

ISOKINETIC ANALYSIS OF HAMSTRINGS AND QUADRICEPS MUSCLES IN THE MALE AND FEMALE TAEKWONDO BRAZILIAN NATIONAL TEAM

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The purpose of this study was to analyze the ratio and peak torque of hamstring and quadriceps of knee joint in male and female athletes of the Taekwondo Brazilian National Team. Six women and six men had been evaluated. The Isokinetic Dynamometer Biodex 3 System Pro® was used to assess hamstring/quadriceps (H/Q) ratio at 60°/s and 300°/s. All athletes presented the H/Q ratio below 60% at 60°/s and below 75% at 300°/s. The dominant limb had the lowest values of ratio H/Q and flexor peak torque compared with the non-dominant limb at both speeds.

KEYWORDS: knee, athletes, isokinetic assessment.

INTRODUCTION:

Taekwondo is a martial art introduced in the 1988 Olympics games, in South Korea (Kasemi et al., 2004; Burke et al., 2003). The main objective of this martial art is to win the opponent for points or knock-out, using kicks and punches in the head and trunk regions (Kasemi et al., 2005). Prospective studies point out the lower limbs as the most injured regions in this sport. Bruises, sprains and muscular strains are the most frequent injuries. (Kasemi et al., 2004; Burke et al., 2003). Practice in sports results in the development of specific musculature, according to the modality trained. In this case, practice may cause a force imbalance acting statically and dynamically on joints (Siqueira et al. 2002). Thus, musculoskeletal evaluation of Taekwondo athletes may provide relevant information, because flexibility and muscular power in extreme range of motion (ROM) are required, mainly of adductors and hamstrings during the high kicks. In accordance with Gable and collaborators (2006), exists a high prevalence of hamstrings muscles injury in martial arts and the following risk factor for such injury were identified: reduction of flexibility, muscular weakness, age, etnia, former history, position, fatigue and inadequate previous warming. Isokinetic evaluation is commonly used to evaluate the muscular condition of healthy and injured athletes, because it promotes a dynamic, objective and reproducible evaluation (Cools et al., 2005; Chandler et al., 1992; Codine et al., 1997). Moreover, literature out points as the isokinetic force ratio analysis between hamstrings and quadriceps muscles (H/Q) injuries predictors (Bittencourt et al., 2005; Devan et al., 2004; Oberg et al 1986). In order to understand the contribution of such muscle imbalance for muscle injuries, it is important to know the normal values of athletes of various sports. However, there is a paucity of data on taekwondo athletes. Therefore, the purpose of this study was to analyze the ratio and peak torque of hamstrings and quadriceps muscles in male and female athletes of the Brazilian Taekwondo National Team.

METHODS:

Six women and six men of Brazilian Taekwondo National Team, was evaluated. All athletes had signed a term of free assent for participation. The knee evaluation were part of evaluation program promoted by the Sports Excellence Center (CENESP-UFMG), carried through in the Laboratory for the Prevention and Rehabilitation of Sports Injury (LAPREV). The subject's descriptive data are presented in table 1. The Isokinetic Dynamometer Biodex 3 System Pro® was used to assess antagonist/agonist (H/Q) ratio at 60°/s and 300°/s. The protocol carried out during the test was five maximum repetitions of extension and flexion of knee in the concentric-concentric way at 60°/s and 30 repetitions at 300°/s.

The hamstring/quadriceps ratio was calculated as percentage of the peak torque produced by hamstrings relative to peak torque of the quadriceps (18).

Table 1 Subject's descriptive data

	FEMALE	MALE
AGE (years)	21,6 ± 3,4	29,2 ± 2,1
HEIGHT (cm)	171,1 ± 4,8	181,2 ± 11,1
MASS (kg)	68,6 ± 4,9	77,9 ± 8,1
TIME OF PRACTICE (years)	9,5 ± 2,1	17,8 ± 3,8
TRAINING HOURS (hours/week)	18,0 ± 4,9	17,3 ± 10,5

RESULTS:

All athletes presented the H/Q ratio below 60% at 60°/s and below 75% at 300°/s (Table 2). In addition, the dominant limb had the lowest ratio H/Q values and of flexor peak torque compared with the non-dominant limb at both speeds (Table 3).

Table 2 Mean and standard deviation of hamstrings / quadriceps ratio at 60° /s and 300° /s of dominant and non dominant knee

	H/Q RATIO			
	60° /s		300° /s	
	D	ND	D	ND
MALE (n=6)	47,9 ± 5,8	54,5 ± 4,2	63,8 ± 12,1	73 ± 11,2
FEMALE (n=6)	49,2 ± 6	50,2 ± 4,9	62,1 ± 4,5	64,7 ± 9,7

Table 3 Mean and standard deviation of peak torque normalized by body mass of hamstring and quadriceps at 60° /s and 300° /s of dominant and non dominant knee

	FEMALE				MALE			
	60° /s		300° /s		60° /s		300° /s	
	D	ND	D	ND	D	ND	D	ND
EXTENSION								
Peak Torque (Nm/Kg)	300,2± 17,9	300,1± 26,5	147,6± 7,6	147± 14,7	363,4± 39	322,8± 28,4	185,6 ± 25,6	169,6 ± 19,6
FLEXION								
Peak Torque (Nm/Kg)	148± 20,7	152,1± 24,2	91,5 ± 7,2	94,8± 20,6	172,8± 19,2	175,4± 15	115,9± 14,9	122,8 ± 13,8

DISCUSSION:

Many authors have made muscular assessment in various sports that might serve to guide the detection of factors related to muscles e tendon injuries and to orientate a rehabilitation program, thereby facilitating preventive action (Bittencourt et al., 2005; Devan et al., 2004; Oberg et al 1986). Devan et al (2004) have performed an isokinetic evaluation of quadriceps and hamstrings muscles in female hockey, soccer and basketball athletes. At 60° /s they considered normal values between 60% to 69%, whereas at 300° /s, these values were considered normal at 80% to 95%. The present study athletes of both genders presented H/Q ratio below to 60% at 60°/s, this may indicate a hamstring weakness or quadriceps increased strength in relation to the hamstrings (Bittencourt et al, 2005). In addition, these athletes presented values below to 75% at 300°/s, indicating an important deficit, that could be related to lack of muscular strength at high speeds of hamstring in comparison to

quadriceps and this low H/Q ratio is reported to be associated with knee overuse injuries (Devan et al., 2005).

The Taekwondo athletes performed lower flexor peak torque (% body weight) at 60°/s compared with non-athletes (D= 185,1; ND= 173,6), jumpers (D=226,1; ND=221,7) and runners (D=200,4; ND= 197,1). Several studies that compared non-athletes with professional athletes have demonstrated larger isokinetic values in professional athletes (Siqueira et al., 2002; Devan et al., 2004; Oberg et al., 1986). Therefore, the Brazilian taekwondo athletes have presented great deficit of hamstring strength. It is important to carry out specific muscular resistance and strength training for the hamstrings to prevent an overload in knee joint, which is commonly injured in Taekwondo.

CONCLUSION:

Male and female athletes of Brazilian Taekwondo National Team presented H/Q ratios below the expected average at the two evaluated speeds, with the dominant limb presenting larger deficits. These athletes produced lower flexor peak torque compared with non-athletes.

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