



# An Examination of Sports Injury Prevention Awareness Among Adolescent and Adult Basketball Players

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## ABSTRACT

**Purpose:** Awareness, knowledge, and attitudes regarding sports injuries play a crucial role in preventing such injuries. In our study, we aimed to examine the awareness of injury prevention among adolescent and adult basketball players.

**Method:** Awareness of sports injury prevention was assessed using the Sports Injury Prevention Awareness Scale, which was created via Google Forms. The Sports Injury Prevention Awareness Scale consists of 18 items and 4 factors (health status, environmental factors and equipment, exercise session, exercise program).

**Results:** This study was conducted on 107 basketball players aged 13 to 48 years. Fifty-eight of the basketball players were adolescents (aged 13–19), while forty-nine were adults (aged 20–48). A statistically significant difference was observed between adolescents and adults in total score ( $p < 0.001$ ), health status score ( $p < 0.001$ ), environmental factors and equipment score ( $p < 0.001$ ), exercise session score ( $p < 0.001$ ), and exercise program score ( $p = 0.021$ ) sub-parameters. The median values for total scores and all sub-parameters were found to be higher in adults compared to adolescents.

**Discussion:** The main finding of this study is that the injury prevention awareness levels differ between adolescent and adult basketball players, with adults demonstrating a higher level of awareness compared to adolescents. Considering that sports injuries are commonly observed in many athletes starting from adolescence, it is crucial to increase awareness of sports injury prevention and implement educational programs accordingly. Additionally, it is important to assess the extent to which the theoretical knowledge provided in these educational programs is practically applied by the athletes.

**Key Words:** Awareness, adolescent sports, sports injuries.

## INTRODUCTION

Basketball is a popular team sport played worldwide, characterized by high levels of competition and frequent physical contact (1). It is practiced by athletes of all age groups and genders (2, 3). The sport involves high-intensity activities such as acceleration and deceleration, repetitive jumping, improper landings, pivot movements, lateral running, and sudden changes in direction (2, 4, 5). Consequently, basketball players have a high incidence of injuries (6). Athletes are susceptible to injuries due to various physiological factors, including individual factors such as physical fitness level, as well as environmental factors, such

as the playing surface and the adequacy of equipment. Sports injuries impact athletes physically, mentally, and financially (7). Additionally, they may hinder an athlete's return to sports and, in certain cases, lead to the premature end of their athletic career. Lower extremity injuries are the most common among athletes. The most frequently injured site in the lower extremity is the ankle (21.9%, followed by the knee (17.8%) (4, 8). Due to the impact of sports injuries on athletes, implementing preventive measures before injuries occur and increasing athletes' awareness of injuries may be essential.

In recent years, athletes have been engaging in intensive training at younger ages. This may increase the risk of exposure to acute injuries (9). A study reported that an annual average of 2.6 million emergency department visits occur due to sports injuries among individuals aged 5–24 years (10). Among high school sports, football has been identified as the sport with the highest annual injury rate, with approximately 41–61% of athletes sustaining injuries each year. Other sports with a high risk of injury include wrestling and gymnastics (40–46%), basketball (31–37%), as well as volleyball, baseball, softball, and track and field (7–18%) (9, 11). There are notable physical and physiological differences between adolescent and adult athletes. Adolescent athletes have open growth plates, and their growing cartilage is more susceptible to stress, leading to a higher risk of overuse injuries (9, 12). Additionally, the continued maturation of motor skills in adolescents, coupled with the influence of circulating androgen hormones that increase muscle mass and speed, can heighten the risk of injury (9). Beyond the physiological differences observed between adolescent and adult athletes, variations in attitudes and behaviors may also be present. Adolescents may also display increased courage and risk-taking behaviors, which can influence their continued sports participation. Without targeted efforts to enhance their awareness of sports injuries during this critical developmental period, these factors may negatively impact their future athletic careers.

