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COMPARING SOME OF ANTHROPOMETRIC, BIO-MECHANIC AND PHYSIOLOGIC PROPERTIES OF MALE ELITE CRICKETERS OF IRAN AND PAKISTAN

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ABSTRACT

The aim of the present study was comparison of some anthropometric bio-mechanic and physiologic properties of male elite cricketers of Iran and Pakistan.

Fourteen Iranian cricketers with averages of 25.57±7.13 year old, height of 176.5±8.406 cm, weight of 70.24±8.98 kg, and fourteen Pakistani ones with averages age of 25.19±4.04 year old, height of 188.91±1.97 cm and weight of 77.25±4.14 kg have been studied, for this purpose. Variables like height, weight, skinfold thickness at 8 common cryotherapy sites, fat weight, systolic and diastolic blood pressure, VO_2max and physical type were gauged. In addition, descriptive statistical methods (mean and standard deviation) and perceptive one (t-student test) were used.

The present results showed that bio-mechanic, physiologic and anthropometric properties (sitting height, height, hip circumference, Mid-Upper Arm Circumference (MUAC), waist circumference, chest circumference, VO_2max, anaerobic power and agility speed) of Pakistani players were superior to those of Iranian ones. However, there was not observed any significant difference in (thigh circumference, strength, endurance, flexibility and endurance in sprint).

Hence, according to the importance of bio-mechanic, physiologic and anthropometric properties for cricket playing, one of the factors that might cause better performances of the Pakistani players to those of the Iranian athletes were the superior mentioned properties of the Pakistani squad.

Keyword: Cricket, Anthropometric Properties, Physiologic Properties, Bio-mechanic Properties

INTRODUCTION

Cricket is an interesting and exiting sport that could attract many fans in some countries specially Pakistan and nowadays Iran. Therefore, in order to develop this field, knowledge about bio-mechanic, physiologic and anthropometric properties of elite athletes are required. This information could be used in exclusive program planning, explanation of strengths and weaknesses of each athlete, avoiding overtraining or low training, comparison of fitness profiles to the superior norms, enhancement of performance predictability, talent hunting, stimuli generation for performance enhancement, preventing injuries, and providing an appropriate reference for future studies **[1]**. Triumph of many sports depends mainly to legs explosive power of the athlete and their muscular strength. This means, the athlete should be able use rapidly his legs with large force of strength, as can as possible **[2]**. Many researches showed elite athletes of each sport field have specific physiologic properties **[3]**. Stuelcken et al (2008) compared physical decomposition of male and female cricketers and concluded that there are differences between the two genders. Because of higher height and larger muscle mass, bowling ball speed of men are faster than that of women, and female cricketers are more endomorph and less mesomorph **[20]**. David et al (2006) compared body composition and strength of youth and adult cricketers to bowling ball speed and deduced bowling ball speed of adults was more than that of youths, because the adult throwers have larger muscle mass and more strength than the youths **[9]**. Koley et al (2010) predicted bowling ball speed through body composition, bio-mechanic and isokinetic power of shoulder and knee muscles, and concluded that these parameters has remarkable linkage to ball speed **[14]**.

According to the above-mentioned issues and the shortage of any standard criteria for authoritative and valid assessment of cricketers' readiness, it is intended to survey desirable bio-mechanic, physiologic and anthropometric properties in cricket sport,

through investigation of physical readiness of Iranian cricketers and comparison to that of Pakistani ones. Since cricket is a new sport in Iran, talent hunting of this field has a great significance, according to the enormous potential of the country. Hence, it is intended to investigate and compare some of bio-mechanic, physiologic and anthropometric properties of Iranian and Pakistani male elite cricketers.

SUBJECTS AND METHODS

Statistical Society

The statistical society of the research consisted of elected Pakistan cricket national team (14 persons) and that of Iran (14 persons). Before the research beginning, the whole stages were completely described to the players, and they participated in the study, voluntary and consciously. According to the research sketch, body and body composition measurements were done at one day, and physiologic and physical readiness test were executed, at two successive days. Nutrition of the subjects was controlled from one week before the tests execution and during the research. In this duration, the players were in camp and ate the same foods. In addition, they were asked to avoid consumption of any sports supplements.

Body composition and Anthropometric Indices

In order to gauge the body composition, the subject were demanded to attend in the measurement hall, with no breakfast, in the morning. At first, their weights and heights were measured by a digital scale and a height gauge (Seca model), with accuracies of 0.1 kg and 1 mm, respectively. Thereafter, their fat bodies from the eight common cryotherapy sites were measured by Harpenden skinfold caliper (Baty Co., made in England). The whole measurements the body, consist of the circumferences (waist, hip, abdomen, forearm, arm, thigh and shank), lengths (standing and sitting heights) by anthropometric meter, and diameters (wrist, knee and elbow) by caliper and form the right side of the body, were recorded, upon the Isaac method.

