THE IMPACT OF CORE EXERCISE AND MYOFASCIAL RELEASE IN THE INITIAL PART OF TRAINING ON THE PERFORMANCE AND PREVENTION OF INJURIES IN FOOTBAL PLAYERS

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ABSTRACT

Introduction: One of the basic processes to improve stability and prevent injuries in sport is warming up. The aim of our work is to verify the impact of the first part of the training unit (warm-up) on the stability and performance of the footballer.
Probands: The research work was carried out on 37 football players in the category U-19 and U-17 in the football club – JUPIE football school of Marek Hamšík. Probands were divided into two groups. The test group consisted of 19 U-19 football players (age average 17.2 ± 0.87), the control group consisted of 18 U-17 football players (age average 15 ± 0.5).
Methods: Both groups underwent input measurement consisting of Y balance test and performance tests – slalom with ball, run 5 × 10m. Subsequently, the test group footballers underwent our intervention, myofascial release + core training, which was added to the opening part of the training unit. The study lasted 4 weeks.
Results: Probands of both groups achieved a statistically significant improvement in the y balance test. When comparing the performance tests, they achieved significant improvement in the test group – run 5 × 10m ($p = 0.0024$) and slalom with the ball ($p = 0.0159$) and in the control group – run 5 × 10m ($p = 0.0182$). The improvement in slalom with the ball test in the control group was not statistically significant ($p = 0.1798$).
Conclusion: We have shown a significant effect of core exercises and myofascial release at the beginning of the training unit. However, the benefit was also achieved in the control group, except for the test - slalom with the ball.

Keywords: postural stability; Y balance test; core training; myofascial release; football

Introduction

Movement or sports can be performed on different levels, from recreational form to amateur to the level of professional sports. Improving one´s skills is most often the main purpose of sports. Athletes try to achieve ever better performance through different procedures. Whether it is forms of regeneration, special training, or precisely defined concepts for the sport. Injuries are another very important topic in athletes. They want to avoid it as much as possible, because it make them to lose their player's form, to take short or long breaks from their active work and to change their financial ratings on a professional level.

A lot of injuries are behind the decline in performance, depending on the development of a sports career and ultimately can also end the sport activity. Football, despite being a contact sport, brings several injuries that are not caused by contact with other player on the pitch. On the other hand,

players get injured without contact with other players. It is mainly an ankle or knee injury. Nowadays, when football pitches already have a fairly good surface quality, it is not possible to refer to the “crooked terrain” as was often mentioned in the past. In our work, we focus on role of postural stability of players and the possibility of influencing stability by changing first part of the training process – warming up.

The Aim

The aim of work was to determine the level of postural stability using the Y balance test kit in football players and subsequently to determine the effect of myofascial release and core exercises on postural stability and performance in general and special tests of football.

A partial goal of our work was also to trace the prevalence and incidence of individual injuries in football players tested by us during their playing career. Data were collected through a questionnaire.

Participants

The sample included 37 participants that were football players in the U-19 and U-17 category in the football club - JUPIE Marek Hamšík football school. Probands were divided into two groups. The test group consisted of 19 football players in category U-19 (age average 17.2 ± 0.87), the control group consisted of 18 football players in category U-17 (age average 15 ± 0.5).

Methods

The participants, who were divided into two groups (test, control), were tested in two stages – diagnostic measurement and output measurement. The test group was tested before and after intervention. The control group was run concurrently with the test group before our intervention, and then the output measurement after our program (4 weeks), which we performed with the test group. We compared the results within and between groups. Diagnostic measurements in both groups were performed as follows. We introduced the players to the whole testing process. Subsequently, we obtained personal data (gender, age, weight, height, playing post, dominant leg) from respondents of both groups using a questionnaire. The questionnaire also included questions on the prevalence and incidence of injuries during the previous football career and also this season, as testing was making in the winter period of football season (mid-season 2018/2019). Questions were also focused on the mechanism of injury (contact, non-contact) and how often individual types occurred. Wound localization and injured structures (muscle, joint, bone) were also followed. After obtaining the data, there was a standard club warm-up, which consisted of warming up the organism (2 min. Free running + motion game – in our case chase for 5 minutes), followed by running alphabet and dynamic stretching. After the collective warm-up, we started to measure postural stability by means of the Y balance test, in our case the Y balance test professional kit. First, we measured the length of the lower limb that was needed in the evaluation. The limb length was measured in the supine, from SIAS - anterior superior spina to malleolus medialis.

The test was performed in the following order, in the anterior direction, followed by posteromedial and then posterolateral. In each direction, the respondent had to record three successful attempts. After testing the stability, we switched to performance testing by testing the general part - boat running 5 × 10m and testing individual gaming activity – slalom with the ball.

