Futbolcularda Uygulanan Kararsız Antrenmanların Pozisyon Duygusu, Statik Denge ve Beceri Belirlenmesine Etkileri

Atakan ÇAĞLAYAN[1], Ali KIZILET[2]*

[1] Istanbul Gedik University Faculty of Sport Sciences,
[2] Marmara University Faculty of Sport Sciences, Health Sciences Institute
*Sorumlu Yazar: akizilet@marmara.edu.tr

Gönderilme Tarihi: 12.01.2020 – Kabul Tarihi: 08.03.2020

Öz

Çalışmamızın amacı, sabit ve dengesiz zeminde uygulanan antrenman programlarının futbolda dizdeki propriyosepsiyon, statik denge ve top sürme becerisi üzerindeki etkilerini karşılaştırmaktır. Çalışmaya dengesiz sahalarda çalışan denge grubu (DBG), stabil alanlar (PG) ve kontrol grubu (CG) üzerinde çalışan plyometrik grup. Çalışma gruplarında (DBG ve PG) oyuncular 12 hafta boyunca 24 antrenman programı gerçekleştirdi. Dizdeki propriyosepsiyon, Statik Denge (SB) ve top sürme becerisi (CST; Yaratıcı Hız Testi) izleri ölçüldü. Yapılan çok sayıda çapraz grup analizi sonucunda DBG'de önemli iyileşme gözlemlendi; SB dominant bacak (% 29.42), SB dominant olmayan bacak (% 31.21), dominant bacakta propriyosepsiyon (% 51.52) ve CST ölçümleri (% 8.31), PG; sadece CST ölçümlerinde (% 5.58), CG; SB dominant bacakta (% 19.25) ve CST ölçümlerinde (% 7.85). DBG'de SB dominant olmayan bacak ölçümlerinde CG'ye göre anlamlı iyileşme görüldü ($p < 0.05$). Parametreler arasında herhangi bir ilişki gözlenmemesine rağmen. Sonuç olarak DBG'de gözlemlenen iyileşme, futbolda her iki bacağı da etkin bir şekilde kullanmak gerektiği düşünüldüğünde optimum performans için önemlidir. İkili dengenin artmasının zor koşullarda top sürme, şut atma ve pas verme gibi futbol performansını belirleyen becerileri geliştirebileceği düşünülmektedir.

Anahtar Kelimeler: Statik denge, Ergen, Plyometrik, Top sürme, Propriosepsiyon

The Effects of Unstable Trainings Applied in Soccer Players on Determination of Position Sense, Static Balance and Skill

Abstract

The aim of our study is to compare the effects of training programs applied on stable and unstable floor on proprioception in the knee, static balance and dribbling skill in soccer. A total of 36 soccer players (age:12±0.86; height:151±7.98; weight:42.35±8.14) participated in the study with equal numbers (n=12) in each group as the balance group working on unstable fields (DBG), plyometric group working on stable fields (PG) and control group (CG). In the study groups (DBG and PG), the players performed 24 training programs for 12 weeks. The proprioception in the knee, Static Balance (SB) and dribbling skill (CST; Creative Speed Test) tracks were measured. As a result of numerous cross-groups analysis done significant improvement has been observed in DBG; SB dominant leg (%29.42), SB non-dominant leg (%31.21), proprioception of dominant leg (%51.52) and CST measurements (%8.31), PG; only in CST measurements (%5.58), CG; in SB dominant leg (%19.25), and CST measurements (%7.85). Significant improvement has been observed in SB non-dominant leg measurements in DBG when compared with CG ($p<0.05$). Although no relation has been observed between parameters. In conclusion, the improvement observed in DBG is important for the optimum performance considering that it is necessary to use both legs effectively in soccer. It is thought that the increase in bilateral balance can improve the skills that determine soccer performance such as dribbling, shooting and passing in difficult conditions.

Keywords: Static balance, Adolescent, Plyometric, Dribbling, Proprioception

1. Introduction

Today soccer is a game that requires a high effort and also it consist of lots of features such as strenght, speed, agility, balance, stability, flexibility and durability. (Bloomfield et al. 2007, Helgerud et al. 2001).

