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RESEARCH ARTICLE

PHYSICAL AND PHYSIOLOGICAL COMPARISON BETWEEN BALL AND RACKET GAMES PLAYERS

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Abstract

The purpose of the studies was to compare the physical and physiological variables of ball and racket games players. For accomplishing the study, twenty (n=20) players were selected from each discipline. The total forty (n=40) players were selected through random sampling technique. Twenty (n=20) players were selected from ball game (Handball) and twenty (n=20) were selected from racket game (Badminton) from Burdwan University, West Bengal, India. Subjects had represented in the district level tournament. The age of the subjects ranged between 18to 21 years. The pertaining data was collected on physical variables: Speed, Agility, Arm power and Leg power, with the Johnson and Nelson motor ability test**.** Physiological variablesi.e**.**blood pressure was measured with the digital sphygmomanometer and VO_{2max} was measuredwith Cooper test. Descriptive statistics (Mean & S.D.) and inferential statistics(S.E. & 't'- test) were used as statistical techniques to find out the difference in physical variables(Speed, Agility, Arm power and Leg power)and physiological variables (Blood pressure, VO_{2max}) between Ballgame(Handball)and Racket game(Badminton)players.To compare results't'- test was used as statistical technique. The level of significance was set at (P>0.05). The results showed significance difference in Physiological variables between Ball game(Handball) and Racket game(Badminton) players. Insignificant differencewas to find in physical variables between Ball game(Handball) and Racket game(Badminton)players.

Introduction:-

The physical and physiological components of athletes largely determine their performance at all levels. Physical characteristics in turn are determined by genetics, nutritional status and training of the sportspersons. Body composition is a factor that can influence athletic performance and has a bearing upon bio-motor abilities like speed, agility, power. Body composition is an important component which can improve maximal work capacity by affecting training-based alterations and some physiological parameters[15].The game was codified at the end of the 19th century in northern Europe, chiefly in Scandinavia and Germany. The modern set of rules was published in 1917 in Germany, and had several revisions since. The first international games were played under these rules for men in 1925 and for women in 1930. Men's handball was first played at the 1936 Summer Olympics in Berlin as

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outdoors, and the next time at the 1972 Summer Olympics in Munich as indoors, and has been an Olympics sport since. Women's team handball was added at the 1976 Summer Olympics [7].The governing body of handball at the international level is the international handball federation (IHF) and all of the national level competitions are organized in India by the Handball Federation of India (HFI) administrative and controlling body [13]. Badminton is a racquet sport played using racquets to hit a shuttlecock across a net. Although it may be played with larger teams, the most common forms of the game are 'singles'(with one player per side) and 'doubles' (with two players per side). Badminton is often played as a casual outdoor activity in a yard or on a beach; formal games are played on a rectangular indoor court. Points are scored by striking the shuttlecock with the racquet and landing it within the opposing side's half of the court.

The game developed in British India from the earlier game of battledore and shuttlecock. European play came to be dominated by Denmark but the game has become very popular in Asia, with recent competitions dominated by China. Since 1992, badminton has been a Summer Olympic sport with four events: men's singles, women's singles, men's doubles, and women's doubles, with mixed doubles added four years later. At high levels of play, the sport demands excellent fitness: players require aerobic stamina, agility, strength, speed, and precision. It is also a technical sport, requiring good motor coordination and the development of sophisticated racquet movements [5]. Badminton is a popular sport which can be practiced by anyone regardless of age or experience. The game involves most of the body, and considered the fastest racket sport in the world, and hence, it demands from the player's quickness in planning, performing movements, temporal and spatial accuracy in the racket position for interception of the projectile (shuttlecock)[1]. A normal person's level of physical fitness is just as important as a person who is taking part in a sporting event [9]. In general, getting fit involves eating right, exercising, and getting enough sleep; regular exercise prevents or limits increases in body mass index and weight (BMI) [11]. Strength, endurance, power, speed, agility, balance, flexibility, and stamina are common components of physical fitness, which play a significant role in enhancing performance in games and sports [10].Psychomotor this is mainly related to physiological functions and their control. When performed in a general way, such as behavior is called a general action and when highly specific tasks occur, indicate a skill. Psychomotor functions are usually used in controlling an object, satisfying or controlling the body, eye coordination, eye-foot coordination and many functions or moving parts of the body[8].Scientist and physiologist have been of the view that physiological parameters of an athlete have a lot to do with their performance more than the techniques and tactics of the player. Most of the games demand a greater amount of speed, strength, endurance, and agility, etc. Fitness from the stand point of the handball players means that the player must have a high standard of physical and physiological condition, which makes possible through the perfect functioning of the organs of locomotion and circulation and of nervous system, the maximum possible use and application of his physical and mental capabilities and knowledge of handball. The existing literature in the field of handball shows that endurance, speed, agility, maximum leg strength, upper body strength, leg power, muscular endurance, flexibility, coordination and reaction time are important prerequisite for efficient handball performance, and whereas excess body fate proves to be a hindrance. The game of handball requires tremendous physical fitness as the duration of the game is longer in time in which basic management such as different skills are involved. The researcher therefore, has made an attempt to compare the selective physical fitness and physiological parameters of the handball game [3].

