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An Analysis upon Relationships among Back Strength and Efficiency Tests in Volleyball Players in India

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Abstract – The purpose of the present study was to estimate the back strength and its correlations with selected anthropometric traits and performance tests in elite Indian volleyball players. Four anthropometric traits viz. height, weight, BMI and right lower extremity length, two body composition parameters, viz. percent body fat and percent lean body mass, three performance tests, viz. sit and reach test, illinois agility test and vertical jump test, and back strength were measured on randomly selected 75 elite Indian volleyball players aged 18–25 years.

An adequate number of controls were also taken from the same place for comparisons. In results, one way analysis of variance showed significant between-group differences in all the variables between volleyball players of both the sexes and controls. In volley players, significantly positive correlations were found between back strength and height, weight, right lower extremity length, percent lean body mass and vertical jump test, whereas significantly negative correlations were found with percent body fat and illinois agility test. In conclusion, it may be stated that back strength had some strong positive correlations with three anthropometric traits, one body composition component and one performance test in elite Indian volleyball players.

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INTRODUCTION:-

Volleyball is an intermittent sport. It obliges players to partake in incessant short episodes of high-intensity exercise, taken after by times of low-intensity activity. The high intensity episodes of exercise, combined with the aggregate term of the match obliges players to have all around created aerobic and anaerobic alactic (ATP-CP) vitality frameworks . As a result, volleyball players require very much created speed, dexterity, abdominal area and lower body muscular force, and maximal aerobic force.

Truth be told, muscular strength, continuance and adaptability are vital segments of healthy back capacities. A number of studies uncover that muscle strength is basic to health and prosperity. A few outer variables, viz. elevation , position of applying strength , diet and internal components, viz. age, sex , height, weight and so on impact the maximum force that can be applied by a muscle.

In various playing positions of volleyball, an incredible measure of strength of the back muscles is required. Mechanical variables assume an essential part in the etiology of degenerative procedures and wounds to the lumbar spine. The maximum limit of the back muscles must be known whether appraisals are to be made of muscle continuance took after by muscle exhaustion amid playing conditions . Be that as it may, the anatomical and biomechanical structures of the back are to a great degree complex and subsequently, precisely measuring back muscle strength is dangerous outside of an exploration setting. In the event that a relationship exists between back strength and effectively realistic anthropometric or strength measurements, coaches and trainers could make dependable appraisals utilizing straightforward methods as a part of the field.

A few studies have analyzed the connections amongst anthropometric and physiological attributes of volleyball players. In any case, data identifying with back strength and its relationship with anthropometric traits in volleyball players is missing, particularly in Indian setting. So the present study was arranged.

METHODOLOGY

Participants –

The present cross-sectional study depends on randomly selected 75 first class Indian volleyball players (40 males and 35 females) aged 18–25 years (mean age 21.07 years, ± 2.38) from the inter-university volleyball competitions composed in Guru Nanak Dev University, Amritsar, Punjab, India in 2011. The taking an interest teams were Punjabi University, Patiala, Punjab University, Chandigarh, Guru Nanak Dev University, Amritsar, Kurukshetra University, Kurukshetra, Himachal Pradesh University, Himachal Pradesh and Delhi University, Delhi. A sufficient number of controls (n = 90, 53 males and 47 females, mean age 21.06 years, ± 2.34) with no specific athletic background were likewise gathered from the same spot for examinations. The age of the subjects were recorded from the date of birth enlisted in their separate establishments. A composed assent was gotten from the subjects. The information were gathered under normal ecological conditions in morning (between 8 AM. to 12 twelve). The study was affirmed by the neighborhood morals advisory group.

Anthropometric measurements -

Four anthropometric variables, viz. height (HT), weight (WT) and BMI and right lower furthest point length (RLEL), two body composition parameters, viz. percent body fat (%BF) and percent incline body mass (%LBM), one physical parameter, viz. back strength (BS) and three execution tests viz. sit and reach test (S and RT), ilinoise nimbleness test (IAT) and vertical jump test (VJT) were tackled every subject. Anthropometric variables of the subjects were measured utilizing the standard methods and were measured in triplicate with the middle quality utilized as the measure.

