

HEIGHT, WEIGHT AND MOTOR PERFORMANCE IN RELATION TO SKELETAL AGE IN ATHLETIC GIRLS

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Abstract: The data for the present cross-sectional study have been collected on 174 sports girls and 166 controls ranging in age from 11.5 to 17.5 years. Radiographs of left hand and wrist were taken by following TW2 method. Height, weight and motor performance tests were taken by following standard techniques. The results of the present study reveal that athletic girls and controls do not differ in height and weight at matched maturity status. At all maturing level sports girls possess greater explosive power of legs, strength of abdominal muscles, and are more agile with better speeds as compared to controls.

Keywords: Height; Weight; Motor performance; Skeletal age.

Introduction

During growth, performance of children to a certain extent is influenced by the maturity status of the children. Beunen et al (1976) found a low negative correlation between skeletal age and trunk strength, functional strength and running speed of boys at the age 12 and 13 and there after increase has been noticed. Beunen et al (1976) reported that late maturing girls tend to have better results in functional strength than advanced maturing ones due to less body weight. Malina (1986) also concluded that females successful in sports tend to be on an average delayed in maturity status. A relation between skeletal maturity and motor performance has been studied by many authors (Beunen et al 1974, 1976, 1981, 1982, Clarke and Patersen 1961, Espenschade 1940). The objective of the present study is to report relationship between maturity status and motor performance of Punjabi girls.

Material and Methods

The data for the present cross-sectional study have been collected on 174 athletic girls and 166 controls ranging in age from 11.5 to 17.5 years. The girls who regularly played games and participated at least in district level competitions were designated as sports girls, however, most of the sports girls have either participated in state or national level school competitions. The players belonging to various games like kabaddi, kho-kho, hockey, athletics, swimming, gymnastics, basketball, handball, volleyball, football, judo and archery were included in the study. The girls who were apparently healthy and who had neither regularly played games nor participated in any competition were termed as controls.

The data have been collected from September 1992 to September 1993. In order to assess skeletal age of individuals radiographs of left hand and wrist were taken following

TW2 method (Tanner et al 1975). The data on control girls were collected from Govt. Senior Secondary School, Pheel Khana, Patiala.

Height and weight of each individual were taken by following the techniques of Weiner and Lourie (1969). Motor ability was measured by standard methods in respect of explosive power of legs through standing broad jump, agility through shuttle run and fan test, abdominal strength through sit ups in 60 sec and speed through 30 m and 50 m dash. All these tests were taken by following the techniques as per AAHPERD (1976). In order to match skeletal maturity status, skeletal age groups have been made from 11.5 to 16 years of 20 bone age. Mean age of the group is depicted as a whole year figure e.g. skeletal age group 12 includes all girls having the skeletal age of 11.5 to 12.4 years. Similarly, other groups have been made, but the last group i.e. skeletal age group of 16 years includes the girls from 15.5 to 16.0 years because we can assign adult skeletal age only up to 16 years to a mature hand.

Results and Discussion

Table 1 shows that athletic girls on an average are 143.68 cm tall at 12 years and 155.57 cm tall at 16 years, indicating an increase of 11.89 cm from 12 to 16 years of skeletal age. Maximum magnitude of growth in height (6.77 cm) is found at 14 years of skeletal age. The body weight is found to increase from 30.27 kg at 12 years to 44.64 kg at 16 years, thus resulting in a total gain of 14.37 kg, during the growth period of the study. Similarly in the controls an increase in stature (16.37 cm) and weight (15.55 kg) has been noticed from 12 to 16 years of skeletal age (Table 2). When sports girls are compared with controls, no significant difference in height and weight has been observed except for height at 12 years. Thus, it can be generalised that at matched maturity status, differences in height and weight between sports girls and controls disappear. Similar results have been also reported in a sample of sports boys and controls (Singh 1992).

Explosive power of legs as measured through standing broad jump has been found to decrease from 12 (166.03 cm) to 16 (154.13 cm) years of skeletal age. Peak performance has been noticed at 12 years of skeletal age in sports girls. Whereas in controls power has been found to increase with increasing maturity level. Peak performance in this test has been noticed at 14 years of skeletal age. It has been observed that in all maturity groups sports girls possess greater explosive power of legs than controls, however significant differences exist at the skeletal age of 12 and 16 years (Table 3).

Agility was measured through shuttle run and fan test. Sports girls of 12 years skeletal age take 12.14 sec and 32.99 sec to complete shuttle run and fan test, respectively, whereas sports girls of 16 years skeletal age complete these tests in 12.38 sec and 33.61 sec, showing thereby that agility decreases with increasing maturity status. Whereas opposite trend has been observed in case of control girls. Peak performance in agility tests has been found at skeletal age of 12 years in sports girls and 15 years in controls. Sports girls of all skeletal ages are more agile than controls however significant differences exist at 12, 14 and 16 years (Table 3).

