




# Prevalence and Mechanism of Sports Injuries in Poomsae Premier League Players

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Running Title : Prevalence of injuries in Poomsae

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## Abstract

**Background:** Comparison of lower limbs injuries in male and female professional athletes in Poomsae Premier League.

**Methods:** The statistical population consisted of 143 martial athletes in men and women premier leagues who are 76 females and 67 males. Among them, the athletes who suffered injuries were considered as samples of this study. The data was collected by the researcher and under supervision of a physician using questionnaire. Descriptive statistics and chi-Square were used for data analysis.

**Results:** Results of the present study showed that the highest rate of injury in men related to ankle and in female related to hamstring injury. And there was a significant difference between men and women in hamstring injuries ( $\chi^2=12.52, p\leq 0.05$ ). The most common type of injury in men was Ankle sprain and in women was Hamstring strain; and the most common mechanism of injury in men was previous injuries and in women was due to rotational strikes.

**Conclusion:** According to the results of this study, It is better for coaches pay more attention to teaching the techniques completely. Awareness of coaches about the injuries an athlete facing in sports competition can provide valuable help to prevent injuries.

**Keywords:** Poomsae, Prevalence of injury, Mechanism, Males, Females

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## Introduction

Sport injuries are caused by acute trauma or repetitive stress related to accidents, poor techniques, inadequate equipment, and overuse [1]. Injury is one of the main causes of withdrawal from exercise [2]. Repeated stress affects the quality of participation in professional sport [3]. Participation in sports and exercises often carries the risk of injury, but it is more common in martial arts. Since taekwondo was recognized as a medal-winning sport since

2000 Summer Olympics, participation at various levels increased to about 80 million people around the world [4]. In general, taekwondo consists of three main sections: sparing, object-breaking-maneuver, and Poomsae. Among these three types, Poomsae is the only non-contact, non-opponent style of Taekwondo. It was founded in 2000 and was accepted as a competitive sport by the World Taekwondo Federation. It encompasses skill, technique and physical

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### ↑What is “already known” in this topic:

*Poomsae is a non-contact style of taekwondo. There was few researches in this field.*

### →What this article adds:

*The most common lower extremity injuries and mechanism of injuries were identified among female and male players in poomsae. Also, it is found that hamstring injuries among female was higher than male. And there was significant difference in this injury between female and male.*

Table 1. Demographic characteristics

Variable	Male		Female	
	Mean	SD	Mean	SD
Age (years)	28.4	11.1	30.4	12.02
Height (cm)	161.2	7.4	160.6	7.5
Weight (kg)	50.5	6.9	49.5	6.4

performance. It is also practiced for various purposes including self-defense exercises, and preparation for combat [5]. Poomsae includes 13 defined movement patterns that have been repeated over and over in practice. The average workout is six days a week and maximum 4 hours and 40 minutes per day [6]. As a result of this intense exercise, there is the possibility of injury in these athletes. One study in South Korea showed prevalence of chronic overuse injuries in Poomsae athletes to be 71%, while a similar study in Alberta, Canada reported it to be 73%. In these athletes, lower limbs were more prone to overwork injuries than the upper limbs. Knee joints and hamstring were the most common. Koh (2014) reported that 65.8% of Poomsae athletes have experienced chronic overuse injuries, which was more prevalent in female athletes than in males [5]. Kazemi et al. (2016) also showed higher prevalence of chronic overuse injuries (32%) in women than in men. Despite lower rate of chronic injuries compared to Koh (2014) studies, acute injuries (24%) were higher in the studies by Kazemi et al. (2016). It has been recognized that the most common acute injury among Poomsae athletes is muscle strain and most injuries occur in lower limbs [7]. Kazemi et al (2004) conducted another descriptive study on Canadian national team taekwondo players and found that overall prevalence of injuries (males and females) was 62.9 injuries per 1,000 athletes in competition such that in males, this was 79.9 injuries per 1000 athletes [8].

