H.F.R.I.
Hellenic Foundation for Research & Innovation

Description of the funded research project
1st Call for H.F.R.I. Research Projects to Support Faculty Members & Researchers and Procure High-Value Research Equipment

Title of the research project: Language recovery and brain reorganization in post-stroke aphasia

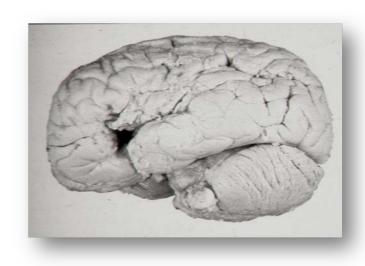**Principal Investigator: Constantin Potagas, Associate Professor of Neurology and Neuropsychology**

Reader-friendly title: Brain mechanisms of aphasia recovery

Scientific Area: Social Sciences (Psychology and Cognitive Sciences)

Institution and Country: National and Kapodistrian University of Athens, Greece

Host Institution: National and Kapodistrian University of Athens, School of Health Science, Department of Medicine

Project webpage: www.labra.nldu.gr *(under construction)*

Budget: 122.238 euros

Duration: 36 months

H.F.R.I.
Hellenic Foundation for
Research & Innovation

Research Project Synopsis

Aphasia has been traditionally defined as an impairment affecting language functions, following brain lesions in the left perisylvian network. However, there is strong evidence indicating that other cognitive domains –possibly underlying language, such as memory and attention, are also disrupted, having a general impact in patients' ability to communicate effectively. Consequently, the symptomatology of aphasia, as well as recovery from language deficits should be investigated in a broader spectrum, in the sense that other cognitive domains should be taken into consideration. On the other hand, the importance and need of an integrated approach to aphasia recovery is emphasized by recent studies aiming to examine neural mechanisms underlying the recovery process and define the possible role of brain's structural and functional changes during post-stroke period. In this framework, several researchers highlight the involvement of the contralesional hemisphere in recovery. We therefore designed a longitudinal study utilizing several neuroimaging and psychometric tools, which could shed light to aphasia recovery, its dependence on other cognitive domains, as well as the neurobiological substrate of the overall process during the early stages (up to six months post onset) of the post-stroke period. The aim of this study is threefold: First, to assess recovery of cognitive and language functions within the first six months post stroke in aphasia. Second, to investigate possible indices of brain reorganization related to recovery. Third, to investigate possible prognostic factors of recovery.

Project originality

Current research proposal is characterized of high-level novelty regarding aphasia investigation approach, as well as the methodological procedures in both imaging data analysis and cognitive assessment. Longitudinal studies, investigating lesion correlates, anatomical variables of the contralateral healthy hemisphere, and language as well as cognitive skills, with large aphasic samples have yet to be conducted. Additionally, possible reorganization, whether it occurs in the affected or the contralesional hemisphere has not thus far been elucidated. The existing controversies regarding the role of both lesioned and intact hemispheres in the process of language recovery after a stroke indicate the need to conduct more well-designed studies, merging information related to the structure and function of the brain, along with the observed deficits. Contemporary findings are sparse, usually derived from small-scale studies, focusing on the analysis and interpretation of either language or imaging data. On the other hand, anatomical studies focus mostly on lesion characteristics, of the ipsilesional hemisphere, while functional studies are only conducted in relation to therapy. Hence, the role of the right hemisphere (RH) in recovery from aphasia is far from understood.

In addition, no similar study, combining the analysis of imaging and behavioural data (of not only language but also cognitive assessment) in two different chronic post-stroke phases has been conducted in Greek population. A longitudinal approach combining different methodologies in structural and functional imaging data analysis can explore the association between ipsi- but also contra-lesional anatomical variables and language/cognitive measures during aphasia recovery.

Expected results & Research Project Impact

The importance of neuroimaging studies in the effort to understand the underlying mechanisms of the language network's reorganization after a focal lesion, is well established among clinical researchers in the broader field of cognitive neuroscience. Furthermore, exploring the relationship between fundamental processing skills and important language components, as well as the value of the former as prognostic factors of post-stroke language recovery, can clarify the suggested overlapping between language and other cognitive abilities. The necessity of longitudinal group studies is stressed by many scholars who argue that larger patient samples and more detailed behavioral and lesion characterization could elucidate the relationship between neuronal reorganization and recovery in chronic aphasic individuals. Finally, the emerging consensus among researchers is that such neuroimaging-based outcomes regarding language recovery may be of great importance for the design of effective therapeutic strategies and consequent implementation of successful intervention programs.

Continuous efforts to learn more about recovery patterns characterising stroke-related language deficits are clearly justified. Post-stroke aphasia is presented to be a frequent condition and is related with multifaceted poor outcomes in cognitive and mobility domains, along with greater use of rehabilitation services and increased cost of care. Consequently, increasing knowledge on the neural mechanisms of aphasia recovery is a constant preoccupation for clinicians and researchers in order to identify more reliable predictors of recovery and to design better strategies for effective rehabilitation in therapy approach. In addition, studies highlighting the impact of aphasia on the patients' quality of life, further stress the importance to address individual needs in order to increase long-term outcomes. In conclusion, the current research project consists of a systematic and of low risk but in the same time of high-quality study of the possible neural mechanisms and cognitive processes underlying recovery of post-stroke aphasia, with an impact in both theoretical and applied scientific knowledge.

The importance of this funding

The present study poses high requirements, since it involves several different subgoals, which will be accomplished by an integrated analysis of imaging and behavioral data. Its success depends on a detailed and accurate design and the effective implementation of contemporary methodologies derived from several scientific fields, such as neurology, neuropsychology, statistics, neuroimaging, within a multidisciplinary framework. This project can only be actualized on the basis of the commitment and dedication of the researchers of the team and the guidance of the principal investigator. Having said that, the actualization of such a demanding project would not be feasible without the financial support of the Hellenic Foundation for Research and Innovation, which allowed our group to be fully dedicated to our scientific goals and focus on the research process, aiming to eventually promote knowledge in a rather broad, multidisciplinary field, with implications for clinical practice and impact on the well-being of patients.

H.F.R.I.
Hellenic Foundation for
Research & Innovation

COMMUNICATION

185 Syggrou Ave. & 2 Sardeon St. 2
171 21, N. Smyrni, Greece
+30 210 64 12 410, 420
communication@elidek.gr
www.elidek.gr