Objective of the study:-

The objective of the present study was to investigate the significant differences of physical variables and physiological variables between Ball and Racket games players.

Significance of the Study:

The result of this study would be helpful to the coaches or trainers to develop most suitable training program through which the desirable fitness components can be enhanced optimally so as to performance can be improved.

Hypothesis:

It was hypothesized that there would be no significant differences in physical and physiological variables between Ball and Racket games players.

Methodology:-

Selection of Subjects:

For this study, twenty (n=20) male Handball and Twenty (n=20) Badminton players between the ages of 18 to 21 who had participated in the district tournament subjects for the present study. Data was gathered at the Mohanbagan Ground in Ragbati, Burdwan, West Bengal, India.

Selection of Variables

Physical Variables

1. Speed
2. Agility
3. Arm power
4. Leg power

Physiological variables

1. Systolic Blood Pressure
2. Diastolic Blood Pressure
3. VO_{2max}

Tools Used for data collection

Test by Johnson and Nelson (1982) was used to measure motor ability components as described below:
Speed: 50 Yard Dash Run test
Agility: Shuttle run test (4x10yards)
Arm Power: Two hands Medicine Ball put test
Leg Power: Standing Broad Jump

Systolic blood pressure was used to measure by using digital blood pressure apparatus (sphygmomanometer) and the unit was measured in mm of Hg.

Diastolic blood pressure was measured by using digital blood pressure apparatus (sphygmomanometer) and the unit was measured in mm of Hg.

To measure VO_{2max} for maximal oxygen consumption, Cooper test was used.

Data collection:

Prior to data collection field marking was done. All subjects were asked to go for warm-up. The tests for speed, agility, armpower and leg power(physical variables); blood pressure, VO_{2max}, (physiological variables) were demonstrated and instruction of complete test was given to the subjects. When subjects were ready for the test, the data was recorded by the administering the tests.

Statistical techniques:

Descriptive statistics (Mean±S.D.), inferential statistics (S.E.& 't'- test) were used as statistical techniques to find out the significant difference to physical variables and physiological variables of Handball and Badminton players, in all the cases to test significance of the data was tested 0.05 level of confidence.

Results of the study:-

The data was analyzed by't'- test. The significance of mean difference found between score were obtained on selected Physical variables and Physiological variables of Burdwan University male Handball andBadminton players.

Table 1:- Computation of Mean difference &'t'- ratio onSpeed between Handballand BadmintonPlayers.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
Speed	Handball	20	7.08	0.39	0.08	38	1.25	0.21
	Badminton	20	6.94	0.31	0.06			

*Significant at 0.05 level 2.02(1, 19)

From table-1 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the speed variable were 7.08±0.39 where as in case of Badminton players it was 6.94±0.31 respectively. Insignificant mean difference was found between Handball and Badminton players as the calculated 't'value1.25 was less than tabulated value of 2.02, (P>0.05).

Table 2:- Computation of Mean difference &'t'- ratio on Agility between Handball and Badminton Players.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
Agility	Handball	20	11.03	0.30	0.06	38	0.77	0.44
	Badminton	20	10.96	0.27	0.05			

*Significant at 0.05 level 2.02(1, 19)

From table-2 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the Agility variable were 11.03±0.30 where as in case of Badminton players it was 10.96±0.27 respectively. Insignificant mean difference was found between Handball and Badminton players as the calculated 't' value 0.77 was less than tabulated value of 2.02, (P>0.05).

