

A study on the influence of FIFA 11+ practice on knee proprioception and dynamic balance ability of young campus football players

Xu Liu

Taiyuan University of Technology, Shanxi 030002 , China

liuxupro@163.com

Abstract. To study the effect of FIFA 11 + warm-up on knee proprioception and dynamic balance of adolescent football players. 30 young school football players were randomly divided into two groups: FIFA 11 + training group and routine warm-up training group. The dominant leg of all athletes is the right leg. FIFA 11 + training was arranged once a day in the pre training warm-up stage of FIFA 11 + group, while the control group was given regular warm-up exercise with the team. Two groups of experimental data were collected and recorded. The closer the feeling (active and passive) of the knee joint was to 135 degrees, the better the result was. In the dynamic balance test of the knee joint (YBT), the scores of the non supporting leg in front were recorded as a, the scores of the non supporting leg in the rear inner side were recorded as PM, the scores of the non supporting leg in the rear outer side were recorded as PL, and the comprehensive scores of YBT were recorded as ybt-cs. The higher the score of analysis and comparison results, the better the balance and stability function. The difference of the above recorded data was analyzed by independent sample t-test, and the significance level α was 0.05. After FIFA After 11 + training, there were significant differences in the comparison values of proprioception (active and passive) between the knee joint groups ($P < 0.05$) compared with the control group, the difference was significant. After FIFA 11 + warm-up exercise, it can significantly improve the knee proprioception and dynamic balance ability of young school football players. Therefore, coaches should be encouraged to use FIFA 11 + warm-up activities in the future football training match warm-up activities.

Keywords: football player; proprioception; dynamic balance; knee joint.

1. Introduction

1.1 Research background

In football matches and football training, athletes' bodies will play a confrontational role[1]. In the process of football, athletes stop and get up in a hurry. Kicking, hitting, tripping, pushing and pulling are very easy to cause athletes' injuries. Therefore, researchers are urged to look for ways to prevent athletes from being injured during training or participating in football matches. Therefore, the medical research team of FIFA needs to work out an exercise plan to prevent football injuries according to the characteristics of football[2-3]. Moreover, this contact program is named "FIFA11+", and the full name of FAF11+ is FIFA 11+ comprehensive warm-up injury prevention exercise. Through the implementation of FIFA 11+ practice plan, the sports performance of football players can be effectively improved, and the physical injuries suffered by football players in training and competition can be reduced. However, there is still a lack of relevant research on whether warm-up exercises through FIFA 11+ program can improve the knee joint proprioception and dynamic balance ability of young campus football players, and reduce the severity of sports injuries caused by football[4]. This study analyzes the changes of knee proprioception and dynamic balance ability of juvenile campus football players through experimental detection, discusses whether FIFA 11+ training program can improve the influence of knee proprioception and balance ability of juvenile campus football players, and collates the results obtained from experimental data, so as to provide methods and selection suggestions for improving the training of juvenile football players' physical function[5].

1.2 Research status

1.2.1 The Development Status of FIFA 11+

According to the statistics of the International Football Federation, there are more than 20 million young football players in the world, with the highest proportion of sports organ injuries. However, recent research shows that the occurrence of football injuries is closely related to the lack of initiative and coordination of athletes' lower limb multi-joint muscles, and the injured parts of athletes are mostly human lower limbs. Under the high injury rate of football, the FIFA medical evaluation research team formulated the injury prevention exercise plan "FIFA11+". Jia Meng et al. pointed out that FIFA11+ practice has improved the biological model of lower limb exertion of football players, enhanced the strength and dynamic balance of knee muscles of football players, and helped to prevent and reduce the risk of sports injuries of football players [4]. Therefore, in the future, during the warm-up activities of football players in training or competition, coaches should be actively encouraged to practice FIFA11+. To sum up, FIFA 11+ has a great influence on teenagers, and FIFA 11+ is widely used abroad, so it is of great significance to study FIFA 11+ in China.

1.2.2 Related research on dynamic balance

Balance ability is the basis of human activities, including static and dynamic balance ability, and dynamic balance is the trend of human research. According to the dynamic balance ability of human body, balance refers to a kind of shape of the body and a special ability that can automatically and quickly adjust and maintain the stability of the body posture when moving or under the action of external force, without falling down[6]. Under normal circumstances, it is coordinated by the vestibular system, visual system and proprioception system of human body. Dynamic balance refers to the ability to control the center of gravity of the body and adjust the posture balance under various conditions[7]. Rui Ding and others confirmed that scientific and reasonable sports training can significantly improve the dynamic balance function of football players and effectively reduce the incidence of sports injuries, and found that FIFA 11+ practice can significantly improve the dynamic balance ability of football players. This study also shows that the experimental results are not much different from the above experimental results, and the balance ability of the athletes' knee joints in the experimental group is obviously improved after FIFA 11+ warm-up exercises. Experiments show that this method can obviously improve the balance ability of knee joint of young football players[8-9].

