

An Addendum to Injury Rates in Iranian Taekwondo Athletes; a Prospective Study

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Abstract

Purpose: The objective of this study was to compare the Iranian *taekwondo-in* statistically in terms of total injury rates to international counterparts as gleaned from the extant literature.

Methods: The Iranian sample consisted of 204 male *taekwondo-in* participating in the national championship. The international sample included the participants in national and international tournaments. Validated standard questionnaires were employed at all tournaments to collect injury data that were always diagnosed by the respective tournament physicians. An injury was defined as any circumstance for which assistance was sought from the medical personnel. In addition to injury rates, 95% confidence intervals (CIs) around the rates were computed. To assess which group was at higher risk, odds ratios were calculated, including the 95% CIs.

Results: Compared to Greek counterparts, the injury rate for the Iranian *taekwondo-in* was statistically significantly higher. The Iranians were also at a higher risk to incur an injury: OR = 11.2 (95%CI: 6.60 – 18.88, $P < 0.001$, CLR = 2.86). When comparing the Iranian *taekwondo-in* to their colleagues competing at the 1999 World Championships, the former recorded a statistically significantly lower injury rate but the latter were not at a higher risk (OR = 0.61, 95%CI: 0.41 – 0.91, $P=0.014$, CLR = 2.20).

Conclusion: A statistical comparison of total injury rates in Iranian and international *taekwondo-in* revealed no difference between the two groups. However, what is of concern is that the total injury rate across taekwondo studies is significantly higher than those reported for American football.

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INTRODUCTION

Full-contact or Olympic taekwondo is a modern sport from the second half of the 20th century^[1-4]. Despite its young age, it became an Olympic

demonstration sport in 1988 (Seoul) and 1992 (Barcelona) and a full medal contender at the 2000 Sydney Olympic Games. The earliest known epidemiological study on taekwondo injuries was published in 1989 based on the 1988 US Olympic

Taekwondo Team Trials^[5]. A proliferation of (observational) injury research has subsequently ensued on both young and adult taekwondo athletes (*taekwondo-in*) [e.g., 6-22] with a recent meta-analysis of the available literature to date^[23]. The most recent of these investigations was reported by Ziaee et al.^[24], which is believed to be the first of its kind in Iran.

The risk of participating in any sport is typically expressed in terms of comparing total injury rates. For instance, American adult male elite *taekwondo-in* were reported to incur an injury rate of 127.36 injuries/1,000 athlete-exposures (A-E) (95%CI: 79.33–175.40)^[20], Their Canadian colleagues recorded a rate of 79.91/1,000 A-E (95%CI: 53.44–106.38)^[18].

Due to the increase of research on the epidemiology of taekwondo competition injuries, it has now become possible to compare injury rates statistically and identify those are at higher risk of injury. The purpose of this study, then, was to add to the existing body of knowledge by comparing the Iranian *taekwondo-in*^[24] statistically in terms of total injury rates to international counterparts as gleaned from the extant literature. Recent reviews of taekwondo competition injuries^[3, 25] served as the basis for comparing the Iranian athletes to get a firmer grasp of what was reported^[24].

METHODS AND SUBJECTS

As reported by Ziaee et al.^[24], the Iranian sample consisted of 204 male *taekwondo-in* participating in the national championship. They competed in bouts lasting 3 rounds of 2 minutes each with 30-second breaks in between rounds. The international sample participated

in national and international tournaments in bouts consisting of either 3 rounds of 2 minutes with 30-second breaks in between rounds or 3 rounds of 3 minutes each interspersed with 1-minute breaks in between rounds. The competition rules used at all competitions were those of the World Taekwondo Federation (WTF).

Validated standard questionnaires were employed at all tournaments to collect injury data that were always diagnosed by the respective tournament physicians. An injury was defined as any circumstance for which assistance was sought from the medical personnel.

Exposure data were gathered from records of bouts actually fought. Since two athletes contested each bout, there were two athlete-exposures (A-E) per match. Injury rates were calculated as (number of injuries/athlete-exposures) x 1,000 = number of injuries per 1,000 A-E^[5, 24].

In addition to injury rates, 95% confidence intervals (CIs) around the rates were computed. Statistical comparisons were made with one-tournament groups in which elite *taekwondo-in* competed. To this end, the following studies were included: Pieter et al.^[8], Beis et al.^[14], Koh et al.^[15] and Kazemi and Pieter^[18].

To assess which group was at higher risk, odds ratios were calculated, including the 95%CIs. The level of significance was set at 0.05.

RESULTS

Table 1 shows comparative injury rates in elite *taekwondo-in* from various countries. When compared to those competing at the European Cup^[8], the Iranian

Table 1: Competition injury rates per 1,000 athlete-exposures in taekwondo athletes

Study	Country	Sample size	Injury rate (95%CI)
Ziaee et al. ^[24]	Iran	204	69.51 (55.38-83.64)
Pieter et al. ^[8]	Europe*	67	139.54 (93.95-185.12)
Pieter and Zemper ^[26]	American	1,665	95.07 (84.72-105.42)
Koh et al. ^[15]	World**	330	120.81 (92.91-148.72)
Beis et al. ^[14]	Greece	533	20.55 (11.76-29.34)
Kazemi and Pieter ^[18]	Canada	219	79.91 (53.44-106.38)

*European Cup

**World Championship

taekwondo-in were not at a lower risk of incurring an injury: OR = 0.85 (95%CI: 0.52–1.41, $P = 0.528$, CLR = 2.71), although the injury rate was significantly lower.

