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Comparative study of selected physiological and bio-motor parameters among male and female taekwondo players of schools and colleges in Trivandrum district of Kerala

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Abstract

For the purpose of the study the investigator identified male and female Taekwondo players from schools and colleges in Trivandrum District, Kerala. Twelve players were selected from each category. The age group of the subjects was ranged from 14 to 17 years for school and 17 to 20 years for college. The average age of the subject is 18.5 ± 0.5 yr and the height is 167.7 ± 1.8 cm, and the weight is 62.8 ± 0.7 kg. The criterion variables selected were speed, agility, resting pulse rate and breathe holding period and the test items were 50M run, shuttle run, radial pulse and maximum time. The obtained data was statistically analysed using SPSS version 20. The result of the study shows that there was a significant difference in selected physiological variables between school and college Taekwondo male players, significant difference in selected physiological variables between school and college Taekwondo female players, significant difference in selected bio-motor variables between school and college Taekwondo male players and significant difference in selected bio-motor variables between school and college Taekwondo female players.

Keywords: Agility, bio-motor variables, radial pulse, shuttle run, resting pulse rate, breathe holding period.

Introduction

Taekwondo is a martial arts of Korea and its origin date back to 1500 years. Nowadays, taekwondo is practiced by numerous athletes in 140 countries around the world and 120 nations became official members of world taekwondo federation (WTF). As a combat sports taekwondo require high levels of technique, tactic and physical fitness specially strength, aerobic fitness, muscular power and speed. The bio-motor and physiological demands required to achieve top levels performance in taekwondo is unique than any other combat sports. From the last decades, the assessment of bio-motor and physiological features is implemented by coaches. In few sports, some of features are more important in compared to some other features, which, these important features may be no important in some other sports. Moreover, these features may have close relationship with success in that sport. On the other hand, the possibility for identifying and screening the talented athletes in sport is more obtained through gaining more information about this relationship.

Independent from sport type, having physical abilities such as bio-motor and physiological characteristics is a prerequisite to success against any competition or tournament. Knowing the mentioned characteristics is one of the determinant factors affecting athletes' performance. Being aware of these characteristics is an important issue for comparing an athlete's results to his previous achievements as well as other athletes, finding the weak points and correct them and finally, basic and accurate training planning in order to gain maximal results and to achieve determined goals.

According to the studies carried out in this field, elite athletes in each sport have special bio-motor and physiological features which result in their success in sport events and Competitions. From the last decades, the assessment of bio-motor and physiological features is implemented by coaches.

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In few sports, some of the features are more important in compared to some other features, which, these important features may be no important in some other sports. Moreover, these features may have close relationship with success in that sport. One of the significant aspects of taekwondo is its intermittent nature. For instance, after doing diverse and explosive kicks and punches, there is a time of low intensity actions for balancing time, as well as controlling the match. Thus, being aware of the relationship between kicks and punches and this period of time, also knowing athletes' physical requirements during the match is an important factor in the athletes' development pathway in taekwondo.

The success in taekwondo depends on various factors and regularly, successful taekwondo athletes have remarkable bio-motor and physiological characteristics. High speed for fast and on time performing of techniques, high levels of agility for changing the directions quickly, good reaction time for abrupt reaction against opponent's attacks, top levels of anaerobic power in order to fast, explosive and repetitive kicks and punches and finally, proper aerobic power for quick recovery between training sessions, competition rounds and between the matches are performed in a day, all are the important characteristics affecting taekwondo athlete performance which can have determinant role in success of these athletes. The goal of the present study was to compare the relationship between bio-motor, physiological parameters of school and college level men and women Taekwondo players.

Methodology

The purpose of the study was to compare the bio-motor and physiological variables among the male college and school Taekwondo players and the female college and school Taekwondo players. Twelve players were selected from each category. Subjects were from schools and colleges in Trivandrum District, Kerala. The age group of the subjects ranged from 14 to 17 years for school student and 17 to 20 years for college students. The criterion variables were speed, agility, resting pulse rate and breath holding period and the test items were 50M run, shuttle run and radial pulse method.

Analysis of the data and result of the study

Twelve male and female Taekwondo athletes studying in schools and colleges in Trivandrum district (mean age 14.24 ± 1.20 years) participating in inter district competitions 2018-19 season volunteered for the study. Inclusion criteria for this study included male and females between 14-20 years old who have participated in state level Taekwondo championships. Exclusion criteria included athletes participated in the national/ international level competitions.

