

Analysis of Heart Rate and Vital Capacity among the Racket Games Players

¹Sajal Halder, ²Dr. Sushma Ghildiyal, ³Nitai Biswas, ⁴Titir Hore

^{1,3,4}Research Scholar, ²Professor
Department of Physical Education
Banaras Hindu University
Varanasi, Uttar Pradesh, India.

Abstract- The purpose of the study was to analyze of resting heart rate and vital capacity among the racket games players. For this study, Sixty (n=60) subjects were randomly selected, Fifteen (15) each from Badminton, Tennis, Table tennis and Squash players of the Purba Barddhaman district Tennis Associations, West Bengal, India. Subjects had represented in the junior level tournament. The age of the subjects ranged between 15 to 17 years. The pertaining data was collected by administrating the stethoscope to measure the resting heart rate and Dry Spiro meter to measure the vital capacity of the racket players. Descriptive statistics (Mean & S.D.), inferential statistics (S.E.) and analysis of variance (ANOVA) were used as statistical techniques to find out the significant difference of resting heart rate among the junior Badminton, Tennis, Table tennis and Squash players. The result of the finding should that there were significant mean differences of resting heart rate in junior Badminton, Tennis, Table tennis and Squash players as the calculated 'F'- ratio 5.50 is greater than the tabulated 'F'- ratio 2.77 at 0.05 level of confidence (P<0.05). The level of significance was set at P<0.05. The result of the finding should that there were significant mean differences of vital capacity in junior Badminton, Tennis, Table tennis and Squash players as the calculated 'F'- ratio 12.48 was greater than the tabulated 'F'- ratio 2.77 at 0.05 level of confidence (P<0.05).

Further, post-hoc test was applied using Scheffe's to determine paired means differences of vital capacity between the Badminton and Table tennis players; Tennis and Table tennis players; And Badminton and Squash players as their mean difference was -0.78, -0.84 and -0.40 respectively (P<0.05). Insignificant mean difference of vital capacity between the Badminton and Tennis players were found as their mean difference was 0.06 respectively (P>0.05).

Keywords: Badminton, Tennis, Table Tennis, Squash, Resting Heart rate, Vital Capacity.

INTRODUCTION:

Badminton, Tennis, Table tennis and Squash are the common racket game most likely played in the world. But, different playing styles, duration of a match, and different playing areas are different in every racket game. Nature of the playing ability and playing area, every racket game has demands different physical and physiological efficiency^[1]. The so-called racket sports include a variety of disciplines such as: badminton, tennis, table tennis, and squash, etc., which are competed individually or in pairs. Racket sports are characterized by being cyclical disciplines, which combine very intense physical load cycles with short breaks, allowing incomplete recovery from the efforts performed^[2]. The physical and physiological demands in racket sports vary to a large extent and are influenced by a multitude of factors, such as the style of the player, the gender, the level and style of the opponent, the surface, the equipment (racket characteristics) and the environmental factors i.e., temperature and humidity^[3]. Monitoring resting heart rate (RHR) during competition allows for exercise intensities to be quantified and appropriate training programs to be established^[4]. Regular exercise as in athletes produces a positive effect on the lung by increasing pulmonary capacity, and thereby improving the lung functioning^[5]. Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inhalation^[6]. It is equal to the inspiratory reserve volume plus the tidal volume plus the expiratory reserve volume^[7]. Tennis players have demanded a long duration of strength endurance capacity compared to the other racket game. Badminton occupies the most preferred sports as an individual as well as team sports in spite of frequent changes that have occurred in various aspects of competition pertained to the game including fitness level, skills, strategies, and tactics^[8]. Badminton players are required to have a good stroke production and physical fitness, as well as physiological characteristics that will enable successful performance^[8]. Squash at the elite level is primarily aerobic in nature, with intermittent bursts of activity being supplied from anaerobic energy sources^[9].

Objective: The objective of the present study was to find out the status and to investigate the significant differences of Resting heart rate and vital capacity among the junior Badminton, Tennis, Table tennis and Squash players.

Hypothesis: It was hypothesized that there would be no significances differences of Resting heart rate and vital capacity among the junior Badminton, Tennis, Table tennis and Squash players.

