DYNAMIC BALANCE DEVELOPEMENT TO FOOTBALL PLAYERS

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Abstract: The role of unstable surfaces is to intensify muscular activity, particularly the neuromuscular component associated with static balance at the expense of the mechanical load. By the introduction of unstable surfaces in the training process the proprioceptive feedback is weak on account of the permanent stimulation on the balance controlling mechanism, maintaining balance becoming difficult. The correct and timely use of unstable surface procedures during training sessions, when compared to classical football training methods, clearly lead to a better development of static and dynamic balance. The use of static and dynamic unstable surface procedures influences the appropriate space and time orientation indicators as well as balance. The research was carried out during one sport season on two groups: experimental and control, each comprising ten players. The training of both groups was executed based on the same anual training plan, the difference being that on the experimental group unstable surface procedures were used, while on the control group procedures specific to football training. The following tests were applied: stability test with multiple single leg jumps (right and left), two-leg balance with legs close together, eyes open and closed. After applying the tests there was visible improvement in results for the experimental group, while there was no obvious change in the results of the control group. The procedures used on the experimental group proved to be more effective than the procedures specific to football training. The results of the experimental group in both tests, following the use of unstable surface procedures, shows an improvement in balance compared to control group subjects.

Key words: balance, unstable surface, optimization, football, training.

Introduction

On a high level, football players have a vast technical repertoire backed by their skills, like coordination, balance, or reaction and execution speed [1].

One of the current trends is to introduce specific elements of proprioceptive development into frame of training programmes, meant to improve the specific indicators of static and dynamic balance, as well as neuromuscular coordination, starting from an early age [2].

The programmes meant to develop neuromuscular control often include balance exercises whose purpose is optimizing training, prevention of and recovery from injuries [3].

Posture control or balance can be defined as the ability to maintain a foothold with minimal movement, as well as the ability of executing a task while preserving a stable position. This is maintained by way of a dynamic integration of forces and both internal and external factors involving the environment [4, 5]. Adjusting balance dependson visual, vestibular and proprioceptive stimuli [6, 7].

Maintaining posture control includes integrating information from neurosensors of three types, vestibular, visual and somesthetic, into the vestibular nuclei, to generate a motoric response in a certain context which leads to control of the anti-gravitational activity [8].

The authors Freiwald, J. and Gstöttner, M., underline the importance of training balance based on scientific programmes on coordination to prevent lesions and improve performance [9, 10].

Various studies show that developing balance may lead to improving posture and neuromuscular control. The same studies show that, from a clinical point of view, developing balance leads to improving static and dynamic postural balance.

Periodical evaluation and monitoring of static and dynamic balance in young athletes may be an important instrument the correct layout and alternation of training programmes, depending on the sport in question, the improvement rate of balance scores in time and athlete's age. This would allow, in each period of the athlete's development, the creation and optimization of a large, well rounded set of fundamental motoric skills [11].

Hypothesis

This research was started from the idea that the optimization of the training of men football players, can be achieved with greater efficiency when developing balance by way of utilising unstable surfaces.

Materials, methods, procedures

Period and location of research

This research was carried out during 2014-2015 sport season, on two groups: a experimental group and a control group. The athletes from the experimental group were

players of Stadium GAZ Tirgu Mures. The members of the control group were players of the Stadium ASA Tirgu Mures.

Research subjects

The subjects of this research had the age of 18 to 22 and were a total of twenty (15 for the experimental group and 15 for the control group).

Both groups had ten training sessions per week, each of a duration of an hour and half, based on the training plan devised by the two coaches. Traditional training methods were used, specific to the game of football and adapted to the level of training of the two groups. In addition to these specific procedures of football training, the experimental group, during individualised training, was subjected to specific balance developing procedures on unstable surfaces, with elastic bands, on gym balls and with TRXs, three times a week, for thirty minutes each.

Procedures

The procedures proposed by us were adapted to the game of football, having the purpose of static and dynamic balance development.

The proposed programme aimed at the development of the following skills: force, speed, balance and leg control. The procedures used were aimed at improving posture and neuromuscular control.

Ex.1. Forward movement on 10 lined-up balance fits.

Ex.2. Backward movement on 10 lined-up balance fits.

Ex.3. Standing on two balance fits in basic position specify football players (facing the ball), with defender's opposition.

Ex.4. Elastic band around hip, drawn, lateral movement to intermediary defenders' area.

Tests applied

The efficiency of the procedures used during this research was verified by applying the following tests:

Two-leg balance with legs close together, eyes open (15 seconds recording time)

Two-leg balance with legs close together, eyes closed (15 seconds recording time)

Aim: evaluating static balance through marking the average displacement.

Before the start of the training programme and at its end measuring sessions (Table 1) were held by means of AMTI BP400600 force plate (www.AMTI.biz).

Table 1 **Two-leg balance with legs close together, eyes open**

Group	Avg.	Avg. diff.	Median	Minimum	Max.	Variation coeff.	Mann-Whitney		Effect size
							Z	P	
Experimental	0.254	-0.065	0.227	0.172	0.419	35.0%	-2.268	0.023	0.51
Control	0.319	-20.5%	0.321	0.274	0.379	10.8%			

Upon testing two-leg balance with legs close together and eyes open, a 0.065 (20.5%) cm lower average value of displacement was found for the experimental group. This difference shows an increase of static balance for the experimental group. The average values are 0.254 for the experimental group and 0.319 cm for the control group.

