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Gulsah Sahin

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Tumucin Yagcioglu

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Battal Cınar

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Can Özgider

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Ufuk Özbey

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Murat Kaytaz

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Serra Ayse Cakar

Canakkale Onsekiz Mart University,
Beden Egitimi ve Spor Yuksekokulu,
Antrenorluk Egitimi Bolumu,
Terzioğlu Kampusu, Canakkale,
Türkiye

Correspondence

Gulsah Sahin

Canakkale Onsekiz Mart
University, Beden Egitimi ve Spor
Yuksekokulu, Antrenorluk Egitimi
Bolumu, Terzioğlu Kampusu,

Effect of Short Time Neuromuscular Training on Single Leg Hop Test in Young Soccer Players

**Gulsah Sahin, Tumucin Yagcioglu, Battal Cınar, Can Özgider, Ufuk Özbey,
Murat Kaytaz, Serra Ayse Cakar**

Abstract

Objective: The objective of this study was to determine whether a six week neuromuscular training program is effective for improving single leg- hop test performance in young soccer players. Thirty-two young soccer players from the Dardanel Sport Club participated in this study; comprising a research group (age= 15 years, height=1.72±5.98 m, weight= 62.56 ± 6.12 kg) and control group (age=14 years, height =1.70±5.32 m, weight=58.6 ± 7.24 kg). Soccer players were asked to perform single-leg hop distance measurement. All subjects completed tests before and after training (single leg hop test) and following a 6-week training program.

Results: There was a statistically significant difference in right leg hop distance between research and control group ($p<0.05$). **Conclusion:** Implemented short term training resulted in improvements in the parameters investigated in this study. However, it was only effective on right leg hop distance.

Keywords: soccer, balance, elastic band, single leg-hop test.

1. Introduction

Latest research in school-going children has determined that the sports branches with most frequent injuries are football and basketball [1]. It has been emphasized that the majority of injuries in footballers are due to muscle strains [1]. These types of injuries generally occur in the thigh, groin and calf regions [1, 6]. Again during the school period coinciding with the period of puberty sports injuries may increase [1]. Previous studies have shown that traditional weight training together with neuromuscular training, increasing in use and in different application methods in recent years, may develop leg power, strength and balance after injury [2, 3, 8].

Neuromuscular training develops nerve-muscle control and increases the stability of functional joints thus providing protection against injury (Valovich 2009; Griffin et al. 2000) [5].

Previous research on new training methods has determined that combined training is effective on the jumping performance and leg strength of sportspeople [4, 7]. In spite of this, the intensity of football training, tactical preparation and competitions may limit the productivity of extra training sessions, especially in the competition period. Short duration extra training has been tested and its efficiency remains controversial. The training materials and location on the training field may prevent time loss by sportspeople and trainers. Additionally it is thought that this study may make a difference in revealing the effects of balance exercises and use of elastic bands as opposed to pure weight training.

The aim of this study is to investigate the short duration effects of neuromuscular training including balance, jumping and strength exercises, in addition to technical and tactical training, on the single leg hop test.

2. Material and Methods

2.1 Participants

The study included sports people with average training age, playing soccer actively for 2 years, with no other treatment program due to injury, who volunteered, with all initial tests completed. Any participants who did not participate in initial tests, did not volunteer, was following another treatment program due to injury and did not come to 3 consecutive training sessions were not included or were excluded.

The 15-year old team participating in the study was the training group, while the 14-year old team was the control group. The 15-year old team comprised 17 players while the 14-year old team comprised 15 players. The training took place on 2 days in addition to team training and lasted about 25 minutes, over a total of 6 weeks. Due to training that could not be completed due to weather conditions, the study lasted a total of 8 weeks. The single leg hop test was completed before and after training.

2.2 Tests

Height and weight measurements were completed in accordance with the standards. For the **Single leg hop test** a tape measure was placed on the ground and it was explained that the soccer player should hop without losing balance or using the other leg to take a step. The soccer player completed the test 3 times for each leg and if they lost their balance they were told to hop again. Care was taken that the tip of the big toe of the soccer player was behind the start line before each hop and the hop distance was measured from the heel. The distance of each hop was not revealed to the soccer player and they were allowed to rest for about 30 seconds between hops. For each leg the average of 3 hops was taken. During the hop they were allowed to use their arms for balance. All soccer players were tested on the non-dominant leg first and the test points were taken from the separate averages of the right and left legs [5].

2.3 Training Program

Each training session lasted about 25 minutes. There were 15 repetitions for both legs with 1 set in the first three weeks and 2 sets in the second 3 weeks. During the training period according to the individual development of the soccer player,

increases in intensity were provided (color of elastic band, number of repetitions). During the study the following exercises were used; single leg stand (right-left) on a balance platform (height from ground: 7 cm, top surface: 40 cm), double leg jump on trampoline (forward-backward), prone leg bend with elastic band (right-left), tying both ankles with elastic band, side leg raise with elastic band (right-left), and hitting the ball with the inside of the foot with elastic band (right-left) (elastic band tying both ankles).

2.4 Statistical Analysis

To evaluate the results the SPSS 15.0 packet program was used. Descriptive statistics, arithmetic mean and standard deviation values were calculated. To determine the difference in hop distance within the groups the paired t-test and to determine the difference between the groups the independent t-test was used. The level of significance was accepted as $p < 0.05$.