Methodology:

The following methodological steps were taken in order to conduct the present study.

Subjects: For this study, Sixty (n=60) subjects were randomly selected, Fifteen (15) each from Badminton, Tennis, Table tennis and Squash players of the Purba Barddhaman district Tennis Associations, West Bengal, India. Subjects had represented in the junior level tournament. The age of the subjects ranged between 15 to 17 years.

Administration of the test:

Resting heart rate: The stethoscope was used to check the heart beat or pulse rate. Resting heart rate was measured by placing the chest piece against the thoracic valve. Record the pulsations felt for about 10 seconds and multiplied by 6 or the pulsations was recorded for 1 whole minute to calculate the resting heart rate of the subject [10].

Vital capacity: Vital capacity was measured by dry Spiro meter. The subject was asked to take a deep breath and then to blow hard into the mouthpiece of the dry Spiro meter with a sharp blast. There recordings were taken at one minute intervals and the average of the three highest was noted. Subjects were asked to flow a maximum inspiration, all the air possible was forcibly exhaled through the mouthpiece [11].

Measuring tools: The pertaining data was collected by administrating the Stethoscope to measure the heart rate and dry Spiro meter to measure the vital capacity of the racket players.

Statistical technique: Descriptive statistics (Mean±S.D.), inferential statistics (S.E.) and analysis of variance (ANOVA) were used as statistical techniques to find out the significant difference of Resting heart rate and vital capacity among the junior Badminton, Tennis, Table tennis and Squash players. The level of significance was set at $P < 0.05$.

Result:

The pertaining data of Resting heart rate were treated by using the descriptive analysis to find out the Resting Heart Rate (RHR), Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) shows in table 1.

Table – 1- Descriptive Analysis and Inferential statistics of RHR among the Racket Games Players

Parameter	Sleeted Games	N	RHR	M	S.D.	S.E.
Resting Heart rate (in numbers)	Badminton	15	868	57.86	3.66	0.94
	Tennis	15	880	58.66	3.26	0.84
	Table tennis	15	940	62.66	4.18	1.08
	Squash	15	912	60.80	3.09	0.80

Table 1 shows that the Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of the resting heart rate for Badminton, Tennis, Table tennis and Squash players were 57.86 ± 3.66 , 58.66 ± 3.26 , 62.66 ± 4.18 , and 60.80 ± 3.09 respectively. Standard errors were 0.94, 0.84, 1.08 and 0.80 respectively.

The result of analysis of variance (ANOVA) used to find out the significant mean differences of resting heart rate of junior Badminton, Tennis, Table tennis and Squash players is shows in table 2.

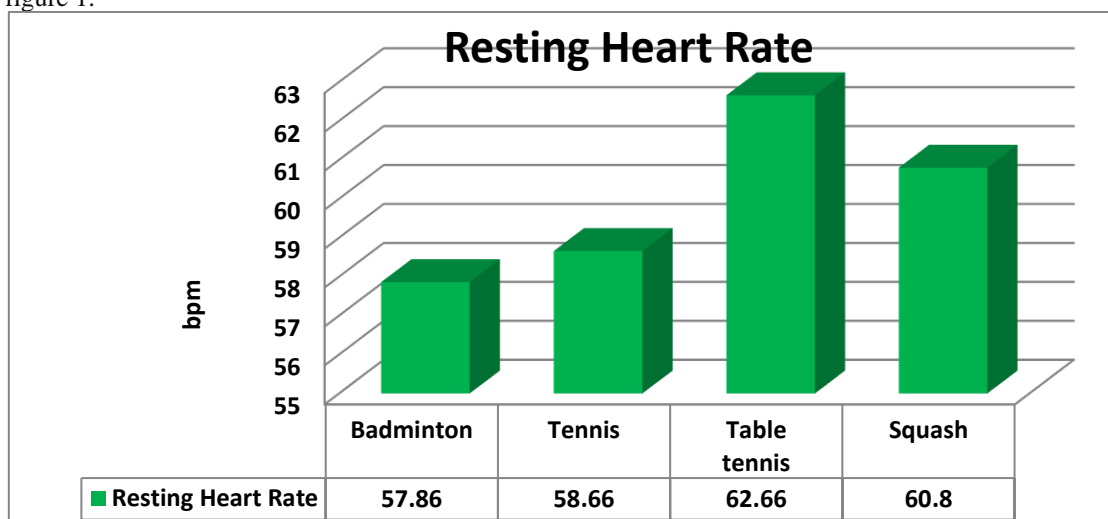
Table – 2: Significant Mean Differences of RHR among the Racket Games Players

