

RESEARCH ARTICLE

Diagnostic of the Moroccan “Kyorugi” National Team Participation in the World Championship held in Guadalajara-Mexico 2022

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Abstract

Taekwondo is a very popular sport discipline in Morocco. It is ranked second after Karate in terms of followers' number. The objective of this study was to examine the participation of the Moroccan national team in the world championship held in Mexico 2022. For this study, we collected videos of all matches played by the Moroccan team during the different rounds and stages of selection. All the matches were monitored and studied. The parameters examined were the kick types and their effectiveness, the number of points scored compared to the number of attempts to score. This process was carried out for all types of points to be scored punches or kicks to the trunk or the head (1 point, 2 points, 3 points, 4 points, 5 points). The analysis showed that the Moroccan team game strategy was based on defensive movements in the first place (58%), attacks constituted (31%) of attempts and counterattack (9%). The trunk received the most hits with over 1380 attempts. The front leg was the most preferred for the game (77%) either aimed to the head or the trunk. Back leg was used for the round kick trunk movements (6%). The points scored were from the punches, the round kick trunk and the head kick respectively. Attempts to score with head round kick had the highest percentage.

Keywords: Taekwondo, Morocco, kicks, Athletes, The World Championship.

1. Introduction

Taekwondo is a very popular Olympic combat sport, involving punches (to the trunk only) and kicks (to the trunk and head) requiring movement of the opponent's body segments [1]. At the competition, Taekwondo consists of sharp, strong and fluid circular movements in which an athlete uses bare hands and feet to push an opponent away. Since the successful use of kicks, both offensively and defensively, will earn the athlete points, it is the most important objective of a Taekwondo competition [2].

At the 1988 and 1992 Olympic Games, Taekwondo only appeared as a demonstration sport [3].

However, at the Sydney Olympic Games in 2000, it was finally recognized as an official sport [3]. The analysis of game strategies has been widely used on the tactics used in squash, football, basketball, rugby, netball and badminton [4,5,6,7,8]. However, a systematic analysis of the strategy involved in Taekwondo is still lacking. In taekwondo competitions, athletes must wear a trunk protector, a head protector and, for male athletes, a groin protector worn under the dobok. Athletes must also be equipped with forearm and shin guards, gloves, sensor socks and a mouth protector before entering the competition area. Detection of valid points is determined primarily using the electronic scoring system installed in the

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head or trunk protectors, known as Protection and Scoring Systems (PSS) [9].

Points awarded for punching techniques and spin kicks are scored by judges using manual scoring devices [9]. The points noted and taken into consideration are:

- One point for a valid punch on the trunk guard
- Two points for a valid kick to the trunk guard
- Four points for a valid spinning kick to the trunk guard
- Three points for a valid head kick
- Five points for a valid spinning kick to the head
- One point awarded for each penalty (called gam-jeom) inflicted on the opponent
- The only penalty in taekwondo is a gam-jeom.
- A gam-jeom is declared when an athlete punches in the face, or punches or kicks below the waist.
- It is also forbidden to attack an opponent with the knee or the head.
- Athletes are penalized if they use their leg to block or kick their opponent's leg to prevent a kick attack, if they have their leg in the air for more than three seconds to block or avoid an opponent's potential offensive moves.
- Players lose points if they cross the boundary line with both feet, fall to the ground, avoid or delay the match, and push or grab their opponents.

There are eight different weight categories: Fine (male not exceeding 54 kg, female not exceeding 46 kg), Fly (male 54 kg – 58 kg, female 46 kg – 49 kg), Bantam (male 58 kg – 63 kg, female 49 kg – 53 kg), Feather (male 63 kg – 68 kg, female 53 kg – 57 kg), Light (male 68 kg – 74 kg, female 57 kg – 62 kg), Welter (male 74 kg – 80 kg, female 62 kg – 67 kg), Medium (male 80 kg – 87 kg, female 67 kg – 73 kg) and Heavy (male over 87 kg, female over 73 kg) [10].

The duration of the matches was three two-minute rounds with one-minute rest between rounds.

