

## LETTER TO THE EDITOR

## Analysis of Influencing Nerve Strength of the Players in Football Matches under the Ecological Cognition

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In the football match, the changes of the cerebral cortical nerve strength of the players have a significant impact on the athletes. The football players in the random Province of China is taken as the study objects. The short-term intensity load competition, continuous high-intensity competition and recalling competition are used to test the football players. The results show that in the short-term intensity load competition, short-term high-intensity training is beneficial to players to master and improve the level of sport skills. In continuous high-intensity competition, players are subjected to high-intensity physiological and psychological load stimulation, the body's energy reserves are exhausted, and the recovery ability is reduced, which may cause fatigue. The changes of neurotransmitters in the recalling competition reflect the interaction of various related neurotransmitters released by the cerebral cortex, which plays a role in balancing and promoting the normal work of the nerve center.

### I Introduction

Xiantao Huang, Keqing Sheng, Yue Hu published "Key Factors Influencing Ecological Operation Risk of Football Sports" on Issue 107, Pages: 3715-3720, Article No: e107414, Year: 2019, in the article, Eco-football sports is one of the favorite subjects of many people, and it is also the best way for young students to vent their physical strength. The football sports ecological movement is full of risks. In view of the major student sports accidents in the country, risk management is bound to become an important issue in school sports management. Therefore, how to reduce the casualties caused by accidental injuries in sports ecological activities is really a subject worthy of my research. In this study, the relevant practitioners of the football sports eco-industry in Hubei Province were selected to conduct the questionnaire survey. In this study, a total of 420 questionnaires were distributed as research samples, and 325 valid questionnaires were collected, with a recovery rate of 77%. The results of the study: 1. In the second level of assessment, the most important facet is "site equipment", followed by "management strategy" and "other factors". 2. Among the 14 evaluation indicators, the top five indicators that are most important are: maintenance and repair, protection measures, replacement, natural environment, and risk. Moreover, based on the results, suggestions are proposed, and it is expected that the accidents can be reduced for the football sports ecological activities in China, so that the sports ecological activities can be carried out in a safe and innocent environment

### II Research objects and methods

In the recalling competition, the participant is subjected to a recall state experiment using the "motion state

monitoring EEG” (Niere et al. 2016) to determine that no drugs or instruments that affect brain function re taken during the test. The participant should be clear about the purpose of the experiment, and the content of the recall should be communicated with the participant several times, so that they are fully prepared to accept the experimental process at the beginning stage, and motivate the participant to cooperate with the imagination. At the beginning of the experimental phase, the participants’ closed-eye state at rest is first recorded for 1 minute, and the neurotransmitter data at rest is measured; secondly, the test of the participants’ recalling game scene is performed (Mizuma et al. 2015, Hui et al. 2016). The specific recall content is from the surrounding environment before the game to the most intense four real game scene, and then back to the quiet stage.

**III Results**

Table 1 shows the comparison results of the six neurotransmitter levels of the subjects. After detection and comparison, S2, S4, S5 and S11 showed an upward trend after intensity stimulation, and S1 and S7 followed a downward trend. Compared between two groups, except S5 was statistically significant, and the difference was very significant ( $t=3.224$   $P < 0.01$ ). In addition, the changes of the other five neurotransmitters were not statistically significant ( $P > 0.05$ ). Tip: after a short-term intensity load, Ach activity was significantly increased. The distribution of Glu, 5-HT, and DA in the whole brain was increased, and the average distribution of GABA and NE in the whole brain was reduced.

**Table 1.** Comparison of six levels of neurotransmitters

	GABA	Glu	5-HT	Ach	NE	DA
Before examination	6.3±3.9	3.3±4.2	20.9±6.5	15.4±5.4	12.8±5.9	6.4±4.1
After examination	6.1±3.8↓	4.0±3.4↑	22.3±5.4↑	20.3±4.7↑	9.1±5.1↓	6.5±3.9↑

It was shown that after short-term intensity stimulation, the ratio of Glu/GABA increased from 0.52 to 0.66, and a state in which the excitatory effect prevailed in the brain was appeared. Although Glu has increased, the difference from it before the intensity stimulation was not significant, and the Glu content in the brain did not change abnormally, which did not cause changes in brain function (Sminkey 2015, Zhao et al. 2016) and the central fatigue. The moderate increase of Glu caused by short-term intensity stimulation improved the excitability of football players’ brain and enhanced their learning and memory ability.

The results of the test showed that 5-HT increased slightly after short-term intensity stimulation, but the difference from it before intensity stimulation was not significant. In addition, some scholars believed that there is a negative correlation between 5-HT and DA in the occurrence of central fatigue, and there was no significant decrease in DA in the test results (Ozdinler et al. 2016, Yildirim et al. 2018). This suggested that short-term intensity stimulation did not trigger the central fatigue of football players, consistent with the findings of “central fatigue caused by enhanced 5-HT activity caused by prolonged exercise”.