Physical Readiness and Physiologic Indices

After 30 min rest, heartbeat rate and blood pressure were gauged by analogue pressure gauge (ALR K2 model, made in Japan). The physical readiness measurements were performed in the multi-purposes gym. The concerning measurements included aerobic capacity (1 mile running), anaerobic power (RAST), sprint (40 yards), agility (4×9 m sprint) endurance of abdominal muscles (1 min sit-up), flexibility (forward trunk flexibility), strength (claw; dynamometer Jamar model, made in USA), endurance in

sprint (20×10 m running) and balance (stork test).

Statistical Approach

In order to describe the collected data, descriptive statistical method in a comparative manner was implemented. In addition, Kolmogorov-Smirnov test was utilized to approver naturalness of data distribution, and independent t-test was used to determine correlation between the measured variables. All of statistical analyses were achieved by SPSS v.22. The significant level was set at the level of P=0.05, for the entire statistical calculations.

RESULTS

After measurement and analysis of variables, mean and standard deviation of individual properties were presented in **Tables 1-4**.

As has been observed in **Table 4**, VO_2max, minimum power, maximum power, average power, fatigue index, sprint and balance of Pakistani players were superior to those of Iranian players, and agility of Iranian players was better than that of Pakistani players, and also the two group had almost the same endurance in sprint, flexibility, strength and endurance.

Table 1: Mean and standard deviation ($\bar{X}$ + SD) of anthropometric properties in the two groups

Property	Iran cricket team (n=14)	Pakistan cricket team (n=14)
Height (cm)	176.5±806	188.91±1.97
Sitting Height (cm)	96.21±6.24	101.97±5.04
Two hands width (cm)	175.28±8.17	176.35±7.58

As has been seen in table 1, Pakistani players are taller and heavier than Iranian ones

Table 2: Anthropometric indices (body circumferences) of the two groups

Property	Iran cricket team (n=14)	Pakistan cricket team (n=14)
MUAC	32.42±3.81	43.15±6.25
Chest circumference (cm)	90.42±5.38	94.99±6.00
Waist circumference (cm)	80.42±6.55	89.22±6.29
Hip circumference (cm)	93.50±3.50	104.18±5.09
Thigh circumference (cm)	54.42±3.22	57.51±3.22

As has been observed in table 2, the body parts circumferences of Pakistani players were larger than Iranian ones.

Table 3: Anthropometric indices (aggregate skinfold thickness) in the two groups

Property	Iran cricket team (n=14)	Pakistan cricket team (n=14)
Aggregate skinfold thickness (cm)	174.17±85.53	165.64±30.45

As has been indicated in table 3, the aggregate skinfold thickness of Iranian players was more than Pakistani ones.

Table 4: physical abilities and physiologic indices in the two groups

Property	Iran cricket team (n=14)	Pakistan cricket team (n=14)
VO_2max	77.27±5.60	80.85±2.08
Sprint	5.48±0.37	4.64±0.34
Minimum power	339.37±158.29	495.18±168.35
Maximum power	578.05±327.91	786.53±129.24
Average Power	459.36±233.8	625.63±148.70
Fatigue index	12.61±8.71	18.22±4.50
Strength	233.07±29.31	236.79±54.94
Endurance	30.85±14.90	38.28±13.41
Agility	10.00±0.65	8.76±0.84
Flexibility	33.71±9.42	32.74±7.04
Endurance in sprint	112.23±19.17	112.86±16.11
Balance	78.93±31.01	76.06±15.11

Table 5: Analysis of anthropometric indices of the two groups (cm)

Property	Statistics / Group	Differences of the means	DoF	t value	P
Height	Iran	12.41	26	5.26	0.000
	Pakistan				
Sitting height	Iran	5.75	26	2.68	0.012
	Pakistan				
Two hands width	Iran	1.07	26	0.36	0.72
	Pakistan				
Skinfold thickness	Iran	8.52	26	0.35	0.72
	Pakistan				
MUAC	Iran	9.72	26	4.96	0.000
	Pakistan				
Chest circumference	Iran	4.56	26	2.11	0.044
	Pakistan				
Waist circumference	Iran	8.79	26	3.62	0.001
	Pakistan				
Hip circumference	Iran	10.68	26	6.46	0.001
	Pakistan				
Thigh circumference	Iran	3.08	26	1.76	0.090
	Pakistan				