In the event of a tie at the end of the third round, an additional 2-minute round is allowed until one athlete scores a golden point, which is the first point scored by 1 of the 2 athletes. Matches may also end before the usual 3 rounds when one of the following conditions occurs: a knockout; a difference of 7 points between opponents; and an athlete scoring 12 points to 0. Official competitions include qualifying sessions, semi-finals and finals organized over a day with a

variable schedule [11]. Therefore, athletes could compete in up to 5 or more bouts while progressing towards their final match.

Information on Taekwondo game strategy can expand coaches' knowledge of the patterns used in this sport. It is expected that this will also help Taekwondo coaches train their athletes more effectively in the use of relevant tactics in competitive situations and game management.

Strength and power are relevant components of taekwondo competitions [12], and performance in grip strength and countermovement jumping (CMJ) has been used to assess the anaerobic profile of combat sports. Although anaerobic exercise has been used to treat changes resulting from intense exercise loading after team sports training and games [13], the effects of combat on strength and performance power must be established. Thus, to verify whether Taekwondo athletes are really capable of coping with the physical demands of the entire championship, the decreases in total performance at the end of the different competitions could be a good marker of the development of combat fatigue, in particular when it is linked to the cardio-respiratory condition of the athlete and the load imposed by the match. In reality, the hectic atmosphere of official competition does not favor the cooperation of athletes and coaches.

In addition, it is mandatory that scientific research does not violate sports safety regulations and does not affect the athlete's performance.

2. Materials and Methods

The Taekwondo World Championship was selected due to its importance to the athletes and the number of participating athletes. It was held from November 14 to 20, 2022 in Guadalajara, Mexico. Notational analysis, based on frame-by-frame video analysis, was used to categorize the movements performed by each athlete. The athlete's movements and strategy used during the competition were divided into several elements in the scoring analysis. Each movement was broken down and categorized into different predefined parameters to document the frequency of their occurrence. The preset parameters included action, kick technique, attack section and action effectiveness.

2.1 Kicking Technique: The offensive kick was defined as a continuous movement in which the leg was used to attack an opponent. On the other hand, the continuous movement of the leg in response to an opponent's attack was defined as a defensive kick. Kicking technique was analyzed based on two

variables: preferred leg (front or back) and type of kicking technique. Eight different types of kicks were used: roundhouse, double roundhouse, back, cut, push, spinning hook, side and hook.

2.2 Attack Section: The attack section has been classified into trunk and head. These are the only areas that can be legally attacked in Taekwondo.

2.3 Effectiveness of Action: Effectiveness of action was categorized into effective, ineffective and lacking. Effective action was defined as attacking legal scoring areas in which plays using the parts of the foot below the ankle bone or the front parts of the fist were used. Otherwise, the kick was designated as an ineffective action (i.e., unable to attack the legal zone or attacking

the legal zone without using the appropriate parts of the foot or fist). Missing was awarded when the kick did not touch the opponent. The percentage distribution of the action, the kick technique, the attack section and the effectiveness of the action were calculated.

3. Results

A total of 755 athletes participated in this championship. A number of 423 males and 332 females were registered. Out of these numbers only 663 have competed (365 males and 298 females). Registered female athletes were distributed according to weight categories as shown in the table 1. Registered male athletes were distributed according to weight categories as shown in the table 2.

Table 1. Female athletes number per weight category

Seniors Female-A -46	45
Seniors Female-A -49	50
Seniors Female-A -53	48
Seniors Female-A -57	42
Seniors Female-A -62	49
Seniors Female-A -67	36
Seniors Female-A -73	35
Seniors Female-A +73	27
Total	332

World taekwondo 2022 draw sheets

Table 2. Male athletes number per weight category

Seniors Male-A -54	51
Seniors Male-A -58	56
Seniors Male-A -63	61
Seniors Male-A -68	61
Seniors Male-A -74	59
Seniors Male-A -80	50
Seniors Male-A -87	44
Seniors Male-A +87	41
Total	423

World taekwondo 2022 draw sheets

Moroccan national team participated with 12 athletes 6 males and 6 females. Weight categories for female players were -46, -49, -53, -57, -62 and +73. For male players, weight categories were -54, -58, -63, -68, -87, +87. From the 19 matches and 57 rounds 1598 movements were analyzed. The distribution

of offensive and defensive movements is shown in Figure 1. The predominance in the use of back kicking is presented in Figure 2. From Figure 3 it is evident that the trunk was the area that received the greatest percentage of attacks. Figure 4 includes a distribution of types of kicks.