In soccer match players do so many attacks that requires a high-level strength such as shat, dribble, jumping, getting the ball, sprint and taking steps In soccer realizing such motor activities is so important to continue the balance duty both at internal and external factors that disrupts the balance (Haghighi et al. 2012, Nikseresht 2014).

With each movement change, the balance and orientation requirements of the body also change, and in order to perform these tasks with minimum effort, it is necessary to make the transition to the next position in the most controlled and fast manner, the postural changes during the ongoing posture and the increase in body release (Cobb 1999, Şimşek and Ertan 2011).

Unstable surfaces such as Swedish ball, bosuball, and wobble board restrict sensor and motor feedback cycles, causing increases in body oscillation, for example loss of balance and muscle activity.

It is very important to keep the balance in the fast position changes carried out while keeping the whole body in balance and applying necessary movements for the sporting event (Atılgan 2013). This requires a significant change in the capacity of incoming proprioceptive information, ie a high-level control system (Kean et al., 2006, Anderson and Behm 2005).

This study was conducted to investigate the effects of training on unstable surface in young soccer players to determine position sense (proprioception), static balance and dribbling skills.

2. Methods

2.1. Subjects

Soccer players constituting balance (DBG) and plyometric groups (PG) were selected from the same amateur soccer team of the same age and similar socio-economic structure while the control group (CG) was selected from a different amateur team in the same age group (İstanbul amateur league, Turkey). In the study, athletes divided into DBG (n=12, age: 12.66 ± 0.49, bmi:18.3), PG (n=12, age: 12.66 ± 0.49, bmi:18.6) and CG (n=12, age: 13 ± 0, bmi:18.6)

2.2. Experimental Approach to the Problem

In the study, while DBG were doing balance study on the unstable surfaces for 12 weeks, PG players did plyometric studies. Control group continued their classical soccer training. On the results of pre-and post-tests, it is compared whether training programs were effective on proprioception, static balance and dribbling

2.3. Training

Balance and Plyometric groups were given a circular training program with 10 movements on each training day. Balance trainings are carried out on an unstable surface; bosu ball, balance board, balance disk, trampoline and gymnastics were used. Participants were given the opportunity to lower their speed of movement when they did their movements uncontrollably, and to make the jumpers more balanced in the falls.

The adolescent players who participated in the research are very young, and it taken into consideration that they had never conducted plyometric exercises before. Plyometric implementations were done on horizontal plan in towards and sideways multiple jumps, and medium level difficulty training level was selected considering the stress on muscle-tendon units. All exercises were conducted on artificial grass ground in order to reduce the trauma effect of jumps (Bozdoğan ve ark 2014).

The training program was conducted for 12 weeks and 2 days a week. The exercises of both groups were designed to be very balanced to less balanced, difficult to easy and simple to complex. The training program was done over 2 sets in both groups. The movements started to apply with 20 seconds, 25 seconds after 4th week and finally 30 seconds after 8th week. The rest between sets was given for 5 minutes.

While the studies lasted between 35-40 minutes, soccer players in both groups applied dynamic warming to upper and lower muscle groups in order to avoid any difference in practice (Gelen, 2010). For the control group, only classic soccer practice was applied.

2.4. Data Collection Procedures

Three groups were tested at the beginning and end of 12 weeks. Laboratory and field tests were applied on two separate days.

Laboratory tests were performed on the first day; field tests were performed on the second day. Laboratory tests were performed after a standard 15-minute warm-up. Static balance and proprioceptive test were applied to the athletes respectively. On the second day, a Creative Speed Test (CST) battery was used to test the dribbling skill.

