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# Comparison of Balance Performance of Elite Soccer Players and Skiers

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**Abstract** This study aims to detect whether balance capability varies for elite soccer players and skiers. This study has been carried out by participation of 10 elite male athletes and 10 elite male athletes who are involved in active sports and do not have any health problem. The content of the study requires Warm- up and Stretching Exercises and, subsequently, the performance of One Leg Standing Test, One Legged Hop for Distance, Triple Legged Hop for Distance, Six-Meter Hop for Time, Cross Six-Meter Hop for Time and Flamingo Balance Tests. The analysis of some statistical data has been carried out by using the SPSS program version 13.0. The level of significance is specified as $p < 0.05$. It has been measured that the average of age, height, weight and years in active sports of the participants are respectively 23.35 ± 3.13, 175.95 ± 6.62, 72.35 ± 8.21, 10.55 ± 4.76. The one leg standing test has given the observation that the performance of the skiers are apparently superior to the footballers' performance. It is possible that the skiers have shown better performance since they usually use the lower extremities. In addition, despite the lack of observation of a difference in statistically significant level, a slight superiority on the skiers' side has been observed the values derived from the left-leg flamingo test, the right-leg standing test, the right-leg cross 6m hop for time and the left-leg cross 6m hop for time.

**Keywords** Balance, Ski, Football, Performance

## 1. Introduction

Human body, by its very nature, needs to move regularly and permanently. Therefore, a person needs to do sport exercises in order to maintain a anatomically, physiologically and psychologically good state, to resume one's activities and to reveal one's reserve power (Celik & Kurkcu, 2007). Today, doing sportive exercises is accepted as part of a healthy and balanced life and one of the most useful social activities (Kurkcu & Gokhan, 2011).

In particular, sportive activities acted regularly during childhood play an important role for development and continuation of a healthy physical formation. Action of a child in regular sportive activities before and after puberty makes circulatory system and respiratory system more healthy and contributes to mental and psychic development (Alpay et.al 2007).

Elite athletes are said to exhibit a control of balance developing in relation with the discipline requirements. Getting familiar with sport activities and training within a long period of time develop the effectiveness of dynamic and static postural control in daily life activities. (Perrin & Perrot, 2002). Elite athletes predominantly utilize sensory information in order to regulate posture based on the requirements of the relevant branch of sport (Perrin, & Constantinescu, 1998), (Vuillerme, & Nougier, 2001). For instance, somatosensorial signals are much more expository than otolithic signals for body orientation for experienced gymnasts. (Bringoux, & Raphel, 2000). However, vision is a characteristic factor in posture regulation for professional dancers. (Golomer, & Ohlmann, 1999).

The purpose of sports is generically improving human health, character and productivity in individual perspective and maintaining a high potential of human collaboration by means of concrete, strong and common feelings and treatments in national perspective. Also in international perspective, governments benefit for their countries from sports organizations or activities by means of high ranks by successful athletes or by successfully carrying out organizations and introducing political, cultural, social and touristic aspects of their countries. (Çelik, & Kurkcu, 2007).

Getting familiar sports involves performing high level motoric applications during training or matches and simultaneously resuming both static balance and dynamic balance. For a successful performance, a gymnast should be able to keep the balance as falling down on the ground subsequent to a move, a footballer should be able to keep the balance when receiving a ball and controlling the position of an opponent player or a basketball player should be able to

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keep the balance when falling down on the ground after a rebound battling with an opponent. (Karakucuk, 1989).

A combination of different physiological mechanisms occurring in central and peripheral levels causing a decrease in motor control induces exhaustion. Thus, a possible effect of exhausting sportive applications on postural control is reasonable. Exhaustion occurring due to stress emerging during training will prevent sportive capabilities from being performed as desired. This exhaustion may also cause injuries as a result of lose of balance. (Erkmen, 2006).

Through agility, it is aimed to make the whole body or some specific part of it have ideal angular values. Therefore, the whole organism or a specific part of it as result of a stimulation, position, status or event emerging agility can be defined as abrupt fulfillment by coordinating actions as priorly known or not from the values of ideal angles of the status up to the values of ideal angles required by the status (Renklikurt 1991).

## 2. Material and Method

This study is performed by participation of 10 elite male footballers and 10 elite male skiers who do not have any health problem. The footballers and skiers were told of the aim of the study, and they have joined voluntarily. The height and weight of the athletes in the groups were measured by scales in terms of cm and kg respectively. Before tests, the athletes ran for 5 min. for making them sweat. After running, they did exercises for stretching waist-hip muscles and lower extremity muscles. Stretching exercises were performed for each muscle bundle for 30-40 sec. and for 2-3 times at pain level.