The height was recorded amid motivation utilizing a stadiometer (Holtain Ltd., Crymych, Dyfed, UK) to the closest 0.1 cm, and weight was measured by advanced standing scales (Model DS-410, Seiko, Tokyo, Japan) to the closest 0.1 kg. BMI was then figured utilizing the formula weight (kg)/height2 (m)2. Right lower furthest point length was measured vertically from iliospinale back to the floor by anthropometer in cm. Percent body fat was surveyed utilizing skinfold measurements taken from four sites, viz. biceps, triceps, subscapular and suprailiac utilizing Harpenden skinfold caliper (Holtain Ltd, Crosswell, Crymych, UK) to the closest 0.2 mm, and utilizing the Durnin and Womersley skinfold mathematical statement. Percent incline body mass was figured subtracting percent body fat from 100.

Back strength estimation -

Back strength were measured utilizing a back-leg-chest dynamometer. Following 3 minutes of independent warm-up, the subject was positioned with body erect and knees twisted so that got a handle available rests at legitimate height. At that point rectifying the knees and lifting the chain of the dynamometer, pulling force was connected on the handle. The body would be slanted forward at an edge of 60 degrees for the estimation of back strength. The strength of the back muscles was recorded on the dial of the dynamometer as the best of three trials in kg. Thirty seconds time interval was kept up between each back strength testing.

Sit and reach test-

The subject was asked to warm up properly and then made to sit on the floor with feet placed against the inner side of the box. With one hand over the other, the tips of the two middle fingers on top of one another, the subject was then asked to slowly stretch forward without bouncing or jerking and slide fingertips along the 20- inch scale as far

as possible. The test was repeated thrice and best reading was recorded in inches.

Illinois agility test-

Before the actual test started, the subject warmed up thoroughly and lied face down on the floor at the "start" point with his/her head facing the "start", legs out straight, feet together and arms by side . On the command the subject jumped to his/her feet and negotiated the course around the cones to the "finish" point as fast as possible. The total time taken from when the command was given to the subject till the time when he/she passed the "finish" point was recorded as the score for the trial. Best of the three readings in seconds to 2 decimal points was recorded.

Vertical jump test-

An adequate warm up with several easy jumps proceeded with a few minutes rest, which also served the purpose of reviewing the jumping technique of the subject. The subject was told to bend the knees immediately prior to the jump (countermovement technique) which activates the stretch-shortening cycle in the muscles, resulting in greater power production in the legs. While resting, the subject was asked to stand with side toward wall and reach up as high as possible keeping the feet flat on the ground to mark the standing reach height. As and when the subject was ready, with colour on the distal part of his/her third finger (of right hand), he/she was asked to jump up as high as possible using both arms and legs to assist in projecting the body upwards and touch the wall at the highest point of the jump. The subject performed multiple attempts with short rests until a plateau or decrease in performance was observed and the best score was recorded in cms.

The "net height" was calculated by subtracting the standing reach height from the jump height in cm.

Statistical analysis-

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. One way analysis of variance was tested for the comparisons of data among elite Indian volleyball players and controls, followed by post hoc Bonferroni test. Pearson's correlation coefficients were applied to establish the relationships among the variables measured. Linear regression was also done for further analysis. Data were analyzed using SPSS (Statistical Package for Social Science) version 17.0. A 5% level of probability was used to indicate statistical significance.

RESULTS

Illustrative statistics of back strengh, selected anthropometric, body composition part traits and execution tests in tip top Indian volleyball players and controls were given in Table 1. In volleyball players, huge sex contrasts (p≤ 0.006 - 0.001) were noted in every one of the variables concentrated on, with the exception of S and RT. At the point when male volleyball players were contrasted and their control partners, factually noteworthy contrasts (p≤ 0.002 - 0.001) were found in every one of the variables considered, with the exception of BMI, %BF and %LBM. Female volleyball players had additionally noteworthy contrasts (p≤ 0.01 - 0.001) in every one of the variables considered, with the exception of BMI, RLEL, %BF, %LBM and BS.

