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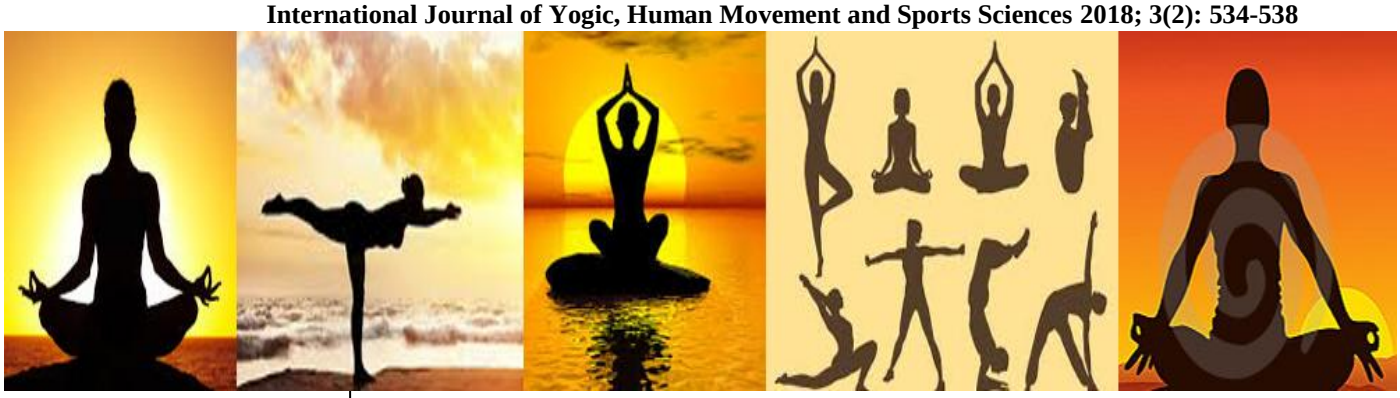

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Kinanthropometric dimensions of champion and non-champion kabaddi players a comparative study

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Abstract
Aim The purpose of this study is was to evaluate kinathropometric attributes between champion and non-champion kabbadi players at university level. Sample- The sample of the present research work was selected from different colleges of Punjab a sample of 50 kabaddi players were taken 25 champion and 25 non champions. Tools.-Height was measured by using Portable stadiometer to the nearest 0.5cm. Age-Age of the students was verified from the school record. Weight- weight was assessed to the nearest 0.1 kg using a certified electronic scale. Chest Circumference-The chest circumference was taken at the level of 3rd and 4th sternebrae. The tape was wrapped around the chest so that it gently touched inferior angles of scapula at the back and directly about the nipples in the front. Upper Arm circumference the measurement was taken at the midpoint of the upper arm between inferior, border of acromion and the superior border of the head of the radius was marked. Hip Circumference-It measured the circumference of hip at their widest portion, steel tape was used to measure. Thigh circumference-The steel tape was wrapped around the thigh just beneath in gluteal fold. It was ensured that no pressure was applied on the tape and the tape touched gently around the thigh. Calf Circumference-The measurements were taken at right angle to the long axis of the lower leg where the girth was maximum. Biceps Skinfold-The biceps skinfold was measured over biceps muscle in the middle of upper arm. Triceps Skinfold-Triceps skinfold was measured over the triceps muscle at the level where the upper arm circumference was measured. Sub-Scapular Skinfold-This skinfold is measured below the angle of the scapula. The skinfold was picked a little below the angle of the scapula, pointing downwards and outwards. Supra-iIliac skinfold-it was measured about 1cm above and 2cm medial to the anterior superior-iliac-spine. Calf Skinfold-It is the thickness of the double layer of skin plus subcutaneous fat on the medial side of calf in line with the long axis of the leg exactly at the level of calf circumference.
Statistical Analysis- To determine whether the relationship among the research variables exists or not, Statistics for each characteristic were calculated; Mean, Standard deviation, Standard error of Mean and T-value. Results- results reveals that significant exist at $p<0.5$ on the variable of age, time, weight, chest circumference, upper arm circumference, thigh circumference, hip circumference, biceps skinfold, triceps skinfold, calf skinfold, subscapular skinfold and suprailiac skinfold. Conclusion- champion had unique physical dimension than the non-champions which surpass the rest population.

