

Cortical activation during power grip task with pneumatic pressure gauge: an fMRI study

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Abstract. Aging is associated with a decline in cognitive and motor function. But, the relationships with motor performance are less well understood. In this study, functional magnetic resonance imaging (fMRI) was used to assess cortical activation in older adults. This study employed power grip task that utilised block paradigm consisted of alternate 30s rest and active. A visual cue was used to pace the hand grip movement that clenched a cylindrical rubber bulb connected with pressure pneumatic gauge that measure the pressure (Psi). The objective of this study is determined the brain areas activated during motor task and the correlation between percentage signal change of each motor area (BA 4 and 6) and hand grip pressure. Result showed there was a significant difference in mean percentage signal change in BA 4 and BA 6 in both hemispheres and negative correlation obtained in BA 4 and BA 6. These results indicate that a reduced ability in the motor networks contribute to age-related decline in motor performance.

1. Introduction

Decline in cognitive and motor function of older adults is pointed as the reasons for a range of neurodegenerative and neurochemical changes with advancing age [1, 2]. Functional magnetic resonance (fMRI) is one of the approaches that has been used to map age-related changes [4, 5]. Previous studies depicted that the regions of motor area activation on studying the movements of normal right and left fingers via finger tapping stimulation were shown in the primary motor cortex [6, 7, 8]. In a published article of Cortical Activity in Precision-Versus Power-Grip Tasks which utilised auditory cues, power-grip task in right handed 5 young and healthy subjects were associated with stronger activity in the contralateral primary motor cortex (M1), primary sensory cortex (SI) and parietal operculum (PO) than in the precision-grip task [9]. However in this current study, power-grip task was employed which utilised visual cues instead of auditory cues in 14 older adult male and female subjects to identify brain areas activated in older adults while subjects were performing power-grip task.

One of the methods to map functioning human brain is blood oxygenation level dependent (BOLD) which relies on the magnetic properties of blood to measure the changes in local hemodynamic related to neuronal activity [10]. Hence, in finding the activation in motor regions in this fMRI experiment, BOLD contrast was utilised in this study because of its non-invasive nature and it proved to identify