After the diagnostic measurement, we entered the training process of the test group. The control group continued its training process without our intervention. So, according to the instructions of the coach, he was instructed not to change the opening / preparation part of the training unit – from the standard club warm-up in the category. So it was similar to what we described before the diagnostic measurement. Regarding the introductory part of the training group of the test group, we intervened as follows: the training started with 3 minutes running on pitch (with / without ball), then each player took a soccer ball to serve as a foam roller for myofascial release – these muscle areas have

gradually relaxed – calf, hind thigh, outer thigh, anterior thigh, inner thigh, back – each region for 10 seconds. Subsequently, players of test group practiced core training, which consisted of the following exercises: plank on palm, plank on forearm, plank side on the forearm (both side), endurance in the squat, glute bridge on one leg (right/left), superman (5 reps with 5s endurance), eccentric decline squat (5 reps on each leg). The exercises were performed for 25 s, with 10 s pauses between exercises. Core exercises were performed in two series. Between the series, the players practiced an exercise with a passing ball. The second series of core exercises followed by activation / mobilization, it means exercises with dynamic stretching elements, in a collective form. This training program lasted for 4 weeks (from 21 January to 15 February 2019). After the 4-week program, the final measurement was performed, where all tests were again tested as in the diagnostic measurement (Y balance test, 5 × 10m boating, slalom with ball) with the same process.

Questionnaire

The non-standardized questionnaire we created contained 20 questions, which consisted of two parts:

- *Part 1* consisted of questions for obtaining personal data: age, height, weight, playing post, dominant lower limb; the age category;
- *Part 2* consisted of injuries related to sports activity, in particular from football.

The questionnaire consisted of open questions where the respondent himself answered the question, closed questions where the respondent had to choose the answer from the given options. Among the elimination criteria we included incomplete listing of the questionnaire and the reluctance of football players to issue a questionnaire.

Y balance test

We tested players for Y balance test (YBT) using the Y balance test kit, we made sure that there was one, at most two testers in the test room to eliminate disturbing factors, such as to compete and compare with other players. Subsequently, the proband was asked to remove the shoes and in the case of inappropriate clothing for testing he was asked to remove his underwear so that the clothing did not prevent him from performing the maximum reach. Then there was a verbal explanation of testing for the Y balance test kit and a demonstration of the therapist. After that, the respondent made measurements. Testing proceeded as follows:

1. right leg in anterior direction (3 successful attempts) and then left leg in anterior direction (3 successful attempts)
2. right foot in posteromedial direction (3 successful attempts) and then left foot in posteromedial direction (3 successful attempts)
3. right leg in posterolateral direction (3 successful attempts) and then left leg in posterolateral direction (3 successful attempts)

Failure was evaluated according to YBT standards. The duration of the test depended on the ability to perform a successful YBT experiment. Some probands did 3 successful attempts for the first time, some needed more attempts.

In our work, we have identified a risk factor for injury, a data based on YBT testing. The composite reach distance below 94% as well as the second risk factor was the absolute reach asymmetry (in the anterior and posteromedial directions) with a difference ≥ 4 cm. (Plisky, 2006; Smith, 2015; Gonell, 2015)

Run 5 × 10m – acceleration factor

At a distance of 10 m from each other we mark two parallel lines on the track. Behind the first of them from the half-start, starts the tested to the second line. After stepping one foot behind the other line, it returns as quickly as possible beyond the starting line, which must again cross one leg. In the same way he will pass all 5 sections without interruption. There was only one run, who had two attempts with a minimum break of 5 minutes between each start. We recorded only the best respondent time in the statistics. Time was measured with a GARMIN Forerunner 235 Optic sports watch.

Slalom with ball – the level of technical mastery of ball at speed

The player must run obstacle course as fast as possible with the ball. There were eight cones at an unequal distance, the track twists twice at right angles. We recorded only the best respondent time in the statistics. Time was measured with a GARMIN Forerunner 235 Optic sports watch. Test sketch:

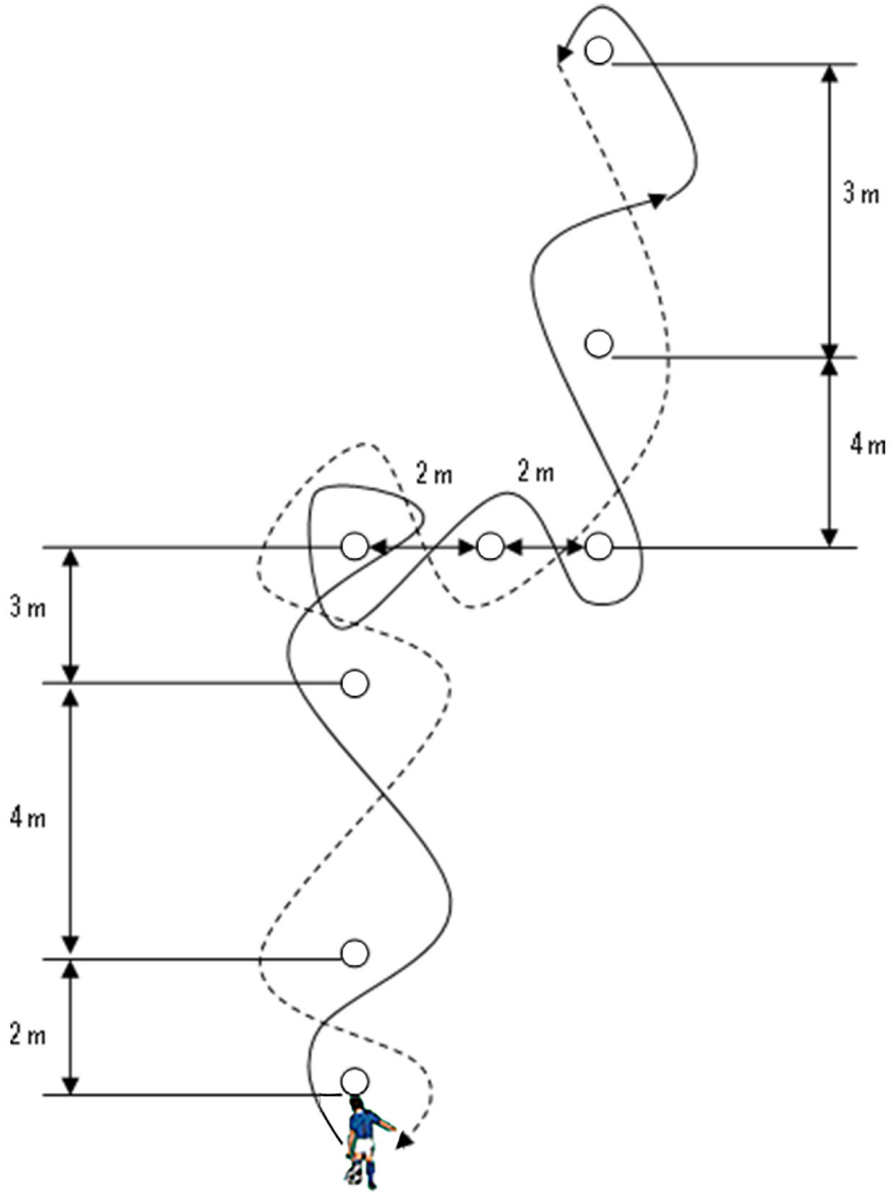

Figure 1 *Slalom with ball*

Statistical methods

For processing of data we used descriptive statistics with meaning arithmetic average and standard deviation. Based on normal data distribution we used paired T-test for comparison in groups. In

comparing between groups we used the T-test with unequal variance. The interdependencies were determined based on Pearson's correlation coefficient. A significance level of 95% (α = 0.05) was determined for all established comparisons.

Results

The test group consisted of 19 football players who completed 20 training units from 21. January 2019 to 15. February 2019. The control group consisted of 18 football players who completed 20 training units from 8. January 2019 to 3. February 2019. Group characteristics and data of injury is shown in Table 1.

Table 1 *Basic characteristics of groups*

	The test group	**The control group**
Age	17,2 ± 0,87	15 ± 05
BMI	21,88 ± 1,67	20,1 ± 1,75
Without injury	2	1
1 injury	0	4
2–3 injuries	8	6
4–6 injuries	5	7
6 or more injuries	4	0
Average career injuries	3,71	2,69
Contactless injury	4	4
Contact injury	5	5
Both forms of injury	8	8
Without injury	2	1
Contactless injury dominance	10	7
Contact injury dominance	7	10
***The number specifies the number of players**		

Evaluation of results at YBT:

**PDK= right lower limb*
***Ľ DK= left lower limb*

The respondents of the test group achieved a statistically significant improvement when comparing the composite range of reach in the input measurement for PDK was 93.51 ± 8.76% compared to the 95.63 ± 8.95% measured in the output measurement (p = 0.010). There was also a statistically significant improvement for Ľ DK at 94.78 ± 7.96% in the input measurement versus 96.36 ± 8.70% in the output measurement (p = 0.038).

The control group respondents achieved a statistically significant improvement when comparing the composite range of reach in the input measurement for PDK was 89.31 ± 5.24% compared to 91.55 ± 5.62% measured in the output measurement (p = 0.025). There was also a statistically significant improvement for Ľ DK at 89.51 ± 6.19% in the input measurement versus 91.66 ± 5.45% in the output measurement (p = 0.0279).