Bivariate connections of back strength and anthropometric traits and execution tests were inspected in tip top Indian volleyball players in Table 2. Back strength had fundamentally positive connections (p≤.01) with HT, WT, RLEL, %LBM and VJT, though fundamentally negative connections were found in %BF and IAT. If there should be an occurrence of IAT fundamentally positive connection (p< 0.01) was discovered just with %BF however negative relationships (p< 0.01) with HT, WT, RLEL, %LBM and BS. For VJT, fundamentally positive connections (p< 0.01) were accounted for with HT, WT, RLEL, %LBM and BS and negative relationships (p< 0.01) were found with %BF and IAT.

(Table 3) demonstrated the linear regression analysis of dependent variable as back strength regarding other independent variables. Back strength was observed to be fundamentally associated with HT (R2=0.297), WT (R2=0.488), RLEL (R2=0.614), %BF (R2=0.278), %LBM (R2=0.280), IAT (R2=0.564) and VJT (R2=0.532).

DISCUSSION

In volleyball, teams contend by nail trims taking care of the ball over the head, height is thought to be the most vital physical trait. In the present study, the mean height of the male players (181.93 cm, ± 7.83) was more prominent than the male volleyball players of West Bengal, India (173.10 cm ± 4.19) , yet lesser than the English (191.00 cm ± 5.0) , while in female players, the mean height (159.67 cm, ± 5.83) was lesser than the American (176.70 cm, ± 4.60) and Japanese (168.70 cm, ± 5.89) female volleyball players. In the concentrate, altogether more noteworthy body weight among volleyball players may be disadvantageous for them in achieving a decent jumping height as they need to lift a more prominent weight.

In the present study, tip top Indian volley competitors (both males and females) have essentially higher mean qualities for back strength than their control partners. These distinctions were likely because of standard physical exercise also, strenuous preparing projects of thye volleyball players. It was discovered as well, that back strength had fundamentally positive relationships (p<0.01) with HT, WT, RLEL, %LBM and VJT and negative connections (p< 0.01) with %BF also, IAT in world class Indian volleyball players. The discoveries of the study mirrored that the aforementioned variables had noteworthy commitments for the back strength of the players (RLEL 61%, IAT 56%, VJT 53%, WT 49%, HT 30%,%BF and %LBM 28% each). Actually, jumping and landing require geeat measure of back strength in volleyball players. Solid back muscles lift the body in jumping and in addition appropriate landing. To maintain a strategic distance from game particular wounds and more noteworthy accomplishment in game, estimation of back strength is key. According to the prerequisites of the players,

strengthening exercises of the back muscles ought to be given to the players in the preparation programs. The discoveries of the present study took after the same line demonstrating solid positive relationships of back strength and selected anthropometric variables in world class Indian cricketers , Indian field hockey players , Indian youths and physical workers .

Body composition incredibly influences the vitality related physical strength and ability in different sports . In volleyball players, the assessed % body fat was lower than controls in both genders which took after the discoveries of Tsunawake et al. and Filaire et al. . These contrasts amongst players and controls may be because of standard physical exercise and delayed preparing impact.

The confinements of the study were the less example size and thought of players just from inter-university level competitions. In future concentrates, every one of these confinements would be taken consideration.