The data dispersion is inhomogenous with the experimental group and homogenous with the control group. The difference is statistically significant according to the Mann-Whitney significance test, for $z = -2.268$ and $p = 0.023 < 0.05$. The effect size index (0.51) shows a high to very high difference between the two groups (see Table 1).

Table 2 **Two-leg balance with legs close together, eyes closed**

Group	Avg.	Avg. diff.	Median	Minimum	Max.	Variation coeff.	Mann-Whitney		Effect size
							Z	P	
Experimental	0.299	-0.144	0.279	0.253	0.485	22.9%	-3.214	0.001	0.72
Control	0.443	-32.6%	0.455	0.356	0.532	12.6%			

The test for two-leg balance with legs close together and eyes closed showed a 0.144 (32.6%) cm lower average value of displacement for the experimental group. This signifies a better static balance of the experimental group.The average values are 0.299 for the experimental group and 0.443 cm for

the control group. The data dispersion about the average is relatively homogenous with the experimental group and homogenous with the control group. The difference between the two average values is statistically significant according to the Mann-Whitney significance test, for z = -3.214 and p = 0.001 < 0.05. The effect size index (0.72) shows a high to very high difference between the two final testings (see Table 2).

Stability test with multiple single leg jumps

Aim: evaluating control over body position and balance during functional performance with repeated jumps.

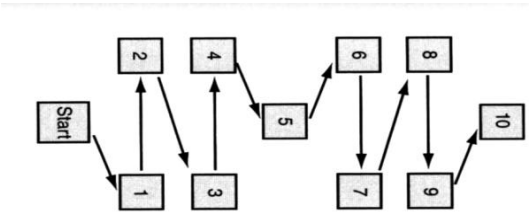

Figure 1.

Table 3 **Stability test with multiple single right leg jumps**

Group	Avg.	Avg. diff.	Median	Minimum	Max.	Variation coeff.	Mann-Whitney		Effect size
							Z	P	
Experimental	21.20	-29.90	20.50	6	36	53.1%	-3.100	0.002	0.69
Control	51.10	-58.5%	52.00	21	73	38.6%			

The multiple single right leg jumps stability test showed a 29.90 (58.5%) point lower average value of execution errors for the experimental group. The average values are 21.20 for the experimental group and 51.10 points for the control group. The data dispersion with both groups is inhomogenous. The difference is statistically significant according to the Mann-Whitney significance test, for z = -3.100 and p = 0.002 < 0.05. The effect size (0.69) shows a high to very high difference between the two final testings (see Table 3).

Table 4 **Stability test with multiple single left leg jumps**

Group	Avg.	Avg. diff.	Median	Minimum	Max.	Variation coeff.	Mann-Whitney		Effect size
							Z	P	
Experimental	23.60	-26.40	22.0	6	43	55.8%	-2.879	0.004	0.64
Control	50.00	-52.8%	42.0	28	79	35.9%			

The multiple single left leg jumps stability test showed a 26.40 (52.8%) point lower average value of errors made by subjects from the experimental group. The average values are 23.60 for the experimental group and 50.00 points for the control group. The data dispersion with both groups is inhomogenous. The difference is statistically significant according to the Mann-Whitney significance test, for z = -2.879 and p = 0.004 < 0.05. The effect size (0.64) shows a high to very high difference between the two groups (see Table 4).

Discussion

The results recorded in this research indicate the emergence of significant differences between the two groups from the initial to the final testings, on account of, as we believe, the procedures carried out on unstable surfaces, proposed by us. After applying the Two-leg balance tests with legs close together, eyes open and closed (15 seconds recording time) and the Stability test with multiple single (right and left) leg jumps, a significant progress can be observed with the experimental group as compared with the control group.

It is recommended that with young athletes training balance be started with exercises aiming static balance, followed later by more complex ones for dynamic balance.

It is also recommended that training balance should start on a stable surface with a wide base for foothold and visual feedback. For increased efficiency the difficulty level of execution can be raised: narrow base for foothold with eyes open; wide base fro foothold with eyes closed; narrow base for foothold with eyes closed.

The complexity of movements involved as well as the execution of exercises on different types of surfaces (sand, lawn, grass, various devices etc.) lead to the facilitation of the balance training process.

The role of unstable surfaces is to intensify muscular activity at the expense of mechanical load. By introducing unstable surfaces the proprioceptive feedback is unreliable due to the fact that the control mechanism responsible for maintaining balance is being permanently stimulated, its task thus becoming more difficult.

Conclusion

In view of the results of this study we can conclude that implementing programmes that include procedures on unstable surfaces can have a considerable impact on performance by creating and optimizing a wide array of fundamental motor skills.

The role of unstable surfaces is to intensify muscular activity at the expense of mechanical load. By introducing unstable surfaces the proprioceptive feedback is unreliable due to the fact that the control mechanism responsible for maintaining balance is being permanently stimulated, its task thus becoming more difficult.

These exercises, carried out in special conditions (on balance fits, using TRXs, gym balls), stimulate proprioception and may lead to an increase in athletic performance both in case of a high stress game and of technical performance demands in particular situations: imbalance, shooting, passing etc.

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