

A Comparative Study of Some Biological Characteristics and Posture Deflections of the Egyptian Junior National Taekwondo Team

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Abstract: The research aimed to identify the biological characteristics excelling the Taekwondo Juniors under 15 years old of both boys and girls, through some physiological, physical, anthropometric and posture state variables, in addition to the comparison between junior boys and girls in the selected variables, a sample of 40 Egyptian Junior national Taekwondo under 15 years old were deliberately selected as 20 boys and 20 girls whom are Egyptian Taekwondo Junior champions, the results showed the existence of statistically significant differences between junior boys and girls in some of the selected variables as follows:

- Physiological variables (relative vital capacity, hemoglobin concentration, fat ratio) in favor of the junior category.
- Physical variables (relative strength, power, pelvis flexibility) in favor of the junior category, legs muscular strength, back muscular strength and power.
- Anthropometric variables (hand length, foot length) in favor of the junior category, (chest girth, pelvis girth, thigh girth) in favor of the junior girls category.
- Posture deflections, the existence of binary posture deflections of 6 junior girls compared to 3 junior boys have cluster posture deflections (more than posture deflection) of whom two have three posture deflections and one player has two posture deflections.

The research recommended to pay attention for the junior boys and girls categories, cultivating them physically, physiologically and healthy and to achieve future international distinguish results, where training junior boys and girls is a strong base for the first degree players, with the importance of paying attention to junior girls, as they were close in various variables with the junior category, even surpassed them in some variables, considering their chance to achieve International results due to the lack number of Taekwondo participants of the girls category compared to boys category.

Key words: Biological Characteristics • Posture Deflections • Taekwondo

INTRODUCTION

Selecting suitable individual for the type of sports activity is considered the first step towards reaching the championship; therefore recently many scientific researches paid attention to selecting individuals of suitable abilities for a particular activity and directing them to the appropriate activity to their abilities.

Moreover, studying qualities of the senior international players from the physical, physiological and corporal aspects are of the most important factors to depend on when determining the ideal characteristics which must be available in the player when selecting or directing him to practice a certain type of activities [1].

The anthropometric measurements provided us with fundamentals and certain concepts related to motor aspects that are used in comparing sport performance among individuals, as these measurements have an effect on the emergence of muscle strength, speed, endurance and flexibility, as well as the player's body response to various circumstances surrounding it and also his physical efficiency and achieving high sporting results [2].

Corporal characteristics are considered the first and main plan to achieve high levels [3, 4].

Moreover, the physical characteristics are of the important fundamentals to reach high levels in the sports activities as they contribute in developing the players

levels, they are the back boon that enables the player to effectively perform the basic skills where the nature of sports requires the presence of those qualities (physical elements) in a varying degrees according to their relative importance and the type of the practiced activity [5].

The researcher confirms the importance of the physical characteristics as it helps the individual by a great deal in the appropriate direction for the suitable type of physical activity where he can score and reach the high levels and also is of the important factors for excellence in the sport of Taekwondo.

As for the player to reach the high levels, requires hard effort in training which requires having high level of physical and physiological fitness required by the competition circumstances that meets the exerted work. The individual's physiological state recently has gained the attention of many researchers worldwide as it contributes by a great deal in judging the individual's high competency [2].

Many specialists pointed out that poor posture has many negative effects on human health and all body organs are affected by the posture state, as good posture enhances the physiological ability of the vital body systems, reduces and delays stress, improves the outward appearance and improves the individual's self-concept. The sports performance is considered as a mechanical feature of the human body characteristics and no doubt that differences in the somatotype have a great relationship to its efficient respond to the requirements of the physical activity aspects, therefore the presence of posture declination in the body changes its mechanism when performing different skills and disperses powers in side paths does not serve the skill itself [6].

