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***Original article***

# THE EFFECT OF BALANCE ON AGILITY IN SOCCER PLAYERS

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**Abstract***

*Aim* of this study was to examine the effectiveness of balance on agility performance in professional soccer players.

*Methods.* A total 16 professional soccer players participated as volunteer. Their mean age was 24,38±5,536 years, mean height was 1,77±0,064 meters, mean weight was 74,13±15,024 kg, and mean sport age was 7,13±4,978 years.

Pro-agility test was applied for agility performance. Balance performance was measured by firm surface and foam surface as eyes closed.

*Results.* There was no a significant (P>0,05) effectiveness of firm surface balance score, foam surface balance score, and total balance score.

*Conclusion,* it is thought that the balance and agility performances are improved at a high level when the athletes' training levels are thought to be the same.

*Keywords:* Agility, Balance, Soccer

## Introduction

Nowadays, soccer is a highly demanding game in which the soccer players are exposedto numerous actions that require overall strength and power production, speed, agility, balance, flexibility, stability, and the adequate level of endurance (Bloomfield et al., 2007; Krustrup et al., 2005; Jovanovic et al., 2011). Balance, the ability to maintain the center of body mass over a base of support, has long been classified as an important aspect of motor development. It is the underlying component of all movement skills, especially agility (Verstegen and Marcello, 2001). Agility is generally expressed as the ability to quickly change directions and to start and to stop quickly. Also, it has identified as the ability to maintain and control correct body positions while quickly changing direction through a series of movements (Little and Williams, 2005; Sporis et al., 2010). Many movements in soccer demand rapid changes of direction. A soccer player changes direction every 2-4 seconds and makes 1,200-1,400 changes of direction during a game (Verheijen, 1997; Bangsbo, 1992). Considering the results of Sporis et al. (2010) that improvement of balance should be considered as one of the key features of agility improvement. Agility can be thought of as a systemic integration of neuromuscular coordination, reaction time, speed, strength, balance. Enhanced power, balance, speed, and coordination are some of the objectives of their agility training. This complex nature of agility performance has lead many researchers to conduct studies that involve a breakdown of its component parts (Wallmann et al., 2008). Although there is no consensus on the measurement of agility, in soccer, the pro – agility test is very often used as a measure of agility.

Thus, the purpose of this study was to determine the extent to which effectiveness of balance on agility performance in professional soccer players. It is our hypothesis that these agility qualities will be shown to be relatively balance qualities in soccer players. Such knowledge would help sports scientists and soccer trainers choose appropriate testing and training procedures when working with elite soccer players.

## Method

Experimental Approach to the Problem

This investigation involved to evaluate the extent to which effectiveness of balance on agility performance in professional soccer players. A total of 16 professional soccer players were obtained. These soccer players are playing in third leagues of Turkey. The pro-agility test and balance foam matt was used for soccer players.

Subject

Sixteen elite male soccer players volunteered to participate in the study. These soccer players were playing in third league of Turkey. The mean (SD) age was 24.38±5.536 years, 1.77±0.064 m, weight was 74.13±15.024 kg, and sport age was 7.13±4.978 years. All were of similar body mass and height. The daily workload was monitored and was similar for all subjects. Full details of the study were provided to the players prior to their participation in the study, and informed consent

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was obtained in accordance with the ethical standards of the Helsinki Declaration (1975).

Procedures

All of the soccer players included the study had the same physical fitness because they attended the preparatory period, which had lasted 40 days. The tests were applied the second week of December in the contest season, and the aims of all tests were explained to the players before the tests were conducted. The tests were started with a 25-minute warm-up session. While the tests were conducted, the same weather conditions were taken into consideration. This was followed by the administration of balance test and pro-agility test.

The methodology employed during the tests is summarized in the following paragraphs.

Pro-Agility Test

To assess agility performed the pro-agility test (5-10-5 test). Each soccer player straddled the middle/marked line and sprinted in 1 direction for 5 yards. The soccer player changed direction and sprinted back 10 yards to another line and pivoted back and sprinted through the starting line (5 yards). The photocell was positioned at the middle line, which is the starting and finishing point of the test. Each soccer player performed 3 attempts and the fastest time was recorded.

