

Research Paper: Comparing the Musculoskeletal Injuries Between the Professional Greco-Roman and Freestyle Wrestlers



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ABSTRACT

Purpose: Wrestling, due to its contact and oppressive training nature, is subject to massive injuries. The present study aimed to compare musculoskeletal injuries between professional Greco-Roman and freestyle wrestlers.

Methods: This was a retrospective cross-sectional study. The statistical population consists of male Greco-Roman and freestyle wrestlers (N=86; age: 15-20 years) in Guilan Province, Iran. The study participants had a history of at least two continual years of wrestling training of 3 weekly sessions and participating in national and international competitions. The modified Fuller and Hawkins questionnaire was applied for recording recent two-year injuries. Using the descriptive statistics, the retrieved data were summarized and classified in tables. Besides, the difference between the study variables was determined by the Chi-squared test in SPSS.

Results: A statistically significant difference was observed in neck injuries between the investigated Greco-Roman and freestyle wrestlers (P=0.01). Additionally, a significant difference was observed in the frequency of training per week (P=0.01), techniques (P=0.001), and injury mechanisms (P=0.02) between the two study groups.

Conclusion: The present study findings revealed a significant difference in neck injury between Greco-Roman and freestyle wrestlers. Furthermore, a significant difference was detected in the frequency of training, techniques, mechanism of injury, and the injury rate between the study groups. Designing appropriate training sessions and plans and teaching the principles of warm-up and procedures for preventing additional damage in wrestlers are suggested to coaches.

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Highlights

- Neck injuries in the Greco-Roman style wrestlers were more frequent than the freestyle ones.
- The injury rate increases by the enhanced frequency of training in wrestlers.
- In terms of injury mechanism, contrary to freestyle wrestling, most injuries in Greco-Roman style wrestlers occur in the upper part of the body.
- Common factors involved in injury in wrestling are muscular force, flexibility, applied techniques, and the level of the wrestler's tactfulness.

Plain Language Summary

Apart from the style (Greco-Roman/free), wrestling is a sort of contact and heavy exercise with a high prevalence of injury due to the applied techniques and mechanisms in different body regions. The findings of our study revealed a difference between the neck injury, and some variables (training frequency, techniques, and injury mechanism), and injury occurrence among the wrestlers of two styles.

1. Introduction

Wrestling is among the oldest competitive exercises with two Greco-Roman and freestyle types. Apart from massive tensions imposed by wrestling on the athlete's body in both styles, the athlete assumes abnormal body positions during training and champions. There are apparent differences in adopting body positions for two wrestling styles during the training and champion leagues. In Greco-Roman style wrestling, the trunk position is more vertical, and using feet for implementing techniques is not allowed; however, in freestyle wrestling, the athlete assumes a curved position and using all limbs is allowed for performing techniques [1, 2].

In wrestling, the competition is held between the same age and weight groups; therefore, it is popular in youth [3]. Despite its simplicity, wrestling is a combinational exercise. To succeed, a wrestler must have the power of a weight lifter, the agility of a gymnast, endurance of a runner, and the creativity of a chess player [4]. Furthermore, wrestling is a form of contact and aggressive exercise and not free from potential injury-inducing occasions. A better understanding of the prevalence rate and the mechanisms of potential injuries in wrestling would help with implementing preventive actions in providing efficient care to wrestlers [5].

A great body of literature suggests the occurrence causes and the prevention strategies for exercise injuries to

decrease the treatment costs and promote the athlete's performance and well-being. Preventing risk factors and injuries are considered by exercise specialists [6]. Apart from all the health benefits of physical activity, athletes in any sports field are subject to exercise-induced injuries [3]. After football, wrestling injuries are the most frequent exercise-induced injuries [7].

The most common reasons for wrestling-induced injuries belong to musculoskeletal power, flexibility, and skill level. Agel et al. found that the injury rate among the wrestlers is 9.6 per athlete; sprains, strains, and contusions are among the most common injuries in athletes [8]. Goodman et al. explored the prevalence of shoulder and elbow injuries in the wrestlers of colligate athlete's academy; they revealed a rate of 21.59% injuries per 100000 exercise. Moreover, the first-year colligate wrestlers experienced more injuries than the senior ones, illustrating the relation between the athlete's experience and injury risk [9].

