

Enhanced functional connectivity and increased gray matter volume of insula related to action video game playing

With the support by the National Natural Science Foundation of China and the Ministry of Science and Technology of China, Prof. Yao Dezhong's group at the Key Laboratory For NeuroInformation of Ministry of Education, School of Life Science and Technology, University of Electronic Science and Technology of China, reported enhanced functional connectivity (FC) and increased gray matter volume (GMV) of insula related to action video game (AVG) playing, which was published in *Scientific Reports* (2015, 5: 9763).

Comparing 27 AVG experts and 30 amateurs, we found that AVG experts had significantly enhanced FC between insular subregions with a stronger anterior-posterior integration in a left-lateralization pattern (Figure 1). Furthermore, AVG experts had significantly increased GMV in the left insula (Figure 2). More importantly, in AVG experts, the regions of interest (ROI) in the posterior insula were associated with the bilateral middle frontal gyrus (MFG), which is widely accepted as a key node in the attentional network (Figure 3). In addition, AVG experts had enhanced FC within the attentional and sensorimotor networks. These enhancements may be due to the fact that AVG is similar to conventional sports (e.g., basketball, tennis) that require a high level of attention and hand-eye coordination. In general, the results suggested that AVG might be a valuable intervention tool for mental and brain deficits, such as Attention Deficit Hyperactivity Disorder, Alzheimer, Stroke, and Brain tumor.

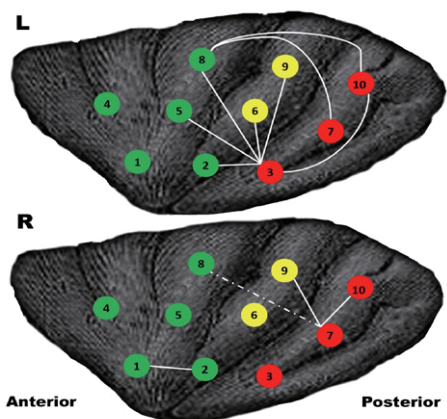


Figure 1 Enhanced FC of the insular subregions (white lines).

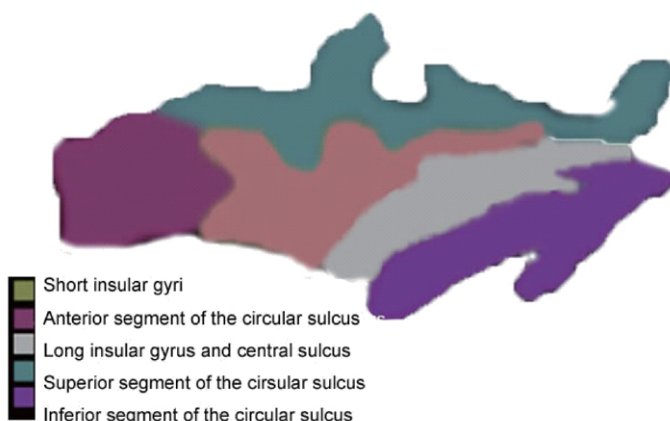


Figure 2 Increased GMV in insular subregion (white color region).

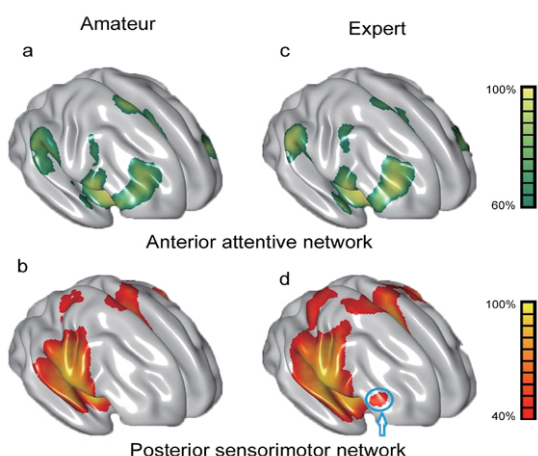


Figure 3 Enhanced functional networks (color bar and blue circle).

Enhanced FC of the insular subregions: The white lines denote the pathways where experts had significant enhancements compared with amateurs. ROIs 1, 2, 4, 5 and 8 (green) were located in the anterior subregions. ROIs 3, 7 and 10 (red) were located in the posterior subregions. ROIs 6 and 9 (yellow) were located in the transitional subregions.

Increased GMV in insular subregion: The white area denote the long insular gyrus and central sulcus.

Enhanced functional networks: Colours ranging from green to yellow or red to yellow indicate increasing spatial consistency (40% value = activated 40% subjects). The blue circle indicates the MFG, which is believed to be a key node in the anterior attentive network, identified in the posterior sensorimotor networks of experts.