Taekwondo is considered of combat games which characterized by its changing dynamics between offense and defense, in which both players strikes and kicks in specific places of the body, abdomen, chest and face and that has a great importance to the physical, somatotype and physiological measurements to achieve the required aim. The Taekwondo regulations states that in order to count a strike (kick) as a correct point, it must reach the right place with the required speed and strength and affects the opponent, that can not be achieved without the availability of physical and corporal characteristics to the player so that the kick will reach the aim by the required strength, speed and accuracy. Speed and power elements are important in the sport of Taekwondo [7].

Through the field experience of the researcher as a former international player, holds world Taekwondo championship's title many times, an international coach

and holds the international black belt of the seventh category which is the highest grades at the local, continental and Arabian levels and through reviewing many international Taekwondo games especially for junior boys and girls, the researcher noted that the surpass of one category than the other of boys and girls are likely due to the enjoyment of this category with physical, corporal, physiological and good somatotype characteristics, may be granted better chances in the technical performance level.

Although the multiplicity of local and international efforts that interests in the problem of selection in sport, this interests were not of the same category considering Taekwondo, especially for juniors. The researcher has noted that there are some players who regularly practice this sport in training for long periods without any significant progress in their level resulting in the reluctance of those players to practice the game before achieving the expected results due to the improper selection for those players from the beginning.

Moreover, the researcher has also noted an increase in the player's performance speed and the development of physical, technical and used skillful performance as a result of the new bouts officiating system by using the electronic trunk guard, which requires specific physical, corporal and physiological characteristics whether for boys or girls of different age stages.

That made the researcher eager to identify some of the biological characteristics excelling the Taekwondo junior boys and girls, conducting a comparison between them to determine the differences between both sexes and to study the extent of progress of a category than the other especially while some national teams adopted the mutual training between junior boys and girls, also mutual international contests may take place like Germany's international junior championship where boys and girls compete in mutual bouts as girls might surpass boys in some bouts, the situation may be different in Egypt and the Arabian countries, where boys training are separated from girls and there are some Arabian countries already do not have Taekwondo for girls as in Saudi Arabia and Yemen.

Therefore, the researcher was prompted to conduct this research to study the differences between the two categories of junior boys and girls in some physical, physiological, corporal characteristics and posture deflections.

Where the problem of the research is determined in reaching a classification of the Egyptian Taekwondo national team under 15 years old of both junior boys and

girls, as the sport of Taekwondo has a biological nature requires an efficient cardiovascular system, as well as muscular strength, power, flexibility and corporal characteristics, moreover the player is subjected to many posture deflections when practicing this game, therefore all the above mentioned facts drives the attempt to classify these variables in a complete and accurate manner to reach training and protective programs for those junior boys and girls.

Aims of the Research:

- Identifying some biological characteristics (physiological, physical, anthropometric and posture state) which are characterized by the Egyptian Taekwondo junior national team's players under 15 years old in both categories of boys and girls.
- Identifying the differences between junior boys and girls of the Egyptian Taekwondo national team under 15 years old, in some selected biological characteristics (physiological, physical, anthropometric and posture state).

The Research Terminology:

- Physical characteristics of Taekwondo: are these qualities helping the player to increase his physical ability aiming to improve and develop his physical level required by the high levels in Taekwondo [4].
- Physiological characteristics of Taekwondo: are the player's physiological abilities to increase the level of his internal systems in face of the physical requirements which are required by the competition circumstances [4].
- Anthropometric measurements: It's the method that decides and rule on the growth and somato type phenomenon [7].
- Good posture: is the posture where the main body parts and its systems are balanced and regular over the deployment base, the organizational relationship between these parts is unique and enables him to perform his functions efficiently and with less effort [8].

Posture deflection: is a deformation in a form of the body organs or part of it and it deflected from the normal posture that is anatomically recognized, allowing a change in the relationship of this organ to other organs [8].

MATERIALS AND METHODS

Method of the Research: The researcher has used the descriptive method as it suits the nature of the research.

Sample of the Research: A sample of 40 junior boys and girls of the Egyptian junior national Taekwondo team under 15 years old were deliberately selected and divided into two equal groups each of 20 players.

Spatial and Temporal Field of the Research: The research was conducted in the period from 11.12.2007 to 21.12.2007 at the Scientific Center of the National Teams Olympic Center in Maadi.