3. Results

Table 1: Demographic characteristics of the soccer players

| | Age (year) | Height (cm) | Weight (kg) |
|----------------------------|------------|-------------|-------------|
| Training Group n=17 | 15 | 172.4±5.98 | 62.56±6.12 |
| Control group n=15 | 14 | 170.1±5.32 | 58.6±7.24 |

The average training age in the study was 2 years, with players from U-14 (control group) (height: 170.1 ± 5.32 cm; weight 58.6 ± 7.24 kg) and U-15 (study group) (height 172.4 ± 5.98 cm; weight: 62.56 ± 6.12 kg) participating.

Table 2: Results before and after training

| | Before Training | | After Training | |
|---------------------|---------------------|--------------------|---------------------|--------------------|
| | Training group n=17 | Control group n=15 | Training group n=17 | Control group n=15 |
| Single leg hop test | | | | |
| Right | 185.10±17.40 | 183.30±16.11 | 186.20±20.03 | 175.1±16.35 |
| Left | 183.60±19.18 | 184.50±10.60 | 188.40±11.19 | 179±17.59 |

The soccer players in the training group participating in the study had single leg hop test performance of 185.10 ± 17.40 and 183.60 ± 19.18) before training and 186.20 ± 20.03 and 188.40 ± 11.19 after training in the right and left legs (respectively).

In the soccer players in the control group the single leg hop test performance before training was 183.30 ± 16.11 and 184.50 ± 10.50, while after training the hop test performance was 175.1 ± 16.35 and 179 ± 17.59 in the right and left legs (respectively).

The results of the statistical analysis indicate that while the difference between left leg hop distance in the control and study groups was not significant ($p=0.062$), the difference in right leg hop distance was significant ($p=0.044$) ($p < 0.05$).

4. Discussion

A training program should be both effective and easy for the players to apply. In this study with the aim of investigating the effect of short duration neuromuscular training, in addition to technical-tactical soccer training, on leg strength and single leg

hop distance, materials and test methods that were easy to apply on the field were chosen to increase the effectiveness of training. The strength exercises were completed on the training field in addition to the soccer players' own training. It was aimed that the effectiveness of the training program in this study would be observed in a short time.

Research by Gualtieri *et al.* (2008) [6] found that while not at a very high level in young footballers, there was a relationship between strength capacity and balance. The aim of using balance exercises different to traditional strength training in this study was to see the effect of balance exercises on hop performance along with leg strength. In spite of the fact that balance exercises used alone have less effect than strength training (Zech *et al.* 2010) [18], they determined that the increase in leg strength, hop performance, sprint duration and agility performance after combined training is similar or greater to that provided by strength training. Myer *et al.* (2006) [13] reached the conclusion that plyometric and balance exercises did not produce significant differences between the groups for the parameters of hopping, body control and leg

strength. Balance exercises, in addition to being an effective method for balance skills, are more effective to develop performance (like sprint performance, hopping and strength) when used together with other training methods (Zech et al. 2010) [18]. In this study combining strength and hopping exercises of balance exercises, the right and left leg hop performance in the single leg hop test were found to improve after training. Though another study emphasized that balance training or multiple training programs may be effective for young players in sports branches such as soccer [9], they indicated that the frequency and duration of training undoubtedly had an effect on the difference in results.

Young sports people are classified as elite or not elite or with low football skills or high football skills. However the relationship between sport skills and body size and growth are generally not checked by functional tests. It is known that the evaluation of sportspeople as elite or not is subjectively made by trainers [14]. In this study the leg length of the soccer players was not measured and the soccer players were not classified according to skill level. As a result the effect of leg length and skill levels on hop performance is not discussed in this study. The hop test is a reliable test method used to gain information about activity after injury or surgery or for a return to training [7]. However at the same time Hamilton et al. stated that this test method may be used to test the lower extremity muscle strength and power in young healthy soccer players.

When the training group and control group are compared, a significant difference was only observed in right leg hop distance. The hop distance in the training group increased after 6 weeks while the control group hop distance reduced and a significant difference was found. While the statistical difference between the two groups was for the right leg, there was better improvement of the left leg hop distance, lower at the start, at the end of the 2 day training each week compared to the right leg hop distance. In conclusion as the dominant leg in the soccer players was the right leg, which is used more and had greater average hop distance compared to the other leg, we consider that the training may have had more effect on the less used supporting leg (left leg). So the effect of training was observed in both legs, however a greater increase was identified for the weaker left leg (supporting leg) or for the supporting leg carrying the weight of the body. As a result when strength training programs are prepared we consider that it is necessary to take account of the differences in muscle strength and balance between the dominant and non-dominant legs. At the start of planned studies, the difference between dominant and non-dominant legs should be known. Kearns *et al.* (2001) [10] emphasized the size of the difference in leg muscle thickness between dominant and non-dominant legs of footballers in the 16-18 year age group in their study. Separating and comparing soccer players based on dominant leg may be a road marker for studies in the future.

5. Conclusion

In conclusion the training program used in this research was tried for a short duration within the season and according to these results the hop distance improved in both legs in the training group, with a significant change found in the right leg hop distance between the groups. It is considered that training programs and test methods should take account of dominance in test evaluations for both strength training programs and research-based testing, especially in sports branches where sportspeople frequently lead with a leg or arm (dominant and non-dominant), and the frequency of these test programs should be increased and expanded with other research. This

research may investigate the response difference to application and training in young male and female soccer players at the same time.

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