Tests for the athletes joining the study; One Leg Standing Test. This test evaluate the athletes' capability of keeping balance on one leg. The test was applied on a medium-hard mat on bare feet and eyes shut. Initially, the participants were asked to take a position on double feet in the middle of the mat and then to move their knees to flexion position and to shut eyes when ready. As soon as eyes were shut, a 1 minute of period was started. During the test, opening eyes, touching of the other foot onto the ground, any action changing the position of the test foot like jumping, lifting up front part or rear part of the foot, flexion or abduction of hip joint more than 30 degrees and any action decentralizing the body from the middle were estimated as 1 error point. At the end of the test, all error points were summed up. 3 tests were performed for each leg. Test for One Legged Hop for Distance asked from the athletes to jump as far as they can using one leg. The distance between the starting point and the point reached (on the toe) was measured in terms of cm using tape measure and results were recorded, and the average of 3 tests was calculated. Triple Legged Hop for Distance asked from the athletes to jump as far as three steps without pausing and keeping the balance as far as possible on a single leg. Swinging arms was allowed in the test. The distance between the starting point and the destination (on the toe) was measured using a tape measure and the results were recorded in terms of cm. 3 tests were carried out for each leg and the average of these 3 tests was calculated. The athletes were allowed to use their own shoes.

Test for Six Meter Hop for Time asked from the athletes jump onto a straight line of 6m on one leg in the shortest time. The volunteers were asked to jump in a short time, in a powerful manner, along a straight line and as far as possible. Time was triggered as movement started from the starting point and stopped as soon as 6 meters are finished. 3 tests were carried out for each leg and the average was calculated. Test for Cross Six Meter Hop for Time asked from the athletes to jump a distance of 6m on one leg in the shortest time transversely (10cm far from the straight line for each step). The volunteers were asked to jump in a short time, in a powerful manner, along a straight line and as far as possible. Time was triggered once action started from the starting point and stopped as 6 meters passed, and 3 tests were performed and accumulated in the average.

Flamingo Balance Test requires wooden or metal beam that is 50 cm in length 4 cm in height and 3 cm in width. Two wedges 15 cm in length and 2 cm in width are required to maintain stability. The feature measured is balance of the body.

The definition of the test is keeping the balance on one leg on a beam. The test was performed to try to keep the balance as long as possible on one leg during the balance period. Free leg was bent backward and held by the hand on the same side to have a flamingo position. Free arm could be used to help keep the balance. The forearm of a supporter could be used to take one to the balance position. As soon as the arm holding is released, time was triggered. The athlete tried to keep the balance in this position. Test was paused at each lose of the balance. For instance, in case the leg held by the hand was released or a part of the body touched the ground, the balance was accepted to be lost. After each pause, the period was restarted and resumed until 1 minute elapsed.

The number of trials made to keep the balance on the balance wood is the result of the test. For instance, the one losing the balance for 5 times in one minute and keeping the balance again got 5 points. In case the athlete was subject to 15 balance trials within the first 30 seconds, the test was stopped and the participant got 0 point.

## 3. Findings

This section of the athletes at the elite level football and ski industries participated in the survey will be compared to balance performance. 1. Overview of the physical properties in Table 2. The data obtained from comparative stability tests are given in the table.

The participants' average age, average height, body weight and years in sports are respectively 23.35±3/13, 175.95±6.62, 72.35±8.21 and 10.55±4.76.

**Table 1.** Physical Features of the Test Participants

| | N | X | S.S |
|---|---|---|---|
| Age | 20 | 23.35 | 3.13 |
| Height | 20 | 175.95 | 6.62 |
| Body Weight | 20 | 72.35 | 8.21 |
| Years In Active Sports | 20 | 10.55 | 4.76 |

**Table 2.** Comparing test Values of the Volunteers Joining the Study

| TESTS | BRANCH | N | M.Rank | z | p |
|---|---|---|---|---|---|
| Flamingo Balance Test-right | Football Group | 10 | 10.50 | 1 | 1 |
| | Ski Group | 10 | 10.50 | | |
| Flamingo Bala nce Test-left | Football Group | 10 | 12.70 | -1.785 | 0.074 |
| | Ski Group | 10 | 8.30 | | |
| One Leg Standing Test-right | Football Group | 10 | 12.30 | -1.37 | 0.171 |
| | Ski Group | 10 | 8.70 | | |
| One Leg Standing Test-left | Football Group | 10 | 13.45 | -2.254 | 0.024* |
| | Ski Group | 10 | 7.55 | | |
| 6 m Hop For Time-right (sec) | Football Group | 10 | 10.65 | -0.114 | 0.909 |
| | Ski Group | 10 | 10.35 | | |
| 6 m Hop For Time-left (sec) | Football Group | 10 | 11.25 | -0.576 | 0.565 |
| | Ski Group | 10 | 9.75 | | |
| 6 m Cross Hop For Time- right (sec) | Football Group | 10 | 12.30 | -1.367 | 0.172 |
| | Ski Group | 10 | 8.70 | | |
| 6 m Cross Hop For Time- left (sec) | Football Group | 10 | 12.95 | -1.903 | 0.057 |
| | Ski Group | 10 | 8.05 | | |

* $p<0.05$

Comparison of the balance test values of the volunteers joining the study is given in the table 2. Accordingly, the values for the left one leg standing test were in favor of the skier group rather than the footballer group ($p<0.05$). Moreover, despite no significant difference statistically, the results for the tests of left leg flamingo balance test, right one leg standing test, right leg 6m cross hop for time and left leg 6m cross hop for time were in favor of the skier group.

