

Joint Injury and Rehabilitation in Taekwondo-Short Review

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ABSTRACT— Taekwondo is a traditional Korean martial art combining foot (tae) and hand (kwon) techniques. It is among the most popular martial arts worldwide and became an official Olympic discipline in 2012. Taekwondo can be divided into two types kyorugi and poomsae, kyorugi is full-contact sport, such as The Olympic Taekwondo, and the other is non-contact sport, which mainly focuses on performances and demonstrations, the non-contact sport known as “Poomsae”. In order to achieve results in various competitions, the training of ordinary athletes focuses on sparring (Olympic style) taekwondo. In recent years, however, many experienced athletes have begun to engage in mind training centered on the unity of posture (Poosae). Poosae is the only non-contact training in taekwondo. Poomsae consists of 13 defined patterns of movement, which are repeated over and over in practice.

KEYWORDS—Taekwondo, Injury, Rehabilitation

I. INTRODUCTION

A previous study found lower limb injury was most frequent in taekwondo, next is head and trunk, and upper limb was the minimum injuries part of body. Contusions/hematomas/bruises are the most common taekwondo injury [1]. This was identical to a study [2] which found the most common type, and mechanism of injury in Taekwondo athletes were the ligament sprain, and contact with another player [2].

Several studied 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 [8-10]. But in “Poomsae”, the main injury occurred in the landing phase of the flight, mainly in the knee joint. Studies have found that, in the long-term training and performance of Poomsae athletes, jumping and landing movements occupied the majority, so the injury frequency of lower limbs was significantly higher than other parts of the body [11,12,13]. In addition, three out of five Taekwondo athletes were reported to have experienced knee joint anterior cruciate ligament injuries at the moment of landing. [14.15.16,17]

Among Korean taekwondo athletes, female injuries were greater than male injuries, and junior’s injuries were greater than adults [1.2]. In addition, head and neck injuries were second only to lower limb injuries in male athletes [10,12].

II. INJURY SITE

Several studies have identified the foot and ankle as the anatomic region with the highest risk for injury in taekwondo [1-6]. The second was knee joint [11]. But, another results suggested the knee joint to be the most vulnerable [18], Among ankle injuries, the non-dominant side has more significant research results than the dominant side [3]. Poomsae was the only non-contact and unopposed form of taekwondo, but despite its non-contact nature, the lower extremities and back remained the most common areas of injury [19].

Doo H et al. (2021) found that although Poomsae was a non-contact sport, the injury rate was higher than that of Kyorugi, but in terms of the severity of injury, Kyorugi was much higher than That of Poomsae. Their study also showed that thigh was the most likely to be injured. [20]

III. CASE OF INJURY

The turning kick was most often involved in causing injury: 56.9% of all injuries in the men and 49.8% in the women [10,12]. In contact injury, lack of blocking skill was considered to be one of the main injury mechanisms in most studies. However, because kick techniques are more powerful and more effective for scoring points than punches during competitive performances, most of the skills used in taekwondo were dependent on kick techniques to efficiently score points in competitions [21,22,23]. In previous studies, it was reported that the vast majority of injuries in participating athletes in taekwondo were found on the lower extremities owing to the exchange of accurate and powerful turning kicks) [23,24,25]. Furthermore, while conducting kicking techniques during competitions, taekwondo athletes often exchange kicks concurrently, which can result in lower extremity injuries. [11-13] The trunk was the least injured area, which may be related to the use of protective gear in these areas during training and competition [26,27] The injury of female athletes was higher than that of male athletes [1.2], which maybe because men had 20%–30% higher concentric and isometric knee extensor and flexor strength than females in both legs. [28]

In the non-contact sport, Poomsae athletes’ strain and joint dysfunction were the most common injury types, and lower limbs were the most common injury sites. In addition, lower limb injuries were more likely in women than in men, and the

results were similar to Kyorugi's survey results by Jeong HS et al. [1] and Son B et al. [2]. Women with lower experience levels are more likely to suffer chronic overuse injuries than men [1.2.24]

IV. INJURY REHABILITATION

It was suggested that improvement of strength, endurance, and postural stability under strain was recommended for prevention ankle injuries [3].