Table 3:- Computation of Mean difference & 't'- ratio on Arm power between Handball and Badminton players.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
Arm power	Handball	20	2.74	0.21	0.047	38	1.89	0.06
	Badminton	20	2.62	0.19	0.042			

*Significant at 0.05 level 2.02(1, 19)

From table-3 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the speed variable were 2.74±0.21 where as in case of Badminton players it was 2.62±019 respectively. Insignificant mean difference was found between Handball and Badminton players as the calculated 't'value1.89 was less than tabulated value of 2.02, (P>0.05).

Table 4:- Computation of Mean difference &'t'- ratio on Leg power between Handball and Badminton Players.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
Leg power	Handball	20	1.53	0.13	0.029	38	1.57	0.12
	Badminton	20	1.59	0.11	0.024			

*Significant at 0.05 level 2.02(1, 19)

From table-4 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the speed variable were 1.53±0.13 where as in case of Badminton players it was 1.59±011 respectively. Insignificant mean difference was found between Handball and Badminton players as the calculated 't'value1.57 was less than tabulated value of 2.02, (P>0.05).

The mean differences of Speed between Handball and Badminton players have been graphically presented in figure 1. .

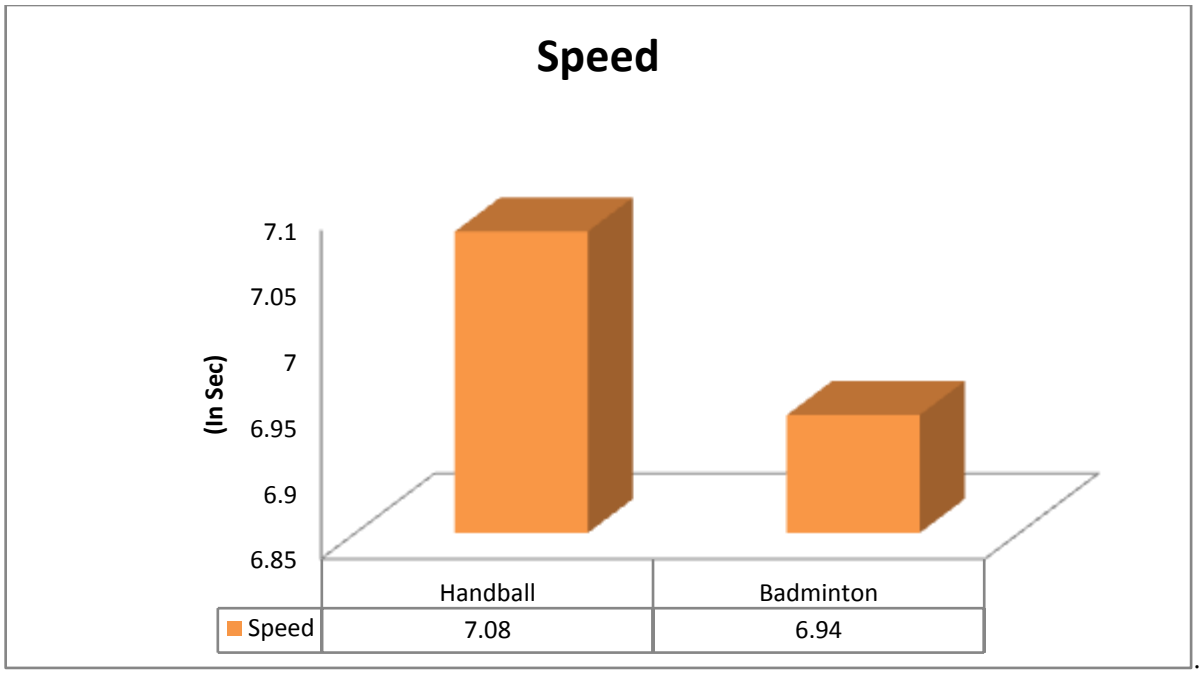

Fig.1:- Mean difference of Speed between Handball and Badminton players.

The mean differences of Agility between Handball and Badmintonplayers have been graphically presented in figure 2.