Keywords: Skinfolds, skinfold calipier, anthropometric rod, Kinanthropometric

Introduction
The human Body is the result of the interaction between the genotype (the genes of a subject) and environment, the surrounding conditions to which an individual is subjected, including sport training, nutrition, climate, lifestyle, habits etc. kinanthropometric, the study of the human body in terms of size, proportion, composition (in terms of fat and fat free mass) and function, in order to understand growth, performance and nutritional status, especially in relation to sport practice Different Kinanthropometric attributes helps in the success of elite athletes but the combination of different traits that helps them to become champion found only in small sample of population. Hence, it is expected from top-level athletes to have a specific physical, psychological, and physiological etc traits suited to the functional requirements of the sport in question. The relationship of body dimensions to physical functioning and natural process has been considerably inquired in the field of sports. It is well established and wide accepted that performance in sports need specific human traits. Sports scientists working overnight to find new methods and techniques so that human body be shaped to perform to its maximum limits. Scientists also study the traits of elite sports persons so that from general

Population these traits be selected and refined further for sports performance.

Kabaddi is basically a traditional game of rural India, which requires skill, agility and power. It has the characteristics of wrestling and rugby. Kabaddi a combative team game require no equipment, it is less expensive game require minimum infrastructure. Kabaddi is played both outdoor and indoor played on a rectangular clay court having two set of games of 20 minute duration and 4 time intervals of 30 second each. Team Kabaddi is a composite intermittent game, which requires players to have well acquired aerobic and anaerobic capacities. Motor ability, sprinting, jumping, flexibility and throwing velocity represent physical activities that are considered as important aspects of the game and contribute to the high performance of the team. Successful performance requires explosive power of the legs and arms, sprint velocity. Sibila [4]. (1997). Anthropometric characteristics are very relevant for Kabaddi players because the game of Kabaddi entails physical contact in which specific physiques with a high level of strength and power may provide an advantage.

Aim of the Study: The purpose of this study is was to evaluate kinanthropometric attributes of champion and no champion kabbadi players at university level.

Champions: Those who attain first three positions at university level.

Non-champions: Those who did not attain first three positions at university level.

Methodology

Sample: The sample of the present research work was selected from different colleges of Punjab a sample of 50 kabaddi players were taken 25 champion and 25 non champions.

Limitation: The study is limited to Punjab only and to National style Kabaddi players.

Statistical Analysis: To determine whether the relationship among the research variables exists or not, Statistics for each characteristic were calculated; Mean, Standard deviation, Standard error of Mean and T-value. Data was analyzed using SPSS (statistical package for the social sciences). Statistical significance was set at $p < 0.05$.

Tools

Age: Age of the students was verified from the college record/Date of Birth certificate.

Weight: Weight was assessed to the nearest 0.1 kg using a certified electronic scale (scale certified by weight and measure department).

Height

Portable Stadiometer was used for measuring height. The subjects were made to stand bare footed against a wall with his heels, buttocks, and upper back and back of head in contact with the wall. The heels were touching each other and head was so held that the Frankfurt plane was horizontal. Arms were hanging down on the sides. The anthropometric rod was held vertically and the horizontal arm was brought so that it touched the highest point on the head in the mid saggital section (vertex). Height was taken without socks. Height was recorded to 1/10 of a centimeter.

Chest Circumference

Subject position: The subject assumes a relaxed standing position with the arms hanging by the sides and slightly abducted.

Method: This girth is taken at the level of the Mesosternale. The anthropometrist stands to the right of the subject who abducts the arms to the horizontal position allowing the tape to be passed around the thorax. The stub of the tape and the housing are then both held in the right hand while the anthropometrist uses the left hand to adjust the level of the tape at the back to the adjudged level of the marked Mesosternale. The anthropometrist resumes control of the stub with the left hand and using the cross-hand technique positions the tape in front at the level of the marked Mesosternale. The subject is instructed to lower their arms to the relaxed position with the arms slightly abducted. The tape is then readjusted as necessary to ensure it has not slipped and does not excessively indent the skin. The subject should breathe normally and the measurement is taken at the end of a normal expiration (end tidal). The measurement was recorded up to nearest 1/10 of centimeter.

Upper Arm circumference

The measurement was taken with taken with a steel tape. The measurement was taken while the arm is handing down freely in a relaxed position. The midpoint of the upper arm between inferior, border of acromion and the superior border of the head of the radius was marked. The measurement was taken at the marked level knee, ping the tape horizontal. It was ensured that the tape was touching gently and not pressing anywhere. Measurement was taken up to nearest 1/10 of a centimeter.