Therefore, it is desirable to place the landing foot down at a wide angle to prevent injury in performing Taekwondo jumping kicks. Continuous training for the symmetry and balance of lower extremity strength is expected to play an important role in preventing Taekwondo demonstration athletes' injury. Further research is needed to determine whether muscle strength symmetry and balance are effective in preventing injury. [17]

A study [29] provided of rehabilitation strategies for a 16-year-old male world-class sports athlete who presented with right ACL rupture and LCL sprain. Extensive clinical examination and imaging confirmed the correct grade 3 ACL tear with a complete tear and an imminent world championship, the study implemented a preoperative rehabilitation strategy and a treatment regimen aimed at expediting his return to competition [29]. Subjects who competed last and placed in the top 10, once or twice a week during the 12-week rehabilitation period, did not report any concessions or pain during competitions or training [29]. This case showed the multimodal treatment (multiple mode of nursing intervention measures including strengthening practice sport-specific proprioception support activities Neuromuscular stimulation vibration therapy and lasers, which have proven beneficial in the treatment of ACL injuries [31-36]) were used in combination with the aggressive treatment using Whole Body Vibration to treat acute unstable lower limb injuries in world-class athletes that require a high degree of coordination and control [29].

The application of plyometrics training in ankle rehabilitation would improve stability and shock absorption and help prevent injuries during taekwondo demonstrations [37]. All [29,37] studied poomsae players, and poomsae players had different injury types from Kyorugi, so there should be differences in rehabilitation methods. Park J H et al. (2020) helped improve the ankle joints of Kyorugi Taekwondo athletes with chronic ankle instability through instrument-assisted soft Tissue mobilization (IASTM) rehabilitation exercises ROM, isokinetic muscle strength and balance [38].

Punnoose A et al. (2015) helped a subject with severe hip joint injury carried out individualized for 12 weeks. The importance of dividing the rehabilitation of these patients into distinct phases was that each phase has different goals related to the different healing properties of the associated tissues ROM exercises were gradually initiated at the beginning of the rehabilitation program to control pain and inflammation at the surgical site, during which proprioceptive exercises plyometrics and weight training were used [39].

V. CONCLUSION

In taekwondo, poomsae and Kyorugi [20] both have high risk of injury in lower limbs, of which Poomsae is more prone to injury while Kyorugi is more serious [40]. Knee and ankle are the most damaged joints in lower limbs. In terms of gender, female has higher risk of injury than male [1.2]. Taekwondo athletes often kick at the same time during kicking practice in competitions, which may lead to lower limb injuries [11-13].

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REFERENCES

- [1] Jeong HS, Ha S, Jeong DH, O'Sullivan DM, Lee SY. Injury and Illness in World Taekwondo Junior Athletes: An Epidemiological Study. *Int J Environ Res Public Health*. 2021 Feb 22;18(4):2134. doi: 10.3390/ijerph18042134. PMID: 33671704; PMCID: PMC7926313.
- [2] Son B, Cho YJ, Jeong HS, Lee SY. Injuries in Korean Elite Taekwondo Athletes: A Prospective Study. *Int J Environ Res Public Health*. 2020 Jul 16;17(14):5143. doi: 10.3390/ijerph17145143. PMID: 32708739; PMCID: PMC7399793.
- [3] Willauschus M, Rütther J, Millrose M, Walcher M, Lambert C, Bail HJ, Geßlein M. Foot and Ankle Injuries in Elite Taekwondo Athletes: A 4-Year Descriptive Analysis. *Orthop J Sports Med*. 2021 Dec 15;9(12):23259671211061112. doi: 10.1177/23259671211061112. PMID: 34950743; PMCID: PMC8689624.
- [4] Pieter W, Fife GP, O'Sullivan DM. Competition injuries in taekwondo: a literature review and suggestions for prevention and surveillance. *Br J Sports Med*. 2012 Jun;46(7):485-91. doi: 10.1136/bjsports-2012-091011. PMID: 22661697.
- [5] Lambert C, Pfeiffer T, Lambert M, Brozat B, Lachmann D, Shafizadeh S, Akoto R. Side Differences Regarding the Limb Symmetry Index in Healthy Professional Athletes. *Int J Sports Med*. 2020 Oct;41(11):729-735. doi: 10.1055/a-1171-2548. Epub 2020 Jun 3. PMID: 32492733.
- [6] Ji M. Analysis of injuries in taekwondo athletes. *J Phys Ther Sci*. 2016 Jan;28(1):231-4. doi: 10.1589/jpts.28.231. Epub 2016 Jan 30. PMID: 26957764; PMCID: PMC4756010.
- [7] Pieter W, Fife GP, O'Sullivan DM. Competition injuries in taekwondo: a literature review and suggestions for prevention and surveillance. *Br J Sports Med*. 2012 Jun;46(7):485-91. doi: 10.1136/bjsports-2012-091011. PMID: 22661697.
- [8] Zemper ED, Pieter W. Injury rates during the US Olympic Team Trials for taekwondo. *Br J Sports Med*. 1989;23:161-4.
- [9] Ziaee V, Rahmani SH, Rostami M. Injury rates in Iranian taekwondo athletes; a prospective study. *Asian J Sports Med*. 2010;1:23-28.
- [10] Pieter W, Fife GP, O'Sullivan DM. Competition injuries in taekwondo: a literature review and suggestions for prevention and surveillance. *Br J Sports Med*. 2012 Jun;46(7):485-91. doi: 10.1136/bjsports-2012-091011. PMID: 22661697.
- [11] Ji M. Analysis of injuries in taekwondo athletes. *J Phys Ther Sci*. 2016 Jan;28(1):231-4. doi: 10.1589/jpts.28.231. Epub 2016 Jan 30. PMID: 26957764; PMCID: PMC4756010.
- [12] Pieter W, Bercades L, Heijmans J. Injuries in young and adult taekwondo athletes. *Kines*, 1998, 30: 22-30.