Tools and Measuring Devices:

- Restameter for measuring height (cm.).
- Measuring tape for measuring heights and girths of body parts.
- Medical scale for measuring weight.
- Hand dynamometer for measuring strength of the grip.
- Dynamometer device for measuring the strength of the back and legs.
- Skin fold caliper for measuring fat ratio.
- Vertical jump device for legs power.
- A device for measuring trunk flexibility.
- A device for measuring hip joint flexibility.
- Respirometer device for measuring the vital capacity.
- Measuring pulse device.
- Blood analysis for measuring the hemoglobin concentration.

Devices for measuring different body postures (shoulder obliquity, Kyfosis, scoliosis, lumber concavity (lordosis), symmelia, rhaebosclia and flat foot).

Measurements Conducted: The set biological measurements were 38 measurements, included measuring age, five physiological measurements, seven physical measurements, fifteen anthropometric measurements (corporal) and ten posture declination measurements of different kinds.

Statistical Processes: The researcher has used the arithmetic mean, standard deviation, coefficient of torsion, percentages and T-test to find significant differences.

RESULTS AND DISCUSSION

Table 1 illustrates that the coefficient of torsion shows direct indications that the total sample members degrees (junior boys and girls) are free of defects in variable distributions, where it appears that the torsion coefficients is close to zero in all variables, ranging between 0.12 and 0.97 for junior boys and 0.13, 1.3 for junior girls in the limits of ± 3 , which shows the homogeneity of the research sample in these measurements.

Table 2 illustrates that there are statistically significant differences between junior boys and girls in the variables of relative vital capacity, hemoglobin concentration and fat ratio in favor of the junior boy's category, while there were no statistically significant differences in each of the vital capacity and resting pulse.

Table 3 illustrates that there are significant differences between junior boys and girls in the variables of legs muscular strength, back muscular strength and muscular power in favor of the junior boys, while there are

Table 1: Sample description by arithmetic mean, standard deviation, medium and coefficient of torsion (junior boys and girls). n = 20 junior boys, n = 20 junior girls

No.	Variables	Measuring unit	Junior boys				Junior girls			
			Arithmetic mean	Standard deviation	Medium	Coefficient of torsion	Arithmetic mean	Standard deviation	Medium	Coefficient of torsion
1	Age	Year	13.55	0.510	14.00	0.12	13.60	0.503	14.0	0.13
2	Height	Cm.	152.70	10.43	148.80	0.27	157.70	7.270	756.5	0.29
3	Weight	Kg.	46.30	9.169	43.00	0.97	47.80	5.500	48.3	1.30

Table 2: The differences between junior boys and girls in the research physiological variables. n = 20 junior boys, n = 20 junior girls

No.	Variables	Junior boys		Junior girls		Differences between two means	Calculated "T"	Significant
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
1	Vital capacity	2.790	0.747	2.917	0.378	0.122	0.65	Not Significant
2	Relative vital capacity	0.066	0.009	0.058	0.004	0.008	3.66	Significant
3	Rest pulse	100.600	13.20	103.0	14.46	2.400	0.54	Not Significant
4	Hemoglobin concentration	13.450	0.826	12.40	0.754	1.050	4.20	Significant
5	Fat ratio	11.390	4.675	7.295	2.262	4.095	3.58	Significant

"T" 39, 0.05= 1.684

Table 3: The differences between junior boys and girls in the research physical variables. n = 20 junior boys, n = 20 junior girls

No.	Variables	Junior boys		Junior girls		Differences between two means	Calculated "T"	Significant
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
1	Right grip	20.84	5.146	18.82	4.422	2.02	1.33	Not Significant
2	Left grip	19.65	5.371	18.28	4.831	1.37	0.85	Not Significant
3	Legs strength	102.80	28.45	76.30	18.28	26.50	3.51	Significant
4	Back strength	66.05	19.72	53.10	11.79	12.95	2.52	Significant
5	power	42.67	5.934	36.57	3.937	6.10	3.83	Significant
6	Trunk flexibility	11.15	5.480	11.20	4.589	0.05	0.03	Not Significant
7	pelvis joint flexibility	18.70	10.61	22.35	7.936	3.65	1.23	Not Significant

