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Relationship between anthropometric indices and physical fitness of male cross-country athletes

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Abstract
This study aims to find out the anthropometric and physical fitness performance characteristics of inter university male Cross-country players (n=20).of Punjab having age ranging from 18 to 25 years and also to examine the relationship between selected parameters under study. Twelve anthropometric parameters and six general physical fitness tests were taken with standard instruments and standardized techniques. Results of present study revealed that Mean and SD values of anthropometric parameters i.e. body weight, height, sitting height, Upper arm girth, fore arm girth, thigh girth, calf girth, waist girth, Arm span, hand span and foot length were 56.20 ±6.25kg, 169.70 ± 4.65cm, 88.40± 2.29cm, 81.43±2.94cm, 24.25 ± 1.42cm, 23.43 ±1.22cm, 48.28 ±2.67cm, 32.60±21.3cm, 71.73 ±3.92cm, 176.38 ±7.22cm, 22.00 ±1.28cm and 24.35 ±0.88cm respectively and physical fitness parameters like 30m dash, standing broad jump, vertical jump, shuttle run, push ups and sits ups were examined 4.64 ±0.20sec, 212.05 ±13.19cm, 43.70 ±4.92cm, 9.84 ±0.32sec, 23.70±1.45 and 21.00 ±1.30 respectively. On applying coefficient of correlation (r) between anthropometric and physical fitness tests, 30 meter dash has shown highly significant correlation at 5% and 1%with all anthropometric parameters except sitting height, upper arm girth, waist girth and hand span respectively. Standing broad jump (SBJ) has shown significant correlation with all anthropometric parameters at 5% and 1% level. Vertical jump was recorded non-significant correlation with all anthropometric parameters except sitting height (r=0.37*). Shuttle run (4x10m) was reported significant r values with calf girth, arm span, hand span and non-significant correlation with other anthropometric parameters. Push ups (in 30 seconds) has shown highly significant correlation with body weight (0.50**), upper arm girth (0.38*), and arm span (0.40*) and non-significant correlation with all other anthropometric parameters. Non-significant correlation was observed between sits ups (in 30 seconds) and all anthropometric parameters. It was concluded from this study that anthropometric parameters and physical fitness parameters have significant role for talent identification and Selection.

Keywords: Anthropometric variables, physical fitness tests, talent selection, correlation

1. Introduction
Many Scientist has conducted anthropometric and somatotype studies on various sports populations of National and International level (Tanner 1964; Sodhi and Sidhu, 1984), de Garry *et al*. (1974) [4], Carter *et al*, (1984) [3] and Kang *et al* (2005) [10, 11]. The aim of this study was to find out the relationship between anthropometric and physical fitness parameters and also to explore the selected anthropometric and physical parameters of male inter-college Cross-country players, which helps us to select children at early ages for talent identification and to make guidelines and counselling about their body structure and physical fitness.
Cross-country is an endurance sport popular in Northern Europe, Canada and the United States of America. Individual races last 12 to 90 minutes for female athletes, and 22 to 140 minutes for the men, involving downhill, uphill and level skiing. In contrast to distance running and long-distance cycling, cross-country skiing uses both upper and lower body muscles. Athletes spend many years building their aerobic performance capabilities, and this explains why elite cross-country skiers demonstrate increased training age compared to athletes from other endurance sports. An optimum sport-specific body size and body composition is required in order to maximise athletic performance, elite cross-country skiers are as lean as distance runners. However, within the sport itself variations in physiology have been noted being attributed mainly to the body mass of the athletes, with the heavy skiers being faster in all types of terrain, except for the steep uphills, and the light skiers having an advantage on steep

Uphill courses. Anthropometric properties of athletes represent important prerequisite for successful presence at the same sport, effecting athlete's performance and are necessary in order to gain excellent performance of sports skills (Duncan *et al* 2006, Bayios *et al*, 2006, Ibrahim, 2010, Gualdi-Russo & Zaccagni, 2001) [5, 1, 9, 7].

