

# Sports injury prevention awareness in adolescent basketball players: is it associated with core muscle endurance?

## *Adolesan basketbol oyuncularında spor yaralanmalarının önlenmesi farkındalığı: kor bölge dayanıklılığı ile ilişkili midir?*

Birgül Dingirdan Gültekinler<sup>1,2</sup> , Livanur Çifci<sup>2</sup> , Fatmanur Yeşilyurt<sup>2</sup> , Sena Gizem Arslan<sup>1,2</sup> 

<sup>1</sup>Physiotherapy and Rehabilitation Application and Research Center, Health Sciences Faculty, Sakarya University of Applied Sciences, Akyazi, Sakarya, Türkiye

<sup>2</sup>Physiotherapy and Rehabilitation Department, Health Sciences Faculty, Sakarya University of Applied Sciences, Akyazi, Sakarya, Türkiye

### ABSTRACT

**Objective:** The aim of our study is to examine the relationship between core muscle endurance and awareness of sports injury prevention in adolescent basketball players.

**Material and Methods:** This study is a cross-sectional study. The study was conducted on 50 athletes (aged  $13.5 \pm 1.7$  yrs). The prone bridge test and side bridge test were used to evaluate core muscle endurance. Athletes' awareness levels of sports injuries were assessed using the Sports Injury Prevention Awareness Scale.

**Results:** A positive low-level relationship was observed between the Sports Injury Prevention Awareness Scale and the durations of the prone bridge test ( $r=0.349$ ,  $p=0.013$ ) and side bridge test for the dominant extremity ( $r=0.312$ ,  $p=0.027$ ). No significant relationship was observed between Sports Injury Prevention Awareness Scale results and the duration of the side bridge test for the non-dominant extremity ( $r=0.140$ ,  $p=0.331$ ).

**Conclusion:** In conclusion, cognitive processes regarding injuries have shown a relationship between awareness and core endurance. It is important to consider both parameters together for athletes to continue their sports performance in a healthy manner.

**Keywords:** *Prevention, athletic injuries, athletic performance*

### ÖZ

**Amaç:** Bu çalışmanın amacı, adolesan basketbolcularda kor bölge dayanıklılığı ile spor yaralanmalarının önlenmesi farkındalığı arasındaki ilişkiyi incelemektir.

**Gereç ve Yöntem:** Bu çalışma kesitsel bir çalışmadır. Çalışma, 50 sporcu ( $13.5 \pm 1.7$  yaş) ile gerçekleştirildi. Kor bölge dayanıklılığını değerlendirmek için yüzüstü plank testi ve yan plank testi kullanıldı. Sporcuların spor yaralanmalarına yönelik farkındalık düzeyleri Spor Yaralanmalarını Önleme Farkındalık Ölçeği kullanılarak değerlendirildi.

**Bulgular:** Spor Yaralanmalarını Önleme Farkındalık Ölçeği ile yüzüstü plank testi ( $r=0.349$ ,  $p=0.013$ ) ve yan plank testi dominant ekstremité süreleri ( $r=0.312$ ,  $p=0.027$ ) arasında pozitif düşük düzeyde ilişki gözlemlendi. Spor Yaralanmalarını Önleme Farkındalık Ölçeği sonuçları ile yan plank testi non dominant ekstremité süresi arasında anlamlı bir ilişki gözlemlenmedi ( $r=0.140$ ,  $p=0.331$ ).

**Sonuç:** Sonuç olarak, yaralanmalarla ilgili farkındalık düzeyi ve kor bölge dayanıklılığı arasında bir ilişki gözlemlendi. Sporcuların spor performanslarını sağlıklı bir şekilde sürdürebilmeleri için her iki parametrenin birlikte ele alınması önemlidir.