2.4.1. Static Balance

Static balance (SB) measurement of young soccer players was conducted in balance laboratories during the relaxed position of body and necessary precautions were taken to avoid any effect coming from environmental factors (noise, temperature). The measurements were performed by using Force Platform. Verbal and visual information about tests was given to the subjects. Before balance tests (for all measurements), stabilimeter was calibrated and subjects were allowed to settle on the balance platform with their feet naked. Measurements were performed with the eyes closed for the dominant and non-dominant legs and the areas of oscillation were determined. In the measurements where the smallest oscillation field points to the best balance, three trials were made for each measurement and the best ratings were taken. Data were recorded in forms and statistically interpreted (Yaggie ve Campbell 2006).

2.4.2. Proprioception

Proprioception was evaluated with the knee joint position sense. Joint position sense was tested with Biodex Balance System 4 Pro (New York USA) isokinetic dynamometer. Proprioception test was verbally explained and shown to the subjects. Subjects performed a trial before starting the test. Proprioception was measured by passive positioning of the previously articulated joint position. The legs of the subjects with which they started the test were randomly selected and the knees were manually placed in the starting position (90°) before finding the position sense. While the knee was brought to extension from flexion at 90°, it was held at 45˚ flexion angle for 5 seconds and this angle was taught to young athletes. Then the knee was brought back to the 90 ° flexion and the athletes were asked to move their knees towards the 45 ° flexion angle they previously learned and to press the stop button when they felt they reached this angle. During the test, the eyes of the subjects were closed and the test environment was silent. In the test where the closest value to true angle indicates good proprioception in the knee, the difference between the actual angles taught and those found by the subjects was determined and recorded. Three repetitions were made for each leg and their average was recorded. 30 seconds of pause was allowed between repetitions while 5 minutes of break was allowed in change of legs (Daneshjoo ve ark. 2012).

2.4.3. Creative Speed Test

Before starting the test, 20 minutes standard warming process was done. The test began with the taking the pass and giving it back to the friend at the penalty point turning his face to the goal point. As soon as he returned the ball, the athlete turned to the opposite side and sprinted towards the ball between the cones placed in the middle of the penalty area arc. By taking the ball there the player continued to dribbling between the cones and the line of penalty area. After that he continued dribbling to the middle of the arc. Then by turning behind the cones that were in the middle of the arc, he tended to the goal point and continued dribbling to the point he started. The test finished when he came to the starting point and scored a goal on either one of the two 2-metre-wide goals located at the corners of the goal line. If and when the final kick didn't result in a goal, subjects were requested to repeat the test after 5 minutes of rest. Subjects performed two trials ending with a goal and the best scores were recorded. In CST test, a Smart brand single-port photocell was used as the entrance and exit on the penalty spot and 2 soccer balls and 12 cones were made available (Bangsbo and Mohr 2011).

2.5. Statistical Analyses

The data obtained in the study were analysed using SPSS (Statistical Package for Social Sciences) for Windows 21.0 program. The Shapiro Wilks test was used when the distributions of the variables were determined and it was found that the distributions are normal. Descriptive statistical methods (Number, Percentage, Mean, Standard deviation) were used when evaluating the data. In the comparison of quantitative data, one way Anova test was used for the comparison of parameters between two groups in the case of more than two groups and the Scheffe test was used in determining the group causing the difference. The relationship between the continuous variables of the study was analysed by Pearson correlation. The findings were evaluated at 95% confidence interval and 5% significance level.

3. Results

3.1. Within Group Changes

When the pre-and post-test results of all variables were analysed, in DBG players SB dominant leg (d=-2.66, % 29.42, p=0.00), SB non-dominant leg (d=-3.21, % 31.21, p=0.01), PRO dominant leg (d=-2.68, %51.52, p=0.017) and CST (p=-1.75, % 8.31, p=0.00) measurements were statistically significant (p<0.05).

Plyometric Group (PG) soccer players only in CST measurements (d=-1.16, % 5.58, p=0.03), and for Control Group (CG) soccer players in Static Balance (SB) dominant leg (d= -2.12, %19.25, p=0.03) and CST (d= -1,61, % 7.85, p=0.00) measurements were statistically significant (p<0.05).

3.2. Between Group Changes

When the pre- and post-test variables of the groups were examined, a statistically significant difference was observed only in the SB non-dominant leg measurements. A statistically significant increase was found when DBG soccer players were compared with CG soccer players (p<0.05).