- [13] Cunningham C, Cunningham S: Injury surveillance at a national multi-sport event. *Aust J Sci Med Sport*, 1996, 28: 50–56.
- [14] Olsen OE, Myklebust G, Engebretsen L, Bahr R. Injury mechanisms for anterior cruciate ligament injuries in team handball: a systematic video analysis. *Am J Sports Med*. 2004 Jun;32(4):1002-12. doi: 10.1177/0363546503261724. PMID: 15150050.
- [15] Koh J.O., Kim S.J., Ji C.H. Incidence rate of Taekwondo demonstration related injuries and potential risk factors. *J. Sport Leis. Stud*. 2012;47:887–908.
- [16] Moon Y.L., Kim D.H., Lee J.Y., Yoon O.N., Kim C.Y. Injury mechanism and progress of anterior cruciate ligament injury in Taekwondo players. *Korean J. Sports Med*. 2007;25:83–86.
- [17] Ryu S, Lee TK. Biomechanical Parameters that May Influence Lower Limb Injury during Landing in Taekwondo. *Medicina (Kaunas)*. 2021 Apr 12;57(4):373. doi: 10.3390/medicina57040373. PMID: 33921422; PMCID: PMC8070168.
- [18] Altarriba-Bartes A, Drobnic F, Til L, et al. Epidemiology of injuries in elite taekwondo athletes: two Olympic periods cross-sectional
- [19] Kazemi M, Ingar A, Jaffery A. Injuries in elite taekwondo poomsae athletes. *J Can Chiropr Assoc*. 2016;60(4):330–341.
- [20] Doo H, Kim D, Kim C, Lee SY, Park J. Comparisons of musculoskeletal injuries among three different modalities of Taekwondo (Kyorugi, Poomsae, and Shibum): a one-year follow-up prospective epidemiologic study. *Res Sports Med*. 2021 Dec 14:1-16. doi: 10.1080/15438627.2021.2010201. Epub ahead of print. PMID: 34905996.
- [21] Engebretsen L, Soligard T, Steffen K, et al. Sports injuries and illnesses during the London Summer Olympic Games 2012. *Br J Sports Med*. 2013;47(7):407–414.
- [22] Willauschus M, Rütther J, Millrose M, Walcher M, Lambert C, Bail HJ, Geßlein M. Foot and Ankle Injuries in Elite Taekwondo Athletes: A 4-Year Descriptive Analysis. *Orthop J Sports Med*. 2021 Dec 15;9(12):23259671211061112.
- [23] Altarriba-Bartes A, Drobnic F, Til L, et al. Epidemiology of injuries in elite taekwondo athletes: two Olympic periods cross-sectional retrospective study[J]. *BMJ open*, 2014, 4(2): e004605.
- [24] Kazemi M, Ingar A, Jaffery A. Injuries in elite Taekwondo Poomsae athletes[J]. *The Journal of the Canadian Chiropractic Association*, 2016, 60(4): 330.]
- [25] World of Taekwondo Federation What is taekwondo. [Internet] World of Taekwondo Federation. 2013. [cited 2014 May 10]. Available from: <http://www.worldtaekwondofederation.net/what-is-taekwondo>.
- [26] Til L, Orchard J, Rae K. El sistema de classificació i codificació OSICS-10 traduït de l'anglès. *Apunts Medicina De L'Esport* 2008;43:109.
- [27] Kazemi M, Pieter W. Injuries at the canadian national taekwondo championships: A prospective study. *BMC Musculoskelet Disord* 2004;5:22
