Growth and Motor Development of 9-14 Years Girls of Northern India

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ABSTRACT

The present study have been conducted on 600 untrained girls (100 of each group) of north India, during the selection trials for various SAI schemes at different time and places (trials from Punjab, Haryana, Himachal Pradesh, Jammu Kashmir; Chandigarh). Two growth parameters (body height & body weight) and six motor ability tests (Forward bend and reach, standing broad jump, 6 x10m shuttle run, 30 meters sprint, medicine ball put and 800 meter run) were conducted by using standard instruments and standardized techniques. The results revealed that there is a progressive increase in body height and body weight of untrained girls and have shown significant differences (Anova 'f ' values & post hoc 't' test values) among all age groups from 9-14 years. It was investigated that progressive improvement in leg strength, running speed, agility and endurance of untrained girls of 9-14 years age groups (significant 'f ' values and post hoc 't' test values were examined). There is no progressive development in arm and shoulder strength and trunk flexibility in 9 to 14 years old girls (non-significant 'f ' values were recorded). There were found non-significant differences between progressive year-wise mean values of almost all the age groups except between 10 & 11years and 12 & 13 years, in leg strength, 9 & 10 years in agility and 13 & 14 years in body weight.

Key words

Height, Body Weight, Endurance, Agility, Speed, Strength, Flexibility.

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INTRODUCTION

Motor development is the most important aspect of growth and development, which has direct implications for training children, the growth and development of motor abilities and their accurate assessment definitely helps in identifying the talented children and also formulating scientific training programme for the children and youth of different age groups; so that it leads to the achievement of high performance at the right age and also to preclude any negative or harmful effect of training on them. (Negi, 1996). The science of growth and development has become crucial for sports performance, because it is being studied from different aspects in order to utilize its knowledge maximally to enable the children/youth to achieve high performance when they grow up. (Reilly et al, 2000).

Countries which are sports conscious and have achieved higher ranking in the international competitions, and want to maintain their higher ranking, have long since realized the importance of studying growth and motor development of their children and youth .The study of various aspects of motor development, especially the development of motor abilities and their assessment, have been an area of interest for physical education teachers, sports coaches and sports scientists, for many years, and this still continues with greater momentum.

Sports science provides essential support for the development of sports at all levels. Fitness testing and analysis of performance are just some of the ways sports science interface with today's sportsmen and women. The training in childhood has to be such that the growth and development is positively affected and fully exploited for achieving high performances in the age of high performance. The motor development of untrained children has been studied quite extensively; but, the motor development of children undergoing systematic sports training has been scantily explored.

Athletic ability in girls reached the maximum at the age of 13 or 14 years then tended to decline so that a six year old girl usually had a better performance than a girl of 18 years of age (Morehouse & Miller,1968; Espenschede, 1956)

Study of motor development patterns of trained girls were found superior to untrained girls, on selected motor performance, at every age level. The trend of improvement is rapid up to 13 or 14 years of age; after that the trend seems to be slow or stagnated or deteriorated (Ghai and Negi, 2007).

India, unlike the countries of Europe and America, is a vast country inhabited by people of different racial origins, and living under vastly different geographical, economical and socio-cultural conditions. This feature, therefore, makes the study of motor development pattern of Indian children more important. Speed, strength, flexibility, endurance and agility are to be considered an essential element for players' success; yet,

it remains one of the most under researched areas of sports performance. Basic movement structures are of vital importance for successful participation in any sport. If the movement technique is better, the athlete achieves better effects of a training process and is more effective in competition.

Keeping these objectives in mind, the investigator has made an attempt to study the growth and motor development pattern of untrained Indian girls.

METHODOLOGY

The data of 600 untrained girls (100 of each group) was collected during the selection trials for various SAI schemes, at different time and places (trials from Punjab, Haryana, Himachal Pradesh, Jammu Kashmir; Chandigarh).

The following motor ability tests was conducted by using standard instruments and techniques.