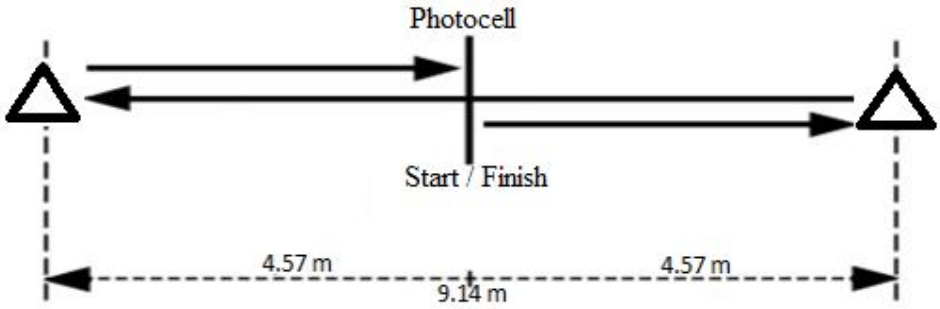


Figure 1.Pro-agility test

Balance Error Scoring System (BESS)

Postural performance of soccer players was measured using the BESS. The BESS is a valid and reliable measure of postural stability and comprises 6 stance conditions: double-leg, single leg, and tandem stances on both a firm surface and a foam surface (Riemann and Guskiewicz, 2000). The BESS requires participants to stand unsupported with their eyes closed. The foam surface was done on a 50 x 41 x 6 cm block of medium-density foam (Airex Balance Pad, Alcan Airex AG, CH-5643 Sins/Switzerland). A stopwatch was used to time each of the 20-second trials. One BESS error was scored if the subject engaged in any of the following: (1) lifting the hands off the iliac crests; (2) opening the eyes; (3) stepping, stumbling, or falling; (4) moving the hip into more than 30° of flexion or abduction; (5) lifting the forefoot or heel; or (6) remaining out of the test position for longer than 5 seconds. Error scores were calculated for each of the 6 conditions and summed to obtain the total BESS score. The double-leg stance conditions consisted of the soccer players standing with feet together. The single leg stance was performed on the non-dominant leg, as determined by which limb the subject would not preferentially use to kick a ball. The dominant leg was positioned so that the hip was flexed to approximately 30° and the knee flexed to 90°, leaving the foot approximately 6 to 8 inches off the ground. In tandem stance, the non-dominant foot was positioned behind the dominant foot, and the subject was instructed to maintain the stance with the great toe of the non-dominant foot touching the heel of the dominant foot. For all conditions, we instructed the subject to remain still with eyes closed and hands on the hips (Guskiewicz, 2004). After the instruction, each soccer players were given 2 familiarization trials on each condition before the actual data collection. The soccer players remained as still as possible; if he moved from the test position, he was to return to it as soon as possible. The number of errors for each of the 6 tests was observed and recorded for the soccer players' BESS score. A higher score on the BESS indicate a poor postural control. All subjects and all trials were scored by one examiner ((Erkmen et al., 2010).

Statistical Analysis

SPSS 22.0 statistical package program was used for evaluation and calculation of the obtained data. The data are summarized as mean and standard deviation. One Sample Kolmogorov-Smirnov test was used to determine whether the data were normal distribution or not. The effect of the independent variable on the dependent variable was evaluated by Linear Regression analysis. In addition, the relationship between dependent and independent variables was tested by the Bivariate Correlations test. The error level in this study was accepted as 0.05.

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**Results**

**Table 1.** Descriptive Statistics for Soccer Players.

| Variables | N | Mean | S.D |
|---|---|---|---|
| Age (years) | 16 | 22.62 | 2.986 |
| Height (m) | 16 | 1.83 | 0.056 |
| Weight (kg) | 16 | 73.00 | 13.871 |
| Sport age (age) | 16 | 11.75 | 2.352 |

**Table 2.** Effect of Firm Surface Balance Scores on Agility Performance of Soccer Players.

| Variables | Firm Surface | B | S.E | Beta | T | P |
|---|---|---|---|---|---|---|
| Depended variable=Agility | | -0.001 | 0.016 | -0.013 | -0.050 | 0.961 |
| | R = 0.013 $R^2$= 0.000 F = 0.002 P = 0.961 | | | | | |

When the table is examined, it is observed that the model is not significant (P> 0.05).It was found that the firm surface balance scores did not affect agility performance (P> 0.05).