**Anahtar Sözcükler:** *Önleme, sporcu yaralanmaları, sporcu performansı*

### INTRODUCTION

The healthy performance of sports activities is closely related to many parameters. Dynamic balance, adequate core endurance, agility, and the ability to change direction are some of these parameters (1,2). A deficiency in any of these parameters is a risk factor for sports injuries. Team athletes are often at higher risk of injury due to the complex nature of their interactive play, which involves various movements and interactions with both their teammates and opposing

players (3). The causes of sports injuries can be examined under environmental, personal, coach-related, and psychological factors subcategories (4). In basketball, most injuries occur in lower extremities. A study examining the epidemiology of injuries among NBA athletes from the 2013-2014 season to 2018-2019 revealed that lower extremity injuries accounted for 61.8% ( $n=3201$ ) of all injuries. It was observed that the two of the most common injuries were lateral ankle

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**Correspondence / Yazışma:** Birgül Dingirdan Gültekinler · Sakarya Uygulamalı Bilimler Üniversitesi, Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Uygulama ve Araştırma Merkezi, Akyazi, Sakarya, Türkiye · birguldindirdan@gmail.com

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sprains (n=571, 11.0%) and hand/wrist soft tissue injuries (n=407, 7.9%) (5).

Sport injuries affect athletes psychologically. Sports injuries can cause athletes to be concerned about returning to sport and maintaining their previous level of performance. The challenges of readapting to sport, participating in competitions, and improving performance can reduce an athlete's desire to return to sport (6). Developing prevention strategies before injuries occur is more effective and easier than treating injuries after they happen. At this point, evaluating athletes' awareness of injuries is the first step towards conducting efforts to increase awareness through targeted interventions. The Sports Injury Prevention Awareness Scale (SIPAS) assesses athletes' cognitive awareness of injuries. This scale evaluates personal health status, environmental factors and equipment, and exercise program under various subheadings (7).

Core muscles are important for examining the movement and position of the trunk as a whole in conjunction with the pelvis (8). Having good core endurance is also crucial for athletic performance. Adequate core endurance can help prevent injuries by improving postural control and balance (9). Having good endurance in this area helps maintain dynamic balance during activities and improves coordination between upper and lower extremity muscles (10). It is observed that core stabilization plays an important role in preventing injuries, protecting against them, and enhancing activity in basketball, which involves dynamic activities (11). Psychological factors and beliefs also play an important role among other parameters that affect an athlete's performance. Awareness, attention and focus are also parameters that can be included among these factors. The aim of our study is to examine the relationship between core muscle endurance and awareness of sports injury prevention in adolescent basketball players.

## MATERIAL and METHODS

### Study design

This study was a cross-sectional study. Before the study, ethical approval Approval date: 17.05.2024, Approval number: 44) was received from Sakarya University of Applied Sciences Ethics Committee. Since the included population is adolescents, consent forms were obtained from the athletes' families before starting the study. The study was conducted in adherence to the Helsinki Declaration.

### Participants

The study was conducted at the **Recep Tayyip Erdoğan Sports Complex**. The study included fifty athletes (aged 13.5

± 1.7 yrs). The study was conducted between January and June 2024.

**Inclusion criteria:** (i) being between the ages of 12-18, (ii) training at least three days a week, having at least one year of basketball experience.

**Exclusion criteria:** (i) having undergone any orthopedic surgical injury in the past six months, (ii) presence of metabolic, cardiovascular, neurological, or musculoskeletal disease.

### Outcome Measures

#### Prone bridge test

The prone bridge test was used to evaluate core muscle endurance. This test is a valid and reliable measure for evaluating abdominal performance, abdominal endurance (ICC=0.91). Before beginning the timed prone bridge, athletes were shown proper technique. For the prone bridge test, athletes positioned themselves in a plank position with elbows shoulder-width apart and their bodies parallel to the ground, beneath their shoulders (Figure 1) (12). Athletes were warned up to three times if they deviated from the neutral position. The duration during which they could not maintain the neutral position despite three warnings was recorded with a digital stopwatch. The effort level during the test was assessed using the Modified Borg Scale (0=minimum effort level, 10=maximum effort level) (13).



