

The Effect of Traditional Chinese Medicine “Qigong State” on EEG of College Students under the Anxiety State

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ABSTRACT

To investigate the effects of traditional Chinese medicine (TCM) “Qigong state” on the EEG of anxious college students, 72 college students were randomly divided into an experimental group and a control group. The experimental group underwent a 2-month TCM Qigong static exercise which the control group remained in its original state. This work firstly analyzed the EEG of the experimental group and the control group in different states, and then discussed the significance of “Qigong state”, finally found the students of the experimental group showed the advantage of θ wave and δ wave of EEG after the intervention of “Qigong state”; the EEG β wave occupied a clear advantage in the control group after sitting and resting; the difference in EEG between the experimental group and the control group was concentrated in the δ wave before and after the experiment; the approximate entropy index of the two groups of subjects showed an increasing trend compared with anxiety work after the experiment, but the experimental group was significantly higher than the control group. So the brain electrical activity in the “Qigong state” of TCM tends to be more synchronized, coordinated, and orderly, indicating that the regulating effect of “Qigong state” on the central nervous system is more significant than that of sitting-resting, which can promote the recovery of brain function.

Keywords: Traditional Chinese Medicine; “Qigong state”; EEG characteristic

1. INTRODUCTION

The health defined by WHO refers to the individual's well adaptation state in five aspects of physiology, psychology, reproduction, morality and society [1]. TCM “Qigong state” is playing an increasingly important role in maintaining people's health. “Qigong state” is a special state of Qigong exercise in TCM, which reflects entering the state of practice. It represents that the practitioner adopts a sitting or lying position, and enters a highly quiet, relaxed and comfortable state when the mind is concentrated and conscious remained wake [2,3]. Many studies have shown that TCM Qigong exercises can regulate the central and autonomic nerves, and there are positive changes in the exerciser's EEG during the exercise. In order to observe the influence of TCM “Qigong state” on EEG, 72 college students were specially tested, and the results are reported as follows.

2. SUBJECTS AND METHODS

2.1. Subjects

Recruited 72 volunteers from Jiangxi University of TCM (No systematic experience in traditional martial arts and sports), Age 18-30 years old, no organic diseases and psychosomatic disease history. Randomly assigned them into the experimental group and control group, there is no significant difference between 2 groups of subjects in age, height and weight. The basic information of the subjects is shown in Table 1.

Table 1. Basic Information of Subjects

Subjects	N	Age	Height	Weight
Experimental Group	36	20.53±0.74	164.10±6.71	52.61±9.19
Control Group	36	20.61±0.69	164.53±6.55	54.33±9.50

2.2. Research Methods

Under the guidance of professional teachers with rich experience in Qigong practice and teaching, the students in the experimental group conduct Qigong exercises, 5 days per week for 2 months. On the practice day, perform static exercises with “Qigong state” music three times, 20 minutes each time, with an interval of 5 minutes. The control group does not do “Qigong state” exercises and maintain daily activities.

2.3. Testing Instruments and Analytical Systems

The 16-channel multi-lead physiology recorder of the United States Biopac company introduced by Beijing Pushengda Science and Trade Co. Ltd. was used for testing, and the MATLAB system was used for EEG data analysis.

2.4. Testing Methods

2.4.1. Electrodes Placed

The researchers first degreased and cleaned the area where the electrode was placed, and then installed the electrode according to the internationally standard lead 10-20 system (as shown in Figure 1). Place the electrodes on the left and right forehead, left and right center, left and right temporal and left and right occipital areas, and the reference electrodes on the left and right earlobes.