Comparisons of diagnostic and outcome evaluation of YBT data and performance tests in the test and control group: Respondents of both groups achieved a statistically significant improvement in run 5 × 10m; in the test group, input measurement 13.13 ± 0.82 (s) versus output measurement 11.83 ± 0.62 (s) (p = 0.0024); in the control group, an input measurement of 12.36 ± 0.77 (s) versus an output measurement of 12.27 ± 0.69 (s) (p = 0.0182). When comparing the slalom performance

test with the ball, a statistically significant improvement was achieved by the test group, the input measurement of 19.73 ± 1.25 (s) over the output measurement of 19.53 ± 1.08 (s) ($p = 0.0159$); in the control group, the change was not statistically significant, the input measurement 20.13 ± 1.22 (s) versus the output measurement 20.03 ± 0.90 (s) ($p = 0.1798$). Comparison of absolute impact asymmetry (in anterior and posteromedial direction) to YBT within the group was not statistically significant. For the test group in the anterior direction ($p = 0.255$) in the posteromedial direction ($p = 0.095$). For the control group in the anterior direction ($p = 0.406$) in the posteromedial direction ($p = 0.055$).

Discussion

Low levels of postural stability, changed motor control, or insufficient neuromuscular control were all described as predictors of lower limb injury in athletes. The implementation of an injury prevention program, which includes exercise for balancing and neuromuscular control of footballers, has been shown to reduce injuries and also reduce healthcare costs (McGuine, 2000). The aim of our work was to determine the level of stability of YBT players and also to verify the impact of basic exercises and myofascial release on the stability and performance of players.

There was no statistically significant change in either the test or control group when comparing the input and output testing results for absolute reach asymmetry in the anterior and posteromedial direction. However, we have noticed a change in the correlation of asymmetry of reach and number of injuries. In the test group, there was a correlation between asymmetry reach of anterior direction and the number of injuries at the input measurement ($r = 0.51$), at output, the correlation decreased ($r = 0.37$). In the control group, the correlation was at input ($r = 0.03$) and output ($r = 0.41$). In the posteromedial direction, the correlation between asymmetry of reach and injuries was very low. Based on the results, there is therefore a correlation between the asymmetry of reach in the anterior direction and the number of injuries. Our results agree with the study presented by Plisky, 2006 and Smith, 2015.

In our work, we included an intervention in the test group in the form of a change in warming up compared to the control group. The intervention consisted in a change or addition of core exercise elements that have positive effects as prevention of injuries and support performance improvement – Soligard, 2008; Leetun 2004; Peate, 2007. Based on our results, the full effect of our intervention in improving YBT results in the test group ($p = 0.010$ for PDK, $p = 0.038$ for LDC) cannot be attributed, since the control group also achieved statistical improvement ($p = 0.025$ for PDK, $p = 0.0279$ for LDK). When comparing the results between the groups, there were differences in both the input and output testing. However, a comparison of the average of the differences did not show statistical significance. However, despite these results, we did not rule out the effect of core training and myofascial release to improve stability on YBT. Intervention could also contribute to improving stability and performance at YBT. It is important to recall that the intervention took place for 4 weeks in the winter period of season, where the emphasis is placed on the physical aspect of the athlete – strength, speed, etc. And just the strength increase could have contributed to improving the results of the YBT control group. It would certainly be interesting to continue our program or add the intervention we have created to the training process during the competition period.

Some authors describe that core exercise and also myofascial release has an impact on improving sports performance – Afyon, 2017; Nesser, 2008; Healey 2014; MacDonald 2013. Based on our results when comparing the effect of the intervention on the sports performance of a football player, we achieved a statistical improvement in both tests in the test group ($p = 0.0024$ run 5 × 10m; $p = 0.0182$ slalom with ball). In the control group, we observed only a significant change in the run 5 × 10m ($p = 0.0182$); Just as the YBT performance could be affected by the winter period of season and its training process could also be affected by performance testing. However, the effect of core training and myofascial release seems to have a significant effect on the need to improve the individual's gaming activity over the control group.

The nervous system is 90% developed within 8 years of age. Coordination skills in boys develop between 7 and 12 years (Laczo, 2014). Thus, there is no assumption that age differences in groups could affect results due to ontogenesis.

Conclusion

Observation of the results, we demonstrated a significant effect of core exercise and myofascial relaxations at the beginning of the training unit. However, the benefit was also achieved in the control group. Our intervention contributed to improving stability on the Y balance test kit, and also showed a significant improvement in the performance tests – run 5 × 10m, but especially in the individual gaming activity of the individual – slalom with the ball, where there was no significant improvement in the control group. Further work could complement the relationship of core training and myofascial release to performance on the Y balance test kit, because we have not confirmed or refuted this relationship in our work.

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