Park et al. conducted a 10-year epidemiological study on the prevalence of injury in elite male and female Korean athletes. They found that 59% of the injuries were slight. Moreover, most injuries were respectively in the lower limb (37.7%), upper limb (27.4%), as well as head and neck regions (9.7%) [10]. Based on Mauntel's study on the epidemiology of wrist sprains in the athletes of 25 colligate exercise disciplines, 56.7% of wrist sprains with 9.8% repetitions occurred during champion leagues, and wrestling had the highest wrist injury ratio per 10000 athletes [11].

Agarwal et al. (2016) performed a retrospective study on the pattern of knee injuries in 196 Indian wrestlers for 2 years. Using a self-constructed questionnaire, they recorded an overall of 188 injuries with an injury ratio of 5.13 per 1000 athlete (35 knee injury for 71 wrestlers). Although most occurred during the championships and in attacking state, 71.88% of injuries were new and occurred for the first time. Moreover, the registered injury ratio had a significant correlation with the age and exercise duration, and no relationship was found between the recorded injury rate and wrestling style (Greco-Roman/free), weight, and height. Besides, tendon sprains and muscular strains were the most prevalent registered injuries.

The objective of the mentioned retrospective study was to reduce the wrestlers' injuries by determining the factors effective on injuries and providing acts to prevent the injuries [7]. Given the results of the mentioned studies and the higher provenance of injury in wrestlers than other sports fields, investigating injury prevalence among the professional Greco-Roman and freestyle wrestlers, especially in Guilan Province, was necessary. Considering the scarcity of available studies on the incidence of injury in each Greco-Roman and freestyle wrestler groups, the main objective of the present study was to compare the musculoskeletal injuries between these two groups.

2. Materials and Methods

This was a retrospective cross-sectional study. The statistical population consisted of male Greco-Roman and freestyle wrestlers (N=86; age 15-20) in Guilan Province, Iran. The study participants had a history of at least two continual years of wrestling training for 3 weekly sessions as well as participating in national and international competitions. The study subjects were selected by a convenience sampling method. The sample size was determined according to the inclusion and exclusion criteria of the previous studies [12]; a total of 86 wrestlers (43 per style) participated in this study.

To achieve a highly-valid questionnaire, the personal characteristics, championship records, and the information related to injury were obtained using a form and during a face to face interview. Informed consent was obtained, and all participants voluntarily took part in the present study. The inclusion criteria were a history of at least two years of participation in national and international competitions, continual presence in wrestling training in two Greco-Roman and freestyle wrestling styles at the club level in Guilan Province, and the occurrence of injuries that caused the athlete to deprive the training session and required treatment [13].

Exclusion criteria were a non-continuous presence in wrestling training during the past two years, history of injuries not relevant to wrestling. The Hawkins and Fuller injury prevalence questionnaire with Cronbach's alpha coefficient of 0.79 was used to collect the required data. The content validity of the modified Hawkins and Fuller questionnaire (1998) was approved by 8 professional specialists and coaching experts in the wrestling field [14]. Using the descriptive statistics, the retrieved data were summarized and classified in tables, and the difference between the study variables was determined by Chi-square test in SPSS.

3. Results

The results of the present study in two descriptive and inferential statistical sections are presented as follows:

Table 1 illustrates the demographic characteristics of the investigated Greco-Roman and freestyle wrestlers.

Table 2 reports the most common injury sites in the studied Greco-Roman and freestyle wrestlers. Except for Sprain and swelling of the ears, the Greco-Roman style wrestlers experienced more injuries than the freestyle wrestlers, in all instances.

Table 3 reveals the Chi-squared test data for comparing injury sites in the investigated Greco-Roman and freestyle wrestlers. A statistically significant difference was observed between the Greco-Roman and freestyle wrestlers in injury sites ($P=0.015$); accordingly, the neck injury in Greco-Roman style wrestlers was more frequent than the freestyle wrestlers. However, no significant difference was observed in the back, rib, shoulder, and ankle, and other site injuries between the study groups ($P<0.05$).