Hip Circumference

Subject position: The subject assumes a relaxed standing position with the arms folded across the thorax. The subject's feet should be together and the gluteal muscles relaxed.

Method: The girth is taken at the level of the greatest posterior protuberance of the buttocks which usually corresponds anteriorly to about the level of the symphysis pubis. The anthropometrist passes the tape around the hips from the side. The stub of the tape and the housing are then both held in the right hand while the anthropometrist uses the left hand to adjust the level of the tape at the back to the adjudged level of the greatest posterior protuberance of the buttocks. The anthropometrist resumes control of the stub with the left hand, and using the cross-hand technique, positions the tape in front and the sides so that the tape is held in a horizontal plane at the target level. The tape is then readjusted as necessary to ensure it has not slipped and does not excessively indent the skin.

Thigh circumference

Subject position: The subject assumes a relaxed standing position with the arms folded across the thorax. The subject's feet should be separated with the weight evenly distributed.

Method: This is the right mid-thigh girth at the marked Mid-trochanterion-tibiale-laterale site. It is usually helpful to have the subject stand on a box or stool for this measure. The anthropometrist passes the tape between the lower thighs and then slides the tape up to the correct plane. The stub of the tape and the housing are both held in the right hand while the anthropometrist uses the left hand to adjust the level of the tape to the target level. The anthropometrist resumes control of the stub with the left hand and using the cross-hand

technique positions the tape so that it is held in a perpendicular plane. The tape is then readjusted as necessary to ensure it has not slipped and does not excessively indent the skin. Reading was recorded up to nearest 1/10 of centimeter.

Calf Circumference
The subjects were asked to stand with feet slightly apart and body weight equally supported on both the legs. A steel tape was used for the measurements. The measurements were taken at right angle to the long axis of the lower leg where the girth was maximum.

Subject position: The subject assumes a relaxed standing position with the arms hanging by the sides. The subject's feet should be separated with the weight evenly distributed.

Method: The maximum girth of the calf at the marked skinfold site. The subject stands in an elevated position. The elevated position will make it easier for the measurer to align the eyes with the tape. The anthropometrist passes the tape around the calf and then slides the tape to the correct plane. The stub of the tape and the housing are both held in the right hand while the anthropometrist uses the left hand to adjust the level of the tape to the marked level. The anthropometrist resumes control of the stub with the left hand and using the cross-hand technique positions the tape so that it is held in a plane perpendicular to the axis of the leg. The tape is then readjusted as necessary to ensure it has not slipped and does not excessively indent the skin. Reading was recorded up to 1/10 of a centimeter.

Biceps Skinfold
The biceps skinfold was measured over biceps muscle in the middle of upper arm. Skinfold caliper was used for measuring skinfold. Biceps skinfold is skin and subcutaneous tissue fold over the biceps muscle at the marked midpoint picked up about 1 cm in line with the cubical fascia. Jaws of caliper were applied at the marked level. Measurement was noted after applying full pressure for 2 seconds. Measurements were recorded up to nearest 1/10 of a centimeter.

Triceps Skinfold
Triceps skinfold was measured over the triceps muscle at the level where the upper arm circumference was measured. Skinfold was picked up about 1cm above marked level. The jaws of skin fold caliper were applied to the skinfold and reading was noted after two seconds. Reading was recorded up to nearest 1/10 of a centimeter.

Sub-Scapular Skinfold
This skinfold is measured below the angle of the scapula. The skinfold was picked a little below the angle of the scapula, pointing downwards and outwards, while the subjects stood erect. The jaws of skinfold caliper were applied to the fold and measurement was noticed after two seconds. The measurements were recorded up to 1/10 of a centimeter.

Supra-iIliac skinfold
The suprailliac skinfold was measured about 1cm above and 2cm medial to the anterior superior-iliac-spine. Subjects were in standing posture. The skinfold was picked at the above mentioned site and jaws of skinfold caliper were applied to the fold. The measurement was taken after 2 seconds. The measurement was recorded up to nearest 1/10 of a millimeter.

Calf Skinfold
It is the thickness of the double layer of skin plus subcutaneous fat on the medial side of calf in line with the long axis of the leg exactly at the level of calf circumference. The subject was asked to sit on the corner of a tabletop in such a way that his one leg was in front of the longer side of table and other leg was in front of the breadth side of table. The tester picked up the skinfold on the medial side of the left leg of subject and applied the jaws of the caliper exactly in the line with the marked level where the calf circumference was measured as usually, the reading corrected up to 0.2mm is recommended about two seconds after releasing the full pressure on the jaws of the caliper.