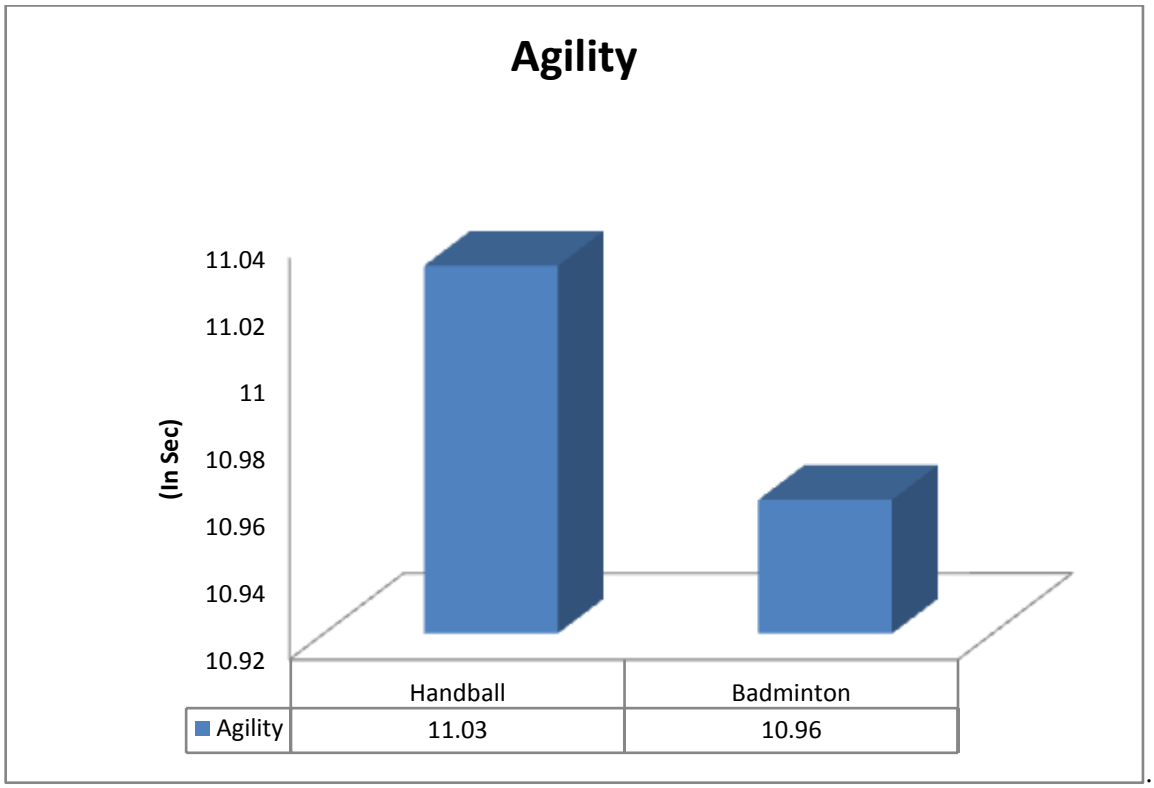

Fig.2:- Mean difference of Agility between Handball and Badminton players.

The mean differences of Arm power between Handball and Badminton players have been graphically presented in figure 3.

