Prevalence and Mechanism of Sports Injuries in Poomsae Premier League Players

Ali Yalfani1, Maedeh Taghizadeh*1, Aylar Haji Ahmadi1

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 ($\chi^2=12.52, p\leq0.05$). 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

Conflicts of Interest: The authors have no conflict of interest in this study.
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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: sparring, 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...
In these athletes, etes is 43.75% beneficial for coaches and health. Injuries in the past 6 years in the lower limbs were 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). Pangale 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 a 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). EXELL 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 ($\chi^2=12.52, p≤0.05$) (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 1).
3). And the difference between types of injury in women was statistically significant (p≤0.05, χ²=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≤0.05, χ²=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≤0.05, χ²=20.5). Also, there is a significant difference between mechanisms of injury in females (p≤0.05, χ²=87.4) (Table 4).

**Table 3. Types of injuries**

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprain</td>
<td>17</td>
<td>38.6%</td>
<td>7</td>
<td>11.9%</td>
</tr>
<tr>
<td>Strain</td>
<td>11</td>
<td>25.0%</td>
<td>32</td>
<td>54.2%</td>
</tr>
<tr>
<td>Rupture</td>
<td>1</td>
<td>2.3%</td>
<td>1</td>
<td>1.7%</td>
</tr>
<tr>
<td>Fracture</td>
<td>1</td>
<td>2.3%</td>
<td>1</td>
<td>1.7%</td>
</tr>
<tr>
<td>Dislocation</td>
<td>3</td>
<td>6.8%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Contusion</td>
<td>8</td>
<td>18.2%</td>
<td>12</td>
<td>20.3%</td>
</tr>
<tr>
<td>Other (superficial: scratch, laceration)</td>
<td>3</td>
<td>6.8%</td>
<td>6</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

**Table 4. Mechanism of injury**

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Females</th>
<th>Percentage</th>
<th>Males</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling</td>
<td>8</td>
<td>13.6%</td>
<td>10</td>
<td>22.7%</td>
</tr>
<tr>
<td>Rotational strike</td>
<td>26</td>
<td>44.1%</td>
<td>5</td>
<td>11.4%</td>
</tr>
<tr>
<td>Low time duration between doing forms</td>
<td>8</td>
<td>13.6%</td>
<td>5</td>
<td>11.4%</td>
</tr>
<tr>
<td>Performing base strikes at the end of range</td>
<td>4</td>
<td>6.8%</td>
<td>6</td>
<td>6.13%</td>
</tr>
</tbody>
</table>

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 finding 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. Blijd 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.
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.

Acknowledgement
We thank and appreciate all men and women athletes, Taekwondo Federation, coaches and medical staff of the teams participating in Poomsae Premier League in 2018-2019 who cooperated with us in doing this research.

Conflict of Interests
The authors declare that they have no competing interests.

References
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 ماکباده.

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 پیش آنها ورزشکارانی که دچار آسیب دیدگی شدند، نمونه‌هایی این تحقیق در نظر گرفته شدند. ورزشکاران در 6 ماه کناره نه‌ی انسیب 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 مج پا و همسترینگ بود. و تفاوت معنی‌داری بین زنان و مردان در آسیب‌های همسترینگ مشاهده شد و بیشترین نوع آسیب در مردان اسیرین و در زنان استرین بود. بیشترین مکانیسم دچار آسیب هم در مردان افتاده و در زنان ضربات چرخشی بود.

نتیجه‌گیری: از نتایج این تحقیق می‌توان نتیجه گرفت که بهتر است مربیان نوجه بیشتری در آموزش فنون داشته باشند. آگاهی مربیان در مورد صدماتی که ورزشکار در مسابقه ورزشی با آن مواجه می‌باشد می‌تواند کمک کننده بهتری از دیدگاه‌ها و نیروی کلاسی باشد.

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

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