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Name of Student:
Adriana Cardoso Martins da Silva

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Frequency analysis of cortical connectivity by functional magnetic resonance.

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Mark:
Very Good

Jury:
President: Professor J. Alexandre Ribeiro (FMUL)
Orientator: Professor Alexandre Andrade (FCUL)
Co-Orientator: Professor Teresa Paiva (FMUL)
Jury Members: Professor Patrícia Figueiredo (ISTUTL)

ISTUTL – Higher Technical Institute of the Technical University of Lisbon

ABSTRACT

Understanding brain functional connectivity is essential to the understanding of neural function. Functional Magnetic Resonance Imaging (fMRI) studies in the human brain have been suggesting that low frequency fluctuations of BOLD (Blood Oxygen Level Dependent) signal acquired during resting states correspond to functionally relevant resting networks.
In the present study we intend to analyse the behaviour of spatially different resting state neural networks in 3 bands of the low frequency spectrum [0.000-0.025; 0.025-0.050; 0.050-0.075]Hz. The adopted methodology is based on coherence analysis of time series extracted from BOLD signal in fMRI. Fast acquisition schemes were applied during rest in two different groups of subjects. The strategies for obtaining resting state networks were different between the groups. In particular, it was based on correlation analysis and probabilistic independent component analysis (PICA), respectively.
The majority of articles on this subject do not address much relevance to the methodological aspects. Here we discussed several parameters that influence the application of Welch modified periodogram in order to improve both frequency resolution and statistical significance of spectral estimators. In addition, it was also implemented an extension of the“difference of coherence test” for the individual analysis of coherence values and Wilcoxon statistics for the analysis of coherence values between the three different frequency bands.
Results indicated inter-subject variability with regards to the dominant frequency band.
On the other hand, intra-subject analysis revealed a general consistency in the dominant frequency band between the several different resting state networks. Considering that each method applied to the extraction of resting state networks has specific characteristics, the focus of analysis should be on the reproducibility and similarity of intra-subject results after the application of different processing strategies. In this perspective, the coherence analysis applied in this study may constitute a relevant tool of analysis.

Keywords: fMRI; Connectivity; Coherence; Probabilistic analysis of independent components; Resting state networks.