Table 6: Analysis of physiologic indices of the two groups

Property	Statistics / Group	Differences of the means	DoF	t value	P
VO_2max (ml/kg/min)	Iran	3.58	26	2.24	0.034
	Pakistan				
Minimum power (w)	Iran	80.155	26	52.2	0.018
	Pakistan				
Maximum power (w)	Iran	208.48	26	2.21	0.036
	Pakistan				
Average Power (w)	Iran	166.26	26	2.247	0.033
	Pakistan				
Fatigue index (w/s)	Iran	5.61	26	2.12	0.043
	Pakistan				

Table 7: Analysis of bio-mechanic indices of the two groups

Property	Statistics / Group	Differences of the means	DoF	t value	P
Strength (kg)	Iran	13.72	26	0.82	0.41
	Pakistan				
Endurance (s)	Iran	7.42	26	1.38	0.17
	Pakistan				
Agility (s)	Iran	1.23	26	4.34	0.000
	Pakistan				
Flexibility (cm)	Iran	0.97	26	0.30	0.76
	Pakistan				
Endurance in sprint (s)	Iran	0.62	26	0.09	0.92
	Pakistan				
Balance (s)	Iran	18.72	26	2.40	0.024
	Pakistan				
Sprint (s)	Iran	0.83	26	6.12	0.000
	Pakistan				

As has been observed in **Tables 5, 6 and 7**, there are significant differences between the two groups in height (t=5.26 and P=0.000), sitting height (t=2.68 and P=0.012), arm (t=4.96 and P=0.000), chest (t=2.11 and P=0.044), waist (t=3.62 and P=0.001) and hip (t=6.46 and P=0.001) circumferences. In addition there are significant differences between the two groups in VO_2max (t=2.24 and P=0.034), minimum (t=2.56 and P=0.018), maximum (t=2.21 and P=0.036), average (t=2.24 and P=0.033) powers. In addition there are significant differences in fatigue index (t=2012 and P=0.043), agility (t=4.34 and P=0.000), balance (t=2.40 and P=0.024) and sprint (t=6.12 and P=0.000), between the two groups.

In the other hand, there was not observed any significant difference in two hand width (t=0.36 and p=0.72), fat thickness (t=0.35 and P=0.72) and thigh circumferences (t=1.76 and P=0.09), between the two groups. In addition, there was not seen any significant difference in strength (t=0.82 and P=0.41), endurance (t=1.38 and P=0.17), flexibility (t=0.30 and P=0.76) and endurance in sprint (t=0.09 and P=0.92), between the two squads.

DISCUSSION

Bio-mechanic and Physiologic Parameters

The results of the present study showed there were significant differences between the two groups in some of physical readiness parameters, and Pakistani cricketers had higher physical readiness than Iranian ones. These results indicated Iranians' and Pakistanis' VO_2max as 77.27 (ml/kg/min) and 80.85 (ml/kg/min), respectively. That means 3.58 (ml/kg/min) fewer VO_2max of Iranians in comparison to that of Pakistanis, and denotes a significant decrease in VO_2max

Iranian players to that of Pakistanis. It appears, the persons, who have higher level of physical readiness, would have higher level of VO_2max, and they could practice and perform at higher levels of intensity than other people that have not these great levels of VO_2max **[4]**.

Greater aerobic power could increase the retrieve speed, in the rest time, and improve performance quality of the athlete, in such a way **[17, 19]**. The studies on other sports athletes (like football, rugby etc.) showed similar results, which aerobic and anaerobic powers of the athletes enhance versus their technical level heightening **[18]**.

Regarding to the lower level of VO_2max among Iranian players that that of Pakistanis, perhaps the weaker performance of Iranian cricketers could relate to their lower VO_2max. Nevertheless, the other influencing factors like age, weight and heredity should not be neglected **[5]**.

Another result of the present study showed the fatigue index of Iranian players and Pakistani ones as 12.6 (w/s) and 18.22 (w/s), respectively. That means 5.61 (w/s) fewer fatigue indices of Iranians compared to those of Pakistanis. In addition, these results denoted the cardiovascular endurance level of Iranian players was lower than that of Pakistanis, because they had more heartbeat. A stunning cardiovascular endurance could delay players' fatigue. Perhaps, one of the other probable reasons of the superior performance was better cardiovascular endurance of Pakistanis cricketers than that of Iranians players.

In addition, the present results showed the averages of sprint and balance among the Pakistani players were 0.84 s and 2.87 s shorter to those among the Iranians, respectively. Regarding to the point that sprint is a genetic property, and genetic is the determining factor about sprint **[16]**. Upon this issue, sprint trainings are needed, to achieve the peak of individual sprint. Enhancement of maximal sprint depends to some factors like strength, power, flexibility, anaerobic capacity and power, and aerobic power **[4]**. Results of some researches denoted the black race has greater genetic sprint properties in comparison to the other races **[15]**. Therefore, some reasons about sprint weakness of Iranian players might relate to their lower levels of VO2max and anaerobic power, and even their genetic, according to the results of the present study.