Administration of test and scoring: Before administration of test the students were explained briefly the purpose of test.

Kinanthropometric measurements
All the kinanthropometric measurements were taken on the left side of the body, Instruments used for taking measurements were-

1. **Skinfold caliper** - Skinfold calipers require a constant closing compression of 10g.mm–2 throughout the range of measurements. They should ideally be calibrated to at least 40 mm in 0.2 mm divisions. Skinfold calipers require regular calibration.
2. **Protable Stadiometer** - (Charder HM-200P Portstad) be used to measure height
3. **Anthropometric tape** - A flexible steel tape of at least 1.5 m in length is recommended for girths. This should be calibrated in centimetres with millimetre gradations. Any used should be non-extensible, flexible, no wider than 7 mm.
4. **Weighing machine** - Electronic scales is used to measure weight. The accuracy of the instrument is to within 50 g. Calibration of scale be done before use.

All the 12 kinanthropometric measurements (Body weight, height, chest variables circumference, upper arm circumference, thigh circumference, calf circumference, hip circumference, biceps skin fold, triceps skin fold, calf skin fold, supra Iliac skin fold, sub scapular skin fold) were taken according to Singh and Bhasin [3] 1989. The investigator noted all the measurements of 50 players (25 champion 25 non-champion).

Table 1: Kinanthropometric measurements of champion and Non-champion kabadi Players

		Champion			**Non-champion**		
	Mean	S.D	SE m	Mean	S.D	SE m	t-value
Age	21.55	1.33	0.27	20.74	1.68	0.33	1.88*
Time	5.144	0.8	0.16	3.78	1.27	0.25	4.51*
Weight kg	60.88	3.87	0.74	67.24	2.68	0.53	5.69*
Height cm	181.328	2.84	0.57	170.944	32.03	6.4	1.61
Chest cir cm	86.56	1.27	0.25	83.416	1.44	0.28	8.2*
Upperarm cir cm	28.64	0.87	0.17	24.988	1.68	0.33	9.63*
Thighcir cm	52.142	1.09	0.22	50.874	0.83	0.16	4.61*
Calfcir cm	34.25	0.78	0.16	34.33	2.2	0.44	0.17
Hipcir cm	79.93	0.6	0.12	81.54	1.56	0.31	4.81*
Bicepsskinfold mm	3.16	0.23	0.05	3.73	0.5	0.1	5.09*
Tricepsskinfoldmm	5.53	0.48	0.1	5.96	0.47	0.09	3.25*
Calfskinfoldmm	6.09	0.3	0.06	6.4	0.16	0.03	4.54*
Subscapularskinfold mm	7.88	0.57	0.11	8.37	0.56	0.11	3.1*
Suprailiacskinfold mm	7.96	0.46	0.09	8.42	0.28	0.06	4.32*

*$P<0.05$,

Result and Discussion

Table 1 shows the distribution of mean values and standard deviation and t-value of different kinanthropometric measurement among Champion and non-champion Kabaddi players.

On the variable of age the Champion have higher mean value of 21.55 years than the non-champion having mean value of 20.74 years showing significant difference among them as t-value is 1.88. This shows that with the increase in age the player become more experienced and polished his skill which help him to become champion.

Regarding (time period for which game has been played) the Champion has higher mean value of 5.14 years against non-champion having mean value of 3.78 years. The mean difference is significant, as t- standing is 4.51. It is significant at 0.05 levels. This shows that longer time spent on training is no doubt an attribute of champions.

The mean value of weight of champions is 60.88 kg and the mean value of non-champions is 67.24 kg, showing significance difference at 0.05 levels among them as t-value is 5.69.The result of Devaraju and Needhiraja [12] (2012) revealed that speed, agility, weight and flexibility become the common characteristics which can predict the playing ability in Kabaddi players.

In case of height the champion's shows higher mean value 181.3 cm. than non-champions 170.94 cm having t-value 1.61. From means it may be concluded that the champions have mechanical advantage of height over the non-winner players. There is non-significant difference among them. The results of Kaushik Halder *et.al* [15] (2016) corresponds with results of the study.