1.2.3 Research on the Influence of FIFA 11+ on Body Function (proprioception, dynamic balance)

Some researchers pointed out that from the perspective of athletes' physical function, after one-time FIFA 11+ exercise (about 25min minutes)[10], except for the maximum isometric voluntary contraction strength and strength development rate of quadriceps femoris, the 20-meter sprint, agility, vertical jump, body stiffness and SEBT were significantly improved, and the related physiological indexes were also significantly improved. The results showed that FIFA 11+ injury prevention exercise was an effective warm-up exercise for football players, which greatly improved athletes' health[11]. Other researchers[12] have suggested that after 16 weeks of FIFA 11+ training, the position and strength reproduction ability of FAI students in the experimental group are significantly improved compared with those before training, and the same rehabilitation effect is achieved as that of the control group[13]. This shows that FIFA 11+ training effectively improves the proprioception ability of FAI football college students. According to the above data, it can be found that FIFA 11+ practice can significantly improve the physical function of the exercisers. By consulting the data, it is found that there is little research on the youth campus football players. This research will be a reference for the youth campus football players to choose warm-up activities and introduce foreign sports techniques through a comparative study of two kinds of football warm-up activities, and also serve as a reference document for related research in the future.

2. Research object and method

2.1 Research object

This paper selects 30 middle school campus football players in a middle school in Taiyuan as the research object, among which, 15 players in the control group are football players without FIFA 11+ training, and 15 players in the experimental group are also football players without FIFA 11+ training before. And whether there is much difference in knee proprioception and dynamic balance among the groups of subjects. See Table 1 for the basic information of the experimental subjects.

Table 1 Basic information of the research object

	n	Height(cm)	weight(kg)	age(years old)	Training years
Experimental group	15	163.67 ± 7.49	53.07 ± 7.22	13.52 ± 0.65	1.86 ± 0.45
control group	15	160.13 ± 6.70	51.93 ± 7.64	12.89 ± 0.28	2.04 ± 0.56

2.2 Research methods

2.2.1 Documentation method

In the database of China HowNet and Wanfang, the literatures about the research of knee proprioception and dynamic balance ability of football players were collected, and the collected data were sorted out and summarized. Moreover, the influencing factors of knee proprioception and dynamic balance ability were analyzed, which laid the research basis of this article.

2.2.2 Experimental method

The instruments used in the experiment are Y-type balance test (YBT), tape measure and joint goniometer.

The experimental steps are as follows:

[The proprioception test steps of knee joint]

Step 1: In the active proprioception knee joint test, the subject closes his eyes and sits upright, so that the center point of the knee joint is facing the center of the circle. Then, the subject's knee joint is stretched out for 135 degrees, and then the subject takes the initiative to stretch out the knee joint. When the subject feels 135 degrees, the abduction of the knee joint can be stopped. The main subject should observe the difference between the angle of the subject's knee joint and the original required angle, and record the results.

Step 2: In the passive proprioception knee joint test, the subject closes his eyes and sits upright, so that the center of the knee joint is right at the center of the circle. Then, the subject's knee joint is extended 135 degrees, and then the subject guides the subject to extend the knee joint. When the subject feels 135 degrees, the abduction of the knee joint can be stopped. The subject should observe the difference between the angle of the subject's knee joint and the original required angle, and record the results.

[Dynamic test steps]

Step 1: before the formal test, the tester should explain the requirements and matters needing attention of the dynamic balance test to the subjects, so that the subjects can be familiar with the dynamic balance test environment for the smooth development of the subsequent measurement work; Then measure the leg length of the subject (the distance between the anterior superior iliac spine and the medial malleolus of the foot) and mark it as L.

Step 2: during the formal test, the tester needs to take off his sneakers (which can reduce the deviation influence of sneakers on the test results). The tester stands in the middle of the test platform with his feet supported and his hands naturally placed at his waist. Lift the unsupported leg and extend it to the maximum distance along the test direction; At this time, record the maximum distance of unsupported legs in three directions respectively. According to the above sequence, the actions to be measured are completed in three directions clockwise. In the last test link, the subjects

need to be measured twice and the data recorded, and finally the average value is calculated, which can better reflect the overall level and concentration trend of the test data.

[Test index]

The proprioception test index of knee joint is that the closer the knee joint extends to 135 degrees, the better the result.

The test index of dynamic balance is represented by (PM, PL, YBT-CS) score. The higher the score displayed by the data of the subjects, the better the balance and stability function of the subjects and the higher the dynamic balance ability.