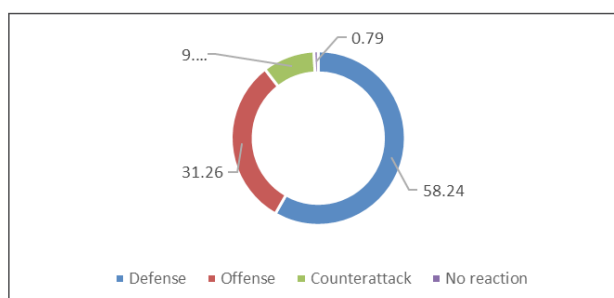


Figure 1. The distribution of offensive and defensive movements

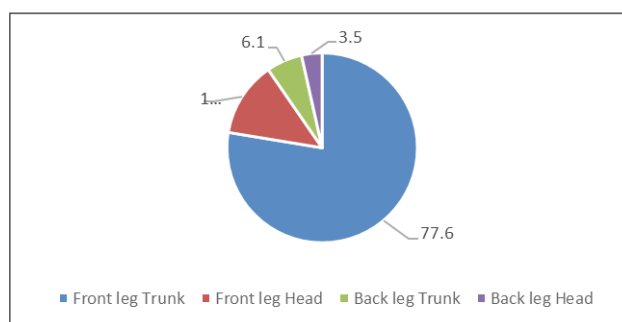


Figure 2. The distribution of use of preferred leg in both offensive and defensive kicking.

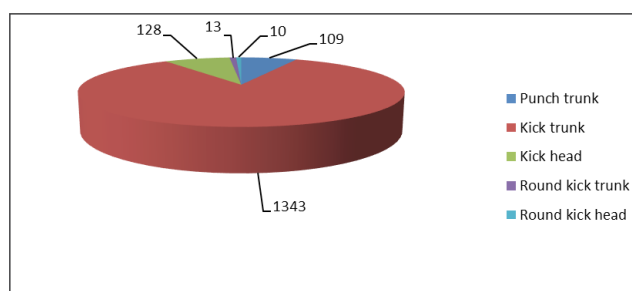


Figure 3. The distribution in number of “action” in the 19 matches involving 1598 movements.

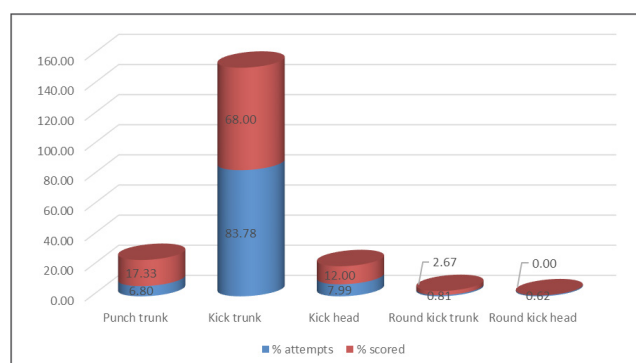


Figure 4. Distribution of effectiveness of kicks types in percentage

4. Discussion

Our analysis showed that for the athletes of the Moroccan national team, the game strategy was based on defensive movements in the first place (58%), attacks constituted 31% of attempts and counterattack (9%). The trunk received the most hits with over 1380 attempts. The use of the front leg in (77%) of cases either aimed at the head or the trunk. The front leg was the most preferred for the game. Back leg was used for the round kick trunk movements (6%). The points scored were from the punches, the round kick trunk followed by the kick head. Attempts to score with round kick head had the highest percentage.

The first difficulty encountered in this study was the little research existing regarding official Taekwondo championships. Generally, athletes tend to primarily use their lower limbs to score points since major focus has been put on kicking skills in Taekwondo [14].