Table 1: SB non-dominant leg pre-test, post-test and change scores of DBG, PG, and CG athletes

Groups	Pre		Post		Difference		%	N	T	p
	Avr.	Sd	Avr.	Sd	Avr.	Sd				
DBG	10.303	3.264	7.087	2.3	-3.216	3.57	-31.21	12	3.121	**0.010**
PG	11.62	2.498	10.603	2.435	-1.018	2.14	-8.76	12	1.647	0.128
CG	11.545	3.843	11.755	3.438	0.21	3.525	1.82	12	-0.206	0.840
F	0.623		9.242		3.645					
P	0.543		**0.001**		**0.037**					
Diff.			**3 > 1 ---- 2 > 1**		**3 > 1**					

Table 2: SB dominant leg pre-test, post-test and change scores of DBG, PG and CG athletes

Groups	Pre		Post		Difference		%	N	T	p
	Avr.	Sd	Avr.	Sd	Avr.	Sd				
DBG	9,048	1,813	6,386	1,746	-2,662	1,889	-29,42	12	4,881	0,000
PG	11,81	2,669	10,899	2,905	-0,911	1,711	-7,71	12	1,844	0,092
CG	11,027	2,731	8,904	2,016	-2,123	3,051	-19,25	12	2,41	0,035
F	4,083		11,842		1,831					
P	0,026		0,000		0,176					
Diff.	2 > 1		3 > 1 ---- 2 > 1							

Table 3: Pre-test post-test and change scores of proprioception dominant leg of DBG, PG and CG athletes

Groups	Pre		Post		Difference		%	N	T	p
	Avr.	Sd	Avr.	Sd	Avr.	Sd				
DBG	5.208	3.286	2.525	1.55	-2.683	3.306	-51.52	12	2.812	0.017
PG	4.558	2.875	3.417	2.324	-1.142	2.273	-25.05	12	1.74	0.110
CG	3.275	2.82	2.175	1.509	-1.1	3.23	-33.59	12	1.18	0.263

F	1.29	1.464	1.105
P	0.289	0.246	0.343
Diff.			

Table 4: Pre-test, post-test and change scores of proprioception non-dominant leg of DBG, PG and CG athletes

Groups	Pre		Post		Difference		%	N	T	p
	Avr.	Sd	Avr.	Sd	Avr.	Sd				
DBG	4.283	2.742	2.508	0.733	-1.775	2.897	-41.44	12	2.122	0.057
PG	4.242	2.915	3.233	1.847	-1.008	3.383	-23.76	12	1.032	0.324
CG	4.4	2.556	3.317	1.886	-1.083	2.594	-24.61	12	1.447	0.176
F	0.011		0.948		0.242					
P	0.989		0.398		0.786					
Diff.										

Table 5: CST pre-test, post-test and change scores of DBG, PG and CG athletes

Groups	Pre		Post		Difference		%	N	T	p
	Avr.	Sd	Avr.	Sd	Avr.	Sd				
DBG	21,091	0,885	19,337	1,532	-1,753	1,123	-8,31	12	5,41	0,000
PG	20,865	1,035	19,7	0,824	-1,165	1,053	-5,58	12	3,833	0,003
CG	20,571	0,823	18,955	0,764	-1,615	0,736	-7,85	12	7,606	0,000
F	0,966		1,383		1,172					
P	0,391		0,265		0,322					
Diff.										

4. Discussion

In our study, when SB non-dominant leg pre-test and post-test scores were evaluated, a statistically significant improvement was found in DBG athletes (3.21±3.57cm²), even though the improvement was seen PG athletes did not have any statistical significance (1.01±2.14cm²). However, in CG athletes, it was observed that the oscillation was increased (-2.1±3.52cm²), but this was not statistically significant. The balance characteristic of an athlete is affected from the ground, its movements or both. In this study, the results of the exercises performed on unstable grounds for 12 weeks on static balance, proprioception and skill have been evaluated and it was seen that the DBG athletes working on unstable grounds have made more progress than PG and CG athletes in terms of all parameters. In soccer, the effect of the balance during the game has different significance levels according to dominant and non-dominant legs.