Parameter	Sleeted Games	M	SD		Sum of Squares	df	F	Sig. (p-value)
Resting heart rate (in numbers)	Badminton	57.86	3.66	Between Group	211.199	3	5.50	0.002
	Tennis	58.66	3.26					
	Table tennis	62.66	4.18	Within Group	716.797	56		
	Squash	60.80	3.09	Total	927.996	59		

*Significant at 0.05 level of confidence, where, $F_{(0.05), df(3, 56)} = 2.77$

Table 2 reveals that there were significant mean differences of resting heart rate in junior Badminton, Tennis, Table tennis and Squash players as the calculated 'F'- ratio 5.50 is greater than the tabulated 'F'- ratio 2.77 at 0.05 level of confidence ($P < 0.05$).

The mean differences of Resting heart rate of junior Badminton, Tennis, Table tennis and Squash players have been graphically presented in figure 1.

**Figure 1: Mean Comparison of Resting Heart Rate among the Junior Racket Game Players**

The concern data of vital capacity were treated by using the descriptive analysis to find out the range (R), minimum (min), maximum (max), Mean (M), Standard Deviation (S.D.) and Standard Errors (S.E.) shows in table 3.

Table – 3- Descriptive Analysis of Vital Capacity among the Racket Games Players

parameter	Slected Games	N	R	Min	Max	M	S.D.	S.E.
Vital Capacity (Lit)	Badminton	15	1.3	4.3	5.6	5.06	0.37	0.09
	Tennis	15	2.0	4.2	6.2	5.12	0.62	0.16
	Table tennis	15	0.9	3.9	4.8	4.28	0.26	0.06
	Squash	15	1.2	4.1	5.3	4.66	0.35	0.09

Table 3 shows that the mean (M) and standard deviation (S.D.) of the vital capacity for Badminton, Tennis, Table tennis and Squash players were 5.6 ± 0.37 , 5.12 ± 0.62 , 4.28 ± 0.26 and 4.66 ± 0.35 respectively; the range were 1.3, 2.0, 0.9 and 1.2 respectively and standard error (S.E.) were 0.09, 0.16, 0.06 and 0.09 respectively.

The result of analysis of variance (ANOVA) used to find out the significant mean differences of vital capacity of junior Badminton, Tennis, Table tennis and Squash players is shown in table 4.

Table – 4-Significant Mean Differences of Vital Capacity among the Racket Games Players

Parameter	Slected Games	M	S.D.		Sum of Squares	df	F	Sig. (p-value)
Vital Capacity (Lit)	Badminton	5.06	0.37	Between Group	6.776	3	12.48	0.001
	Tennis	5.12	0.62					
	Table tennis	4.28	0.26	Within Group	10.113	56		
	Squash	4.66	0.35	Total	16.909	59		

*Significant at 0.05 level of confidence, where, $F_{(0.05), df(3, 56)} = 2.77$

Table 4 reveals that there were significant mean differences of vital capacity in junior Badminton, Tennis, Table tennis and Squash players as the calculated 'F'- ratio 12.48 is greater than the tabulated 'F'- ratio 2.77 at 0.05 level of confidence ($P < 0.05$).

Hence, further post hoc test was applied by using the Scheffe's to determine paired mean differences among the junior Badminton, Tennis, Table tennis and Squash players and results have been presented in table 5.

Table – 5: Paired Mean Differences for the Vital Capacity among the Junior Racket Games Players

Parameter	Mean				Mean difference	SE	Sig. (p-value)
	Badminton	Tennis	Table tennis	Squash			
Vital Capacity	5.06		4.28		-0.78	0.117	0.0001
		5.12	4.28		-0.84	0.174	0.0001
	5.06			4.66	-0.40	0.132	0.005
	5.06	5.12			0.06	0.186	0.75

*Significant at 0.05 level of Confidence ($P \leq 0.05$).