"T" 39, 0.05= 1.684

Table 4: The differences between the researches anthropometric variables

No.	Variables	Junior boys		Junior girls		Differences between two means	Calculated "T"	Significant
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			
1	Total arm length	67.50	6.955	66.80	2.668	0.70	0.42	Significant
2	Hand length	18.77	1.500	17.65	1.590	1.12	2.30	Significant
3	Thigh length	44.20	3.864	43.40	3.470	0.80	0.69	Not Significant
4	Foot length	24.68	1.880	23.40	1.410	1.28	2.43	Significant
5	Shoulders girth	86.60	5.626	89.60	3.560	3.00	2.02	Significant
6	Chest girth	72.60	7.091	76.90	4.621	4.30	2.27	Significant
7	Pelvis girth	69.58	6.398	75.50	7.082	5.92	2.78	Significant
8	Humerus girth	21.38	1.891	23.40	1.119	2.02	4.12	Significant
9	Wrist girth	15.38	3.124	14.80	1.081	0.58	0.78	Not Significant
10	Thigh girth from above	46.63	5.081	53.00	3.947	6.37	4.43	Significant
11	Thigh girth from the middle	42.50	4.788	47.05	3.232	4.55	3.52	Significant
12	Thigh girth from below	33.94	3.083	36.35	2.938	2.41	2.54	Significant
13	Foot girth	20.43	1.480	20.30	1.436	0.13	0.27	Not Significant

"T" 39, 0.05= 1.684

Table 5: Repetitions and percentages of posture deflections for both samples of the research junior boys and girls

No.	Posture deflections	Junior boys		Junior girls	
		Number	%	Number	%
1	Natural state	7	35%	-	-
2	Shoulder obliquity to the right	-	-	5	25%
3	Kyphosis	-	-	1	5%
4	Right scoliosis	1	5%	-	-
5	left scoliosis	2	10%	-	-
6	lumber concavity (lordosis)	6	30%	10	50%
7	Foot arcuation	4	20%	4	20%
8	Symmelia	2	10%	6	30%
9	Rhaebosclia	2	10%	-	-
10	Flat foot	1	5%	-	-
11	Injured with (2) deflections	1	5%	6	30%
12	Injured with (3) deflections	2	10%	-	-

no statistically significant differences in each of the right and left hand power grip, the trunk flexibility and pelvis joint flexibility (the extent of legs front opening).

Table 4 illustrates that there are significant differences between junior boys and girls, in the variables of hand length and foot length in favor of junior boys and in the variables of shoulders, chest, Humerus and thigh from above and middle and below girth in favor of junior girls.

Table 5 illustrates that there are 7 players from the Taekwondo junior boys have natural posture with no posture deflections, concerning the junior girls most of

them (20 players) have posture deflections distributed as lumbar concavity (lordosis) by 50% for the junior girls (10 players) and 30% for the junior boys (6 players), moreover the thighs symmelia recorded 30% for the junior girls (6 players) and shoulder obliquity to the right 25% for the junior girls (5 players).

Concerning junior boys and girls injured with (2) deflections represented 30% of the junior girls (6 players) and only 5% of junior boys (only one player), where injured with (3) deflections represented 10% for of junior boys (2 players) while no representations for the junior girls were recorded in those injured with (3) deflections.

DISCUSSION

Through the aims of the research the results will be discussed where the first aim was verified that refers to identifying some characteristics (biological, physiological, physical, anthropometric and posture state) which are characterized by the Egyptian Taekwondo junior national team's players under 15 years old in both categories of boys and girls, in addition to the second aim that refers to identifying the differences between junior boys and girls of the Egyptian Taekwondo national team under 15 years old, in some selected biological characteristics (physiological, physical, anthropometric and posture state) through Tables 1 -5.