While it is stated in literature that soccer is the most ideal sport branch that improves balance (Jacobsen et all 2010), it is uttered in another study emphasizing the importance of balance in soccer that the soccer players of national league are better when static and dynamic balance measurements of players are compared (Paillard et all 2006).

In literature, Tropp et al. (1984) found that the use of uniaxial and multi-axis balance discs significantly reduced postural oscillation values on soccer. In another study Blackburn et al. (2000) divided their athletes into a control group, a force training group, a proprioceptive training group, and a force proprioceptive training group. The researchers found that there was no statistical difference between the groups as a result of the studies, but reported that the improvements in proprioception and muscular strength were equally effective in improving joint stability and stabilizing. However, these developments in SB are very valuable because the improved balance characteristic of younger ages can be contributed to elite soccer players by making them more ergonomic by carrying younger soccer players biomotor features to the next years and making them able to perform technical skills specific to soccer. It is stated that starting neuromuscular training such as balance, agility and proprioception in this period will make a great contribution as an important advantage due to the peak height of males in the adolescence period (Malina et all 2004) and the decrease in balance and coordination (Myer et all 2004). These competences are important characteristics affecting the performance in soccer (Little and Williams 2005).

Similar situation is observed in proprioception results. In the study presented, only proprioception of dominant leg (2.68±3.31) has been found statistically significant in DBG athletes according to the proprioception pre-post test results of both dominant and non-dominant leg at 45° target angel. This is very important for the hypothesis of our study. Here, the proprioception development in DBG athletes also affected from SB improvements is considerably more apparent than the other two groups and supports the hypothesis of our study.

Many studies in literature state that balance trainings programs improve proprioceptive control (Bernier and Perrin 1998, Lephart et all 1997). Ross et al. (2004) have stated that the dominant leg proprioception of subjects is better than the other leg. Although proprioception doesn't display significant development in PG group, there are contrary evidences in literature. Zech et al. (2010) have concluded that balance works are effective in the postural and neuromuscular control developments. These results reveal the importance of plyometric exercises in soccer practices and those to be performed on unstable grounds.

In conclusion, the improvement observed in DBG is important for the optimum performance considering that it is necessary to use both legs effectively in soccer. Considering the multitude of activities performed on one foot in the soccer, it is thought that the increase in bilateral balance can improve the skills that determine soccer performance such as dribbling, shooting and passing in difficult conditions. Both in our study and in the studies done in the literature, as well as the studies on the unstable surfaces, there are positive effects on the balance as well as strength and agility development in the plyometric studies. In this respect, it is important that both training programs are integrated into the training plans and included in the annual training plan.

References

Anderson, K, Behm, DG. The impact of instability resistance training on balance and stability. Sports Medicine 35 (1): 43-53, 2005

Atılgan O.E., 'Effects of trampoline training on jump, leg strenght, static and dynamic balance of boys', Science of Gymnastics Journal, Vol. 5, Issue 2: 15 – 25, (2013).

Bangsbo J., Mohr M., 'Fitness testing in soccer', Bangsbosport, Stormtryk, Rosendahls-BookPartnerMedia, ISBN 9788799488001, (2011).

Bernier, JN, Perrin, HD. Effect of coordination training on proprioception of the functionally unstable ankle. J Orthop Sports Phys Ther 27(4): 264–275, 1998

Blackburn T., Cuskiewicz K.M., Petschauer M.A., Prentice W.E., 'Balance and joint stability: the relative contributions of proprioception and muscular strength' Journal of Sport Rehabilitation, 9: 315 - 328, (2000).

Bloomfield J., Polman R., O'Donoghue P., Mcnaughton L., 'Effective speed and agility conditioning methodology for random ıntermittent dynamic type sports', Journal of Strength and Conditioning Research, 21(4), 1093–1100, (2007).