For M. Kazemi *et al.*, (2006) and contrary to our findings, (98%) of all techniques used to score in matches were kicks. This was expected since major

focus has been put on kicking skills in Taekwondo. However, this fact may be used to develop punching techniques to score since most Taekwondo athletes may not use this technique [15].

In comparison with our results, studies found that in offensive and defensive actions, the percentage of back leg kicks was relatively high (75.9%). Kong, Luk, and Hong (2000) found that the movement time for the front leg roundhouse kick was shorter than that for the rear leg roundhouse kick. However, the rear leg roundhouse kick could produce higher linear speed. In other words, more momentum could be produced by the rear leg roundhouse kick than by the front leg roundhouse kick. In Taekwondo competition, the significant momentum of the kick can be useful in pushing away an opponent or attacking the legal striking zone in order to score points [16].

In general, offensive techniques were more used to score, (57%) in the men's competition and (53%) in the women's [15]. Even if Yujin and Zeng, 1999 concluded that training should focus on offensive fighting, they did not provide any rationale [17].

It has been found that athletes prefer to hit the opponent's trunk section rather than the head section. Luk and Hong (2000) found that significantly higher muscle activity in the gastrocnemius, *sartorius*, tensor *fasciae latae*, and *vastus lateralis* muscles was required to perform the roundhouse kick at eye level. Therefore, increased use of core kicks may reduce the degree of fatigue throughout competition in order to maintain relatively high levels of exercise performance over a long period of time [16].

Overall (83%) kicks were to trunk, although, in taekwondo competitions the roundhouse kick was the most used kicking technique with (72.7%). Compared to the side kick and spinning back kick, competitors were able to generate greater final velocity in the roundhouse kick (Pieter & Pieter, 1995). The frequent selection of the roundhouse kick in taekwondo competitions may be explained by the relatively high momentum that could be produced with this kick [18].

It is therefore important for coaches and sports scientists to collect objective information about their players' physical performance capabilities to justify training goals, establish short- and long-term training programs, and provide an objective feedback and motivate athletes during training. In this context, information obtained from physical performance tests can be used to identify strengths and weaknesses in an individual's physical attributes, to monitor fitness status over time, and to verify effectiveness of specific training interventions [19, 20]. This information can also be useful in identifying physical attributes that are favorable for competitive success and serve as an indicator of the minimum fitness standards required to compete at specific levels [21, 22].

5. Conclusion

The analysis of the Moroccan national team matches showed that the game strategy used is based on punches in the first row, attacks are focused on the trunk by the front leg and that the back leg is used for rotating movements towards the trunk first and the head after. According to this analysis and according to the data available on the internet we allow ourselves to declare that the Moroccan school is characterized by its use of punches first and the attack of the trunk and the head by the front leg in defensive attacks more offensive ones. The use of rotating movements towards the head was not effective for the vast majority. This study encountered a problem of scarcity of studies on the championships and the absence of scientific studies on Moroccan athletes. The physical activity and physiological demands of taekwondo competition

require athletes to be competent in several aspects of physical fitness, including aerobic and anaerobic power, muscular strength, muscular power, flexibility, speed and agility. It is therefore important for coaches and sports scientists to collect objective information about their players' physical performance capabilities to justify training goals, establish short- and long-term training programs, and provide an objective feedback and motivate athletes during training. In this context, information obtained from physical performance tests can be used to identify strengths and weaknesses in an individual's physical attributes, to monitor physical fitness status over time and to check the effectiveness of specific training interventions required to compete at specific levels.

Conflicts of Interest: The authors declare no conflict of interest.

Author Contributions

Madiha Bahouq and Ali Amassnaou participated in the conceptualization and the study design. Madiha Bahouq and Hanane Bahouq realized the investigation and the formal analysis. Madiha Bahouq and Driss Elhilali revised and validated the manuscript. Madiha Bahouq and Hanane Bahouq prepared the original version. Madiha Bahouq and Hanane Bahouq reviewed the final version of the manuscript.

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Declarations

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Data availability statement

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