## METHODS

Given the high incidence of sports injuries, raising athletes' awareness is crucial. The initial step involves educating athletes about potential risks, followed by the implementation of preventive measures to reduce injury rates. One such measure is the implementation of injury prevention programs (13). Recent studies have indicated that injury prevention programs can be up to 50% effective in reducing sports injuries (14-17). Sports injury prevention programs include the widely used FIFA (Fédération Internationale de Football Association) 11+ for football players (18-20), the Nordic Hamstring Exercise Program (17, 21), which is effective in preventing hamstring injuries, the Oslo Sports Trauma Research Center (OSTRC) neuromuscular training program

designed to prevent injuries in handball (22), and the The Surveillance in High school and community sport to Reduce (SHRed) injuries basketball neuromuscular exercise program, which has been proven effective in preventing ankle and knee injuries in basketball players (23). In addition to sports injury prevention programs, measures such as optimizing sports equipment, using sport-specific protective gear, and evaluating athletes' risk factors play a crucial role in reducing sports injuries (24, 25). Additionally, factors such as high training volume, intensity, and inadequate load management may also contribute to sports injuries (26, 27). The challenges in sports injury prevention include low athlete compliance with injury prevention programs (28, 29), lack of knowledge among stakeholders responsible for maintaining athletes' health (30), time constraints, and excessive training load within training programs (26). In this regard, increasing the awareness levels of athletes, families, and coaches about sports injuries may play a crucial role in injury prevention.

Although studies exist on injury prevention programs (31-33), there remains limited research specifically addressing athletes' awareness of sports injury prevention. Therefore, this study aims to evaluate the awareness levels of basketball athletes regarding injury prevention and examine differences between adolescent and adult players. We hypothesize that overall awareness may be low, with adult athletes demonstrating higher awareness than their adolescent counterparts.

### Study Design

This study is a cross-sectional study. Before starting the study, written approval was obtained from the Ethics Committee of Sakarya University of Applied Sciences (approval date: 17.01.2025, decision no: 52/37). The study was conducted online using a Google Forms-based survey, and informed consent was obtained from the athletes through an online consent checkbox. This study was conducted by the principles outlined in the Declaration of Helsinki. The data was obtained between January 2025 and February 2025. A total of 107 basketball players who voluntarily participated in the study were included.

## Participants

The inclusion criteria were basketball players between the ages of 13 and 50, practicing basketball at least two days per week, and agreeing to participate in the study. The exclusion criteria included the presence of a mental condition that prevents understanding the questions, a history of any orthopedic or neurological surgery within the past six months, and a diagnosed neurological disorder. Adolescent athletes were defined as those aged 13-19 years, while adult athletes were defined as those aged 20-48 years who were included in the study.

## Assessments

### Demographic characteristics

Demographic data, including age, years of sports experience, height, weight, playing position, history of previous sports injury, and dominant upper extremity were collected online via Google Forms. The dominant upper extremity was defined as the hand used to hit the ball.

### Awareness of injury prevention in sports

Awareness of sports injury prevention was assessed using the Sports Injury Prevention Awareness Scale, which was created via Google Forms. The Sports Injury Prevention Awareness Scale consists of 18 items and 4 factors (health status, environmental factors and equipment, exercise session, exercise program) and has been validated and proven reliable for Turkish individuals aged 13 to 66 (34). The scale assesses health status (items 1-4), environmental factors and equipment (items 5-9), the exercise session (items 10-14), and the exercise program (items 15-18). The scale does not contain reverse-scored items, and the total score is calculated by summing all item scores. A higher total score indicates a greater awareness of sports injury prevention (34).

### Sample size calculation

The power analysis was conducted using G\*Power 3.1.9.7 software. The Mann-Whitney test was employed to assess the difference between two independent groups. The analysis was performed using a two-tailed test, with an effect size ( $d$ )

of 0.67, a significance level ( $\alpha$ ) of 0.05, and sample sizes of  $n_1 = 58$  for Group 1 and  $n_2 = 49$  for Group 2. The post-hoc power analysis revealed an achieved power ( $1-\beta$ ) of 0.916, indicating that the study has 91.6% power to detect significant differences.

## Statistical Analysis

The data analysis was carried out using the Statistical Product and Service Solutions (SPSS) software, version 23.0 (SPSS Inc., Chicago, IL, USA). Data normality was evaluated through both visual and analytical approaches, including histograms, Q-Q plots, and the Kolmogorov-Smirnov test. The distributions for a total score, health status section score, environmental factors and equipment section score, the exercise session score and the exercise program score did not meet the criteria for normality. The Mann-Whitney U test was conducted to examine the differences in total and subcategory scores of health status, environmental factors and equipment, exercise session, and exercise program between adolescent and adult athletes. Statistical significance was determined at a threshold of  $p < 0.05$ .