# 4. Discussion - Conclusions

The balance is usually used as a measurement of lower extremity function and defined as a process of maintaining gravity center within the body support surface. Within the studies carried out on athletes, effects of the years in sports, and different exercises are inspected for individual and collaborative sports. The change of balance performances in the study was investigated for all athletes in both groups.

Berger et al. stated that human body resembles an inversely hung swing and the gravity center of the body is to be kept within the support surface to keep the balance. Considering that, it is more difficult for a short person to keep the body weight within the projection of gravity center of the body. Body height and balance were compared within different groups and tall people were found more successful in balance tests. (Noakes, 2000), (Era et al. 1996) stated, as deviating from the aforementioned results, that there is no relation between height and smoother balance. It is stated that there is a medium-level significant negative relation between body height and left leg static balance score for the American football players but no significant relation between right leg static and dynamic score and height. There are also other studies that, similar to this study, state that there is statistically no significant relation between body weight and balance (Era, & Steen, 1996). Despite the studies carried out for the presence of proprioception and its importance, there is not many studies on the mechanisms affecting proprioception. Another parameter acting on proprioception is exhaustion. Joint proprioception and movement perception sense have a significant role in preventing sport injuries. (Erkmen, & Suveren, 2002) Defects that may arise in proprioception perception for various causes are claimed to increase risk of sports injuries.

The participants' average age, average height, body weight and years in sports are respectively 23.35±3/13, 175.95±6.62, 72.35±8.21 and 10.55±4.76.

The skiers are observed to have higher values than footballers in one leg standing balance test. This test reveals that the superiority of the skiers may come from the training. The programs of the skiers promoting balance capabilities derived from the basic trainings since early ages may be the cause for the results giving them superiority. As the skiers usually use lower extremities, they were observed to be superior based on this capability in the tests. As the skiers use their senses more intensely in contests, they are known to orient their sensual receptors for abrupt decision making and balancing the body. (Demirel, et al 2014), (Yaggie et al. 2002). determined that keeping the balance is a performance decisive factor as a result of 2-week balance exercises in the study they had carr'ed out on 36 participants between ages of (Lephart, & 1997). Amoutzas et al. detected that the balance performances were favorly evolved significantly as a result of the balance trainings carried out on a test group within the study alpine skiers. (Malliou, & Douvis, 2010).

A study showed that Bode Miller who is one of the top 5 skiers in the world walks on a rope as one of his regular exercises, which implies how the balance is of importance in skiing. (Brown, & Bowyer, 2002). (Malliou et al., 2008) in the study they carried out on 36 randomly selected tennis players, investigated the effect of the balance exercises performed before and after tennis training season on the

performance, and they found out that the balance capability improved but this did not have a significant effect on the performance as the balance tests explained. (http://www.nationalgeographic.com/adventure/0511/sports /bode_miller.html 2000).

The footballers revealed lower values compared to the skiers in one leg standing balance test. As the footballers' muscle bundles strengthen because of general type of training carried out by footballers based on burst power, they revealed more passive results compared to the skiers in the balance tests.
http://www.mds.qmw.ac.uk/sportsmed/research.shtml,2006.

Another perspective of a study comparing the balance parameters of two groups, one of which play football and the other of which do not, gave results that showed all balance parameters were in favor of footballers, the reason of which is more enhanced control capability of physiological system keeping the balance. (Malliou, & Godolias, 2008). No difference was detected between the balance parameters of professional and academy football players (Sucan, & Suer, 2005). In a similar study Timothy et al. carried out balance tests on 765 basketball and football players who were high school students and detected that ankle flexion cases were significantly decreased by means of training proprioception senses through balance exercises.

These studies revealed a significant difference in favor of the skiers rather than footballers for left one leg standing test values ($p<0.05$). In addition, despite the lack of a significant statistical difference, left leg flamingo balance test, right one leg standing test, right leg 6 m cross hop for time and left leg 6 m cross hop for time test gave values in favor of the skiers.

In conclusion, observing the average values of the balance tests based on the sport branches, the skiers seem to have better performances. This significant result may incur due to better development of all parts of bundles of leg muscles as skiers permanently do heavy exercises on snow. Footballers revealed some results close to, but still less than the skiers in some measurements.

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