



P-ISSN: 2394-1685  
E-ISSN: 2394-1693  
Impact Factor (RJIF): 5.38  
IJPESH 2022; 9(6): 315-317  
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[www.kheljournal.com](http://www.kheljournal.com)  
Received: 08-08-2022  
Accepted: 13-09-2022

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## Evaluation of foot posture in taekwondo players using foot posture index scale

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### Abstract

Taekwondo (TKD) is well known and oriented martial arts from Korea which has been popular in India from past few years. TKD needs frequent use of legs. It is predictable that main injury mechanism was found in receiving kicks with hyperextended knees and foot. The risk of injury is more; hence it is important to understand the importance of foot posture in taekwondo players.

**Method:** Fifty (50) Male Taekwondo players aged between 15-18 years old were recruited in this study. Evaluation of foot posture was done using Foot Posture Index Scale.

**Result and Conclusion:** Findings of present study reveal that taekwondo players demonstrated characteristics of slightly pronated foot bilaterally based on the scoring of foot posture index.

**Keywords:** Male taekwondo players, foot posture index

### Introduction

Taekwondo (TKD) is a well known traditional form of martial art oriented in Korea. It is very quick sport involving both men and women. It includes punching and kicking techniques.<sup>1</sup> The most common injury occurs at the knee followed by foot and ankle, shoulder, neck, elbow, head, hand and hip<sup>[1]</sup>.

In TKD athletes are called to strike their opponents using kicks with full force within the sports rules. A typical combat for adults consists of three rounds intercepted with one minute of recovery in between. Ever since it was established as an Olympic game in 2000, its popularity has increased rapidly and participation of athletes from all age groups has developed rapidly. In TKD peculiar double point scoring techniques are used. It was suggested that the TKD injury rate is lower than that in some sports (eg. Mixed martial arts, snowboard cross) and higher than in other ones (eg. Karate, aikido, kung fu, tai chi, soccer, ice hockey, basketball). This motivated the present study. From a preventive point of view, to identify injury characteristics that is types, body location, and mechanism of injury. Foot Posture Index (FPI) is a quick, diagnostic tool. With patient in standing relaxed, double limb stance position, with equal weight bearing on both the lower extremity, eyes looking straight and arms at their sides<sup>[2]</sup>.

Introduction to FPI, the six clinical criteria in the FPI-6 are: a) Talar head palpation b) Supra and infra lateral malleolar curvature c) Calcaneal frontal plane position. d) Prominence in the region of the talonavicular joint e) Congruence of the medial longitudinal arch f) Abduction/adduction of the forefoot on the rarefoot<sup>[3]</sup>.

The reliability of the FPI-6 has been tested in adults with Excellent intra-rater results but moderate Inter-rater results. Two studies investigating the reliability of the index in a paediatric population Have been identified, one of which evaluated the reliability of the older version of the index. This study looked at a number of measures of foot position in addition to the FPI-8 and following reliability analysis, ICC Values of 0.80 for children and 0.91 for adolescents were Presented. More recently, Cain *et al.*<sup>[8]</sup> investigated the Intra-rater and inter-rater reliability of the refined FPI-6 on ten adolescents. Findings from this study reported excellent intra-rater reliability (ICC values ranged from 0.81 0.92) and good inter-rater reliability.

However, consideration of the nature of the data generated by The FPI-6 would suggest that analysis using ICCs would be Incorrect for the present study unless logit transformed Scores are used. This is the process of changing raw FPI-6 Scores into a data form suitable for parametric analysis but for this, large data sets are required. Without transformation the index produces categorical data and therefore raw scores should be analysed using Kappa scores, particularly when the data is not normally distributed [5].

**Materials and Methods**

**Study Design:** Cross Sectional study

**Sampling Method:** Convenience sampling

**Sample Size:** 50

**Study Setup:** Mumbai Region

**Inclusion Criteria:** a) Male participants practicing/ playing for at least or more than 1 year.

b) Age 15-18 years old

**Exclusion Criteria**

a. Any recent ankle, knee fracture or injury (less than six months)

b. Participants who are not willing to give consent.

**Materials:** Consent form, Demographic detail, Foot Posture Index.

**Results**

Fifty male taekwondo players aged from 15-18 year old were recruited in this study. Demographic details mentioning age, height, weight, Body Mass Index, years and hours of practicing Taekwondo are presented in Table 1.

Foot Posture Index scoring has been presented in Table 2. As per the standard classification of Foot Posture Index by Redmond *et al.*, the foot posture is categorized as highly pronated (FPI score 10 to 12), pronated (FPI Score 6 to 9), neutral (FPI score 0 to 5), supinated (FPI score -1 to -4) and highly supinated (FPI score -5 to -12).