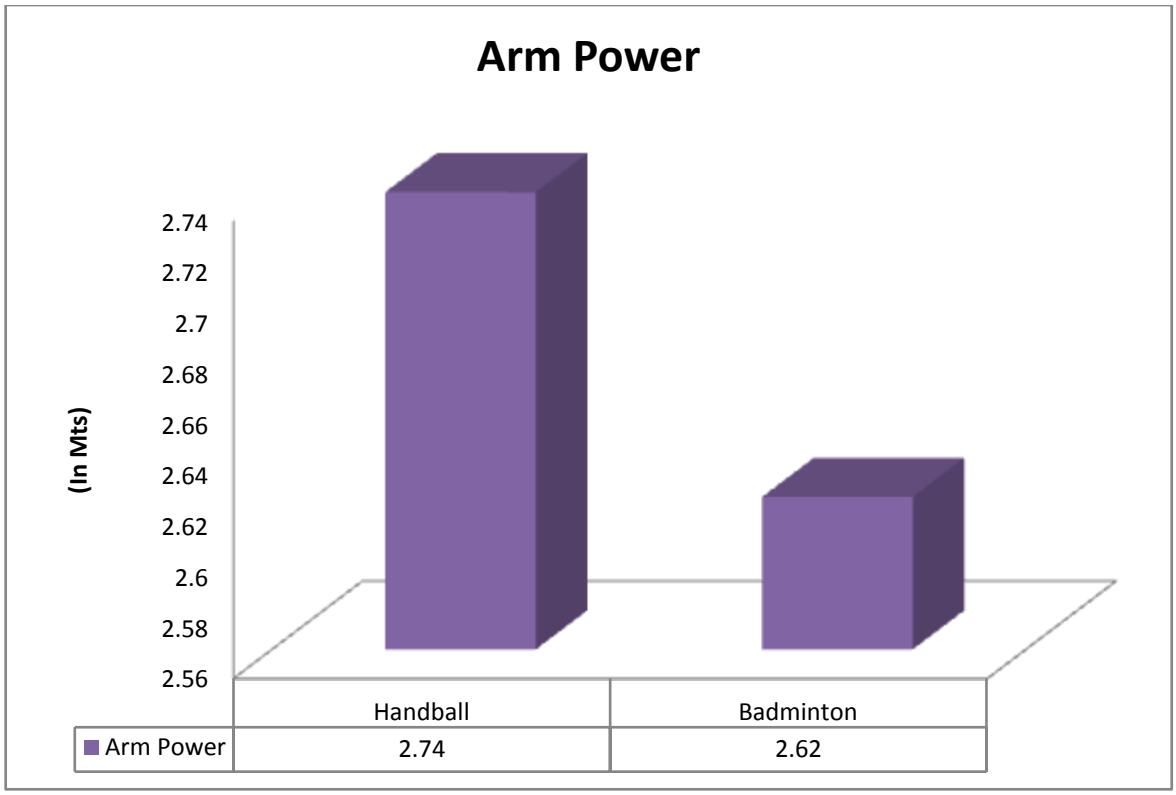

Fig.3:- Mean difference of Arm power between Handball and Badminton players.

The mean differences of Leg power between Handball and Badminton players have been graphically presented in figure 4.

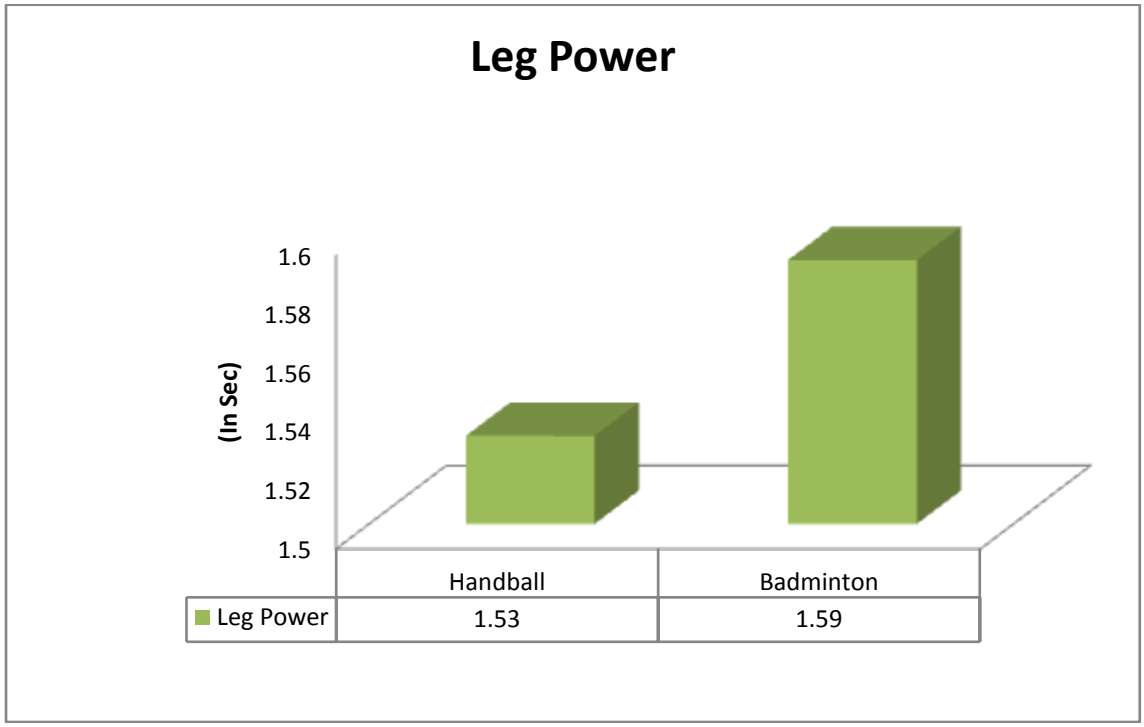

Fig.4:- Mean difference of Leg power between Handball and Badminton players.

