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Introduction

Lesion size and location are often reported as the most reliable factors that predict severity of language impairment in persons with post-stroke aphasia[1,2]. Several studies have also found that demographic and health factors are related aphasia[3–7]. The extent to which these factors predict language impairment, beyond traditional cortical measures, remains unknown. Identifying and understanding the contributions of factors to predictive models of severity constitutes critical knowledge for clinicians interested in charting the likely course of aphasia in their patients and designing effective treatment approaches in light of those predictions.

Methods

Utilizing neuroimaging and language testing data from 224 individuals with chronic aphasia, we conducted a lesion symptom mapping analysis (LSM) to identify regions which predict overall aphasia severity scores. We used residual values from a linear model between severity and proportion damage to these critical regions as the dependent factor in three models: 1) Demographic Model; 2) Health Model; and 3) Overall Model.

Results

Two regions were identified to be associated with aphasia severity: left posterior insula and left superior longitudinal fasciculus. The Demographic Model revealed cognitive reserve and time post-stroke as significant predictors of severity ($p = 0.004$; $p = 0.03$), and the Health Model found that the extent of periventricular hyperintensities was associated with severity ($p = 0.01$). An interaction between presence of diabetes and exercise frequency was also found ($p = 0.04$), indicating that those with comorbid diabetes who exercise more had less severe aphasia than those who do not exercise. Finally, the Overall Model showed a relationship between aphasia severity and time post-stroke ($p = 0.02$), periventricular hyperintensities ($p = 0.001$), and a significant interaction between diabetes and exercise frequency post-stroke ($p = 0.03$).

Summary

Results from this study add to the growing literature suggesting demographic variables can shed light on individual differences in aphasia severity beyond lesion profile. Additionally, our results emphasize the importance of cognitive reserve and brain health in aphasia recovery.

References

1. Plowman E, Hentz B, Ellis C. Post-stroke aphasia prognosis: A review of patient-related and stroke-related factors. J. Eval. Clin. Pract. 2012;18.
2. Mazzoni M, Vista M, Pardossi L, Avila L, Bianchi F, Moretti P. Spontaneous evolution of aphasia after ischaemic stroke. *Aphasiology* [Internet]. 1992;6:387–396. Available from: https://doi.org/10.1080/02687039208248609
3. Basilakos A, Stark BC, Johnson L, Rorden C, Yourganov G, Bonilha L, Fridriksson J. Leukoaraiosis Is Associated With a Decline in Language Abilities in Chronic Aphasia. *Neurorehabil. Neural Repair*. 2019;33.
4. Johnson L, Basilakos A, Yourganov G, Cai B, Bonilha L, Rorden C, Fridriksson J. Progression of Aphasia Severity in the Chronic Stages of Stroke. *Am. J. Speech-Language Pathol.* [Internet]. 2019;Available from: https://doi.org/10.1044/2018_AJSLP-18-0123
5. Kertesz A, Sheppard A. The Epidemiology of Aphasic and Cognitive Impairment in Stroke: Age, Sex, Aphasia Type, and Laterality Differences. *Brain* [Internet]. 1981;104:117–128. Available from: https://doi.org/10.1093/brain/104.1.117
6. Watila MM, Balarabe B. Factors predicting post-stroke aphasia recovery. *J. Neurol. Sci.* [Internet]. 2015;352:12–18. Available from: http://dx.doi.org/10.1016/j.jns.2015.03.020
7. González-Fernández M, Davis C, Molitoris JJ, Newhart M, Leigh R, Hillis AE. Formal Education, Socioeconomic Status, and the Severity of Aphasia After Stroke. *Arch. Phys. Med. Rehabil.* [Internet]. 2011;92:1809–1813. Available from: https://doi.org/10.1016/j.apmr.2011.05.026