	Test	Measurement(unit)	Variables
1	Forward bend and reach	Centimeter(cms)	Trunk Flexibility
2	Standing broad jump	Meter(mts)	Leg Strength
3	6 x10m shuttle run	Second(sec)	Agility
4	30 mts sprint	Second (sec)	Speed
5	Medicine ball put	Meter(mts)	Arm Strength
6	800 meter run	Minute(min)/second	Endurance

Appropriate statistics (Mean, SD, ANOVA 'F' test and Post hoc 't' test ratio) was used to analyze the data (Nelson & Johnson, 1970).

RESULTS & DISCUSSION

The results of this study were given below in table-1 depicting various variables of growth and motor development

Body Height (Cm)

There is an improvement in the height values, progressively, in all age groups from 9 to 14 years. Though there was stagnation in the height during 9 and 10 years age, but a rapid and continuous increase has been observed from 11 to 14 years age group. From Table 3, it is clear that the height values of selected groups of girls were improving progressively. The differences between progressing years were non-significant, in all the groups, from 9 to 14 years age group. In Oehmisch's (1970) study, it was reported that girls develop fast in early ages; and with advancement of age the maturation process takes place; due to which, the rate of growth slows down and fewer changes take place in physique and composition of the girls. The present study has shown similar results as

given by Negi (1996) i.e. height has shown significant differences from age 9 to 13 years, but has shown non-significant differences from 13 to 14 years respectively. From these mean and SD values of the Table 1, it was found that calculated 'f '-value is more than tabulated 'f ' value. Hence, a significant difference existed in height. The post hoc test was applied to test the significance of differences among means of each age group separately, and the results are presented in Table 2.

Table-1 : Means, SDs and ANOVA 'F' values of Anthropometric and Motor Development Variables of 9 to 14 age groups of Northern Indian girls

S. No.	Growth & Motor Depelpment Variables		9 Years	10 Years	11 Years	12 Years	13 Years	14 Years	ANOVA 'F' Test Value
		N	100	100	100	100	100	100	
1	**Body height (cm)**	Mean	136.4	136.4	142.1	146.0	150.6	153.14	27.00**
		SD	20.41	8.34	8.97	7.99	3.46	6.31	
2	**Body weight (kg)**	Mean	27.68	29.95	32.92	35.09	37.53	36.50	68.56**
		SD	6.37	5.97	6.63	6.54	4.62	6.95	
3	**Standing broad jump (cm)**	Mean	1.46	1.47	1.60	1.57	1.69	1.73	19.13**
		SD	0.34	0.24	0.20	0.22	0.25	0.22	
4	**30 meters Flying start (Seconds)**	Mean	5.42	5.10	5.23	5.19	5.05	5.04	4.87**
		SD	0.86	0.65	0.51	0.50	0.48	0.56	
5	**Shuttle run (Seconds)**	Mean	19.09	18.23	18.00	17.88	17.72	17.70	15.17**
		SD	1.91	1.02	1.30	1.05	1.13	1.40	
6	**800 meters run (seconds)**	Mean	239.2	236.3	226.4	226.4	226.4	219.9	4.95**
		SD	31.66	25.99	25.79	25.79	25.78	25.79	
7	**Forward bend and reach (cm)**	Mean	5.42	8.97	9.62	8.99	9.82	11.76	1.76
		SD	0.86	4.64	4.15	4.64	3.94	4.88	
8	**Medicine Ball test**	Mean	1.46	2.67	2.78	3.12	2.81	2.37	1.75
		SD	0.34	0.75	0.89	0.122	1.28	0.73	

*Significant at 5% level (2.23), **Significant at 1% level (3.05).

Body Weight (Kg)

The mean values of body weight indicated that there is an improvement in the weight values, progressively, in all age groups from 9 to 14 years. The 'f '-ratio computed for comparing the girls of 9-14 years of age on the body weight has been presented in the Table 1. From the Table 1, it is clear that the

weight of girls was improving from 9 to 14 years of age groups. The differences between progressing years were non-significant, in all the groups, from 9 to 13 year's age group; and the only significant difference was found between 13 and 14 years. Reverse results were recorded in study by Negi (1996) in which all age groups of untrained girls had shown significant differences between each other.