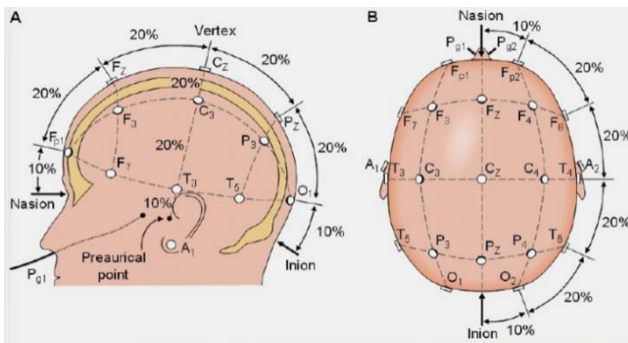


Figure 1. International Standard Lead 10-20 system electrode placement diagram

2.4.2. Testing Process

(1) Pretesting. Adjust the electrode cap according to the size of each subject's head to make it comfortable to wear, then let the subject relax around the body, sit on the backrest chair with eyes closed, try to keep the eyeballs immobile, stay awake, and then conduct an EEG test.

(2) In the test. Through the mobile game (Temple Escape), assign difficult tasks to the two groups. The challenge duration is 10 minutes, and the running distance of the

game role must be 100 million kilometers. After the game is over, conduct an EEG test.

(3) Post-testing. The experimental group closed their eyes and adjusted their minds to "go quiet", and the control group sat and rested for five minutes before conducting an EEG test.

2.5. Statistical Process

Using SPSS16.0 statistical software, based on statistical principles, analyzing the EEG result of pre-experiment, during the experiment and after experiment respectively. $p < 0.05$ indicates that the difference is significant while $p > 0.05$ indicates that it is not statistically significant.

3. RESULTS AND ANALYSES

3.1. Changes of EEG Power Spectrum

It can be seen from Figures 2, 3, and 4 that in terms of comparison within the group, the θ wave and δ wave of the EEG dominate after the Qigong exercise of the experimental group is compared with the post anxiety-work; After resting and compared with after anxiety work, β wave of EEG occupies a clear advantage, with a little θ wave and δ wave. After sitting and resting, in contrast, the subjects in the control group had a significant advantage in β wave with a few θ and δ wave compared with the anxiety-work state. In terms of comparison between groups, the difference in EEG between the experimental group and the control group before and after the experiment is concentrated in the δ wave, and the δ wave occurs more frequently in the experimental group.

In terms of within group comparisons, in this study, the θ wave and δ wave of the EEG dominate after the “Qigong state” in the experimental group is compared with the post-anxiety work, which shows that the subject is in deep Relaxed state, but seems to sleep rather than sleep. At this time, the concentration of thoughts and the emergence of aura, also verified the previous saying that the “Qigong state” is a third state different from the sleep state and the normal state; in the control group, compared with after anxiety work, the β wave of EEG occupies a clear advantage, with a little θ wave and δ wave, which prompts the subject to be nervous after anxiety task and it persisted. The subjects' concentration was distracted and concentrated on the external environment, but it decreased compared with the anxious work, but the trend was not obvious. In terms of comparison between groups, the difference in EEG between the experimental group and the control group before and after the experiment is concentrated in the delta wave. Conventionally, the δ wave occurs only when people sleep [4], but some studies have confirmed that through training Summoning the physical and mental sensation of the δ wave edge state is similar to sleeping. This confirms that the regulating effect of TCM

“Qigong state” on the central nervous system is more significant than the sitting-resting way