There was not reported any significant difference in flexibility, between the two groups. Since the right and appropriate performance in stressful conditions needs desirable flexibility, the flexibility (as a

physical readiness factor) has its remarkable significance. In addition, the desirable flexibility could reduce injuries of the players, and the coaches should further emphasis on flexibility trainings in their training schedules, accordingly **[5]**.

Anthropometric Parameters

The results of the present study indicated that the anthropometric parameters (sitting height, height, hip circumference, MUAC, waist circumference and chest circumference) of Pakistani players are significantly greater than those of Iranians, but the differences in two hands width and thigh circumference were not significant. Level executions of some movements have direct relations to body mass, gender and age, and these factors affect on the abilities. Body parts' sizes and different body sizes affect on sports movements' executions **[6]**. Hence, one of the factors that might cause the superior crick playing level of the Pakistanis than the Iranian squad was the existence of different anthropometric properties between the two groups, regarding to the significance of anthropometric parameters in sports executions.

Several researches have denoted the relation between anthropometric parameters and physical readiness factors. Salimi Avansar et al (2013) studied body composition, anthropometric and physical readiness profiles of youngster volleyball players of Iran national team, and deduced there are significant linkages between body composition factors, anthropometric indices, and physical readiness and physiologic parameters. Their investigated body composition factors consist of weight, BMI, waist to hip ratio WHR, fat percentage and muscle mass. Besides, their surveyed anthropometric indices involved circumferences (waist, hip, abdomen, forearm, arm, thigh and shank), diameters (wrist, elbow and knee) and length (standing height, accessible height, two hands, forearm, thigh and shank). In addition, their studied physical readiness and physiologic parameters included heartbeat rate, blood pressure, BMR, long jump, horizontal bar tension, sit up, 20 min sprint, 4×9 agility, attack jump, block jump, anaerobic power, aerobic capacity, explosive power and flexibility **[8]**.

In another research, Agha-Alinejad et al (2006) studied the description and determination of the relations between physiologic and anthropometric properties and taekwondo players' triumph. They concluded that BMI, speed, anaerobic power, agility, fat percentage and reaction time had significant linkages to the success of superior female taekwondo players **[4]**.

Lockie et al (2013) analyzed sprint properties of cricketers and reported that the maximal running speed is 17.68 m, for the sprint test in cricket sport. There are three tests with potential values that used for evaluation of sprint in cricket. For example, Bat resistance trainer is carried out during the game, when the replacement occurs between the wickets **[21]**.

David et al (2006) surveyed strength and body composition properties of youth and adult cricketers and compared their relations to the speed of fast bowling ball. They deduced the adults are faster throwers than the youths, because the adults have greater strength and body mass than the youths **[9]**. Koley et al (2009) investigated anthropometric profiles of Indian cricketers and included that there were significant differences in body fat, weight thigh length, height and strength between cricketers and control group **[12]**.

Many scientists have reported the relation between body structure and specific performance requirements, for doing various functions. The research results denoted that the anthropometric properties of each person are one hundred percent unique. The major reason of this issue is the heredity and the other one is the environmental factors that the person encounters to them, from birth to death. Hence, specific physical properties or anthropometric profile indicate whether the athlete could be triumphant is a sport field or not. Cricket is an endurance sport, which is playing during the year. Therefore, the level of activity and exercise is a substantial factor in the triumph of the athletes, and one of the probable reasons of the difference between Iranian cricketers and Pakistani ones is the difference in their levels of trainings. Koley et al (2012) deduced that the cricketers were taller and have fewer BMI than the control group **[11]**. In addition, they had other differences in anthropometric properties. The existence of differences in anthropometric properties, especially among the cricket athletes, is another reason of the difference between Iranian cricketers and Pakistani ones **[13, 14, 20]**.

CONCLUSION

The two factors of heredity and environment are proposed about winning achievement and triumph of the athletes. The knowledge of individual differences is necessary, regarding to the matter that the championship achievement in various levels could be rooted in the relationship between the human and the mentioned factors. Sports fields and specific skills of each certain field need a combination of some parameters like; body structure, strength, endurance, power, agility and reaction speed, etc.

The anthropometric indices are the ones that transfer to the human genetically. At the championship level, the shortage of desirable anthropometric indices is only same as the waste of expense and time of the instructors and the athlete, of course.

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