From table 5 shows that there were significant mean difference of vital capacity between Badminton and Table tennis players; Tennis and Table tennis players; Badminton and Squash players as their mean difference was -0.78, -0.84 and -0.40 respectively ($P < 0.05$). However, insignificant mean difference of vital capacity between the Badminton and Tennis players was found as their mean difference 0.06 respectively ($P > 0.05$).

The mean differences of vital capacity of junior Badminton, Tennis, Table tennis and Squash players have been graphically presented in figure 2.

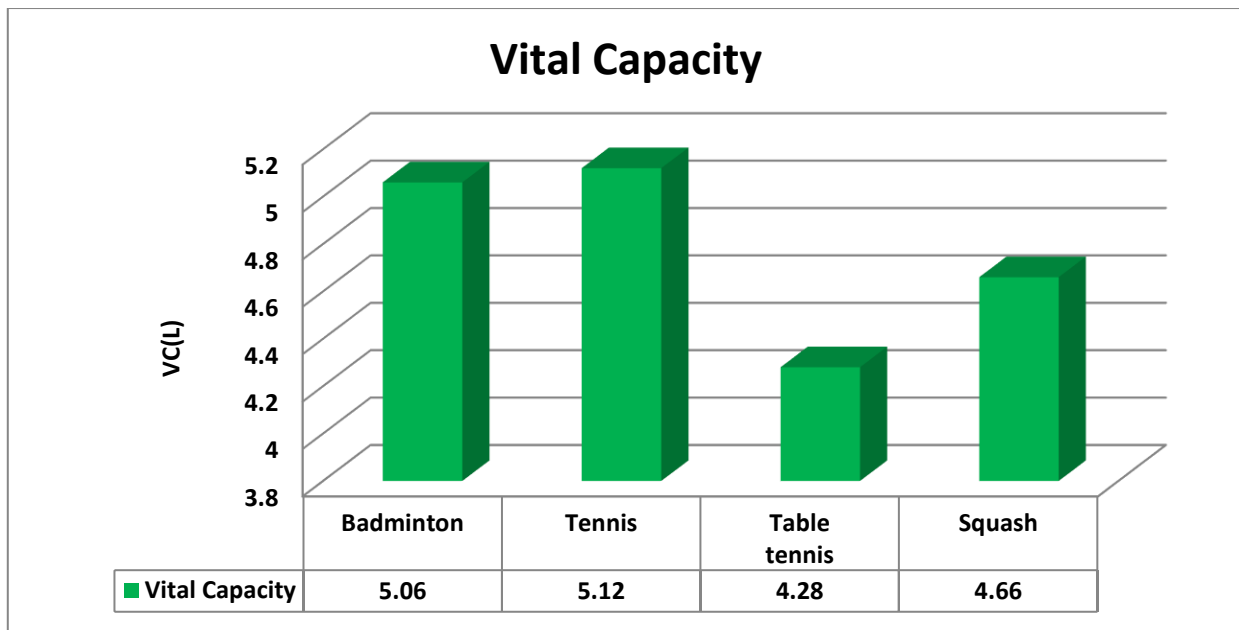


Figure 2: Mean Comparison of Vital Capacity among the Junior Racket Game Players

Discussion:

The result of Descriptive statistics (Mean±S.D.) and Inferential statistics (S.E.) revealed significant difference in resting heart rate among the junior Badminton, Tennis, Table tennis and Squash players. (Table 1 & 2)

Significance mean difference between Badminton and Table tennis players might be due to the reason that Badminton shuttlecock is made of feathers and is heavier. Also Badminton players need more intensity to work on the playing surface area They have more lower body strength and explosive power as compared to Table tennis players (Faccinni, P. and Dal Monte, A. (1996). The difference between Tennis and Table tennis players due to, Tennis players have to run and do movement around the court as well as perform variety of shot types, serves with more intensity^[12]. A comparison of exercise intensity on different player levels in table tennis. *International Journal of Table Tennis Sciences*, 6, 79-82. Difference between Badminton and Squash Players due to, the fact that minimal time is lost between the retrieval of the shuttle and subsequent resumption of play demands more reason might be because of speed and strength as compared to Squash players (Gillam I, Siviour C, Ellis L, Brown P). Their are several discrepancies and similarities between Badminton and Tennis players due to training schedules and diet plans (Martinez, B. S.-A. (2014).