Bozdoğan T.K., Pehlivan A., Kızılet A. 'Effects of coordınatıon and plyometrıc traınıng on runnıng economy ın young women soccer players', International Journal of Academic Research, Vol. 6, No 6, 2014.

Cobb, S.V.G., 'Measurement of postüral stability before and after ımmersion in a virtual environment', Applied Ergonomics, 30, 47-57, (1999).

Daneshjoo A., Mokhtar A.H., Rahnama N., Yusof A., 'The effects of comprehensive warm-up programs on proprioception, static and dynamic balance on male soccer players', Plos One, 7 (12): e51568, (2012).

Gelen, E. Acute Effects of different warm-up methods on sprint, slalom dribbling, and penalty kick performance in soccer players. Journal of Strength and Conditioning, 24(4): 950 - 956, 2010.

Haghighi A., Moghadasi M., Nikseresht A., Torkfar A., Haghighi M., 'Effects of plyometric versus resistance training on sprint and skill in young soccer players', European Journal of Experimental Biology, 2 (6): 2348 - 2351, (2012).

Helgerud J., Engen L.C., Wisloff U., Hoff J., 'Aerobic Endurance Training Improves Soccer Performance', Medicine and Science in Sports and Exercise, 33: 1925–1931, (2001).

Jakobsen, MD, Sundsrup, E, Krustrup P, Aagaard P. The effect of recreational soccer training and running on postural balance in untrained men. European Journal of Applied Physiology 111 (3): 521 – 530, 2010.

Kean, CO, Behm, DG, Young, WB. Fixed foot balance training increases rectus femoris activation during landing and jump height in recreationally active women. Journal of Sports Sciences Medicine 5(1): 138-148, 2006.

Lephart, SM, Pincivero, DM, Giraldo, JL, Fu, FH. The role of proprioception in the management and rehabilitation of athletic ınjuries. The American Journal of Sports Medicine 25(1): 130-137, 1997

Little, T, Williams, AG. Specificity of acceleration, maximum speed, and agility in professional soccer players. Journal of Strength and Conditioning Research 19(1): 76–78, 2005.

Malina, RM, Eisenmann, JC, Cumming, SP, Ribeiro, B, Aroso, J. Maturity-associated variation in the growth and functional capacities of youth soccer (soccer) players 13–15 years. European Journal of Applied Physiology 91(5-6): 555-562, 2004.

Myer, GD, Ford, KR, Hewett, TE. Methodological approaches and rationale for training to prevent anterior cruciate ligament ınjuries in female athletes. Scandinavian Journal of Medicine and Science in Sports 14(5): 275-85, 2004.

Nikseresht A., Taheri E., Khoshnam E., ' The effect of 8 weeks of plyometric and resistance training on agility, speed and explosive power in soccer players', European Journal of Experimental Biology, 4(1): 383 - 386, (2014).

Paillard, T, Noe, F, Riviere, T, Marion, V, Montaya, R, Dupui, P. Postural performance and strategy in the unipedal stance of soccer players at different levels of competition. Journal of Athletic Training 41(2): 172 – 176, 2006.

Ross, S, Guskiewicz, K, Prentice, W, Schneider, R, Yu, B. Comparison of biomechanical factors between the kicking and stance limbs. Journal of Sport and Rehabilitation 13: 135-150, 2004.

Şimşek D., Ertan H., 'Postural kontrol ve spor: kassal yorgunluk ve postural kontrol ilişkisi', Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi, 9: (4), 119-124, (2011).

Tropp H., Ekstrand J., Gillquist J., 'Factors affecting stabiliometry recordings of single limb stance', Am. J. Sports Med., 12(3):185–188, (1984).

Yaggie J.A., Campbell B.M., 'Effects of balance training on selected skills', Journal of Strength and Conditioning, 20(2), 422-428, (2006).

Zech, A, Hubscher, M, Vogt, L, Banzer, W, Hansel, F, Pfeifer, K. Balance training for neuromuscular control and performance enhancement: a systematic review. Journal of Athletic Training 45:4, 2010.