Table 4 presents the results of the Chi-squared test for comparing injury causes in the surveyed Greco-Roman and freestyle wrestlers. A statistically significant difference was observed between two groups in training sessions ($P=0.01$) and the applied techniques ($P=0.01$). A total of 31.39% of Greco-Roman and 11.9% of freestyle wrestlers reported >6 training sessions per week. Moreover, 15.18% and 23.25% of Greco-Roman and freestyle wrestlers were injured with souples and leg tackle techniques, respectively ($P=0.001$). Additionally, A significant difference was observed between the two groups in injury mechanisms ($P=0.022$); 34.88% and 26.74% of Greco-Roman and free style wrestlers were injured with driven into the mat and rotational mechanisms, respectively.

Table 1. Demographic characteristics of the studied Greco-Roman and Freestyle wrestlers

Variables	Mean±SD		
	Freestyle (n=43)	Greco-Roman (n=43)	Total (N=86)
Height (m)	1.74±0.01	1.75±0.01	1.75±0.78
Weight (kg)	75.58±15.63	74.90±16.65	75.26±15.97
Age (y)	16.81±1.95	16.74±1.54	16.77±1.74
BMI (kg/m ²)	24.53±3.83	24.33±4.72	24.40±4.26

PHYSICAL TREATMENTS

Table 2. Prevalence rate of injury by type and site of injury in the studied Greco-Roman and Freestyle wrestlers

Type and Site of Injury	%		
	Freestyle (n=43)	Greco-Roman (n=43)	Total (N=86)
Bruising	30.23	51.16	40.69
Knee	30.23	30.23	30.23
Hand fingers	20.93	27.90	24.41
sprain	20.93	18.60	19.76
Ear swelling	20.93	16.27	18.60
Wrist	18.60	32.55	25.58
Shoulder	18.60	32.55	25.58
Low back	18.60	20.93	19.76
Ankle	13.95	27.90	20.93
Neck	9.30	30.23	19.76
Rib	9.30	13.95	11.62

PHYSICAL TREATMENTS

Table 3. The Chi-squared test results for comparing the site of injury in the studied Greco-Roman and Freestyle wrestlers

Site of Injury	Chi-squared Value	df	P
Neck	5.93	1	0.01*
Low back	0.07	1	0.78
Rib	0.45	1	0.50
Shoulder	2.19	1	0.13
Ankle	2.52	1	0.12

*Significance level: P>0.05.

PHYSICAL TREATMENTS

Table 5 lists the injury variables (in percentage) in the explored Greco-Roman and freestyle wrestlers. Practicing with the opponent was the most common injury-causing variable (91.86%) among the study groups. Moreover, most injuries occurred in the second round of the champion league (65.11%), rather than the first one (36.4%). Most injuries in the studied Greco-Roman and freestyle wrestlers occurred in attack status (39.53%); with 37.20% in the preseason champion league, and 34.88% in championship seasons.

Table 6 demonstrates the injury intensity (in percentage) in the investigated Greco-Roman and freestyle wrestlers. The highest injury intensity was observed among the Greco-Roman and freestyle wrestlers during 1-3 session(s) (51.16%), followed by >7 sessions (25.58%)

and 3-7 sessions (23.26%), respectively, as the cause of withdrawal from training.

4. Discussion

Due to differences between the styles of wrestling, variations exist in the prevalence and form of injury to body parts. In freestyle wrestling, using the feet for attacking is allowed; however, in Greco-Roman style, it is not permitted and the wrestlers are mostly encouraged to perform the throwing upper trunk techniques [15]. The aggressive nature of wrestling results in injuries with a rate of 9 per 1000 athlete that imposes high costs to the wrestlers and the team [16, 17]. In the present study, a significant difference was observed in neck injury between the investigated Greco-Roman style and freestyle wrestlers.

Table 4. The Chi-squared test results for the comparison of injury causes in the studied Greco-Roman and Freestyle wrestlers

Variables	Chi-squared Value	df	P
Training sessions per week	18.63	4	0.01*
Techniques	47.52	5	0.001*
Injury mechanisms	5.25	1	0.02*

*Significance level: P>0.05.