Differences in injury rates between young and adult taekwondo athletes have been studied in the past. Beis et al. (2001) found that young taekwondo athletes, male or female, are more prone to injury, compared to adults [9]. A recent study showed that the injury rate is higher in taekwondo athletes with black belts, and that brain injury only exists in men. Although recent studies have shown that the most common taekwondo injury is in lower limbs, much attention to head injury is most likely due to the severity of such injury [8].

In taekwondo, in terms of the type of injury, sprain was observed to be 30%, inflammation was 18%, strain was 9%, and other injuries constituted 7% of injuries. The sprain was the most common type of injury which was mostly reported in the ankle (52%), knee (13%), wrist (8%) and hands (8%) (Wisdom et al., 2018). Pingale et al. (2017) examined injuries of young female and male taekwondo athletes and found that injury rate per 100 athletes is 43.75% in men and 56.25% in women; and there was little difference in rate of injury between genders [10]. In one study, ACL injury in three fields of basketball, football, and taekwondo was examined and it was found that the highest ACL injury occurred in basketball, football, and finally in taekwondo (46.8%), respectively [11].

As regards treatment of sports injuries is medically complex, time-consuming and costly, and on the other hand, in recent years, studies investigating the prevalence of sports

injuries among men and women in Kyorugi have been increasing, however, few studies have examined injuries rates in Poomsae athletes in Iran. There is an urgent need to elucidate the extent of the injury problem in the competition context. It might also be beneficial for coaches and health care practitioners to understand the types of injuries that Poomsae athletes may encounter during training and competition to ensure success.. So, the present study aims to compare the prevalence and Mechanism of sport injuries in Poomsae martial arts between males and females.

## Methods

The present study is a descriptive-prospective field study. The statistical population consists of 143 martial athletes in men and women premier leagues among which 76 are women and 67 are men. Among these, the athletes who suffered injuries were considered as sample of this study.

In Table 1, the average and standard deviation (SD) of the individual characteristics is provided.

## Measurement and data collection method

The competitions were held for a period of six months as home and away tournaments in 2018. The data were collected by the researcher and under the supervision of a physician using a modified questionnaire of Destombe et al. (2006). The players had no previous injuries in the past 6 months. This questionnaire consists of two parts. The first part evaluates player's personal information such as age, height, weight, position, and duration of the activity, hours of training per session, and the number of training sessions per week. The second part collects information on the extent of injury, type of injury, vulnerable areas, and mechanism of injury.

Descriptive and inferential statistical methods were used for data analysis. In the inferential statistics section, chi-square test was used to compare the prevalence of injury in men and women. The alpha level less than 0.05 was considered as the significance level. It should be noted that all Statistical analysis have been done using SPSS software (version 25). EXCELL software has also been used to draw charts.

## Results

Among 143 participants in Taekwondo Premier League in Poomsae style, 44 men and 59 women suffered lower limb injuries. The most injured part of lower limbs in men was ankle (56.8%) and in women was hamstring (59%) (Chart 1). Only the difference observed between the rate of hamstring injury in men and women was significant ( $\chi^2=12.52$ ,  $p\leq 0.05$ ) (Table 2, Chart 1).

The most common types of injury among martial artist females in Poomsae Premier League were strain (54.2%), contusion (20.3%), and sprain (11.9%), respectively (Table

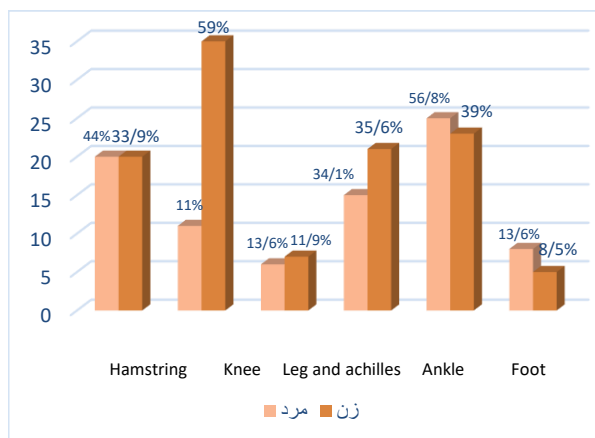


Chart 1. Location of injury

Table 2. Chi-square

Chi-Square	12.522a
df	1
Asymp. Sig.	0.000

Confidence interval: %95

3). And the difference between types of injury in women was statistically significant ( $p \leq 0.05$ ,  $\chi^2 = 137.8$ ). Among men, the common types were sprain (38.6%), strain (25%) and contusion (18.2%), respectively, and the difference between types of injury in men was statistically significant ( $p \leq 0.05$ ,  $\chi^2 = 72.2$ ) (Table 3).