Figure 1. Prone bridge test

#### Side bridge test

The side bridge test was used to evaluate endurance of the side core muscles. This test has high intra-rater and inter-rater reliability (ICC=0.78-0.96) (14). Before beginning the test, athletes were shown the correct position. Athletes placed an elbow at 90° of flexion and below the shoulders, and their legs extended while maintaining body segments' alignment forming a straight line between their shoulder, hip and feet. The foot of their non-preferred leg was positioned in front of the foot of their preferred leg (Figure 2). In

this position, the maximum time athletes could maintain was recorded using a digital stopwatch. The test was concluded when they could not maintain the correct position for more than 3 s (15). The effort level during the test was assessed using the Borg Scale.



Figure 2. Side bridge test

### Sports Injury Prevention Awareness Scale (SIPAS)

Athletes' awareness levels of sports injuries were assessed using this scale. The scale is a valid and reliable scale for this population (Cronbach's alpha reliability coefficient of 0.884) (7). This scale includes 18 items. Items 1-4 measure the health status domain, items 5-9 the environmental factors and equipment domain, items 10-14 the exercise session domain, and items 15-18 the exercise program domain. This scale evaluates athletes' beliefs and thoughts about sports, protective equipment, and measures for preventing sports injuries. A higher score indicates better sports injury prevention knowledge and awareness.

### Statistical Analysis

IBM SPSS v23 software was used for statistical analysis (v20.0, IBM Corporation, Armonk, NY, US). The Shapiro-Wilk test and histogram plots were used to assess the normality of data distribution. The data were found to be normally distributed, and the mean and standard deviation figures were calculated for descriptive statistics. The Pearson correlation test was conducted to evaluate the relationship between SIPAS and prone bridge- or side bridge test durations. The Pearson correlation coefficient is classified between 0 and 1. The 0.00-0.19 range indicates no relationship or a negligible low-level relationship, 0.20-0.39 range suggests a weak (low-level) relationship, 0.40-0.69 range indicates a moderate-level relationship, 0.70-0.89 range implies a strong (high-level) relationship, and 0.90-1.00 range denotes a powerful level of relationship (16). The statistical significance level was set at  $p < 0.05$ .

## RESULTS

### Descriptive data

The descriptive information of the athletes is provided in Table 1. The dominant side extremities of the athletes were recorded. Dominance was determined by the hand with which they hit the ball. Among the included athletes, 96% were right-dominant, while 4% were left-dominant.

Table 1. Descriptive statics of athletes

Parameters	Mean $\pm$ SD	Minimum	Maximum
Age (yrs)	13.5 $\pm$ 1.7	12	17
Sport age (yrs)	3.14 $\pm$ 2.26	0	8
Prone bridge effort	9.88 $\pm$ 2.97	4	17
Side bridge effort (D)	11.8 $\pm$ 3.1	5	20
Side bridge effort (ND)	11.7 $\pm$ 3.8	4	20
SIPAS	74.7 $\pm$ 13.4	35	90
Prone Bridge (s)	104.2 $\pm$ 16.0	33	249
Side bridge D (s)	58.2 $\pm$ 3.1	12	1151
Side bridge ND (s)	54.8 $\pm$ 3.2	12	116

D: dominant side, ND: non-dominant side, s: second

### Correlations

A positive low-level relationship was observed between SIPAS and the durations of the prone bridge test ( $r=0.349$ ,  $p=0.013$ ), and side bridge test for the dominant extremity ( $r=0.312$ ,  $p=0.027$ ). No significant relationship was observed between SIPAS results and the duration of the side bridge test for the non-dominant extremity ( $r=0.140$ ,  $p=0.331$ ).

## DISCUSSION

This study aimed to examine the relationship between core muscle endurance and awareness of preventing sports inju-

ries among adolescent basketball players. The study revealed a significant relationship between awareness of preventing sports injuries and the durations of the plank and dominant side plank tests.

