

## Characterization of brain functioning in vascular cognitive impairment with EEG and MEG: systematic review

Lucia Torres-Simon

Universidad Complutense de Madrid, Spain



### Abstract

**Statement of the problem:** Vascular disease is the second most common cause of dementia after Alzheimer disease (AD). Nevertheless, the lack of consensus in concept definition, classification and diagnosis criteria in both research and clinical fields, difficulties consistent progress in early identification and treatment. Consequently, the establishment of unified subgroups and diagnosis criteria is a crucially important clinic, scientific and social goal. With this purpose, international research groups have invested a great deal of resources to reach a consensus, setting down neuropsychological and neuroimaging (i.e. MRI, CT) protocols for the diagnosis of vascular cognitive impairment (VCI). However, these studies have not found enough harmony and consistency, for neurophysiological techniques such as electroencephalography (EEG) or magnetoencephalography (MEG), to include them as diagnostic criteria.

The purpose of this study is to identify neurophysiological brain patterns for different subtypes of VCI, either mild or major, also called vascular dementia (VaD) according to VICCCS-1 (Figure 1).

**Methodology & Theoretical Orientation:** a systematic search from 2000 in PubMed, Chrocane, Web of Science and PsycInfo databases for physiological patterns, with EEG and/or MEG, findings in VCI subtypes was performed. Chrocane screening and data extraction tool (COVIDENCE) was used for peer-review and risk of bias assessment.

**Findings:** Significant differences between VCI patients and healthy control were found in spectral, connectivity and evoked potential brain signal analysis. Also, significant neurophysiological discriminatory information between VCI and AD is reported, even in early stages.

**Conclusion & Significance:** After this review it could be conclude that EEG could provide relevant discriminatory information between VCI or VaD and healthy control or AD. However, further research is needed to get reliable data to introduce neurophysiological features as clinical diagnostic criteria, trying to discriminate and classify VCI subtypes. Based on the present review, we suggest that future VCI research take into consideration 1) operate with homogeneous criteria established in updated international consensus; 2) emphasize MEG based studies due to its more accurate space resolution combined with other neuroimaging tools.

### Biography

Lucia Torres-Simon has her bachelor's in psychology. She has two master's degrees concerning neuropsychological evaluation and rehabilitation of brain/cognitive damage, and neuroimaging tools analysis and applications. She has passion in understanding impaired brain functioning and mechanisms of rehabilitation. She is developing deep knowledge about cerebrovascular disease in her doctoral studies, trying to shed light on the neurophysiological characterization of different subtypes of vascular cognitive impairment.



### Publications

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