The most common mechanism of Poomsae injury among women was related to the rotational strike (44.1%), previous injury (22%), falling (13.6%), low time duration between forms (13.6%) and performing base strikes at the end of range of motion (6.8%). And among men, the most common were related to previous injury (40.9%), falling (22.7%), performing base strikes at the end of range of motion (13.6%), rotational strike (11.4%) and low time duration between forms (11.4%) (Table 4). Results of Chi-2 test showed that there is a significant difference between mechanisms of injury in males ( $p \leq 0.05$ ,  $\chi^2 = 20.5$ ). Also, there is a significant difference between mechanisms of injury in females ( $p \leq 0.05$ ,  $\chi^2 = 87.4$ ) (Table 4).

## Discussion

The present study aimed to examine prevalence and mechanism of lower limbs injuries in male and female professional athletes in Poomsae Premier League in 2018 in Iran. Results of the study showed that the highest rate of injury in men is related to ankle, and in women, the most injured part is hamstring. And there is a significant difference between men and women in hamstring injuries. Also, the most common type of injury in men and women were sprain and strain, respectively. Pingale et al. found that 83% of injuries occur in lower limbs, and among the lower limbs, knee (54%) and ankle (50%) have the highest rates of injury; also, the rate of injury per 100 athletes was 43.75% in males and 56.25% in females [10]. Koh showed that 73% of chronic injuries occurs in Poomsae athletes and also reported that females athletes who train 3 times a week or more suffer from overuse injuries; and the most common type of injury was in knee and hamstring among which strain was the most common type of injury [5]. Kazemi et al. (2016) reported prevalence of injuries in women to be more than men and found the most common type of injury to be related to strain. These findings are consistent with findings of the present study. Hamstring strain is common among exercises including sprint, striking, and high-speed skills or maneuvers associated with hip flexion and knee extension [12]. Electromyography studies have shown that women, when performing sport maneuvers, activate quadriceps muscles more. In fact, combination of increased quadriceps activity and decreased hamstring activation can increase the risk of ACL in women [13]. Female athletes have been reported to have less hamstring strength than quadriceps compared to men, and thus, it cannot provide sufficient stability to balance the forces produced by quadriceps and the external forces applied to leg [14]. Similar to Poomsae, the nature of Wushu sport is non-contact. Blijid et al. reported that in half-contact Wushu sports, women experience higher rates of injury than men [15]. These findings are similar to those of Poomsae athletes. But in non-contact type, no injury has been reported in Wushu [15]. In contrast to Poomsae, Kyorugi has considered a different procedure for type of injury and the lower limbs are subject

Table 3. Types of injuries

Type of injury	Males		Females	
	Frequency	Percentage	Frequency	Percentage
Sprain	17	38.6	7	11.9
Strain	11	25	32	54.2
Rupture	1	2.3	1	1.7
Fracture	1	2.3	1	1.7
Dislocation	3	6.8	0	0
Contusion	8	18.2	12	20.3
Other (superficial: scratch, laceration)	3	6.8	6	10.2