Findings of statistical analysis of variance (ANOVA) revealed significant differences in Vital Capacity among the junior Badminton, Tennis, Table tennis and Squash players. The insignificant mean difference of vital capacity between the Badminton and Tennis players was also found respectively. (Table 3, 4 & 5)

The mean difference of vital capacity between Badminton and Table tennis players; and Tennis and Table tennis players; Badminton and Squash players. Significance difference in Badminton and Table tennis might be due to the reasons that Badminton players do large work out for the more duration of match. Also, Badminton players take more foot step and more playing court areas, they are stronger, taller as compare to Table tennis players. Tennis and Table tennis players have more work load, more body movement, higher foot step, high intensity, endurance and strength of playing during the match and practice schedules as compare to Table tennis players. Badminton and squash players more movement, more types of techniques required is hitting, Higher work load and high intensity playing activities are the main reason for the higher vital capacity of the players. (Sapna. M & Chandra. J. H, (2020); Jeyaraman R & Kalidasan R. (2012); Bhasker, V. J, J. (2017).

As significant difference was found between Badminton and Table tennis players; Tennis and Table tennis players; and Badminton and Squash players, therefore, in these cases the research hypothesis is accepted and null hypothesis is rejected.

However, between the badminton and tennis players, insignificant difference was found. Hence, the research hypothesis is rejected and null hypothesis is accepted.

CONCLUSION:

In conclusion, the present study revealed that the significant difference is found in resting heart rate between Badminton and Table tennis players; Tennis and Table tennis players; Badminton and Squash players; Badminton and Tennis players.

Other one the significant difference is found in vital capacity between Badminton and Table tennis players; Tennis and Table tennis players; Badminton and Squash players whereas insignificant difference is found in vital capacity between the Badminton and Tennis players. Further, it is also concluded that Badminton and Tennis players have the dominating factors of vital capacity than the Table tennis players for this particular study population.

REFERENCES:

1. Ghai. CL, A text book of practical physiology. New Delhi: Jaypee Publishers, 2007, 155-157.
2. Martinez, B. S.-A. (2014). A study of the physiological characteristics of tennis. *Coach. Sport sci. rev.* 64, 3–5.
3. Fernandez Fernandez, J., Mendez-Villanueva, A. et al., (2006). ‘Intensity of tennis match play’, *British Journal of Sports Medicine*, 40 (5): 387-91.

4. Faccinni, P. and Dal Monte, A. (1996) 'Physiologic demands of badminton match play', American Journal of Sports Medicine, 24: S64-S66.
5. Vedala SR, Paul N, Mane AB. Differences in pulmonary function test among the athletic and sedentary population. Natl J Physiol Pharm Pharmacol, 3(2):118-23.
6. Sapna. M & Chandra. J. H, (2020). Comparative effect of vital capacity in different levels of table tennis players at khelo India. Int J PhysiolNutr Phys Educ, 5(1):136-138.
7. Biersteker MW, Biersteker PA. (1985). Vital capacity in trained and untrained healthy young adults in the Netherlands. European Journal of Applied. Physiology, 54(1):46-53.
8. Jeyaraman R & Kalidasan R. (2012). Prediction of playing ability in badminton from selected anthropometrical physical and physiological characteristics among inters collegiate players. Int J Adv Innov Res, 1(3):47-58
9. Gillam I, Siviour C, Ellis L, Brown P. The on-court energy demands of squash on elite level players (abstract). In: Draper J, ed. Third report on the national sport research program. Canberra, Australia: Australian Sports Commission, 1990: 35.
10. www.nuffield foundation.org/practical-biology/looking heart.
11. Bhasker, V. J, J. (2017). Comparison of the vital capacity of university level female athletes from different games in kerela. Int J Yogic Hum Mov Sports Science, 2(1): 132-135.
12. Suchomel, A. (2010). A comparison of exercise intensity on different player levels in table tennis. *International Journal of Table Tennis Sciences*, 6, 79-82.