Comparison of Vertical Jump Performance of Male Handball & Basketball Players

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Abstract

The present study was conducted on 30 male players (fifteen male basketball players; age: 16.40 ± 0.83 years & fifteen male Handball players; age: 15.80 ± 0.68 years) comprising of players training under the guidance of Punjab State coaches in Patiala (India). The experimental protocol developed by *Bosco et al., (1983)* and *Mcguigan et al., (2006)* were used to measure the vertical jump performance of male handball and basketball players. Test of significance of the differences was applied and data was judged at 0.01 and 0.05 level of significance. Results of this study show that the male basketball players performed better in vertical jump test parameters like the squat jump flight time, squat jump height, countermovement jump height, countermovement flight time, Eccentric Utilization Ratio (EUR), Elasticity Index (EI), Peak Power (0-15sec), Peak Power (45-60sec) and Mean Power (0-60sec), as compared to male handball players ,which may be due to the differnce in playing techniques and effect of training.

Key Words: **Vertical jump Performance, Peak Power, Muscular Power.**

Introduction

The vertical jump is an essential skill that is utilized in most highly competitive sports. Many training regimens strive to maximize vertical jump ability to improve an athlete's performance in their respective sports; the skill used to reach a point high above the ground from a jump can often determine the difference between success and failure, wins and losses *(Reiser et al., 2006).* In sports that require jumping and quick movements, there is a need for muscular strength and power *(Semler, 2011).* During the last few years, performing plyometric exercises in general *(Wilt, 1978)* and drop jumps *(Komi and Bosco, 1978),* also called depth jumps *(Wilt, 1978),* in particular, has become very popular in training. Improvements in vertical jumping performance after drop jump programmes have been reported in several studies *(Blattner and Noble, 1979; Steben and Steben, 1981; Clutch et al, 1983).* In order to increase vertical jumping, one needs to pay special attention to the factor of power which is one of the factors of physical fitness. Power is the product of muscular force and velocity or as an instantaneous value during a given movement. The latter, often referred to as peak power (PP), is typically associated with explosive movements such as sprinting, jumping and throwing and may be an important variable associated with success in a given discipline. The measurement of Peak Power by strength and conditioning-coaches is an important consideration in the training process.

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Changes in peak power throughout the annual plan may be indicative of training status or adaptation to the workload and could be used to plan or adjust the training program based on the athlete's performance. In high-level handball and basketball practice the vertical jump is very important for the shooters or defence actions. Therefore, the aim of the present study was to compare the vertical jump performance of male handball and basketball players.

Materials & Methods

Thirty male players (fifteen male basketball players; age: 16.40±0.83 years & fifteen male Handball players; age: 15.80±0.68 years, were briefed for the purpose of the study and the experimental protocol designed by *Bosco et al., (1983) & Mcguigan et al., (2006).* The subjects comprised of players getting training under the guidance of Punjab State coaches in Patiala (India). All the risks involved were also explained to each player and voluntary consent was taken from them. Each volunteer was first subjected to physical examination that included measurements of corporal data like date of birth, age, training age, height, body mass and sports discipline. The participants performed an adaptation process previous to the vertical jump test so that error could be minimized.

The vertical jump test measurement system consisted of a portable hand-held computer unit connected to a contact mat (Swift Performance, New South Wales, Australia). It has been previously reported that the system is reliable compared with a force platform ***(****Cronin et al., 2001).*

Vertical Jump Tests: Three jumps: Squat jump (SJ), Counter movement jump (CMJ) and Continuous vertical jump Test for 60 seconds (CVJT) were performed according to the experimental protocol reported by *Bosco et al., (1983) & Mcguigan et al., (2006).*

Explosive strength and endurance variables: In this study, Eccentric Utilization Ratio (EUR) was calculated from vertical jump height (CMJ/SJ) or peak power (CMJ/SJ) by using *Sayers et al (1999)* peak power formula. Muscle Elasticity index was calculated from the jump height reached in CMJ and SJ Jumps (CMJ – SJ *100 / SJ) as per *Sayers et al., (1999).* The explosive strength and endurance variables were power peak (PP), mean power (MP) and fatigue index (FI). Concerning the CVJT (continuous vertical jump test), the PP was estimated by the mechanical power produced in the first 15 seconds of a 60-second work. The MP was estimated by the amount of work during a 60-second continuous effort. For PP and MP, the results were expressed in watts/kg (W/kg), according to the equation described by *Bosco et al. (1983).* The fatigue Index (FI) was calculated as the difference between the power peak (work produced in the first 15 seconds) and the mean power generated in the last 15 seconds of a continuous vertical jump work of 60 seconds relative to first 15 seconds peak power. The result was expressed in percentage (%).