Analysis of Table 1 showed that after short-term intensity stimulation, Ach was significantly increased, indicating that the high load intensity stimulation improved the memory and learning ability of the player. The short-term intensity stimulation was more conducive to the player to master and improve the sport skills.

The test results showed that NE decreased after short-term intensity stimulation, indicating that the athlete’s stress

level decreased and there was no anxiety. The DA has increased slightly, indicating that the players' mobility, excitability or motion control functions were increased, which was conducive to the mastery and normal functioning of the skill (Gindrat et al. 2015).

Effects of continuous high-intensity competition on neurotransmitters in football players.

Table 2 showed the results of changes in neurotransmitters in the left and right brains when the player was at the quiet state or recalling state.

**Table 2.** Changes of neurotransmitters in left and right brain in quiet state and recalling state

Neurotransmitter	State and brain region	Left brain	Right brain	T test
5-HT	Be quiet	2±0.76	1.88±0.99	P<0.01
	Recalling	0.75±0.71	4±0.53	P<0.01
Ach	Be quiet	1.63±0.74	3.13±1.13	P<0.01
	Recalling	1.63±1.58	-0.25±1.83	P<0.05
EXE	Be quiet	0.75±0.71	1.5±0.93	P<0.05
	Recalling	0.63±1.6	-1.25±1.83	P<0.05
NE	Be quiet	7.25±1.39	5.75±1.04	P<0.05
	Recalling	5.88±1.13	7.25±1.04	P<0.05
DA	Be quiet	3.13±0.83	4.63±1.19	P<0.01
	Recalling	4±1.31	1.75±1.04	P<0.01
INH	Be quiet	4±0.93	6.13±1.36	P<0.01
	Recalling	9.25±1.16	6.63±1.19	P<0.01

Strongly inhibited neurotransmitters include GABA, and strong excitatory neurotransmitters include GLU. From the data point of view, the overall EXE of the players was reduced at the state of recall, while INH had an increasing trend, and its rise was the result of the overall rise of all inhibitory transmitters.

**IV Discussion**

Discussion on the effect of short-term intensity load on brain neurotransmitters in football players

Studies have shown that neurotransmitters of amino acid kind play an excitatory/inhibitory role in the central nervous system. GABA has an inhibitory effect, Glu has an excitatory effect, and Glu has a significant antagonistic effect on GABA. In addition, most excitatory synapses in the central nervous system use Glu as a transmitter, and some receptors are also involved in learning and memory processes.

The 5-HT is known to have an important regulatory effect on perception, wakefulness, lethargy, sleep and mood. The increase in 5-HT activity is closely related to central fatigue.

Ach is the most abundant neurotransmitter in the body. It is an essential transmitter for neuromuscular signaling and muscle contraction. It plays an important role in maintaining behavior and activation of brain electricity, promoting learning and memory. An important neurotransmitter for systematic learning and memory processes.

NE and DA are the major catecholamine neurotransmitters in the brain, which regulate various functions of the central nervous system. NE participates in the control of sympathetic nervous system activity, antagonizes the effects of 5-HT and Glu, participates in anxiety, alertness and attention. The improvement of psychological stress level is related to the increase of NE activity. DA participates in emotion, memory, motivation, awakening and attention, and play an role in the motion behavior and motivation. Reduction in DA activity are hypothesized to result in reduced mobility, stimulating, or motion control.

## V Conclusion

According to the analysis of the influencing factors of the changes of players' cerebral cortical nerve strength in football matches, the following conclusions are drawn.

The effect of short-term intensity load on brain neurotransmitters in football players is:

Short-term intensity stimulation improves the excitability of football players' brains, enhances the learning and memory ability of football players, and is conducive to the mastery and improvement of athletes' skill level.

Short-term intensity stimulation is not easy to cause central fatigue and anxiety. The implementation of phased short-term intensity training can avoid central fatigue caused by large exercise or continuous intensity training, and is conducive to the effective accumulation of strength load.

The effect of continuous high-intensity competition on the neurotransmitter in the brain of football After continuous high-intensity competition, the 5-HT/DA ratio in the players' brain increases, which may cause the athlete's attention to decrease and cause central fatigue.

After continuous high-intensity competition, the NE concentration in the players' brain is lowered, which may cause the player's psychological stress level to decrease and the anxiety to be relieved before the game.

After continuous high-intensity competition, the increase of Ach and the increase of Glu/GABA ratio in players' brain may be related to the improvement of players' learning and memory ability.

The effect of the recall game on the changes of the cerebral cortical nerve strength of football players is that the changes of neurotransmitters reflect the interaction of various related neurotransmitters released by the cerebral cortex, which balances and promotes the normal work of the nerve center. In the study, there are many brain balances and antagonistic transmitters, but the classical neurotransmitters involved in exercise include Ach, 5-HT, DA, and NE.

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