ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2022; 8(6): 547-549
www.allresearchjournal.com
Received: 19-03-2022
Accepted: 15-05-2022

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Comparison of explosive leg strength and hand grip strength among collegiate badminton and tennis players

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DOI: https://doi.org/10.22271/allresearch.2022.v8.i6h.9928

Abstract
Introduction: Tennis and Badminton are popular sports of all ages of group. Although there are numbers of studies examining collegiate players. Hand grip strength is also important component for badminton and tennis players, but not much comparative studies done on explosive leg strength among Badminton and Tennis players.
Purpose of Study: Comparison of Explosive Leg Strength and Hand Grip Strength among Collegiate Badminton and Tennis Players.
Methodology: This study will examine comparison of explosive Leg Strength and Hand Grip Strength between collegiate Tennis and Badminton players. For Explosive Leg Strength, Standing Broad Jump test was used and for Hand Grip Strength, Hand held dynamometer was used.
Result: There is no significant difference seen in Standing Broad Jump test (F = 0.014) and significant difference was seen in hand grip Strength between collegiate tennis and Badminton Players. (F = 0.335).

Keywords: Explosive leg strength, standing broad jump test, hand grip strength

Introduction
Today, especially the racket sports have become a large sector, with this development, the sportive performance has gradually become more and important. A number of scientific studies have been carried out for long years in order to maximize the performance of sportsmen.
In branch of badminton and tennis the parameters like balance, Flexibility, Reaction Time, Static Power, Agility, Explosive Power, Arm Movement Speed and Speed are among the most important element [1].
Badminton is a sport branch which can be played easily by all people, which can be used for a recreation and fitness purpose. (R.C. Memedav and R. Kale, 1994)
On other hand tennis is not only a sport branch which is so popular but also has new point of views. On other hand it's a kind of sport which is a popular spare time activity and many people can exercise and sport also become a remarkable revenue source provider. (P. Unierzyski, 1995)
Each sports activity demands different types and levels of motor fitness. Motor fitness has been considered to work as foundation for performance in any discipline [2].
The Explosive Strength depends largely on the muscle Cross section, Contraction, Speed and Inter-intramuscular coordination.
In badminton and Tennis grasping and force application is important, if not high degree of handgrip strength for optimizing performance and potentially preventing injury [3].
Previously, some studies done to check the Hand Grip Strength but not focusing on lower limb strength measurement, So in tennis and badminton players also having good Explosive Leg Power so study is needful to compare the explosive leg power and hand grip strength among collegiate badminton and tennis players.

Material and Methodology

Those who fulfil the inclusion criteria who were selected in our study. Sample was taken from the various colleges of Ahmedabad. Total 28 player selected for the study, 14 Badminton Players and 14 Tennis Players.

Inclusion criteria

- Age group 18 to 25 years.
- Male players are included.
- Players who want to participate willingly.
- Playing badminton and tennis for more than 1 year were selected.
- Players who play badminton and tennis for 4 days per week for 2 hours per day.

Exclusion Criteria

- Players having any complaint of musculoskeletal conditions from past 6 months.
- Players who are suffering from neurological, cardiovascular or other medical conditions.
- The players involved in any type of strength training at the time of the study.

Outcomes

1. Standing Broad Jump Test [6]

On each performance testing day, participants performed a standard warm-up that included 5 min jogging and 5 min dynamic stretches. Each subject stood on the starting line with their legs parallel and feet shoulder–width apart. Participants were instructed to bend the knees (the depth of the flexion was self-selected) and bring the arms behind the body. Then, with a powerful drive they extended their legs, moved the arms forward and jumped as far as possible. The distance jumped was measured in centimeters.

2. Hand Grip Strength Measurement [7]

The instrument used for grip strength measurements is the Jamar handgrip dynamometer. Participants will have seated with the shoulder at 0° abductions and 0° flexion, while the elbow was at 90° flexion, as recommended by American Society of Hand Therapists. The participants will have instructed on proper technique (i.e. hand placement) for the grip strength measurements. The participants allowed acquainting themselves with the Jamar by grasping and squeezing the Jamar prior to the execution of study trials. The participants will have informed to execute a maximal grip effort for 3 seconds during the grip test trials. Verbal encouragement will provide by the test administrator to the participants during the tests trials. There were three trials of maximal grip collected with each trial separated by approximately 1-2 minutes. The greatest maximal grip from the three trials will used for subsequent analysis. (ICC = 0.98)

Review of Literature

Aziz GÜÇLÜÖVER1, Erkan DEMİRKAN *et al*. (2012) conducted study on the comparison of some physical and physiological features of elite youth national and amateur badminton. 31 Turkish badminton players participated in the study. The anthropometric measurement, body composition measure and some motor test was checked in this study. They see that elite players had higher values in right hand grip (kg) and agility (sn) than amateur players [4].