## RESULTS

The demographic characteristics of the basketball players are presented in Table 1.

This study was conducted on 107 basketball players aged 13 to 48 years. Fifty-eight of the basketball players were adolescents (aged 13–19), while forty-nine were adults (aged 20–48). There were twenty-four female basketball players and eighty-three male basketball players. Ninety-seven of the athletes were right-handed, while ten were left-handed.

The injury status and distribution of basketball players are presented in Figure 1.

### Group comparisons

There was no significant difference in sports injuries that was observed between adolescent and adult basketball players ( $p = 0.100$ ).

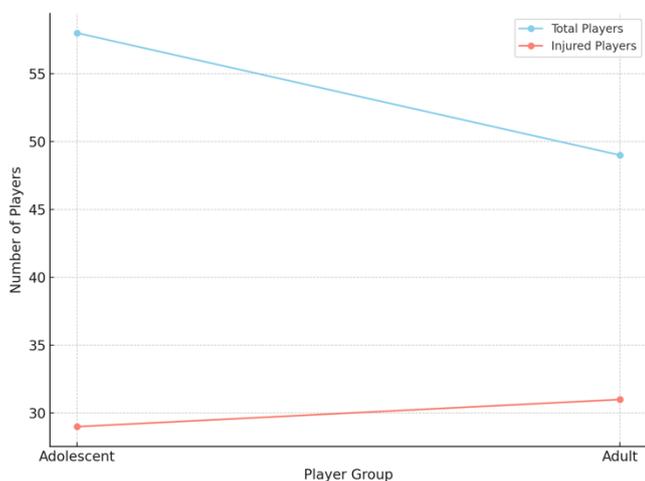
**Table 1.** Demographic characteristics of the basketball players

	Adolescent (n= 58)	Adult (n= 49)	Total (n=107)
<b>Gender</b>	F=10, M=48	F=14, M=35	F=24, M=83
<b>Dominant side</b>	R= 53, L= 5	R= 44, L= 5	R= 97, L= 10
<b>Characteristic</b>	<b>Adolescent (n= 58)</b>	<b>Adult (n= 49)</b>	<b>Total (n=107)</b>
	<b>X±SD</b>	<b>X±SD</b>	<b>X±SD</b>
<b>Age (year)</b>	15.50 ± 1.75	29.42 ± 8.82	21.87 ± 9.25
<b>Sport age (year)</b>	5.27 ± 3.04	13.32 ± 8.64	8.96 ± 7.42
<b>Height (cm)</b>	167.65 ± 8.75	176.55 ± 6.48	171.72 ± 8.95
<b>Weight (kg)</b>	60.67 ± 7.40	76.79 ± 9.56	74.78 ± 71.71
<b>BMI (kg/m2)</b>	21.58 ± 2.09	24.54 ± 1.87	25.18 ± 23.75

**Abbreviations:** X= Mean; SD= standard deviation; cm= centimeter; kg= kilogram; BMI= Body Mass Index; m= meter, R= right side, L= left side, n= number of basketball players.

### The comparison of the Sports Injury Prevention Awareness Scale results

A statistically significant difference was observed between adolescents and adults in total score ( $p < 0.001$ ), health status score ( $p < 0.001$ ), environmental factors and equipment score ( $p < 0.001$ ), exercise session score ( $p < 0.001$ ), and exercise program score ( $p = 0.021$ ) sub-parameters. The median values for total scores and all sub-parameters were found to be higher in adults compared to adolescents (Table 2) (Figure 2).