2. Material and Methods

The present study was conducted on male inter-college Cross-country players (N=20) of Punjab state from 20th September 2013 to 30th November 2013 during the course of Interuniversity coaching camp held at Amritsar, Punjab. Twelve anthropometric parameters like height, body weight, Sitting height, leg length, circumferences (like upper arm, fore arm, thigh and calf), arm span, hand span and foot length (Ross *et al*, 1980, Weiner and Lourie, 1969) [16] and Six general physical fitness tests like 30m dash, standing broad jump, vertical jump, shuttle run (4x10), Push ups (in 30 sec) and sit ups were taken with standard instruments and standardized techniques. Appropriate statistic was used to analyse the data.

3. Results and Discussion

Table-1 depicts anthropometric parameters of present study male inter-college Cross-country players of Guru Nanak Dev University. Mean body weight and SD were 56.20 ±6.25kg having range values (upper and lower limit) of 70.30 kg to 47.50kg respectively. Average body height and SD were examined 169.70 ± 4.65cm having maximum and minimum values 180.00cm and 161.0cm respectively. Mean sitting height and leg length was found 88.40± 2.29cm and 81.43±2.94cm respectively. Mean upper arm girth, fore arm girth, thigh girth, calf girth and waist girth were examined 24.25 ± 1.42cm, 23.43 ±1.22cm, 48.28 ±2.67cm, 32.60±21.3cm, and 71.73 ±3.92cm respectively. Arm span, hand span and foot length were also recorded having mean values 176.38 ±7.22cm, 22.00 ±1.28cm and 24.35 ±0.88cm respectively as shown in table-1.

Table 1: Mean, SD and Range values of Anthropometric parameters of Inter-college Cross-country Players (N=20)

	Body Weight (kg)	Body Height (cm)	Sitting Height (cm)	Leg Length (cm)	Upper Arm Girth (cm)	Fore Arm Girth (cm)	Thigh Girth (cm)	Calf Girth (cm)	Waist Girth (cm)	Arm Span (cm)	Hand Span (cm)	Foot Length (cm)
Mean	56.20	169.70	88.40	81.43	24.25	23.43	48.28	32.60	71.73	176.38	22.00	24.35
SD	6.25	4.65	2.29	2.94	1.42	1.22	2.67	2.13	3.92	7.22	1.28	0.88
Maximum	70.30	180.00	92.00	89.00	28.50	27.00	54.50	36.00	80.00	193.50	24.50	26.50
Minimum	47.50	161.00	84.50	75.00	22.00	21.50	43.50	28.00	65.00	163.50	19.50	22.00

Table-2 has shown six physical fitness parameters mean sd. and range values of intercollege male Cross-country players of Guru Nanak Dev University. Average and standard deviation of 30m dash, standing broad jump, vertical jump, shuttle run, push ups and sits ups were 4.64 ±0.20sec, 212.05 ±13.19cm, 43.70 ±4.92cm, 9.84 ±0.32sec, 23.70±1.45 and 21.00 ±1.30 respectively.

Table 2: Mean & SD values of Physical Fitness tests of Inter-college Cross-country Players (N=20)

	30m Dash (Seconds)	Stand Board Jump(cm)	Vertical Jump (Cm)	Shuttle Run (4X10) Sec	Push-ups in 30 Sec. Numbers	Sits ups in 30 Sec. Numbers
Mean	4.64	212.05	43.70	9.84	23.70	21.00
SD	0.20	13.19	4.92	0.32	1.45	1.30
Maximum	5.23	230.00	55.00	10.19	26.00	24.00
Minimum	4.37	185.00	35.50	9.08	20.00	19.00

To find out the relationship between anthropometric and physical fitness parameters of inter-college male Cross-country players, coefficient of correlation (Pearson's coefficient of correlation, r) is applied as seen in table-3. It was examined that 30 meter dash has shown highly significant correlation at 5% and 1%with all anthropometric parameters except sitting height, upper arm girth, waist girth and hand span respectively). Standing broad jump (SBJ) has shown significant correlation with all anthropometric parameters at 5% and 1% level.