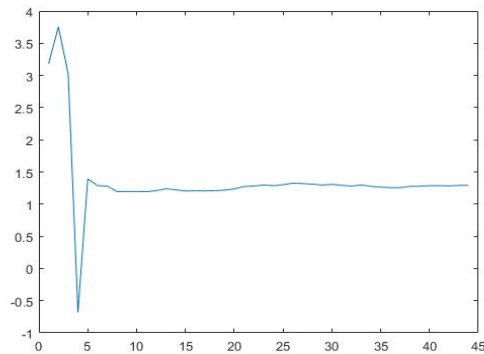


Figure 2. Power spectrum of experimental group before and after resting

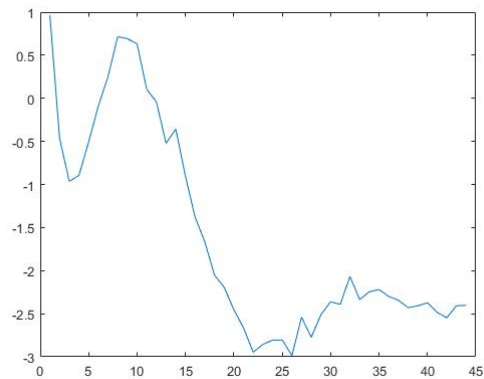


Figure 3. The power spectrum of the control group before and after static

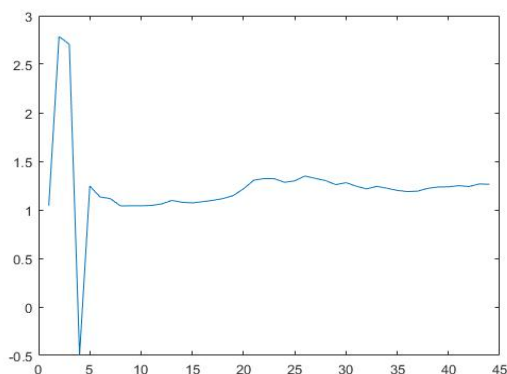


Figure 4. Comparison of the power spectrum between the test group and the control group before and after the experiment

3.2. EEG Approximate Entropy Change

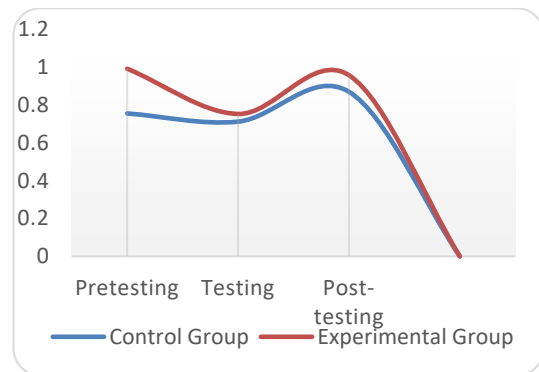


Figure 5. The Change of Approximate Entropy Mean Between Experimental Group and Control Group

It can be seen intuitively from Figure 5 that after challenging anxiety tasks, the average entropy values of the EEG of the experimental group and the control group are approximately equal. The approximate entropy index tended to increase compared with the anxiety task state, but the experimental group was significantly higher than the control group. In this study, the subjects of the experimental group pursued a quiet and beautiful state by coordinating with mind concentration, listening to sweet voices, or guiding words when entering the “Qigong state”. Those who are best in “Qigong state” can also have dream-like inspiration, which makes people happy. When the control group entering a sitting-resting, the subjects only relaxed the muscles of the body, and did not require the relaxation of mental emotions, so although the entropy value also increased, it was still not obvious compared with the experimental group.

4. SUMMARY

Qigong has a long history in TCM, and there are many types of exercises. Some of the exercises have been recommended by the General Administration of Sport of China for national fitness. From the fitness effect of exercise, entering the “Qigong state” is the key to the exercise effect. Therefore, “Qigong state” research is the research content of most researchers. As a non-invasive, low-cost, convenient and practical method of measuring the cognitive function of the brain, EEG is unanimously used by scholars at home and abroad as the first choice for Qigong research [5]. From a cognitive perspective, in EEG research, the larger the entropy value, the more relaxed the thinking, and the less mental activity; The smaller the entropy value, the higher the concentration of thinking, and the more active the thinking [6]. From a physics point of view, German physicist Rudolf Clausius first proposed that entropy represents the uniformity of any kind of energy distribution in space. The more uniform the energy distribution, the greater the entropy [7]. The principle of increasing entropy also shows that when the entropy value is maximum, the system reaches equilibrium. Therefore,

according to the greater increase in entropy of the experimental group, it can also be speculated that the body energy (including the perfusion volume of the body's cerebral blood vessels) of the subjects is more evenly distributed when enters a "Qigong state", and the thinking and emotional activities are more peaceful, and the body and mind are more unified. The changes of the approximate entropy mean of the two groups of subjects indicate that when going to the "Qigong state", the brain electrical activities of the subjects tend to be more synchronized, coordinated and orderly.

In this study, due to the small sample size, the population involved in the test object is relatively single, and the description of the α wave in the experimental results is insufficient, and further research is needed in the future.

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