**Table 3.** Effect of Foam Surface Balance Scores on Agility Performance of Soccer Players.

| Variables | Foam Surface | B | S.E | Beta | T | P |
|---|---|---|---|---|---|---|
| Depended variable=Agility | | 0.002 | 0.024 | 0.023 | 0.086 | 0.932 |
| | R = 0.023 $R^2$= 0.001 F = 0.007 P = 0.932 | | | | | |

When the table is examined, it is observed that the model is not significant (P>0.05). It was found that the foam surface balance scores did not affect agility performance (P>0.05).

**Table 4.** Effect of Total Balance Scores on Agility Performance of Soccer Players.

| Variables | Total Balance Scores | B | S.E | Beta | T | P |
|---|---|---|---|---|---|---|
| Depended variable=Agility | | 0.000 | 0.014 | 0.002 | 0.0075 | 0.994 |
| | R = 0.002 $R^2$= 0.000 F = 0.000 P = 0.994 | | | | | |

When the table is examined, it is observed that the model is not significant (P>0.05). It was found that the total balance scores did not affect agility performance (P>0.05).

**Table 5.** The relationship between the Balance Scores and the Agility Performance of the Soccer Players.

| | | Firm Surface | Foam Surface | Total score |
|---|---|---|---|---|
| Agility | R | -0.013 | 0.023 | 0.002 |
| | P | 0.961 | 0.932 | 0.932 |
| | N | 16 | 16 | 16 |
| Firm Surface | R | | -0.078 | 0.816 |
| | P | | 0.773 | 0.000* |
| | N | | 16 | 16 |
| Foam Surface | R | | | 0.512 |
| | P | | | 0.043* |
| | N | | | 16 |

*P<0.05

As Shown Table 5. There was no statistically significant relationship between agility performance and firm surface, foam surface and total balance scores (P>0.05). In addition, when the correlation between the balance scores was examined, it was found that there was no significant relation between the firm surface and the foam surface (P>0.05), and there was a significant relationship between the firm surface with the total score and the foam floor with the total score (P<0.05).

**Discussion**

Theoretically, agility performance must be improved so that the body can maintain control and balance during movement (Miller et al. 2006). Although the authors express that balancing performance should be improved for the development of agile performance or balancing should be regarded as an aspect of agility, studies of balancing the agility relationship are rare (Little and Williams, 2005; Miller et al. 2006;Sporiset al. 2010).In a study, the performances of 18 elite soccer players in selected tests of speed, balance, agility, and vertical jumping were compared under conditions of untapped, no elastic adhesive taped, Swede-0-braced, New Cross-braced, and McDavid-braced ankles. There were no significant differences in tests of speed, balance, and agility among any of the support conditions (Paris, 1992). In the pre-puberty children, in a study which aim the effect of balance and flexibility on agility performance that was assessed by the flamingo balance test. It was reported that the balance effect was positive on agility performance (Hazar and Tasmektepligil, 2008). In a study examined the relationship between balance performance and agility performances of 12-year-old tennis players, it was determined that there was no relationship between agility performance and firm surface one-foot stand, firm surface tandem stand and total balance scores ($p > 0.05$). Agility performance was found to be significantly related to total balance points of double leg stand, single leg stands and foam surface ($p < 0,05$). There was a significant relationship between agility performance and one-leg stand and total balance scores ($p < 0.05$) (Okudur and Sanioglu, 2012). It has been shown that the balance exercises on recreationally active physical education students improve the agility performance (Simek et al., 2007). In a study on young soccer players, it has been reported that the reduction in agility performance, which requires high-intensity sprint performance, causes significant changes in balance performance (Katis and Kellis, 2009). In a study by Bloomfield et al. (2007), they found that there was a statistically significant relationship between dynamic balance and agility performance ($r = 0.455$, $P < 0.001$).

**Conclusions**

In conclusion, literature and previous studies, it is observed that there is a significant relationship between agility performance and balance performance in some studies, whereas in some studies there is no meaningful relation. It seems that the participants are not athletes at the elite level when they work with meaningful relationships. On the other hand, athletes participating in this study are soccer players in the elite level, the fact that their training levels are the same, and their exposure to balance and agility training are thought to be indicators of the development of these two skills on the same level. At the same time, it is considered that the physical characteristics of the soccer players participating in the study are similar, and that there is a related structure between balance and agility performance.

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