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Research on the influence of Taijiquan on College Students' inhibition control based on fNIRS Technology †

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1. Introduction

Taijiquan originated in China and is popular in the world. It combines dynamic and static, has a degree of relaxation, combines with action, consciousness and breathing, focuses on action, actively controls and eliminates distractions, so as to achieve the effect of fitness and health. In view of the rare research on the inhibitory control effect and brain mechanism of Taijiquan, this study used near infrared brain imaging (fNIRS) technology to study the effect and mechanism of 20 week Taijiquan exercise intervention on inhibitory control of college students. This study hypothesized that Taijiquan can improve the inhibitory control function of college students, and the improvement benefit is related to the neural activation of prefrontal cortex.

2. Methods

60 college students, aged 21.02 ± 2.11, were selected as experimental subjects, 30 in Taijiquan intervention group and 30 in control group. Independent variable 1 is the experimental conditions, including intervention group and control group; Independent variable 2 is the test order, including pre-test and post test.

Dependent variables were Stroop task response time and fNIRS oxygenated hemoglobin changes with consistent and inconsistent conditions. The intervention group exercised intensively three times a week for 15 weeks, 45 minutes each time. Moderate intensity exercise, heart rate 80-100 times / minute.Wear polar heart rate meter.The control group did not change according to the original lifestyle. Test the subject Stroop effect. When the subject reacts to the color of Chinese characters but ignores the meaning of Chinese characters, the consistency condition is that the color of Chinese characters is consistent with the meaning, and the inconsistency condition is that the color of Chinese characters is inconsistent with the meaning. Under inconsistent conditions, the judgment speed of subjects decreased and the error rate increased. Fnris technology used nirport system to monitor the changes of prefrontal oxygenated hemoglobin during Stroop task test. FNIRS data analysis: considering the noise caused by head movement and breathing, exclude the components with frequency > 0.1Hz and frequency < 0.01Hz, record the changes of oxygenated hemoglobin when the subjects perform consistent and inconsistent tasks, analyze the oxygenated hemoglobin signal by SPSS statistics, and compare the oxygenated hemoglobin with the original by paired t-test β the significant difference channels were screened out by data analysis.

3. Results

*I*n Stroop consistent task, the concentration of oxygenated hemoglobin in nine channels in Taijiquan intervention group was significantly higher than that in control group, and there was significant difference between pre-test and post-test, t = 3.28, P = 0.037; The pre-test reaction time was 673.41 ± 168.09, which was greater than the post test reaction

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time 659.34 ± 151.06; There was no significant difference between pre-test and post test in the control group, t = 1.048, P = 0.339. In Stroop inconsistent task, the concentration of CH4 oxygenated hemoglobin in the intervention group increased, t = 3.509, P = 0.004, corresponding to the left dorsolateral prefrontal lobe. There was significant difference between pre-test and post-test in the intervention group, t = 3.78, P = 0.032; The pre-test reaction time was 814.68 ± 167.09, which was greater than the post test reaction time 768.32 ± 118.72; There was no significant difference between pre-test and post test in the control group, t = 0.906, P = 0.513.

4. Conclusion

The Stroop task behavior of college students has been significantly improved after 15 weeks of Taijiquan exercise, which has significantly enhanced the neural activation level of five brain regions under different conditions. The research results provide new thinking and scientific basis for Taijiquan to improve the inhibitory control function of college students.