Table 3: Correlation Matrix between Anthropometric and Physical fitness Parameters of Inter-college Cross-country Players (N=20)

		30 m Dash (sec)	Standing Broad jump (cm)	Vertical Jump (cm)	Shuttle Run (4x10m)	Push Ups (30 sec)	Sits Ups (30 sec)
1	Body Weight (kg)	-0.43*	0.53**	0.15	-0.33	-0.50**	0.08
2	Height (cm)	-0.56**	0.76**	0.34	-0.15	-0.36	-0.01
3	Sitting Height (cm)	-0.34	0.61**	0.372*	0.20	-0.25	-0.06
4	Leg Length (cm)	-0.55**	0.59**	0.16	-0.28	-0.27	0.15
5	Upper Arm Girth (cm)	-0.28	0.37*	0.05	-0.24	-0.38*	0.21
6	Fore arm Girth (cm)	-0.36	0.39*	0.19	-0.25	-0.28	0.25
7	Thigh girth (cm)	-0.41*	0.45*	0.11	-0.33	-0.51**	0.01
8	Calf Girth (cm)	-0.57**	0.74**	0.35	-0.45*	-0.50**	-0.03
9	Waist (cm) Girth	-0.24	0.30	-0.07	-0.12	-0.12	0.09
10	Arm Span (cm)	-0.394*	0.55**	0.12	-0.45*	-0.40*	0.01
11	Hand Span (cm)	-0.32	0.38*	-0.04	-0.63**	-0.21	-0.17
12	Foot length (cm)	-0.45*	0.52**	0.20	-0.31	-0.12	0.07

* Significant at 5% Level (0.367), ** Significant at 1% Level (0.470)

Vertical jump was recorded non-significant correlation with all anthropometric parameters except sitting height (r=0.372, significant at 5% level). Shuttle run (4x10m) was reported significant r values with calf girth, arm span, hand span and non-significant correlation with other anthropometric parameters. Push ups (in 30 seconds) has shown highly significant correlation with body weight (0.50**), upper arm girth (0.38*), and arm span (0.40*) and non-significant correlation with all other anthropometric parameters. Non-significant correlation was observed between sits ups (in 30 seconds) and all anthropometric parameters.

4. Conclusion

The above mentioned research work revealed the correlation between the anthropometric characteristics and Physical fitness parameters of cross country athletes of Punjab state. Following conclusions are made, such as the Mean and SD values of twelve anthropometric parameters body weight, height, sitting height, Upper arm girth, fore arm girth, thigh girth, calf girth, waist girth, Arm span, hand span and foot length were 56.20 ±6.25kg, 169. 70 ± 4.65cm, 88.40± 2.29cm, 81.43±2.94cm, 24.25 ± 1.42cm, 23.43 ±1.22cm, 48.28 ±2.67cm, 32.60±21.3cm, 71.73 ±3.92cm, 176.38 ±7.22cm, 22.00 ±1.28cm and 24.35 ±0.88cm respectively. Mean and Standard deviation of six physical fitness parameters like 30m dash, standing broad jump, vertical jump, shuttle run, push ups and sits ups were examined 4.64 ±0.20sec, 212.05 ±13.19cm, 43.70 ±4.92cm, 9.84 ±0.32sec, 23.70±1.45 and 21.00 ±1.30 respectively. 30 meter dash has shown highly significant correlation at 5% and 1%with all anthropometric parameters except sitting height, upper arm girth, waist girth and hand span respectively. Standing broad jump (SBJ) has shown significant correlation with all anthropometric parameters at 5% and 1% level. Vertical jump was recorded non-significant correlation with all anthropometric parameters except sitting height (r=0.372, significant at 5% level). Shuttle run (4x10m) was reported significant r values with calf girth, arm span, hand span and non-significant correlation with other anthropometric parameters. Push ups (in 30 seconds) has shown highly significant correlation with body weight (0.50**), upper arm girth (0.38*), and arm span (0.40*) and non-significant correlation with all other anthropometric parameters. Non-significant correlation was observed between sits ups (in 30 seconds) and all anthropometric parameters.

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