Dandrieux et al. (17) conducted a study to examine the beliefs, thoughts, and use of injury predictions among elite athletes, coaches, and health professionals. It was found that the use of injury predictions is significant among athletes. Tanaka et al. (18) evaluated the awareness of anterior cruciate ligament (ACL) injury prevention programs among fe-

male collegiate athletes. Among the 440 participants, 85% knew that female athletes were at higher risk than male athletes, and 89% were aware that ACL injuries are preventable. However, only 33% of the athletes were familiar with injury prevention programs, and merely 15% had participated in such programs. This rate is quite low, indicating a need for increased awareness and further research in this area.

In our study, we assessed the awareness of adolescent basketball players regarding sports injuries to contribute in addressing the limitations in the existing literature in the field. The importance of athletes' thoughts and awareness regarding their injuries was considered in this study. Athletes' beliefs and thoughts influence their actions. An athlete with high knowledge and awareness about sports injuries and athletic performance tends to participate more actively in activities and sports. Athletes exhibited high levels of awareness regarding their injuries (mean: 73.1). It is important for awareness levels to be high from adolescence onward and to ensure continuity in maintaining this awareness. This can positively impact athletes' future sports performance.

Good postural and core endurance is crucial in sports activities that involve parameters such as sudden changes in direction, dynamic and static balance, and agility (19). Gong et al. (20) examined the effects of core stabilization training on dynamic balance in young male basketball players, and observed significant changes in the core stabilization training group. Tazji et al. (11) investigated the effects of core region stabilization exercises on lower extremity stiffness, and observed that these exercises reduced lower extremity stiffness. In a systematic review examining the effects of core region exercises on basketball players' athletic performance, it was concluded that these exercises have positive impact on parameters such as dribbling ability, jumping, balance, and agility (21). Based on these studies, it can be concluded that the core region is highly influential on athletic performance. In our study evaluating core endurance in adolescent basketball players, it was observed that athletes had high core endurance. The high core endurance of the athletes may positively affect their future sports performance.

In our study, we observed a significant relationship between beliefs and thoughts about sports injuries and core muscle endurance, which is a critical parameter for athletic performance. However, there was no observed relationship between the non-dominant side plank test and awareness of sports injury prevention. More research should be conducted in this area. The relationship between core endurance and injury prevention awareness can be explained by

the high levels of awareness among the athletes. Furthermore, the observed relationship between core endurance and awareness of injury prevention in the study, along with both parameters being high in the examined population, can be explained by the importance of high core endurance and injury prevention awareness for performance. The strength of our study is that it is the first to examine the relationship between core endurance and injury awareness, which are two important parameters in sports performance.

### Limitations

There are some limitations in our study. One of them is that our population was limited to adolescent athletes. Awareness of sports injury prevention and thoughts in this field can be examined across different age groups. The relationship between injury awareness and core endurance can be examined. These topics can also be studied across different sports disciplines. The athlete population included in our study was limited to 50 individuals. Studies involving a larger number of athletes can be planned in the future.

In conclusion, cognitive processes regarding injuries have disclosed a relationship between awareness and core endurance. It is important to consider both parameters together for athletes to healthily continue their sports performance. Therefore, as practical implications, training sessions may be planned to increase athletes' awareness about injuries and prevention methods, and exercises targeting the core may be incorporated into training programs.

### Ethics Committee Approval / Etik Komite Onayı

The approval for this study was obtained from Ethics Committee of Sakarya University of Applied Sciences, Sakarya, Türkiye (Decision no:44, Date: 17.05.2024).

### Conflict of Interest / Çıkar Çatışması

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

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### Author Contributions / Yazar Katkıları

Contributions: BDG, LC: Designed the Study – Data Collection – Literature Review – Performed Analysis; FY, LC: Literature Review – Writing Paper – Performed Analysis; SGA: Writing Paper – Supervision. All authors contributed to the final version of the manuscript and discussed the results and contributed to the final manuscript.

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