Prior to commencement all participants were asked to provide informed consent and fill out a medical history form prior to their involvement in the study. A preliminary pilot study was performed to examine the inter-rater reliability between the lead investigator and an independent scoring.

Table 1: Interclass co-efficient of correlation on selected dependent variables

Sl. No.	Criterion variables	Correlation coefficient 'R'
1	Speed	0.92
2	Agility	0.90
3	Resting pulse rate	0.91
4	Breath holding time	0.90

Significant at 0.05 level of confidence, Table value required for significance at 0.05 level of confidence is 0.77.

Speed

Sportsmen are eager to discover the relationship between his characteristics and performance abilities so that he can find the strengths and weaknesses which affect their performance. One of the important factors in making Taekwondo competitors successful is speed. Heler (1989) mentioned that elite martial art requires excellent physical ability, speed and power. Speed is the distance covered divided by the time it takes to cover that distance. Having speed is very important to athletes competing in most sports and especially for taekwondo athletes. The analysis of independent 't' -test on the data obtained for speed of male of college and school Taekwondo players have been analysed and presented Table - 2.

Table 2: Mean and independent 't' test for the male and female of college and school taekwondo players in speed (In seconds)

	College	School	't' ratio
	Mean		
Male	7.1+ 0.32	7.7+0.25	6.52
Female	8.2+0.25	8.9+0.24	6.03

Table value required for significance at 0.05 level for 't' - test with df 22 is 2.07.

From table 2 the mean values obtained for the male and female of college and school Tekwondo players were 7.1 and 8.2 and 7.7 and 8.9 respectively and the t test value between the means of male and female of college and school Tekwondo players were 7.85 and 6.89, and 6.52 and 6.03. Since the obtained 't' test values were higher than the table value of 2.07 with df 22 at .05 level of confidence. It was concluded that the male and female of college and school Taekwondo payers had significant difference in the performance of speed.

Agility

Agility in combat sports does not comprise only the ability of changing the direction of movement, but also the capability to anticipate the movement of the opponent, read and react to specific situations Agility has classically been defined simply not only the ability to change direction rapidly and accurately, a new definition of agility is proposed by Sheppard and Yong, 2006 as "a rapid whole body movement which change of velocity or direction in response to a stimulus" which has relationship which trainable physical qualities such as strength, power and technique, as well as cognitive components such as visual scanning technique, visual scanning speed and anticipation. The analysis of independent 't'-test on the data obtained for agility of male and female of college and school Taekwondo players have been analysed and presented in table - 3.

Table 3: Mean and independent 't' test for the male and female of college and school taekwondo players in agility (In seconds)

	College	School	't' ratio
	Mean		
Male	10.65 + 1.20	11.84 + 1.65	7.24*
Female	11.79 + 1.51	12.25 + 1.24	6.53*

Table value required for significance at 0.05 level for 't'- test with df 22 is 2.07.

From table 3 the mean values obtained for the male college and school Tekwondo players were 10.65 and 11.84 and female college and school players were 11.79 and 12.25 respectively and the 't' test value between the mean score of

male and female of college and school Tekwondo players were 7.24 and 6.53. Since the obtained test values were higher than the table value of 2.07 with df 22 at .05 level of confidence. It was concluded that the male and female of college and school Taekwondo players had significant difference in the performance of agility.

Resting pulse rate

Practicing the martial art of Taekwondo has been proposed to have beneficial effects on cardiovascular fitness as well as general physical ability. Taekwondo athletes need high levels of physiological capabilities for optimal performance of movements. Regular exercise causes a reduction in RHR. A healthy resting heart rate for adults is 60 to 80 bpm. Adults with a high level of fitness can have a resting heart rate below 60. Some elite endurance athletes (such as marathon runners or professional cyclists) have a resting heart rate below 40. An average adult resting heart rate range is 60 to 100 bpm. The higher end of the range is associated with increased health risks including metabolic syndrome. An elevated resting heart rate of 80 bpm or higher can be an indicator of increased cardiovascular risk and all-cause mortality risk. The risk is most pronounced when the resting heart rate goes above 90 bpm. Resting heart rate varies by sex. Women tend to have smaller hearts and lower blood volume and hemoglobin, which means the heart needs to beat more frequently to nourish the body's tissues. Monitoring your Resting Heart Rate is a very effective method of assessing the fitness level of an athlete and assisting recovery, and in general it is a very reliable indicator of cardiovascular health. The study analyze and compares the resting rate of school and college Taekwondo athletes and to find out significant difference. The analysis of the independent 't' test on the data obtained for resting pulse rate of male and female college and school Taekwondo players have been analysed and presented in table 4.