The results will be discussed according to the tables and the selected biological variables order.

First: Physiological Characteristics: The results of Table 2 illustrated the importance of the selected physiological measurements which was represented in five measurements (vital capacity, relative vital capacity, resting pulse, hemoglobin concentration and fat ratio) therefore, the researcher confirms that practicing sport activities including Taekwondo will add to its participants some physiological changes that occur under the impact of sports effort, where these results classified these physiological measurements of the Taekwondo junior boys and girls under 15 years old.

This is consistent with the study of Chan *et al.* [9] titled the relationship between sport activity and fitness and the physiological levels for adults in Hong Kong, aimed to identify the physical fitness level and their relationship to sport activity, the sample of the research consisted of 201 students with an average age of 13 years, the study used a battery to measure physical fitness (flexibility, muscular strength, muscular endurance) and a test for measuring the physical and physiological efficiency and the most important results was the existence of correlation between the physical fitness and physiological efficiency level and practicing the physical activity.

The results of the physiological characteristics also showed the existence of statistically significant differences between Taekwondo junior boys and girls in the variables of vital capacity, relative vital capacity, hemoglobin concentration and fat ratio.

Both Allawi and Abdel Fattah [10] confirm on the importance of measuring vital capacity as it's the largest volume of air that human can exert after the maximum inhalation.

The lung's vital capacity reflects the player's physiological efficiency and expresses the safety of the respiratory systems in the body; also it is of the important measurements referring to the biological adaptation occurring as a result of the regular training. The researcher attributes the surpass of Junior boys than girls in the relative vital capacity measurements according to its relevance to body weight where the results from Table 1 illustrated the junior boy average weight of (46.3 kg.), in addition to the continuous and regular training with special effort compared to junior girls training, which allows junior boys to surpass in the respiratory measurements including the vital capacity.

Through the sports training many biological changes occurs (morphological and physiological) in the respiratory system, these changes include the breathing muscles growth and can be judged by measuring the lungs vital capacity [10].

As for measuring the hemoglobin concentration, that gave junior boys surpass compared to girls, the results of measuring hemoglobin concentration indicated an average of 13.45 for junior boys and 12.40 for junior girls.

The researcher attributes that the juniors sports level progress compared to junior girls, which was confirmed by physical fitness measurements in Table 3, which illustrated the surpass of junior boys in some physical measurements such as muscular strength of major muscles such as legs and back. Moreover, the researcher suggests that the junior girls at this age group (adolescence stage) lose large amounts of blood during the menstrual (PMS) that affects the hemoglobin concentration compared to junior boys.

The results indicated to the increase of fat ratio for junior boys of 11.39% compared to junior girls of 7.29% where fat ration is considered of the important factors indicating individual's health and fitness.

Khataby [5] referred to the existence of an inverse correlation between the skinfold and skill level considering that the increase in skinfold is a burden on the body's vital organs, which requires an increase in its effort to carry on their duties, where the few amount of fat is an evidence to the high physical fitness. The researcher attributes the increase of junior boy's fat ratio compared to junior girls to the nutrition method, which differs from junior girls, in addition to the rapid growth of junior girls under 15 years in this age stage compared to junior boys as their growth process delays.

Second: the Physical Characteristics: The results in Table 3 illustrates that there are significant differences between Taekwondo junior boys and girls under 15 years old in the variables of muscular strength of legs back and muscular power in favor of junior boys, while there were no statistically significant differences in each of the right hand and left grip, trunk flexibility and pelvis flexibility (the extent of legs front opening).

The researcher confirms the importance of the physical characteristics it is one of the important factors to excel in Taekwondo. The Taekwondo player needs specific motor abilities represented in muscular power, speed and flexibility, so that he can succeed in performing different motor skills [11].

The researcher attributes the junior players surpass than junior girls in the legs and back muscular strength measurements, in addition to the legs muscular power to the nature of vigorous physical performance, exerted effort and the large training doses of junior boys compared to girls, which allows them greater opportunities to surpass technically and physically in the Taekwondo bouts.