Compared to Greek counterparts^[14], the injury rate for the Iranian *taekwondo-in* was statistically significantly higher. The Iranians were also at a higher risk to sustain an injury: OR = 11.2 (95%CI: 6.60–18.88, $P < 0.001$, CLR = 2.86).

When comparing the Iranian *taekwondo-in* to their colleagues competing at the 1999 World Championships^[15], the former recorded a statistically significantly lower injury rate but the latter were not at a higher risk (OR = 0.61, 95%CI: 0.41–0.91, $P = 0.014$, CLR = 2.20).

There was no difference in injury rate between the Iranian *taekwondo-in* and their Canadian colleagues (Kazemi and Pieter, 2004^[18]). The Canadians were also not at a higher risk (OR = 0.42, 95%CI: 0.26–0.66, $P < 0.001$, CLR = 2.54).

DISCUSSION

To the best of our knowledge, this is only the second statistical comparison of injury rates in taekwondo between studies from a variety of geographical locations^[3], while at risk groups were also recently identified^[25]. However, it is not clear why the Greek *taekwondo-in* recorded the lowest injury rate. It may be that they were not willing to report an injury^[25].

Although the elite Greek *taekwondo-in* had a lower point estimate than British recreational counterparts 51.28 (95%CI: 1.02–101.54)^[25], this was not statistically significant, which was suggested to be due to the small sample size of the British *taekwondo-in*^[25, 27].

On the other hand, a similarly small sample size of American elite *taekwondo-in* yielded an injury rate of 127.4/1,000 A-E (96%CI: (79.3–175.4)^[5], which was not statistically significantly different from the rate recorded by the Iranian taekwondo athletes. However, it was significantly larger than that of the Greek colleagues^[14]

Although experience was suggested to be related to the occurrence of injuries, this was only reported for time-loss injuries^[25]. Future research should investigate this relationship in general injuries as well. To put the injury rates of taekwondo into perspective, it is instructive to compare them to those reported for other combat sports (see Table 2).

American football and wrestling injuries were collected over a 15-year period, while the other injury rates in Table 2 were all based on one competition only. In a recent review of taekwondo injuries, it was revealed that the rates across studies published from 1989 to 2007 ranged from 20.6 to 139.5 per 1,000 A-E, which is based on mostly elite *taekwondo-in* except for one study on recreationalists^[25]. The latter incurred an injury rate of 51.28 (95%CI: 1.02–101.54)^[27]. The large confidence interval is due to the small sample and cell sizes. The injury rate for the elite *taekwondo-in* only would be 89.40/1,000 A-E (95%CI: 79.98–100.66), which is statistically not different from the

Table 2: Comparative injury rates per 1,000 A-E in American football and combat sports

Sport	Injury rate
Iranian elite <i>taekwondo-in</i> ^[24]	69.51 (55.38-83.64)
American football ^[28]	36.11 (35.70-36.52)
Dutch elite <i>karateka</i> ^[29]	168.87 (144.13-193.61)
Iranian Elite <i>karateka</i> ^[30]	186 (159-205)
British elite <i>judoka</i> ^[31]	48.54 (18.45-78.63)
Asian elite <i>judoka</i> ^[32]	25.18 (6.53-43.83)
Elite <i>karateka</i> ^[33]	157.64 (145.20-170.08)
Wrestling ^[34]	26.2 (25.2-27.2)

rate reported for the Iranian *taekwondo-in*^[24]. However, it is significantly higher than that of American football as well as wrestling (Table 2).

Since taekwondo competitions are currently contested in bouts of 3 rounds of 2 minutes each and since each athlete might have to be engaged in several bouts before reaching the finals, the chances of incurring an injury over the course of each tournament is a cause for concern for all involved. Research on injuries over time during a competitive match, regardless of the sport, is scarce. For instance, in American and Australian football, injuries were reported to increase later in the match^[35,36].

In combat sports, injuries were reported to increase over time in karate competition^[37]. In 2001, Beis et al.^[38] reported taekwondo injuries in relation to time of competition, while Ziaee et al.^[24] suggested that most injuries were sustained in the third round of a match. Fatigue is suggested to be at the basis of this finding^[37,38]. Future research should consider taking into account the time of injury occurrence, which in turn may lead to improved preventive measures, such as better conditioning of the athletes^[39,40] or changing competition tactics.

CONCLUSION

A statistical comparison of total injury rates in Iranian and international *taekwondo-in* revealed no difference between the two groups. However, what is of concern is that the total injury rate across taekwondo studies is significantly higher than those reported for American football. The international governing body for Olympic taekwondo and each national counterpart may want to consider more effective preventive measures.

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