**Figure 1.** Sport injuries among adolescent and adult basketball players

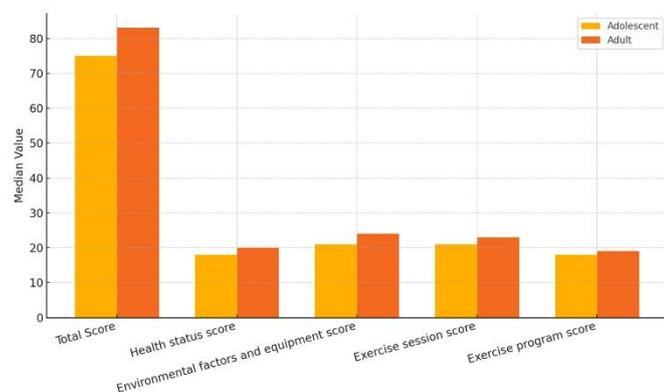
## DISCUSSION

The main finding of this study is that the injury prevention awareness levels differ between adolescent and adult basketball players, with adults demonstrating a higher level of awareness compared to adolescents. The existing literature includes studies investigating awareness and knowledge

levels regarding anterior cruciate ligament (ACL) injuries, injury prevention, and return to sport following ACL injuries, as well as studies focusing on awareness of ACL injury prevention (31, 32, 35). There are also studies examining the perspectives of parents and young athletes on the potential impact of early sports specialization on injury risk (36, 37). To the best of our knowledge, no study has examined awareness of sports injury prevention among basketball athletes.

A previous injury, along with individual differences and overall health status, is among the key factors that increase the risk of subsequent injuries (38, 39). Additionally, health-related risk factors that contribute to sports injuries include prior injuries, sex-related physiological differences, muscle strength deficits, proprioceptive impairments, deficiencies in dynamic balance performance, and coordination deficits (40-42). Environmental factors such as weather conditions, playing surface, and the appropriateness of equipment, as well as training-related parameters including exercise session structure, training content, and training load, are also among the risk factors for sports injuries (43-45). Given the significant impact of these parameters on injuries, evaluating athletes' awareness of each subcategory may be essential. The Sports Injury Prevention Awareness Scale may be important for assessing awareness across all these sub-parameters. The Sports Injury Prevention Awareness Scale is a valid and reliable measurement tool for individuals aged 13 to 66. Although it has been validated for a wide age range, to minimize the potential impact of age-related cognitive

differences on the results, adolescent participants were provided with a pre-survey briefing explaining the questionnaire items. Additionally, they were encouraged to ask questions about any items they did not understand. This approach aimed to ensure that cognitive differences among adolescent athletes did not influence the study outcomes. Our results indicate that the awareness levels of adult basketball players were higher than those of adolescent basketball players in total scores as well as in subcategories, including health status, environmental factors and equipment, exercise session, and exercise program. Several factors may contribute to this difference. These factors may include experience and knowledge accumulation, educational and informational opportunities, professionalization and sense of responsibility, physical and cognitive maturity, environmental factors, and social interaction. Adult athletes may have been engaged in sports for a longer period compared to adolescents, increasing their likelihood of experiencing sports injuries. These experiences may have contributed to a higher level of awareness regarding injury prevention among adult athletes. Adult athletes may have received more extensive training from coaches, physiotherapists, and healthcare professionals. Additionally, with age, athletes' professional approach to sports may evolve. While adolescent athletes tend to be more focused on winning, adult athletes may better recognize the importance of injury prevention to sustain their careers. Furthermore, adults may be more conscious of their decision-making processes and better assess the long-term consequences. In contrast, adolescent athletes may have a higher tendency to take risks and overlook preventive measures.



**Figure 2.** Comparison of median scores between adolescent and adult groups

Çelik et al. investigated the knowledge and awareness of ACL injuries among professional Turkish athletes, including both adolescent and adult athletes (35). Their study found that the proportion of athletes participating in ACL injury prevention programs was higher among adult athletes compared to adolescents (35). Similarly, in our study, we observed that adult athletes had a greater awareness of sports injury prevention than adolescent athletes. In this regard, our findings are consistent with those of Çelik et al. In the study evaluating the awareness of ACL injury prevention programs among female collegiate athletes, it was reported that 89% of the athletes were aware that ACL injuries are preventable. However, only 15% had participated in an ACL injury prevention program. Additionally, 89% of the athletes stated that they would participate in an exercise program if they knew it could prevent ACL injuries (31). Although recent efforts have focused on injury prevention and the development of prevention programs, the implementation and awareness of these programs among female collegiate athletes remain low (31). In this regard, increasing awareness and promoting the wider implementation of these programs could be essential.