Table 5:- Computation of Mean difference &'t'- ratio on Systolic blood pressure between Handball and Badminton Players.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
Systolic blood pressure	Handball	20	133.44	3.23	0.72	38	9.25*	0.0001
	Badminton	20	124.81	2.64	0.59			

*Significant at 0.05 level 2.02(1, 19)

From table-5 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the Systolic blood pressure were 133.44±3.23 where as in case of Badminton players it was 124.81±2.64 respectively.Standard errors were 0.72, and 0.59 respectively. Significant mean difference was found between Handball and Badminton players as the calculated 't'value9.25 was greater than tabulated value of 2.02, (P<0.05).

Table 6:- Computation of Mean difference &'t'- ratio on Diastolic blood pressure between Handball and Badminton Players.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
Diastolic blood pressure	Handball	20	79.76	1.87	0.41	38	5.41*	0.0001
	Badminton	20	76.17	2.30	0.51			

*Significant at 0.05 level 2.02(1, 19)

From table-6 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the Systolic blood pressure were 79.76±1.87 where as in case of Badminton players it was 76.17±2.30 respectively.Standard errors were 0.41, and 0.51 respectively. Significant mean difference was found between Handball and Badminton players as the calculated 't' value 5.41 was greater than tabulated value of 2.02, (P<0.05).

Table 7:- Computation of Mean difference & 't'- ratio on VO_{2max} between Handball and Badminton Players.

Variable	Players	N	Mean	S.D.	S.E.	df	't'	Sig. (p-value)
VO_{2max}	Handball	20	44.12	1.19	0.26	38	11.75*	0.0001
	Badminton	20	49.64	1.73	0.38			

*Significant at 0.05 level 2.02(1, 19)

From table-7 reveals that Mean (M), Standard Deviation (S.D.) and Standard Error (S.E.) of Handball players on the Systolic blood pressure were 44.12±1.19 where as in case of Badminton players it was 49.64±1.73 respectively.Standard errors were 0.26, and 0.38 respectively. Significant mean difference was found between Handball and Badminton players as the calculated 't' value 11.75 was greater than tabulated value of 2.02, (P<0.05).

The mean differences of systolic blood pressure between Handball and Badminton players have been graphically presented in figure 5.

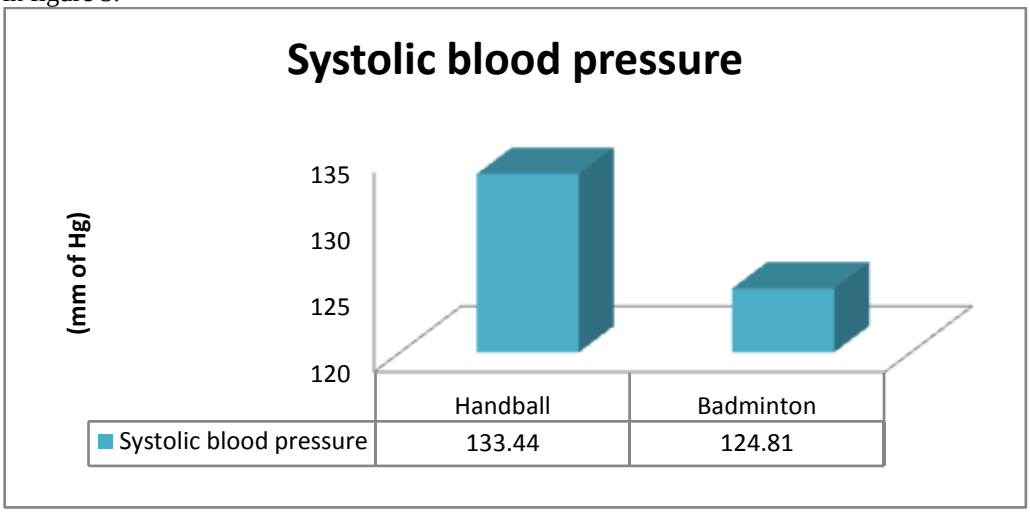

Fig.5:- Mean difference of Systolic blood pressure between Handball and Badminton players.

The mean differences of Diastolic blood pressure between Handball and Badminton players have been graphically presented in figure 6.