Standing Broad Jump (Cm)

The mean values presented in Table 1 indicate that there is an improvement in the leg strength values, progressively with the age, with an exception of deterioration from 11 to 12 years. It was found that calculated 'f '-value is more than tabulated 'f '-value. Hence, a significant difference existed in leg strength of girls of 9-14 years of age. The post hoc test was applied to test the significance of differences among means of each age group separately, and its results are presented in the Table 3. It was found that the present study has shown similar results of standing broad jump, for age group 10 to 11 years and 12 to 13 years as shown in study by Negi (1996). The similar tests were conducted by Barry (1974) in which girls at the age of thirteen years peak out of power development, Same results were observed in present study, where no significant change was recorded after 13 years i.e. between13 and 14 year age groups.

The observation reveals that the leg strength improvement, from childhood on wards, might be attributed to the fact that there is continuous increase in height, body weight and other body composition parameters. The rapid development of the body parts are taking place; but, the cross sectional areas of muscles are not developed with this ratio. The girls, due to the social and cultural factors, tend to avoid vigorous physical training and become physically more inactive than the early age.

Shuttle Run (Seconds)

The mean values presented in Table 1 indicate that there is an improvement in the shuttle run values progressively, in all age groups, from 9 to 14 years. It was found that calculated 'f ' value is more than tabulated 'f' value. Hence, a significant difference existed in the shuttle run. The post hoc test was applied to test the significance of differences among means of each age group, separately; and its results are presented in Table 3. It clearly depicts that the shuttle run of 9-14 years girls improves progressively, with the age. The differences between progressing years were non- significant, in all the groups, except 9 and 10 year's age group. Similar results of agility were observed by Negi (1996) who had found significant improvement from 10 to 14 years age groups, but non-significant improvement in 15 and 16 years age groups, respectively.

Table-2 : Scheffe's 't' Test Values for Anthropometric Tests of 9-14 Years Northern Indian Girls

Anthropometric tests	Age Groups	Mean Difference	Sig.
Body height (cm)	9 years vs 11 years	-9.356*	0.0024
	9 years vs 12 years	-13.282*	7.14846E-07
	9 years vs 13 years	-17.83*	1.46394E-12
	9 years vs 14 year	-20.35*	2.22045E-16
	10 years vs 12 years	-9.602*	0.0016
	10 years vs 13 years	-14.15*	7.82285E-08
	10 years vs 14 year	-16.67*	5.82473E-11
	11 years vs 13 years	-8.474*	0.0096
	11 years vs 14 year	-10.994*	0.00012
Body weight (kg)	9 years vs 11 years	-5.245*	6.715
	9 years vs 12 years	-7.4142*	5.150
	9 years vs 13 years	-9.855*	0
	9 years vs 14 year	-14.945*	0
	10 years vs 12 years	-5.1442*	1.147
	10 years v13 years	-7.585*	1.400
	10 years vs 14 year	-12.675*	0
	11 years vs 13 years	-4.61*	0.00
	11 years vs 14 year	-9.7*	0
	12 years vs 14 year	-7.5308*	2.123
	13 years vs 14 year	-5.09*	1.522

Medicine Ball Test (Cm)

It was examined that arm and shoulder strength has shown increasing trends from 9 and 12 years and decreasing from 12 to14 years progressively, as presented in Table 1. The 'F' ratio for arm and shoulder strength was found to be non-significant with the value of 1.75, which is less than the table value, but in similar study of Negi (1996), reverse trends were found in all age groups, from 10 to 16 years.

Forward Bend and Reach (Cm)

It was found that performance is increasing from 9 and 14 years. But, a fluctuation in the age of 11 to 12 has been

observed which is shown on Table 1. A rapid change was observed in the age group 9 to 10 years and stagnation has been found during 11 to 14 years of age groups. There were no significant differences in the flexibility of girls of 9-14 years of age. The found 'F' ratio for flexibility was 1.76, which was less than the tabulated value and same results were also recorded by Negi (1996) in study of untrained girls of age groups ranging 10 to 16 years.