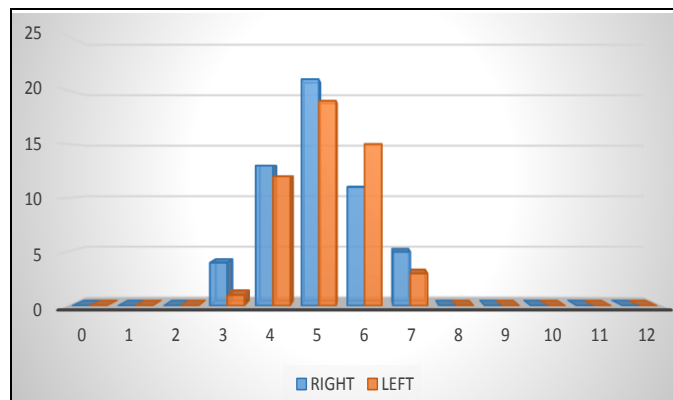
**Table 1:** Shows Demographic detail of taekwondo players in which average age of taekwondo player was 16 years, average years of practicing was 4 years and 2 hours of practicing per day .

	Mean	Standard Deviation
Age (years)	16.36	1.19
Height (cm)	163.16	9.59
Weight (kg)	54.36	6.50
BMI (kg/m <sup>2</sup> )	20.424	1.38
Years of practicing	4.08	1.16
Hours of practicing (per day)	2	0

**Table 2:** Foot Posture Index score

FPI scoring	Mean	Standard deviation
Total (Right)	4.92	1.07
Total (Left)	5.5	1.20

Table 2 shows average scoring of Foot Posture Index between right and left foot which is 4.92 and 5.5 units respectively.



**Fig 1:** Foot Posture Index

**Discussion**

Present study intended to find foot posture in taekwondo players using Foot posture index scale which had six criteria's to assess in three different views which were a)Talar head palpation b)Supra and infra lateral malleolar curvature c)Calcaneal frontal plane position. d) Prominence in the region of the talonavicular joint e) Congruence of the medial longitudinal arch f) Abduction/ adduction of the forefoot on the rarefoot. The Foot Posture Index (FPI) is a clinical tool designed to provide a simple, effective, multidimensional assessment of foot type. The original Foot Posture Index developed by Redmond *et al.* [6] was validated through a Rasch analysis to a 6-variable model.

Taekwondo is Korean martial arts, which is dynamic and practiced by Indian population often.It mainly includes punching, kicking and high intensity athletic movements which are usually performed in a small base of support. Such intricate movements performed in a small base of support subject the small joints of ankle and foot complex to high amount of biomechanical stresses. To counteract these forces, the intrinsic muscles of foot have to produce a strong contraction. Also movements like kicking is known to place huge loading on single foot when the opposite lower extremity is in the air. This inturn places high amount of load on the ankle and foot.

Most of the training for such competitive sport starts from early childhood. It is known that the biological age for growth of foot arches and foot geometry starts from birth and completed by 8-9 years of age. High impact forces on the joints during this period will eventually result in altered growth of the foot arches thereby altering the foot geometry. Collapse of medial longitudinal arch is a common cause of flat foot in growing adults and children. Due to overuse of intrinsic foot muscles and collapse of Medial Longitudinal Arch required to maintain the foot arches, it is speculated that taekwondo players are at a high risk of developing foot posture alteration.

Prevalence of musculoskeletal injuries in young taekwondo athlete's research has already been conducted by Pingale N *et al.* in 2017 [1]. In this study 50 male taekwondo players were assessed using FPI aged between 15-18 years old. They found out that subjects with high level of injuries were the ones who

had pronated feet. Thus, foot altered foot posture can be a high risk threat for sustaining injuries and timely protection of joint along with appropriate exercise program should be prescribed to taekwondo players to prevent foot alteration in long run.

### **Conclusions**

Findings of present study reveal that taekwondo players demonstrated characteristics of slightly pronated foot bilaterally based on the scoring of foot posture index and timely intervention should be prescribed to the taekwondo players to prevent risk of injuries in the future.

### **Clinical Importance**

Prevention and intervention protocol should be prescribed to the taekwondo players to prevent further risk of injuries in future.

### **Acknowledgments (If any, Times New Roman, 12, Bold)**

We would like to express our sincere thanks to all the participants who voluntarily agreed to participate in this study. We extend our gratitude to our Hon'ble Principal Dr. Shweta Phadke Mam, Head of Departments and our guide for their constant support and motivation throughout the course of this study.

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