In the study conducted by Yin et al., which evaluated the knowledge, attitudes, and practices (KAP) regarding ACL injuries among youth, strong positive correlations were identified between knowledge, attitudes, and practices (46). However, it was observed that attitudes and practices related to the prevention and management of ACL injuries were at a moderate level (46). It has been observed that greater knowledge fosters more positive attitudes, which in turn leads to improved health practices (46). Considering the impact of knowledge on attitudes and practices, implementing awareness and injury prevention training for athletes starting from adolescence may be crucial.

In the study conducted by Rees et al., which examined the knowledge and attitudes of field hockey players regarding injuries and injury prevention, it was demonstrated that although athletes possess adequate awareness of injury prevention strategies, there are notable gaps in their practical application (47).

**Table 2.** Comparison of Adolescent and Adult Athletes Scores

	Adolescent (n= 58)		Adult (n= 49)		z	p value
	Median	Min-Max	Median	Min-Max		
<b>Total Score</b>	73.50	(18-90)	83	(40-90)	-4.90	<0.001
<b>Health status score</b>	16.50	(4-20)	20	(8-20)	-4.96	<0.001
<b>Environmental factors and equipment score</b>	20.50	(5-25)	24	(12-25)	-4.56	<0.001
<b>Exercise session score</b>	20	(5-25)	22	(15-25)	-3.60	<0.001
<b>Exercise program score</b>	17	(4-20)	19	(5-20)	-2.31	0.021

**Abbreviations:** n= number of basketball players, min= minimum value, max= maximum value, z= Mann Whitney U test value, p= statistical significance value.

As highlighted in Rees et al.'s study, a high level of awareness does not always translate into practice. In our study, we assessed the initial stage, focusing on the level of awareness. However, we did not investigate the practical applications aimed at preventing sports injuries. As a subsequent step, future research could explore the specific practices implemented to prevent sports injuries.

In the study conducted by Brooks et al., which evaluated the knowledge, attitudes, and beliefs of youth club athletes regarding sport specialization and participation, it was demonstrated that many youth athletes believe that sport specialization enhances athletic performance. However, fewer than half of the athletes believe that specialization increases the risk of overuse injuries (37). Nonetheless, numerous studies in the literature have reported a consistent association between sport specialization and year-round sports participation with an increased risk of overuse injuries (48-51). In a study conducted by McGuine et al., high levels of sports specialization were identified as an independent risk factor for lower extremity injuries during the high school sports season (50). In the study conducted by Brooks et al., it can be inferred that youth athletes have a low level of awareness regarding this issue. Similarly, in our study, we observed that adolescent basketball players demonstrated lower awareness of sports injury prevention compared to adult basketball players. Our findings suggest that enhancing adolescent athletes' knowledge, attitudes, and behavioral awareness regarding sports injuries, risk factors, and injury prevention strategies is crucial to promoting safer sports participation. The unique value of our study is that it is the first to evaluate injury prevention awareness specifically

among basketball players and to compare awareness levels between adolescent and adult athletes.

### Limitations

This study had limitations. The scale used in our study did not have established cut-off values; therefore, we were unable to conduct evaluations based on such thresholds. Future research could focus on determining the cut-off values for this scale. The results are based on the self-reports of basketball players, which may not objectively reflect the actual outcomes. Although we have attempted to minimize the cognitive differences that may arise due to the wide age range, they may not be completely eliminated. This represents one of the limitations of our study. Additionally, in our study, we did not investigate the practical applications implemented by athletes for sports injury prevention. Future studies could explore not only the level of awareness regarding sports injury prevention but also the practical measures adopted to prevent sports injuries.

### CONCLUSION

Our study demonstrated that the level of awareness regarding sports injury prevention is lower among adolescent basketball players compared to adult basketball players. Considering that sports injuries are commonly observed in many athletes starting from adolescence, it is crucial to increase awareness of sports injury prevention and implement educational programs accordingly. Additionally, it is important to assess the extent to which the theoretical knowledge provided in these educational programs is practically applied by the athletes.

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