2.2.3 Mathematical statistics

All the data obtained from the experiment were input into Excle form, and the statistical software SPSS 19.0 was used to analyze and process the data. The difference of knee proprioception and dynamic balance between the two groups was tested by independent sample T test. Among them, if $P < 0.05$, there are differences in the results and the contrast is significant; if $P > 0.05$, there is no difference and the contrast is not significant.

3. Results

3.1 Comparison of the effects of FIFA 11+ training program and common training on the knee proprioception of athletes

The comparison results of proprioception measurement (active and passive) of dominant leg between football players who have implemented FIFA 11+ training program and ordinary football players are obviously different, and the results are statistically significant, so $P < 0.05$, as shown in Table 2 and Table 3.

Table 2 Comparison of measurement results of knee joint active proprioception between FIFA 11+ exercise and common exercise

Index	Experimental group	Control group	t	p
Relative value	135.20±3.32	148.27±4.54	8.99	0.00
Absolute value	2.47±2.13	13.27±4.54	8.33	0.00

Table 3 Comparison of results of passive proprioception of knee joint between FIFA 11+ exercise and common exercise

Index	Experimental group	Control group	t	p
Relative value	136.87±6.48	144.67±7.11	3.14	0.04
Absolute value	4.80±4.59	11.67±5.78	3.61	0.01

3.2 Comparison between FIFA 11+ practice and common practice on the test results of athletes' YBT dynamic balance ability

It can be seen from Table 4 that there is no significant difference between the score A ($P > 0.05$) of the unsupported leg in front and the score PM ($P > 0.05$) of the unsupported leg in the back and inside. There is a significant difference in the posterolateral score PL ($P < 0.05$) and YBT-CS ($P < 0.05$) of the unsupported leg, which is statistically significant.

Table 4 Comparison of test results of athletes' YBT dynamic balance ability between FIFA 11+practice and common practice

Index	Experimental group	Control group	t	p
A	103.60±6.67	103.27±10.92	0.10	0.92
PM	92.20±10.36	91.87±15.18	0.70	0.94
PL	107.06±13.28	92.87±12.57	4.76	0.00

YBT-CS	1.10±0.93	1.02±0.12	2.18	0.04
--------	-----------	-----------	------	------

*A:Support the leg to score in front.PM:The unsupported leg scores on the back inside. PL:Non-supporting legs score on the posterolateral side.YBT-CS:YBT comprehensive score.

4. Discussion

By consulting the research on FIFA 11+ training, it is found that FIFA 11+ can improve muscle and balance quality, improve physical coordination and prevent injury by strengthening the neuromuscular control during running, jumping and landing. After the FIFA11+ training program, the balance ability of campus football players has been improved and improved, and the risk of sports injury has been greatly reduced. Through comparison, it is found that the physical improvement of campus football players is very obvious. Combined with the current national football reform and campus football promotion activities, in order to minimize the social and economic costs caused by football sports injuries and maximize the health benefits brought by football sports, it is particularly urgent to carry out systematic football sports injury research and injury prevention research in China as soon as possible. The introduction of foreign culture is something that China has been doing all the time, so FIFA 11+ training is of great help to us. Many high-quality studies have proved that at present, almost all the research objects about the influence of FIFA 11+ on the physical quality and function of football players are professional or semi-professional players, aged between 17 and 25, but there is still a lack of its effect on the majority of young football players under the age of 18, especially primary and secondary school football players or fans. FIFA 11+ training has immeasurable room for improvement for young football players. More research is needed to discover more benefits of FIFA 11+ to help us develop better in football.

Knee proprioception: The closer the knee joint extends to 135 degrees, the better the result. The dynamic balance ability of knee joint is shown by three-direction score and comprehensive score YBT-CS (the formula of comprehensive score is $YBT-CS = (A + PM + PL/3L) \times 100$). The comprehensive score is the main indicator of dynamic balance ability. The higher the score, the better the ability, but the worse the ability. Therefore, this study mainly studies the knee proprioception and dynamic balance ability of two groups of people who have different football warm-up exercises, so as to provide the basis for improving the knee proprioception and dynamic balance ability of young football players.

4.1 The influence of FIFA 11+exercise and common exercise on knee proprioception of athletes

The proprioception is closely related to our sports injuries. Modern scientific research shows that the main reason for the instability of joints is not the relaxation of ligaments, but the damage of proprioception. The damage of proprioception will cause the reaction delay of the muscle group of reflex joint stability. Research shows that proprioception training or warm-up training can improve the proprioception function of football players, but the improvement effect is good or bad. In this experiment, it is found that the effect of practicing FIFA 11+ is better than that of ordinary training. Practicing FIFA11+ can improve the proprioception of the knee joint, which may be related to the way FIFA 11+ practices. In FIFA 11+ practice, the running direction of the lower limbs is always inconsistent. When the knee joint is in the movement of changing direction, it passively practices the exercise ability of the knee joint during the movement and improves the proprioception of the knee joint. In this experiment, it is found that there are significant differences in the comparison results of knee proprioception measurement (active and passive) between soccer players who practice FIFA 11+ and ordinary soccer players. It is found that the practice of FIFA 11+ can effectively improve the knee proprioception of young soccer players, and help to prevent and reduce the risk of sports injuries of soccer players during training or competition.