Soumendranath Ghosh *et al*. (2018) have conducted study on comparative analysis of selected anthropometric and physical characteristics between sub-junior volleyball and badminton players. Total of 20volleyball players and 20 badminton players participated. Research was designed to determine the comparison between anthropometric measurement and explosive leg strength. They used the arm length and limb length for anthropometric measurement and standing broad jump test for explosive leg strength. In case of explosive leg strength, they were found significant difference between volleyball and badminton players [5].

Garden Tabacchi, Guillermo F. Lopez Sanchez *et al*. (2019) conducted study on Field-Based Tests for the Assessment of Physical Fitness in Children and Adolescents Practicing Sport: A Systematic Review within the ESA Program. They used field-based tests for the assessment of PF in children and adolescents practicing sport a total of 83 article were included in the final review. They coclude that standing broad jump (SBJ) were also frequently used by 40.4% of the 57 studies and further said Vertical and horizontal jumps (i.e., the SBJ) were commonly used to determine lower body strength [6].

Result

Table 1: T-Test

Group Statistics					
	Player	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
SBJ	TENNIS	14	190.2857	28.36691	7.58137
	BM	14	189.7143	27.56371	7.36671

Table 2: Independent Sample Test

		Levene's Test for Equality variance					**t- Test for Equality Means**		**95 % confidence interval of the difference**	
		F	**Sig.**	**T**	**df**	**Sig. (2-tailed)**	**Mean difference**	**Standard error difference**	**Lower**	**Upper**
SBJ	Equal variance assumed	0.014	0.906	0.54	26	0.957	0.57143	10.57098	-21.1575	22.3004
	Equal variance not assumed			0.54	25.979	0.957	0.57143	10.57098	-21.1584	22.3012

SBJ = Standing Broad Jump Test, BM = Badminton

Table 3: Group Statistics

PLAYER	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
TENNIS	14	30.9286	5.53957	1.48051
BM	14	27.9286	3.83234	1.02424

Table 4: Independent Sample Test

		Levene's Test for Equality variance					t- Test for Equality Means		95 % confidence interval of the difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean difference	Standard error difference	Lower	Upper
HGS	Equal variance assumed	0.335	0.568	1.66	26	0.108	3.000	1.80027	-0.70051	6.70051
	Equal variance not assumed			1.66	23.125	0.109	3.000	11.80027	-0.72303	6.72303

HGS = Hand Grip Strength, BM = Badminton

- The data analysis was performed using SPSS Version 26. Descriptive Statistics were used for Mean and Standard Deviation values.
- Independent t Test was used for comparison between groups.
- The results were evaluated a significance level of 5%.
- There was no significant difference seen in Standing Broad Jump Test among collegiate Tennis and Badminton Players. (F = 0.014)
- There was significant difference seen in Hand grip Strength among collegiate badminton and tennis players but hand grip strength of tennis players is more significant compare to badminton players. (F = 0.335)

Conclusion

This study attempted to evaluate the Explosive Leg Strength and Hand Grip Strength of tennis and badminton players using the Standing Broad Jump Test and Hand Held Dynamometer. In total, 28 players, including 14 Tennis players and 14 Badminton players, were examined in this study. Among the tennis players and Badminton players, group performed the Standing Broad Jump Test and seen minor significantly different or not significantly difference (F = 0.014). Among the tennis players and Badminton players, group performed the Hand Grip Strength Test and seen significantly different (F = 0.335).

Lower limb explosive power is an important component of badminton players are able to move quickly and explosively, and therefore allows the player to jump higher, change direction quickly [9]. Moreover, previous studies have reported a significant relationship between lower limb explosive force and badminton performance [10]. In racket sports absolute strength is required in situations where only the arm muscles have to be used that is why this study also included measurement of Hand grip strength.

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