Table 4. Mechanism of injury

Mechanism	Females		Males	
	Frequency	Percentage	Frequency	Percentage
Falling	8	13.6	10	22.7
Rotational strike	26	44.1	5	11.4
Low time duration between doing forms	8	13.6	5	11.4
performing base strikes at the end of range of motion	4	6.8	6	13.6

to direct and rotational strikes of the opponent and, given that Kyorugi is a high-contact sport, the most common type of injury is related to contusion. Also It should be noted that in people who perform Tai chi trainings such as Poomsae, type of injury is muscle strain [16]. Also, Opar et al. (2014) found that prevalence of hamstring strain in track and field athletes was significantly greater in 4×400 than in 4×100 [17]. This has led to the assumption that pelvic and trunk positional changes affect hamstring when running in a straight line or in a curve. The relationship between trunk and hip control with hamstring strain was confirmed by Chumanov et al. [18]. Also, it has been shown that eccentric strength trainings and neuromuscular control reduce hamstring injury and should be considered in rehabilitation program [19, 20]. Determining the type of rehabilitation program effectively affects muscle tissue recovery, and functional recovery seems essential to minimize repeated injury and help athlete's progression. An acceptable approach to injury prevention has been proposed by Van Michelen. According to this approach, we recommend some preventive measures, including conducting longitudinal studies on Poomsae injuries, preferably according to the following pattern: 1- determination of injury rate using a properly designed monitoring system; 2- determination of causes and mechanism of injury using the data from injury monitoring system; 3- preventive measures based on information from previous steps; and 4- evaluation of effectiveness by repeating the first step [4].

The study results showed that the most common mechanism of injury in men was previous injuries and in women was related to rotational strikes. Zurakowski et al. mentioned previous injuries as one of the causes of injury in martial arts [16]. Such a finding emphasizes the need for more attention by coaches and Health care practitioners of teams to rehabilitation of injured athletes and to help returning of athletes after complete recovery. One of the techniques used extensively in Poomsae is rotational strikes. Failure to do this movement properly results in severe injuries. Injuries have been assumed to be related to skill level and experience, although future research needs to be done. Therefore, by properly training the techniques as well as proper rehabilitation of injured athletes, injuries can be reduced to some extent.

### Conclusion

According to the results of this study, most of lower limb injuries in Poomsae occur in ankle and hamstring. Sprain and strain were the most common types of injury. Also, the most common mechanisms of injury were related to previous injury and rotational strikes. Therefore, these should be noted sufficiently in implementation of injury prevention programs.

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### Conflict of Interests

The authors declare that they have no competing interests.

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## شیوع و مکانیسم آسیب‌های ورزشی در بازیکنان لیگ برتر پومسه

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### چکیده

**مقدمه:** مقایسه آسیب‌های اندام تحتانی در ورزشکاران حرفه‌ای زن و مرد در لیگ برتر پومسه و شناسایی مکانیسم آسیب می‌باشد.

**روش‌ها:** جامعه آماری 143 رزمی کار در لیگ برتر بانوان و آقایان بودند که از این تعداد زنان 76 نفر و مردان 67 نفر را تشکیل دادند. از بین آن‌ها ورزشکارانی که دچار آسیب دیدگی شدند، نمونه‌های این تحقیق در نظر گرفته شدند. ورزشکاران در 6 ماه گذشته هیچ گونه آسیبی نداشتند. داده‌ها توسط محقق و تحت نظر پزشک با استفاده از پرسشنامه جمع‌آوری شدند. از آمار توصیفی و خی دو برای تجزیه و تحلیل داده‌ها استفاده شد.

**یافته‌ها:** نتایج تحقیق نشان داد که بیشترین میزان آسیب در مردان و زنان به ترتیب مچ پا و همسترینگ بود. و تفاوت معنی‌داری بین زنان و مردان در آسیب‌های همسترینگ مشاهده شد و بیشترین نوع آسیب در مردان اسپرین و در زنان استرین بود. بیشترین مکانیسم بروز آسیب هم در مردان افتادن و در زنان ضربات چرخشی بود.

**نتیجه‌گیری:** از نتایج این تحقیق می‌توان نتیجه گرفت که بهتر است مربیان توجه بیشتری در آموزش فنون داشته باشند. آگاهی مربیان در مورد صدماتی که ورزشکار در مسابقه ورزشی با آن مواجه می‌شود می‌تواند کمک با ارزشی در جهت پیشگیری از صدمات بنماید.

**کلیدواژه‌ها:** پومسه، شیوع آسیب، زنان، مردان، ایران

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