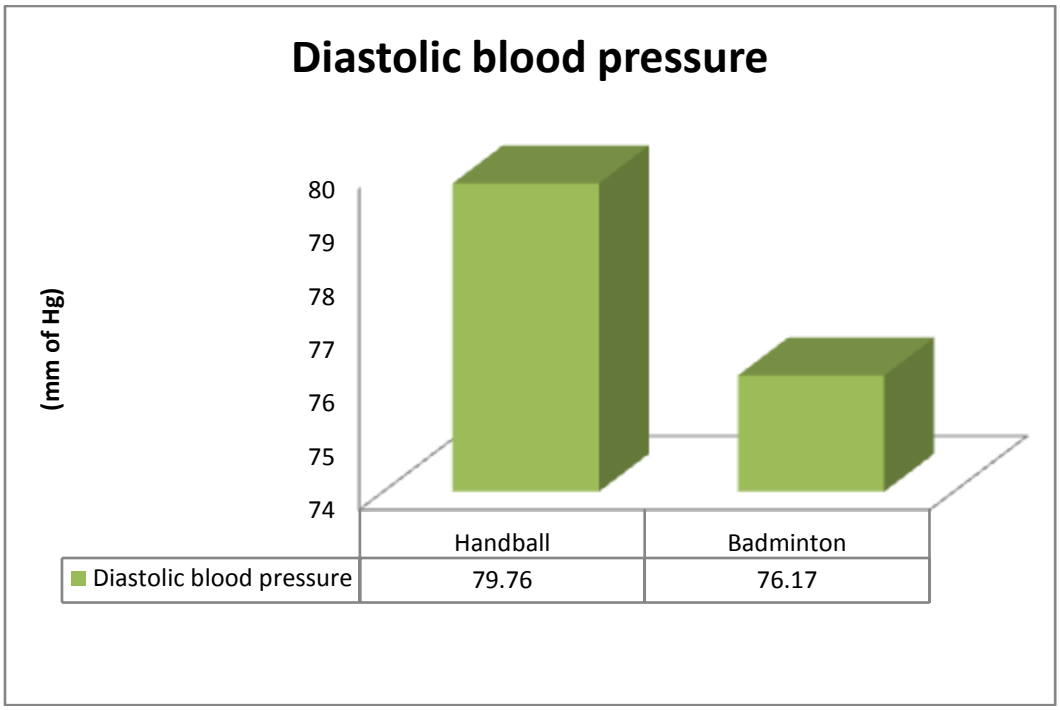

Fig.6:- Mean difference of Diastolic blood pressure between Handball and Badminton players.

The mean differences of V_{O2max} between Handball and Badminton players have been graphically presented in figure 7.