PHYSICAL TREATMENTS

Table 5. The injury variables in Greco-Roman and freestyle wrestlers

Variables	%		
	Freestyle (n=43)	Greco-Roman (n=43)	Total (N=86)
Practicing with the opponent	79.06	93.02	91.86
The first round of the champion	30.23	41.86	36.04
The second round of the champion	69.76	58.13	65.11
attack status	37.20	41.86	39.53
pre-season champion league	30.23	44.18	37.20
Championship seasons	25.58	44.18	34.88

PHYSICAL TREATMENTS

Table 6: The injury intensity in the studied Greco-Roman and freestyle wrestlers

Variables	Freestyle (n=43)	Greco-Roman (n=43)	Total (N=86)
Intensity	%		
1-3 session	39.53	62.79	51.16
3-7 sessions	34.88	11.62	23.25
>7 session	25.58	25.58	25.58

PHYSICAL TREATMENTS

This finding was inconsistent with those of Amirian et al.'s study [13]. Considering that shoulder injury in Greco-Roman style wrestlers was more frequent than the freestyle ones, no difference was detected in an injury site between two groups of wrestlers. Although the back, foot wrist, and rib injuries in Greco-Roman style wrestlers were more frequent than the freestyle ones, no difference was observed in this injury site between the study groups.

The reason for the higher neck injury in Greco-Roman style wrestlers may be related to performing the throwing techniques on driven into the mat as well as some techniques, i.e., more common among the Greco-Roman style wrestlers than the freestyle ones (e.g., souples, rear throw fito, & salto) that cause neck injury. The higher rate of head, face, and neck injuries and concussion in Greco-Roman style wrestlers belongs to the higher rates of throwing in this style of wrestling, compared to the freestyle one that throws the opponent into the mat.

During a throwing, the defender wrestler is being pulled up toward the shoulders of the opponent, then thrown on the mat with a high speed, where the wrestler

may be stricken with his/her head or shoulders. Although throwing the opponent is allowed in freestyle wrestling, this event rarely occurs, because the offender can impede throwing by grasping offenders' feet [18].

Rezasoltani et al. reported that stronger neck muscle force in Greco-Roman style wrestlers compared to the freestyle ones [19]; accordingly, most Greco-Roman style wrestlers attempt to strengthen their neck muscle force, i.e., because of the susceptibility of neck region for injury occurrence. In agreement, Yard et al. reported more neck and shoulder injuries in Greco-Roman style wrestlers than the freestyle ones [18].

Bonza et al. explored shoulder injury in high school students. They reported the highest shoulder injury rates (per 10000 exposed athletes), respectively, for soccer (5.09%) and wrestling (4.34%) [20]. The main factor involved in the higher rate of injury in Greco-Roman style wrestlers, compared to freestyle wrestlers, may belong to guarding against the opponent and the body style of the Greco-Roman style wrestlers. Greco-Roman style wrestlers, usually by assuming a chest to chest orienta-

tion against the opponent, attempt to cross their hands into the armpit of each other. Such practice causes strike in the shoulder and increases the injury rate among the Greco-Roman style wrestlers.

In addition, due to the limitation for implementing techniques in Greco-Roman style wrestling, most techniques are performed in the upper parts of the body, compared to the freestyle wrestling, where techniques are performed in the lower body parts. A common mechanism for the shoulder injury exists when the wrestler is driven by the opponent from a standing position into the mat. In this condition, the offender wrestler attempts to extend the hands to impede the falling, which results in transferring the force to the shoulder girdle. However, even when the wrestler is unable to the extent the hand (where the hands are locked by the opponent), the falling force may be directly applied on the shoulder [5].

The present study results revealed a significant difference in the training sessions per week between the studied Greco-Roman style and freestyle wrestlers. In other words, the Greco-Roman style wrestlers had more training sessions than the freestyle ones. Such difference may be related to the higher rate of the shoulder, back, foot wrist, and rib injuries among the Greco-Roman style wrestlers, compared to the freestyle ones. In addition, a significant difference was observed in the techniques that the Greco-Roman style and freestyle wrestlers applied. In terms of applied techniques, the throwing (souples) techniques and leg tackle techniques were respectively the most commonly applied techniques in Greco-Roman style and freestyle wrestlers, which caused different injuries in each style.

Moreover, the obtained data suggested a significant difference in injury mechanisms among the investigated wrestlers. In terms of mechanisms, falling (throwing) and torsion respectively had the highest rate of injury among the Greco-Roman style and freestyle wrestlers. Yard et al. (2008) reported that being driven into the mat (falling) is the most common mechanism relevant to the injury, followed by other mechanisms. Besides, the mentioned researchers reported differences in injury mechanisms regarding the wrestling style, as follows: being driven into the mat (falling) (95.4%), as the most common mechanism relevant to the Greco-Roman style wrestling, followed by other strikes, as the most common mechanisms (40.8%) corresponding to the freestyle wrestling [18]. According to Yard et al., the falling mechanism in Greco-Roman style wrestlers was considered as the primary mechanism, i.e., in line with the current research findings [18].