Test procedure and data collection: The participants were told to perform a 15-minute routine warm-up before performing the tests through stretching, running, coordination exercises and consecutive jumps (two sets of five vertical jumps). Three squat jumps (SJ) and three counter movement jumps (CMJ) were performed in random order on a

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jump mat connected to an electronic timer without the aid of an arm swing; this was standardized by having participants hold their hands on their hips. Two minutes rest period between attempts was established. The SJ involved the subject flexing the knee to approximately 90 degree maintaining the position for 3 seconds, and then jumping on the command ‘‘go.’’ The CMJ was performed under the same conditions but involved flexion of the knee followed immediately by extension of the legs. Test was executed following the original protocol for both jumps *(Sayers et al., 1999).* On the next day, again the participants performed a 15-minute routine warm-up before the tests through stretching, running, coordination exercises and consecutive jumps (two sets of five vertical jumps). The participants were told to perform the continuous vertical jump Test (CVJT) during a work performed at maximal effort, with no pauses between jumps for 60 seconds. The subjects were told to keep chest in vertical position, with no excessive advance to avoid influence in the results; as well as to keep knees in extension during the flight, remaining with hands around waist. The participants were encouraged to jump the highest as possible during the tests.

Statistics: Mean and standard deviation for all the attributes age, height, body mass and biomechanical transients related to vertical jump tests were calculated. Test of significance of the differences was applied and the level of significance was kept as $p< 0.05$.

Results

Table 1. Mean±SD of Age, height & body mass of male Basketball & Handball players

Discipline	Statistics	Age (years)	Height (cm)	Mass (kg)
Basketball (N=15)	Mean	16.400	181.867	64.600
	S.D.	0.83	6.29	8.61
Handball (N=15)	Mean	15.800	175.867	58.400
	S.D.	0.68	5.18	6.97

Table 2. Mean±SD and t-value of Vertical Jump performance variables of the three vertical jump tests of male Basketball & Handball players

Groups	Statistics	Squat Jump (SJ)		Counter Movement Jump (CMJ)		Continuous Vertical Jump test 60 seconds(CVJT) Mechanical Power (w/kg)					
		JH (cm)	Flight Time (Sec)	JH (cm)	Flight Time (Sec)	EUR	EI	PP (0-15)	PP (45-60)	MP (0-60)	FI
Basketball	Mean	32.533	0.516	35.000	0.533	1.056	7.810	19.902	14.249	16.814	27.989
	S.D.	4.36	0.03	4.28	0.03	0.04	5.02	3.74	3.52	3.17	13.76
Handball	Mean	25.467	0.457	28.800	0.484	1.100	13.967	15.815	11.769	13.607	23.573
	S.D.	3.87	0.03	3.12	0.03	0.06	9.36	3.13	2.70	2.41	18.66
	t-value	6.046**	5.970**	4.786**	4.572**	-2.480*	-2.712*	3.157**	2.947**	3.620**	.762

***significant at the 0.05 level; ** significant at the 0.01 level**

JH - Jump Height; FT-Flight Time; EUR-Eccentric Utilization Ratio; EI-Elasticity Index; PP- Peak Power; MP- Mean Power; FI - Fatigue Index

Table 1 shows mean age, height and mass of the basketball and handball players. Table 2 shows that the differences in the mean values of the various vertical jump performance parameters of male handball and basketball players were statistical significant.

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SJIF IMPACT FACTOR 2013=4.65

Francisco et al., (2010) observed that the average squat jump height 15.8±4.2cm, flight time 357±44.4msec, countermovement jump height 16.9±4.8cm, flight time 369.0±49.9msec and elasticity index 7.1±3.2 for male table tennis players (age 11.32±1.82 years). Whereas in the present study the average value of squat jump height was 32.53±4.36cm, flight time 516±30msec for male basketball players & mean squat jump height 25.46±3.87cm, flight time 457±30msec for male handball players, countermovement jump height 35.00±4.28cm, flight time 533±30msec for male basketball players & countermovement jump height 28.80±3.12cm, flight time 484±30msec for male handball players was observed. The Eccentric Utilization Ration (EUR) has been suggested as a useful indicator of power performance in athletes. *McGuigan et al., (2006)* observed the average value of Eccentric Utilization Ration (EUR) 1.03±0.20 for male soccer players, 1.00 ±0.17 for softball male players, 1.03±0.20 for football male players & 1.01±0.20 for rugby male players. In the present study the average Mean Power (0-60sec) recorded during the vertical jump test for basketball players was 16.81±3.17W/kg whereas *Bosco et al. (1983)* found that average Mean Power (0-60sec) for school going Boys (age 17.3±0.8 years) was 22.2±1.8 W/kg. *Jefferson et al., (2007)* found the average Peak Power (0-15sec) 27.76±3.78w/kg, Mean Power (0-60sec) 19.56±2.59w/kg & fatigue index (%) (FI) 48.60±7.01 for male volleyball players (age 19.01±1.36 years). In another study by *Jefferson et al., (2006)* of the Intermittent vertical jump tests (IVJT) observed the average Peak Power was (0-15sec) 24.68±2.70w/kg, Mean Power (0-60sec) 18.79±2.23w/kg & fatigue index (%) 57.50±9.51 for the male handball and basketball players (age of handball players 25.74±4.71years & basketball players 18.60±0.77years).

Conclusion: The analysis of data shows that the male basketball players performed better in vertical jump test parameters like the squat jump flight time, squat jump height, countermovement jump height, countermovement flight time, Eccentric Utilization Ratio (EUR), Elasticity Index (EI), Peak Power (0-15sec), Peak Power (45-60sec) and Mean Power (0-60sec), as compared to male handball players which may be due to the differnce in playing techniques and effect of training.

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