Table-3 : SCHEFFE'S 't' TEST VALUES FOR MOTOR ABILITY TESTS OF 9-14 YEARS NORTHERN INDIAN GIRLS

Motor Abilities tests	Age Groups	Mean Difference	Sig.
Standing broad jumps	9 years vs 11 years	-0.137*	0.013
	9 years vs 13 years	-0.2287*	2.128
	9 years vs 14 year	-0.2717*	1.536
	10 years vs 11 years	-0.1296*	0.024
	10 years vs 13 years	-0.2213*	6.527
	10 years vs 14 year	-0.2643*	5.810
	11 years vs 14 year	-0.1347*	0.016
	12 years vs 13 years	-0.1201*	0.049
	12 years vs 14 year	-0.1631*	0.001
30 Meters flying start	9 years vs 12 years	0.3039*	0.228
	9 years vs 13 years	0.3105*	0.002
	9 years vs 14 year	0.3328*	0.001
Shuttle run	9 years vs 10 years	0.8657*	0.001
	9 years vs 11 years	1.0917*	5.274
	9 years vs 12 years	1.2171*	1.607
	9 years vs 13 years	1.371*	1.313
	9 years vs 14 years	1.3955*	5.806
800 Meters run	9 years vs 12 years	0.3039*	0.031
	9 years vs 13 years	0.3105*	0.025
	9 years vs 14 year	0.3328*	0.011

30 Meter Run (Seconds)

The mean and SD values indicated that there was improvement in sprint values, progressively with the age, from 10 to 11 years, with an exception of deterioration from 10 to 11 years as shown in Table 1. It was found that calculated 'F' value was more than the tabulated 'F' value. That means, a significant difference existed in speed. The post hoc test was applied to test the significance of differences among means of each age group separately and its result is presented in Table 3. Results from the Table 1 clearly depict that speed of 9 to 14 years girls improves progressively with the age. The differences between progressing years were non-significant for all the age groups. Similar results were observed by Negi (1996) and Hardayal (1991) and Morehouse and Miller (1968) in their studies. May be the increase in their height might have led to the increase in stride length, attributing to the improvement in their speed performance.

800 METER RUN

The mean values presented in Table-1 indicate that there was an improvement in the endurance values progressively, in all age groups, from 9 to 14 years. It was found that calculated 'f ' value was more than tabulated 'f' value. That means, a significant difference existed among the girls of various age groups in 800 meter run test. The post hoc test was applied to test the significance of differences among means of each age group separately and its results are presented in Table 3. The mean values presented in Table 1, has shown that there is a miner change in the performance during 9 and 10 years age group. Stagnation has been observed during the period from 11 to 13 years. Again a drastic change has been found in the 14 years age group. The differences between progressing years were non-significant, in all the groups, from 9 to 14 year's age group, for 800 meter run test. Similar results were observed by Negi (1996) in his study on untrained girls of same age groups.

CONCLUSIONS

Within the limitations and delimitations of the study, following conclusions can be made:

- There is a progressive increase in body height and body weight of girls of 9-14 years age.
- There is a progressive increase in running speed, agility and endurance of girls of 9-14 years age.
- There is no progressive development in arm and shoulder strength in 9 to 14 year old girls.
- There is a progressive improvement in leg strength, agility, endurance and speed ability of girls of 9 to 14 years age group.
- There is non-significant difference between progressive year wise mean values of almost all the age groups, except between 10 & 11years and 12 &

13 years, in leg strength; 9 & 10 years in agility; and 13 & 14 years in body weight.

RECOMMENDATIONS

On the basis of the study following recommendation can be made

- A similar study may be conducted on male players.
- A similar study may be conducted in combination with other associated variables.
- A similar study with the physiological variables may also be conducted.
- A similar study may be conducted on athletes of other "regions".
- A comparative study, on the same variables, may be conducted between male and female.

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