Table 4: Mean and independent 't' test for the male and female of college and school taekwondo players in resting pulse rate (In seconds)

	College	School	
	Mean		't' ratio
Male	70.25 + 1.20	76.84 + 3.65	5.26*
Female	74.65 + 3.54	78.50 + 4.4	4.57*

Table value required for significance at 0.05 level for 't'- test with df 22 is 2.07.

From table-4 the mean values obtained for the male college and school Tekwondo players were 70.25 and 76.84 and female college and school players were 74.65 and 78.50 respectively and the t test value between the mean scores of male and female of college and school players were 5.26 and 4.57. Since the obtained 't' test values were higher than the obtained table value of 2.07 with df22 at 0.05 level of confidence and it was concluded that the male and female of college and school Taekwondo players has significant difference in the performance in resting pulse rate

Breath holding

An athlete is a person who is trained to compete in a sport involving physical strength, speed or endurance. Physical training influences BHT. Breath holding time is the time taken by the subject to hold his breath as long as he can. Normal Breath holding time (BHT) is 45-55 seconds. Breathing can be voluntarily stopped for a variable period

which depends on mechanical factors like lung volume, chemical factors like pCO₂, pO₂ and H⁺ ion concentration, non-chemical factors like involuntary muscular contractions, psychological factors like motivation, stress, competition, and extrinsic factors like training and muscular exercise. Bio-motor qualities like breath holding time is useful in taekwondo athletes to improve their performance. Breath holding test is used as a rough index of cardiopulmonary reserve. The analysis of independent 't' test on the data obtained from breath holding time of male and female of the college and school Tekwondo players have been analysed and presented in table 5.

Table 5: Mean and independent 't' test for the male and female of college and school taekwondo players breath holding time (In seconds)

	College	School	
	Mean		't' ratio
Male	40.5 + 2.1	29.4 + 3.6	11.6*
Female	29.5 + 3.6	25.2 + 4.4	4.61*

Table value required for significance at 0.05 level for 't'- test with df 22 is 2.07.

From table-5 the mean values obtained for the male college and school Tekwondo players were 40.5 and 29.4 and female college and school players were 25.2 and 28.50 respectively and the 't' test value between the mean scores of male and female of college and school players were 11.6 and 4.61. Since the obtained 't' test values were higher than the obtained table value of 2.07 with df 22 at 0.05 level of confidence and it was concluded that the male and female of college and school Taekwondo players has significant difference in the performance in resting breath holding time.

Discussion

Concerning the results, it should be noted that successful taekwondo athletes have remarkable bio- motor and physiological characteristics. High speed for fast and on time performing of techniques, high levels of agility for changing the directions quickly, top levels of anaerobic power in order to fast, explosive and repetitive kicks and punches and finally, proper aerobic power for quick recovery between training sessions, competition rounds and between the matches are performed in a day, all are the important characteristics affecting taekwondo athlete performance which can have determinant role in success of these athletes. The results of the present study showed that both assessed bio-motor (speed and agility) and physiological characteristics (resting pulse rate and breathe holding time) are significantly different in school and college male and female athletes. Considering one of determinant factors in effective and successful performing of taekwondo techniques, as well as in precluding on time reaction by opponent is high levels of speed. Thus, it can be noted that this characteristic has a major role in success of taekwondo athletes. Speed is more a genetic factor in comparison to the factors is affected by training, and genetic endowment has a major role in speed and agility of athletes. Hence, speed can be considered as a predominant characteristic in selection and talent identification of taekwondo athletes. Altogether, it can be stated that from all of the bio-motor and physiological parameters were assessed in this study, resting pulse rate and breath holding time, speed and agility in male and female schools level athletes and males and female college level athletes are different and have more importance in success of taekwondo athletes. Based on

the results of this study, considering bio-motor and physiological characteristics should be addressed by taekwondo coaches in their planning and designing training.

Conclusions

On the basis of the findings of the study the following conclusions were drawn

There was significant difference in selected bio motor variables between school and college male Taekwondo players.

1. There was significant difference in selected bio motor variables between school and college female Taekwondo players.
2. There was significant difference in selected physiological variables between school and college male Taekwondo players.
3. There was significant difference in selected Physiological variables between school and college Taekwondo female players.

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