REFERENCES

[1] American Academy of Sleep Medicine (2014) International classification of sleep disorders (3rd ed.), Darien, IL: AASM

[2] Edinger, J.D., Krystal, A.D. (2003) Subtyping primary insomnia: is sleep state misperception a distinct clinical entity? Sleep Med Rev, 7(3), 203-214

CONTACT

E-mail: elisabettafasiello91@gmail.com; luigi.degennaro@uniroma1.it
Sito web: https://laboratoriosonno.wixsite.com/laboratoriosonno

https://esleepeurope.eu/