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Motor Functional Connectivity Analysis of Brain Control Network on High Level Athletes with fMRI Research

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Objective The nervous system is the control center that performs the function of the human body, including each nucleus of the cerebral cortex and basal ganglia, which can control the motion of the body through three pathways-direct pathway, indirect pathway and hyperdirect pathway. Long-term physical exercise can effectively improve the human respiratory and circulatory system function indicators and promote the development of nervous system. In order to discuss the mechanisms of the high level athletes' control of the brain function network and provide the experimental basis for the study of the motor control of the central nervous system, this research collects the activation images of the cortex and basal ganglia nuclei of the ordinary college students and the high level athletes and analyzes the function connection coefficient between the groups.

Methods The subjects were 15 high level athletes and 15 ordinary college students. The changes of the brain structure and DTI fiber in the state of quiet and fatigue were collected by the functional magnetic resonance imaging (fMRI). Matlab software was used to compare images and data and to calculate the correlation coefficient between the related nuclear groups.

Results (1) Compared with ordinary college students, the functional connectivity coefficient between the left thalamus and the left hippocampus is different in high level athletes ($P < 0.05$). (2) The high level athletes' functional connectivity in the left premotor area-right premotor area, left premotor area-right striatum, right premotor area-left central buckle in supplementary motor area, right premotor area-right central buckle in supplementary motor area, right premotor area-right striatum and right premotor area-left cerebellum were changed significantly after exercise fatigue ($P < 0.05$).

Conclusions The plasticity of brain function can be affected by long-term exercise training, which depends on sport training level. After exercise fatigue, the network connection system and nerve projection density change between cortical and subcortical nuclei, suggesting that exercise fatigue will change the functional connection between parts of the brain. (NSFC: 31401018 SKXJX2014014).