

Comparison of Resting-State Brain Activation between Healthy Normal and Low Auditory-Verbal Working Memory Capacity Participants

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Abstract Working memory (WM) capacity is the ability to maintain attention and store information briefly in the mind. However, each individual has a limited WM capacity that varies from one person to another. An individual can be categorized as having either normal or low WM capacity. This study aimed to evaluate and compare brain activations of healthy individuals with low and normal auditory-verbal WM capacity. A total of 39 healthy male young adults were recruited from local universities for this study. They were categorized into the normal and low auditory-verbal WM capacity group based on their score in the Malay Version of Auditory Verbal Learning Test (MVAVLT). All participants underwent resting-state functional magnetic resonance imaging (rs-fMRI) scans. The functional data were analyzed using Statistical Parametric Mapping (SPM) and Wake Forest University (WFU) Pickatlas softwares. Brain activations and resting-state amplitude fluctuation (RsAF) were contrasted between groups to determine whether there were any significant differences caused by the different auditory-verbal WM capacity. The findings indicated that the low auditory-verbal WM capacity group showed significantly higher cortical activations in the left lingual gyrus, bilateral middle temporal gyrus, left calcarine, left superior frontal gyrus, and left precuneus as compared to normal auditory-verbal WM capacity group. It is suggested that the higher activation of these brain areas in low verbal-auditory WM capacity participants was attributed to the lower neural adaptability of the brain at rest.

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Introduction

Working memory (WM) is defined as the cognitive ability to temporarily maintain and manipulate information [1]. The WM is crucial when performing tasks involving higher cognitive functions. The central executive is the key component of WM and controls one's attention level [2]. Under the central executive,