In case of chest circumference champion players have mean value 86.56cm than the non-champion players having mean value of 83.416cm, showing significant difference among them as t-value is 8.2.The results of Tanner [1] (1964) and Chuhan M.S, Tanwar Bhupinder [11] (2012) are in accordance with the results of the study. Tanner was of the view that Olympic athletes had broader chest circumference when compared to ordinary athletes, which shows that broader chest gave better leverage for better performance-

Regarding upper arm circumference the champion players have mean value of 28.64cm than the non-champion players having mean value of 24.988cm, showing significant difference among them as t-value is. 9.63. The results of Franchini E *et al* [6] (2005) correspond with results of the study. The results of the above studies show that elite athletes have more muscle mass as compared to ordinary athletes.

On the variable of thigh circumference the champion players have mean value of 52.142cm than the non- champion players having mean value of 50.874cm showing significant difference among them as t-value is. 4.61. The results of Kutlu Mehmet *et.al* [7] (2007) corresponds with the studies, they were of view that due to intense training elite sports persons had more muscular cross sectional area as compared to non-champions which help the thigh muscles to contract with greater force hence perform better.

In case of calf circumference the champion players have smaller mean value of 34.25cm than the non- champion players having mean value of 34.33showing non-significant difference among them as t-value 0.17.which corresponds accordance to the need of the event. The study of Romero Juan J. Fernández *et.al* [17] (2016) do not corresponds with the results of the study.

In case of hip circumference the non- champion players have higher mean value of 81.54cm, than the champion players having mean value of 79.93cm. The difference is significant, as t-value is 4.81 resulting more adipose tissue deposit around the hip joint, which further reduces the mobility of the joint and decreases the performance. Stephens Patrick[5] (2004) supports the results of the above study, which shows that smaller hip circumference has better mechanical advantage of trunk mobility than the wider hip circumference.

A On the variable of biceps skin fold once again the non-champion players have higher mean value of 3.73mm than the champion players having mean value of 3.16mm. This exhibits highly significance difference, as t-value is 5.09. The reason for this is that non-winners have more fat deposit in arms, which is responsible for restricted mobility. Singh Kuldeep and Ram Mange [14] (2013) and Cater [2] (1984) supports the result of the above study, which shows that champion players have more muscle mass as compared to non-champion players.

Regarding triceps skinfold the champion players have smaller skinfold thickness 5.53mm and against it non- champion players triceps skinfold mean stands at 5.96mm. The difference between means is significant, as t-value is 3.25.The finding of S. Singh *et.al* [15] (2013) supports the results of the above study, which shows that less fat present in triceps region helps powerful extension of elbow joint during activity.

In case of calf skinfold the champion players have lower mean value of 6.09mm than the non- champion players having mean value of 6.4-mm. This exhibits significant difference, as t-value is 4.54. Findings reveal that winners

have less fat deposit in responsible for better performance by them. The results of Holwaya Francis E and Seara Mariano [11] (2011) were accordance with the above study.

On the variable of subscapular skinfold the champion players have lower mean value of 7.88mm as compared to non-champion players having mean value of 8.37mm. The difference between means is significant, as t-value is 3.1. The findings of Shyamal Koley *et. al.* [10] (2010) supports the findings of the above study. They are of the view that elite athletes possess less fatty tissue when compared to ordinary athletes, which shows that scapular region of winners athletes is better developed which helps the shoulder girdle to work at wider range and to exert maximum power during running, jumping and throwing.

In case of suprailliac skinfold the champion players have lower mean value of 7.96mm as compared to non- champion players having mean value of 8.42mm showing non-significant difference among them as t-value is 4.32. The findings of Cortell-Tormo Juan Manuel *et al.* [9] (2010) support the results of the above study. Smaller skinfold shows that winner athletes have better abdominal muscles when compared to non-winner athletes, which helps them for better mobility of pelvic girdle during activity.

Conclusion

The following conclusions were drawn from the present study. Significant differences exist at $p<0.5$ on the variable of age, time, weight, chest circumference, upper arm circumference, thigh circumference, hip circumference, biceps skinfold, triceps skinfold, calf skinfold, subscapular skinfold and suprailiac skinfold.. No significant differences exist on the variable of height and calf skinfold. From the above results we came to conclusion that before selecting the game or for talent identification coached and physical educationist must compare the physique of individual with the results of the study. Hence we can conclude that specific event need specific kinathropometric measurements, elite sports persons had unique physical attributes than the general population.

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