Moreover, Zahran [6] indicated that the surpass of international levels players in muscular strength measurements especially of legs and back, in addition to legs muscular power that combines power and speed, is attributed to the importance of these muscles in performing different kicks, as Taekwondo directly depends on legs more than hands during the performance, as well as to score a kick it must be powerful and influences the opponent.

This is consistent with Shamandy [11] about the importance of muscular strength as of the main and fundamental important physical factors in the combat games like Karate, especially when implementing the skillful or tactical performance.

Also consistent with Kim [12] as he referred to the importance of muscular strength in the sport of Taekwondo and the possibility of measuring it through legs, back and grip muscular strength.

Third: the Anthropometric Measurements: The results illustrated statistically significant differences between each of the junior boys and girls in the variables of hand and foot length in favor of junior boys and in the variables of shoulders, chest, pelvis, humerus and thigh from top, middle and below girths in favor of junior girls.

The researcher attributes the surpass of junior girls than junior boys in these measurements due to the nature

of the woman corporal shape which is distinct from the man with the chest, pelvis and thigh girth, as the girl takes the pear's body shape, which is distinct with the increase of the lower limb girths, especially the pelvis joint and thigh muscles.

Concerning the surpass of junior boys than junior girls in the measurements of hand and foot length, it is attributable to the nature of boy's corporal shape compared to girls, where body limbs length increases as in foot and hand, that plays an important role to excel in the sport of Taekwondo which is based on performing with feet and represents a great importance in performing skills and different feet movements. That is consistent with Zahran [6] in a study titled the factor analysis of the physical and corporal characteristics of Taekwondo talented players, as length measurements represents great importance gave the highest saturation on the first factor, where feet length measurement scored the highest saturation of 0.992 and the hand length measurement scored a saturation of 0.952, as body, feet and different body limbs length plays an important and effective role in winning Taekwondo bouts, as the games skill depends on using foot and hand in performing different blows and kicks whether directed to the opponent's face such as the front circular kick to the face (Optullio Chagi), the vertical kick from top to bottom (Nara Chagi) or which are performed to the abdomen area and the chest like the back straight kick (T Chagi) from a distance and various distances and can perform various defenses, whether by foot movements in different directions or defenses by using hand-block (Maky).

Fourth: Body Posture Deflections Measurements: The results of Table 5 illustrates the differentiation of posture deflections between junior boys and girls, where results showed that there are 7 Taekwondo junior boys of 20 players with natural posture compared to junior girls of 20 players whom all has at least one posture deflection.

The results illustrated that the important posture deflections of junior girls were respectively represented in lumbar concavity (lordosis) of 50% (10 players), thigh symmelia of 30% (6 players), shoulder obliquity to the right of 25% (5 players); feet arcuation of 20% (4 players) and the less deflection was for the kyfosis of 5% (only one player), moreover the overall result referred to (6) players injured with (2) posture deflections of 30%, as for the junior boys, the most important posture deflections were represented in lumbar concavity (lordosis) of 30% (6 players), feet arcuation of 20% (4 players), where

shoulder obliquity to the left, thigh symmelia and rhaebosclia were represented by 10% (2 players) each; and the less posture deflections were for shoulder obliquity to the right and opening legs of 5% (only one player), moreover the overall result referred to 2 players injured with 3 posture deflections of 10% and 1 player injured with 2 posture deflections.

Recommendation

- The importance of conducting similar studies at equal periodical intervals to follow-up the physical growth of the sample members.
- The importance of paying attention to the overall following-up for the physical, corporal, physiological and skillful aspects to avoid posture deflections resulting from the inappropriate practices.
- Provoking the national awareness among athletes, for not to repeat the wrong habits during training or competitions that will reveal some posture deflections on the long run.
- The importance of using the physical, corporal and physiological measurements resulted from the study, when selecting Taekwondo players.
- The importance of paying attention to standardizing Taekwondo players training loads to suit the juniors age stages.
- Paying attention to increase the junior gradual participations in the international Taekwondo championships.

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