Table 1: Mean and SD of height, weight and certain motor abilities of athletic girls from 12 to 16 years of skeletal age

Skeletal age (yrs)		Height (cm)	Weight (kg)	St. br. jump (cm)	Shutt. run. (sec)	Fan test (sec)	Sit ups (per min)	30 m (sec)	50 m (sec)
12	N	18	18	15	15	15	15	15	15
	Mean	143.68	30.27	166.03	12.14	32.99	22.86	6.05	9.56
	SD	6.48	4.63	25.6	1.05	2.04	10.81	0.42	0.86
13	N	20	20	19	19	19	18	19	19
	Mean	147.74	34.83	154.61	12.64	34.88	22.77	6.02	10.41
	SD	5.44	4.86	24.87	0.73	2.07	8.67	0.52	0.68
14	N	39	39	34	33	33	32	33	33
	Mean	154.51	41.63	161.07	12.53	33.72	24.25	5.83	9.67
	SD	5.61	5.69	16.91	1.16	2.58	11.68	0.75	1.33
15	N	21	21	19	19	19	19	19	19
	Mean	153.94	42.64	158.22	12.46	33.43	17.73	5.83	9.62
	SD	5.97	6.72	16.54	1.22	2.89	8.45	0.43	0.75
16	N	76	76	69	68	68	63	68	68
	Mean	155.57	44.64	154.13	12.38	33.61	19.25	5.83	9.76
	SD	5.27	5.76	18.56	1.09	2.74	9.24	0.83	1.23

Table 2: Mean and SD of height, weight and certain motor abilities of non-sports girls (controls) from 12 to 16 years of skeletal age

Skeletal age (yrs)		Height (cm)	Weight (kg)	St. br. jump (cm)	Shutt. run. (sec)	Fan test (sec)	Sit ups (per min)	30 m (sec)	50 m (sec)
12	N	12	12	12	12	12	12	12	12
	Mean	137.91	30.38	136.00	13.32	36.01	16.00	6.43	10.22
	SD	4.09	6.33	9.05	0.87	2.26	9.41	1.43	0.98
13	N	23	23	23	23	23	23	23	23
	Mean	147.81	36.76	147.37	13.08	35.49	20.50	6.12	10.20
	SD	5.04	5.31	18.53	1.00	2.37	10.47	0.53	0.92
14	N	21	21	21	21	21	20	21	21
	Mean	152.10	39.29	153.07	13.17	36.01	20.00	6.03	10.42
	SD	6.29	6.17	21.31	0.82	2.82	9.54	0.67	1.60
15	N	13	13	11	11	11	11	11	11
	Mean	153.00	42.77	149.27	13.00	35.28	20.80	5.71	9.52
	SD	5.41	9.19	15.04	1.00	3.11	6.90	0.25	0.97
16	N	97	97	86	86	88	75	86	86
	Mean	154.28	45.93	143.20	13.15	36.32	14.97	6.22	10.56
	SD	5.28	8.15	20.36	0.96	3.60	7.47	0.71	1.06

Table 3: Differences of height, weight and certain motor abilities of sports non-sports girls (controls) from 12 to 16 years of skeletal age

Skeletal age (yrs)	Height (cm)	Weight (kg)	St. br. jump (cm)	Shutt. run. (sec)	Fan test (sec)	Sit ups (per min)	30 m (sec)	50 m (sec)
12	2.99*	0.04	4.23*	3.17*	3.59*	1.76	2.32*	1.80
13	0.04	1.24	1.05	1.65	0.87	0.75	0.60	0.83
14	1.47	1.44	1.46	2.36*	3.02*	1.43	1.01	1.78
15	0.47	0.04	1.52	1.32	1.61	1.04	1.00	0.31
16	1.61	1.21	3.48*	4.56*	5.36*	2.95*	3.07*	4.25*

* Significant at 5% level

The strength endurance of abdominal muscles was measured by sit ups executed in one minute. Sports girls of 12 year skeletal age executes on average 22.86 sit ups, 3.61 sit ups more than girls of 16 year skeletal age group (19.25). However, peak performance has been noticed at skeletal age of 14 years. Whereas in controls, an increase in strength has been observed from 12 to 15 years of skeletal age and decline at 16 years. At all maturity levels, sports girls are found to possess greater strength endurance of abdominal muscles than the controls, however differences are significant only at the skeletal age of 16 years.

Speed was measured through 30 m and 50 m dash. It has been found that with increase in skeletal age, the improvement in 30 m and 50 m speed tests is negligible in sports girls. Whereas in controls improvement in 30 m and 50 m has been seen from 12 to 15 years of skeletal age.

Thus, from the above results, it is clear that athletic girls and controls do not differ in body measurements at matched maturity status. Still they differ in motor performance tests. Sports girls possess greater explosive power of legs, strength of abdominal muscles, and are more agile with better speeds as compared to their counterparts. Peak performance in explosive power and agility has been observed at the skeletal age of 12 years in sports girls and 15 years in controls. Thus the results indicate the attainment of peak values 2-3 years earlier in sports girls than the control. The attainment of earlier maturity in various motor performance tests may be ascribed to the nature of various physical activities in which they are engaged. Physical activity in some way or the other helps the sports girls to attain mature values at an early age as compared to the control girls.

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