Variables	VM (n=30)		CM (n=30)		VF (n=30)		CF (n=31)		F value	P value
	aMean	SD	Mean	SD	Mean	SD	Mean	SD		
HT (cm)	181.39	7.33	171.10	4.38	162.3	5.83	157.85	5.38	30.92	<0.001
WT (kg)	78.60	6.63	67.22	7.41	56.00	6.97	51.36	7.96	47.95	<0.001
BMI (kg/m^2)	23.42	4.38	22.98	3.41	21.31	2.76	20.65	3.33	4.31	<0.006
RLEL (cm)	106.92	8.67	97.94	3.47	91.00	3.81	91.14	4.68	54.01	<0.001
%BF	18.91	7.82	19.45	0.66	23.73	3.78	25.81	4.56	19.58	<0.001
%LBM	81.09	5.87	81.55	5.38	74.27	3.78	75.19	4.56	19.58	<0.001
S& R T (sec.)	12.25	4.87	7.40	7.26	12.33	5.19	5.44	7.58	8.82	<0.001
IAT	14.56	0.73	16.31	1.39	19.07	1.26	18.21	1.42	8.82	<0.001
VJT (cm)	51.37	8.39	42.87	6.47	29.72	7.20	24.83	7.21	77.06	<0.001
BS (kg)	165.00	8.84	124.03	9.91	71.02	9.95	67.97	9.98	87.63	<0.001

VM = volleyball males, CM = control males, VF = volleyball females, CF = control females, HT = Height, WT = Weight, BMI = Body mass index, RLEL = right lower extremity length, %BF = percent body fat, %LBM = percent lean body mass, S&RT = ait & reach test, IAT = Illinois agility test, VJT =vertical jump test, BS = back strength.

Table 1. Descriptive statistics of various anthropometric and physiological characteristics in Indian interuniversity volleyball players.

Variables	HT	WT	BMI	RLEL	%BF	%LBM	S & RT	IAT	VJT	BS
HT		0.586**	-0.141	0.575**	-0.595**	0.587**	0.054	-0.608**	0.555**	0.545**
WT	0.650**		0.410**	0.780**	-0.281*	0.283*	-0.130	-0.679**	0.742**	0.699**
BMI	0.233	0.883**		0.163	0.624**	-0.615**	-0.191	-0.150	0.221	0.155
RLEL	0.873**	0.526**	0.132		-0.488**	0.486**	-0.028	-0.728**	0.729**	0.784**
%BF	-0.499**	0.214	0.578**	-0.443**		-1.000**	-0.171	0.617**	-0.473**	-0.527**
%LBM	0.482**	-0.219	-0.562**	0.452**	-1.000**		0.171	-0.617**	0.473**	0.527**
S& RT	-0.108	0.185	0.325*	-0.231*	0.168	-0.164		-0.065	0.068	-0.071
IAT	-0.397**	-0.428**	-0.322*	-0.255*	0.210	-o.209	-0.124		-0.753**	-0.751**
VJT	0.606**	0.497**	0.292*	0.530**	-0.440**	0.439**	0.155	-0.545**		0.729**
BS	0.752**	0.652**	0.373**	0.600**	-0.425**	0.431**	0.184	-0.631**	0.735**	

*Upper triangle correlations for Elite Indian volleyball players and lower triangle correlations for controls; * Significant at 0.05 level (2-tailed); ** Significant at .01 level (2-tailed).*

Table 2. Inter-correlation matrix of dominant handgrip strength and selected anthropometric characteristics in elite Indian volleyball players.

Variables	R^2	F	Sig.
HT	0.297	24.455	<0.001
WT	0.488	55.337	<0.001
BMI	0.024	1.426	NS
RLEL	0.614	92.354	<0.001
%BF	0.278	22.305	<0.001
%LBM	0.280	22.308	<0.001
S&RT	0.005	0.293	NS
IAT	0.564	76.091	<0.001
VJT	0.532	65.860	<0.001

Table 3. Linear regression of dependent variable as back strength with respect to other independent variables.

CONCLUSION

The findings of the present study might be presumed that noteworthy between-gathering contrasts ($p \leq 0.006 - 0.001$) was found in every one of the variables between volleyball players of both the genders and controls. In volley players, altogether positive relationships ($p \leq 0.01$) were found between back strength and height, weight, right lower furthest point length, percent incline body mass and vertical jump test, though altogether negative connections ($p \leq 0.01$) were found in percent body fat and illinois dexterity test. The information exhibited in the present study convey massive functional application and ought to be helpful in ability recognizable proof in volleyball and preparing program improvement of the game.

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