- [28] Harbili S, Harbili E, Aslankeser Z. Comparison of bilateral isokinetic and isometric strength differences in elite young male and female taekwondo athletes. *J Exerc Rehabil*. 2022 Apr 26;18(2):117-122. doi: 10.12965/jer.2244122.061. PMID: 35582688; PMCID: PMC9081412.
- [29] Edgar M, Kazemi M. The use of a multi-modal approach in the rehabilitation of a pre-operative grade 3 ACL tear in a world-level Poomsae athlete: a case report. *J Can Chiropr Assoc*. 2020 Dec;64(3):248-257. PMID: 33487646; PMCID: PMC7815173.
- [30] Kazemi M, Ingar A, Jaffery A. Injuries in elite taekwondo poomsae athletes. *J Can Chiropr Assoc*. 2016;60(4):330–341.
- [31] Strehl A, Egli S. The value of conservative treatment in ruptures of the anterior cruciate ligament (ACL) *J Trauma Acute Care Surg*. 2007;62(5):1159–1162.
- [32] Bogunovic L, Matava MJ. Operative and nonoperative treatment options for ACL tears in the adult patient: a conceptual review. *Physician Sportsmed*. 2013;41(4):33–40
- [33] Hart JM, Kuenze CM, Pietrosimone BG, Ingersoll CD. Quadriceps function in anterior cruciate ligament-deficient knees exercising with transcutaneous electrical nerve stimulation and cryotherapy: a randomized controlled study. *Clin Rehabil*. 2012;26(11):974–981.
- [34] Paluska SA, McKeag DB. Knee braces: current evidence and clinical recommendations for their use. *Am Fam Phys*. 2000;61(2):411–418.
- [35] Gigo-Benato D, Geuna S, Rochkind S. Phototherapy for enhancing peripheral nerve repair: a review of the literature. *Muscle Nerve*. 2005;31(6):694–701.
- [36] Pallotta RC, Bjordal JM, Frigo L, Junior EC, Teixeira S, Marcos RL, Ramos L, de Moura Messias F, Lopes-Martins RÁ. Infrared (810-nm) low-level laser therapy on rat experimental knee inflammation. *Lasers Med Sci*. 2012;27(1):71–78.
- [37] Lee HM, Oh S, Kwon JW. Effect of Plyometric versus Ankle Stability Exercises on Lower Limb Biomechanics in Taekwondo Demonstration Athletes with Functional Ankle Instability. *Int J Environ Res Public Health*. 2020 May 22;17(10):3665. doi: 10.3390/ijerph17103665. PMID: 32456048; PMCID: PMC7277727.
- [38] Park J H, Rhyu H S, Rhi S Y. The effects of instrument-assisted soft tissue mobilization rehabilitation exercise on range of motion, isokinetic strength, and balance in chronic ankle instability taekwondo players[J]. *Journal of exercise rehabilitation*, 2020, 16(6): 516.
- [39] Punnoose A, Gallagher C, Matthews J, et al. Rehabilitation of a national Taekwondo player following arthroscopic hip surgery: successfully achieving a return to gold medal winning performance levels[J]. *J Nov Physiother*, 2015, 5(262): 2.
- [40] Doo H, Kim D, Kim C, Lee SY, Park J. Comparisons of musculoskeletal injuries among three different modalities of Taekwondo (Kyorugi, Poomsae, and Shibum): a one-year follow-up prospective epidemiologic study. *Res Sports Med*. 2021 Dec 14:1-16.