4.2 Effects of FIFA 11+ and general exercises on dynamic balance ability of athletes' knee joints

Dynamic balance refers to the ability of athletes to adjust spontaneously and keep their own body stable and balanced when they are affected by external forces or their own internal forces. Dynamic balance ability is closely related to sports injuries. Ordinary warm-up training can also improve the dynamic balance ability of athletes' knee joints. By contrast, the experimental group is obviously higher than the control group. The second part of FIFA11+ training is related to the core and lower limb neuromuscular exercises, which improves the core and lower limb neuromuscular muscles of the body. However, neuromuscular training can improve the dynamic balance ability of athletes, thus reducing their injuries during training or competition. The score of balance ability of athletes in the experimental group is significantly higher than that of the control group, which indicates that FIFA 11+ practice in this experiment can effectively improve the dynamic balance ability of knee joint of young campus football players.

5. conclusion

This study can draw the following conclusions:(1) After FIFA 11+ warm-up exercises, the knee proprioception of young campus football players is obviously stronger than that of ordinary warm-up exercises.(2) After FIFA 11+ warm-up, it can significantly improve the dynamic balance ability of young campus football players' knee joints.

Domestically, the Chinese Football Association has not cooperated with F-MARC to promote and train FIFA 11+, which is a pity for the growing Chinese football. However, the Chinese database search has not found any relevant Chinese literature, and the research on FIFA 11+ is still a blank in China. I hope that football science and medicine will get more support in China, and more scholars will devote themselves to the research in this field. The development of football in China cannot be separated from the support of football science and medicine.

References

- [1] Wang Dengfeng. Reform and integration: the development effect and future strategy of youth campus football [J]. journal of shanghai university of sport, 2022,46 (07): 1-7+18. doi: 10.16099/j.sus.2022.04.29.0006.
- [2] rankles. Analysis on the implementation of physical training of youth football [J]. Contemporary Sports Science and Technology, 2022,12 (17): 21-24. doi: 10.16655/J. CNKI.2095-2813.2112-1579-9913.
- [3] Zhao Saijia. Physical training methods of youth football [J]. Athletics, 2022(06):29-31.
- [4] Jia Meilin. On the physical training of young football players [J]. Athletics, 2022(05):28-30.
- [5] Lin Jinbiao. Youth campus football sports injuries and prevention strategies-taking Fujian Province as an example [J]. Sports Science Research, 2022,26 (02): 78-82+87. doi: 10.19715/J. Tiyukxueyanjiu.2022.02.013
- [6] Wang Xia-yi, Qin Yi. A systematic review of the influence of football on the physique and health of overweight and obese children and adolescents [J]. Bulletin of Sports Science and Technology Literature, 2022,30 (03): 107-111. doi: 10.19379/j.cnki.issn.1005-03
- [7] Haifa Li, Wang Teng. Research on the coordinated training methods and training principles of young football players [J]. Contemporary Sports Science and Technology, 2021,11 (34): 31-33. doi: 10.16655/J. CNKI.2095-2813.2110-1579-3270.
- [8] Ding Rui, Dai Jie. Problems and suggestions of youth football training in China [J]. China Sports Coaches, 2021,29 (03): 73-74. doi: 10.16784/j.cnki.csc.2021.03.022.
- [9] Qin Yun, Wang Wenhao. Experience and enlightenment of foreign youth football reserve talents training [J]. Sports Culture Guide, 2021(05):72-77.

- [10] You Jia, Tan Miao, Qin Fang, Li Chuanbing. Research on the implementation path of the long-term development of Chinese youth football talents in the new era [J]. Journal of Shenyang Physical Education Institute, 2021,40(03):33-39.
- [11] Shi Xiaobo, Chen Ting. The influence of young football players' resilience on sports aggression: the moderating effect of hostility attribution [J]. Educational Science Forum, 2021(11):43-46.
- [12] Wu Haiqin. Analysis on the injury and prevention of youth football [J]. Contemporary Sports Science and Technology, 2021,11 (09): 51-53. doi: 10.16655/j.cnki.2095-2813.2101-1579-9001.
- [13] Zhao Gang, Bu Yifeng, Chen Chao, Zhang Yingcheng. Research on the training quality management and performance evaluation index system of young football players in Chinese professional football clubs [J]. Journal of Capital Institute of Physical Education, 2021,33 (01): 96-103. doi: 10.14036/j.cnki.cn11-4513.