The Auditory Processing of Persian Plural Markers: An fMRI Pilot Study of Brain Activation

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Abstract

Understanding which brain regions are involved in morphosyntax is a key question in neurolinguistics. Such an inquiry helps identify certain neural activation patterns and clarifies the mechanisms underlying features that may vary across languages/language families. These insights are critical for clinical applications, including rehabilitation and neural assessment. This pilot study investigates the brain regions activated during the auditory processing of Persian plural suffixes (-hɑ/-ɑn) in simple and non-simple nouns, using fMRI. The study involved 12 healthy, right-handed native Persian speakers with an average age of 32 years. The subjects are asked to listen to a block-design task, including 12 auditory-only stimuli, each lasting 20 seconds, with a 5-second rest between them. The distribution of the target words in each block was randomized, and they were presented in the same order for all participants. The structural images were obtained using a 3D T1-MPRAGE sequence, and the functional images were acquired using EPI. The analysis was performed using FLA and SLA. The results indicated that the activated regions in simple nouns corresponded to motor areas, in derivation nouns to complex language processing areas, and in compound nouns to areas associated with emotional and cognitive functions. The processing of data related to derivation and compound nouns was observed across widespread brain regions, encompassing both language-processing regions and memory-related areas, the amygdala and hippocampus. Furthermore, this study demonstrates that Persian plural suffixes lead to extensive activation and an increase in z-score. These changes are more prominent in areas associated with cognitive and language processing.

Keywords: fMRI, Plural marker, Brain regions, Noun, Inflectional suffix

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