In addition, the highest rates of injury were observed in both Greco-Roman and freestyle wrestlers during training exposure with the opponent [8, 18, 21]. The timing of championship is considered as one of the injury-causing factors in wrestlers; as we approach the terminal moments of the championship, the rate of injury increases. Such data may be related to some factors (e.g., fatigue, stress), as in the case of our study. In our study, the injury rate in the second round was more than the first one. Kersey et al., during a tournament held by the National Collegiate Athletic Association, reported the injury rates of 19.1%, 28.2%, and 52.7% in the first, second, and third rounds of the championship, respectively [22], i.e., in line with the present study findings.

Also, the achieved results indicated higher rates of injury in pre-championship season, compared to the championship time. This finding is consistent with those of Agel et al., who reported a double injury rate among the collegiate wrestlers in pre-championship season, compared to the regular interseason championship time. In addition, these researchers reported a higher rate of pre-season championship, compared to regular interseason championship [8].

Furthermore, Shadgan et al. studied the intensity of injuries. They concluded that the injuries with intensities ranged between 1-3, 3-7, and >3 sessions were respectively classified as slight, intermediate, and severe. Shadgan et al., in a study on wrestlers in Beijing Olympics, reported 84.4% (27 out of 32 cases) and 16.6% (5 out of 32 cases) of injuries as slight and intermediate, respectively [23]; i.e., also in agreement with our study findings.

Considering the higher rate of injury in wrestling and the consequence high-costs imposed by injury, it is suggested that coaches and wrestlers use a specific wrestling warm-up exercise to prevent injuries. They are also recommended to use the predictive injury tests (e.g., functional movement screen) to screen the wrestlers in the pre-championship season. Besides, performing the regular muscular force strengthening exercises, safety, and security facilities (e.g., earmuffs) should be used for wrestlers. Factors related to the force, endurance, and flexibility of muscles should be considered to reduce neck injuries. Therefore, a specific exercise for neck muscles [6] should be planned.

Moreover, providing adequate space for exercise could reduce injury risk. In this regard, Snook (1980) suggested a minimum space of 100 sq/ft for a pair wrestler. Providing enough space prevents the inclination of the pair of wrestlers towards the other pairs or walls [24]. Early season tournaments may increase the risk

of injury; the physical fitness of the wrestlers has not reached the optimum level and participating in several daily champions easily imposes them at risk for severe injuries [5]. In this respect, Hewett et al. suggested that the training of the wrestlers should begin earlier in a season, and their champion league could be delayed for acquiring optimum fitness [25].

The Greco-Roman style wrestling coaches should, in advance, ensure about the wrestlers' technical readiness and the ability to withstand against the throwing forces applied on their body. The coaches should emphasize the safety of both opponent and offender wrestlers during the throwing [18]. Moreover, it is suggested that all wrestlers participate in a preseason assessment (e.g., orthopedic screening) before the championship to determine their previous potential condition [17].

Besides the external factors (the style of wrestling), the internal factors are essential in injury; thus, conducting research on the anthropometric indexes of the wrestlers is suggested. Also, designing similar experiments on professional wrestlers of different age groups is proposed. Finally, caution should be considered in applying the present study findings. This study was conducted on Greco-Roman and freestyle wrestlers with a history of participating in national champions; therefore, the generalization of the conclusions should be limited to male wrestlers at the same level.

5. Conclusion

The obtained data revealed that the injury rate among the Greco-Roman style wrestlers was more than in the freestyle ones. The reason for this difference may be related to the robust nature and the mechanisms of throwing techniques, as well as the limitations generated by not using the feet in the Greco-Roman style wrestling.

Ethical Considerations

Compliance with ethical guidelines

This study was jointly approved by the Vice-Chancellor for Research of Guilan University and Guilan General Administration for Sport and Youth (Code: 163056-12760).

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Authors' contributions

All authors contributed in preparing this article.

Conflict of interest

The authors declared no conflicts of interest.

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