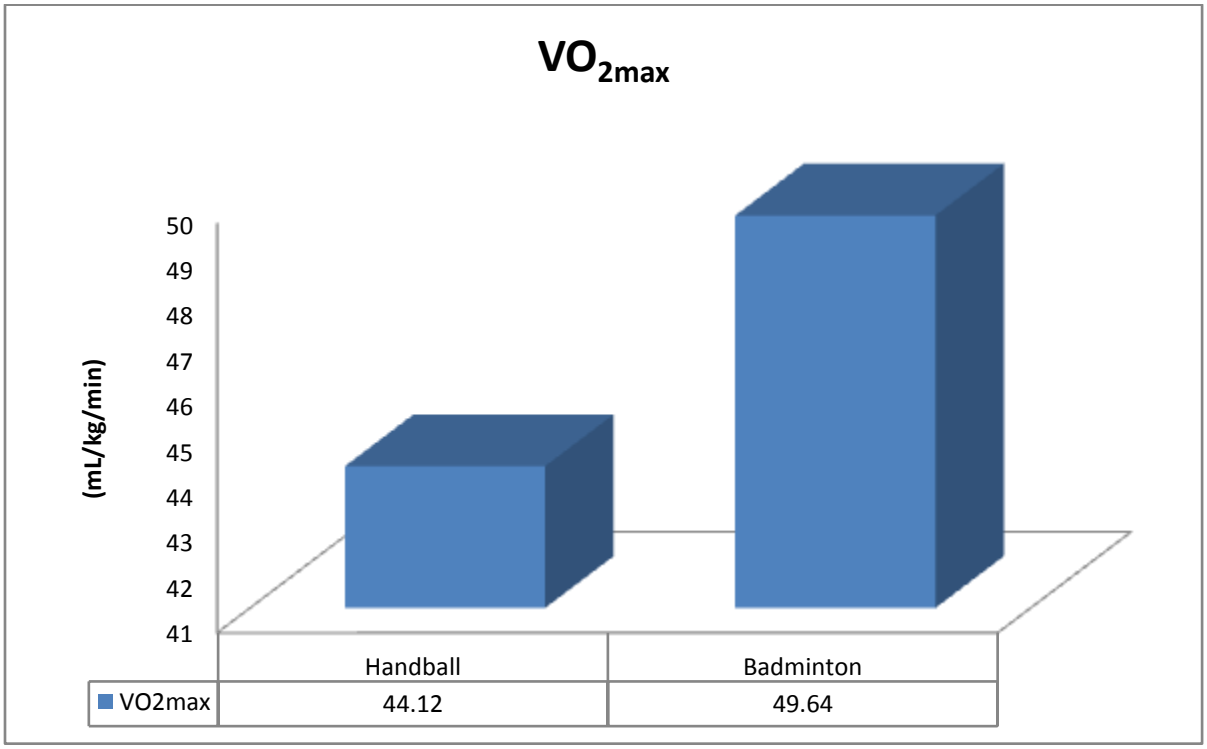

Fig.7:- Mean difference of Diastolic VO_{2max} between Handball and Badminton players

Discussions on Findings:-

The results of descriptive statistics (Mean±S.D.) and Inferential statistic (S.E.&'t'- test) revealed insignificant difference in selected physical variables(Speed, Agility, Arm power & Leg power) between Ballgame(Handball) and Racket game(Badminton) players.(Table1 to 4)

Insignificant mean difference found in speed of Ballgame(Handball) and Racket game(Badminton) players, might be due to the reason that quick movement of all skilland precise footwork during the game was almost same.Also, body weight and playing intensity showsimilarities between both games (Singh K& Mange Ram, 2013).Insignificant mean difference were found in Agility of Ballgame (Handball) players, which might be due to the playingstyle which involve quick direction change and minimal time lost between retrieval of shuttle and ball to play (https://en.Wikipedia.org>badminton and handball) . The arm power and leg power of both Ballgame (Handball) and Racket game (Badminton) show similarities because of jump shot, smash and arm deception which often opponent realize. Also degree of difficulty of the game showed similarities(Downey, J., 2007).

The result of descriptive statistics (Mean±S.D.) and inferential statistics (S.E. &'t' test) revealed significant difference in selected physiological variables(Systolic Blood Pressure, Diastolic Blood Pressure, VO_2max) between ballgame(Handball) and racket game(Badminton) players.(Table5 to 7). The findings of the present study had similarity with the finding of the investigations reflected in the study.

Significant mean difference found in blood pressure of ballgame (Handball) and racket game (Badminton) players, might be due to duration of the match, explosive power, endurance which is more for Ball game than Racket game. Ball game players had more foot step and playing court area, which increases alertness, focus and attention of Ball gamemore than racket game players(Budet Suzanne& Michaell Budet, 1979). Significant mean difference found in VO_{2max} of Ballgame(Handball) and racket game(Badminton) players, might be due to high level of playing intensity, strength and no time out during the match. Cardio-vascular and aerobic endurance fitness training program was different and this also include muscle O_2 uptake more for Racket game than Ball game(Handball) players(Phogat, P. 2019).

As insignificant difference was found in selected physical variables(Speed, Agility, Arm power & Leg power) between ballgame (Handball) and racket game(Badminton) players, therefore, in these cases the research hypothesis is rejected and null hypothesis is accepted.

However, significant differences were found in physiological variables (Systolic Blood Pressure, Diastolic Blood Pressure, VO_{2max}) between ballgame(Handball) and racket game(Badminton) players, Hence the research hypothesis is accepted and null hypothesis is rejected.

Conclusion:-

From the results of this study, the following conclusions were drawn:
The statistics analysis of physical variables revealed that speed, agility, arm power and leg power have insignificant differences between ballgame (Handball) and racket game (Badminton) players of Burdwan University.

Physiological variables revealed that systolic blood pressure, diastolic blood pressure and VO_{2max} have significant difference between ballgame (Handball) and racket game(Badminton) players of Burdwan University. Further, it was also concluded that ballgame(Handball) players have the dominating factor of selected physiological variables than the racket game(Badminton) players for the particular study population.

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