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Sex Differences in Growth and Performance of Track and Field Athletes 11-15 Years

by
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Objective: *To evaluate sex differences in functional performances of youth track and field athletes.*

Methods: *Four tests of functional capacity were administered to 309 youth 11-15 years training for track and field at sport schools, 136 boys and 173 girls. Grip strength, standing long jump, 2 kg medicine ball throw and 20 m sprint were measured; height, weight and adiposity were also. Two age groups were compared, 11-13 and 14-15 years. ANCOVA was used to test sex differences by age group in the total sample (disciplines combined) and specific disciplines; age, height and weight were covariates.*

Results: *For the total sample, males in both age groups performed better than females in the four tests but sex differences were greater among 14-15 year olds. Within disciplines, sex differences among sprinters and middle distance and distance runners were greater at 14-15 years. Results varied for general athletics; the magnitude of sex differences was similar for strength in both age groups, greater for the throw at 11-13 years and greater for the jump and sprint at 14-15 years.*

Conclusion: *Although sex differences in performance were apparent among athletes 11-13 years, they were greater among athletes 14-15 years, reflecting to a large extent the male adolescent spurt in body size, muscle mass, strength and power. Sex differences were more established in sprinters and middle distance and distance runners, and more variable in participants in general athletics.*

Key words: *athletics, power, strength, speed, youth sports*

Introduction

Age- and sex-associated variation in the growth and performances of children and adolescents is well documented. Performances in a variety of tasks (e.g., grip and pull strength, flexed arm hang, sit-ups, standing long jump, vertical jump, throw for distance, running speed, agility) improve, on average, with age during childhood and there is much overlap in the performances of boys and girls. Performances of girls show a slight increase in some tasks and a plateau in others during adolescence, while those of boys show marked improvements. Hence, sex differences are magnified. On the other hand,

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flexibility of the lower back and upper thighs (sit and reach) is, on average, greater in girls than in boys at all ages during childhood and adolescence. The sit and reach tends to be stable in girls and to decline in boys during childhood, and then increases during adolescence (Malina et al. 2004).

A question of interest is the magnitude of sex differences in the performances of young athletes participating in the same sport or discipline within a sport. This is particularly relevant to sports or disciplines in which performance demands for boys and girls are largely the same, for example, distance running, long jump, diving, and so on. Observations on a mixed-longitudinal sample of elite young distance runners 8-15 years indicated attenuation of sex differences in agility and explosive power prior to 13 years of age. During the adolescent spurt, agility and power improved in males and reached a plateau in females. On the other hand, measures of upper body muscular endurance and flexibility were greater from childhood through adolescence, respectively, in males and females (Eisenmann and Malina 2003).

Among Junior Olympic divers, males performed significantly better in the vertical jump, while females performed significantly better in the sit and reach. However, male and female divers did not differ significantly in the medicine ball throw until later adolescence, while sex differences in sit-ups and a quadrant jump were not significant (Malina et al. 2005)

The present study extends these observations to track and field athletes 11-15 years of age. It specifically considers sex differences in four indicators of performance of youth track and field athletes in two age groups, 11-13 and 14-15 years.

Methods

Subjects. A sample of 309 youth training in track and field at sport schools in the Lower Silesia region (Wrocław, Jelenia Góra, Wałbrzych, Bogatynia, Zgorzelec) were studied in 2004. Boys (n=136) ranged from 10.54 to 15.45 years (13.9±1.2 years), while girls (n=173) ranged from 10.55 to 15.42 years (13.4±1.3 years). Disciplines included general athletics (43 males, 58 females), sprinters (36 males, 35 females), middle distance runners (12 males, 34 females), distance runners (31 males, 23 females), jumpers (8 males, 22 females) and throwers (6 males, 1 female). The project was approved by the local Ethics Committee. Parents provided informed consent; each athlete gave assent. Athletes were informed that the project was voluntary and that they could withdraw at any time. Identities of individual athletes were anonymous for analyses.

The youth had been training for one to two years prior to the study for about 1.5 hours per session, two times per week. The sample was divided into two age groups for analysis, <13 years and 14-15 years. The younger athletes (32 males, 85 females) can be viewed as beginners in their respective sport specializations. Males had 1.9±1.0 years of training and trained 2.0±0.3 hours per week, while females had 1.7±1.1 years of training and trained 1.7±0.3 hours per week. The older athletes (104 males, 88 females) had a bit more training experience, 2.4±1.6 and 2.4±1.5 years in males and females, respectively, and generally training time, 1.8±0.3 and 1.8±0.6 hours per week in males and females, respectively.

Variables. Variables considered and protocols for assessment have been described previously [4,5]. Height, weight and three skinfolds (triceps, subscapular, abdominal) were measured. The BMI was calculated and the three skinfolds were summed to provide an indicator of subcutaneous adiposity. Relative fatness was estimated with the near-infrared interactance (NIR) method using a Futrex analyzer apparatus calibrated for youth (model 5000A/ZL). Four indicators of functional capacity were measured (1) static strength - sum of right and left grip strength, (2) muscular power of the lower extremities - standing long jump, (3) muscular power of the upper extremities - 2 kg medicine ball throw, and (4) running speed - 20 m sprint with a running start (5 m).

Analysis. Sex-specific means and standard deviations for age, body size, adiposity, and performance variables were calculated for the two age groups in the total sample of track and field athletes and for specific disciplines with adequate numbers of both sexes. Four disciplines were represented in the two age groups: general athletics, sprints, and middle distance and distance running. The middle distance and distance runners were combined for analysis. Jumpers of both sexes were represented only among youth 14-15 years. There were no male jumpers <13 years and only one female thrower 14-15 years.

Sex differences in age, body size and adiposity were tested with MANOVA, while sex differences in the four performance variables were evaluated with MANCOVA with age, height and weight as covariates. The Statistical Package for the Social Sciences (SPSS) version 14.0 was used for all analyses.

Results

Descriptive statistics for the two age groups are summarized in Tables 1 and 2. As a group, male and female track and field athletes <13 years of age do not differ in height, weight and the BMI. Female athletes have thicker skinfolds and a greater % Fat, while male athletes perform better in the four functional tests. In contrast, all variables except the BMI differ between male and female track athletes 14-15 years. Males are taller and heavier and perform better, while females have thicker skinfolds and a greater % Fat.

Results of the comparison of athletes <13 years by track and field discipline are summarized in Table 1. Small sample sizes should be noted and affect the significance of comparisons (Type II error). Males and females in general light athletics do not differ significantly in body size and adiposity, but males perform significantly better in the four functional tests. There is no overlap in the 95% confidence intervals in the performance items with the exception of slight overlap in the standing long jump.

The small samples of male and female athletes in the sprints differ significantly only in the sum of skinfolds (thicker in girls, $p<0.05$) and standing long jump ($p<0.05$). Height, weight, BMI, % Fat and the remaining performance items do not differ significantly between male and female sprinters. The 95% confidence intervals overlap considerably in grip strength, the 2 kg ball throw and 20 m sprint.

Results are largely the same in male and female middle distance and distance runners. Female runners are have significantly thicker skinfolds ($p<0.01$) and % Fat ($p<0.05$) while male runners perform better in the standing long jump ($p<0.01$). Overlap in confidence intervals is considerable in the grip, throw and sprint; in contrast, there is no overlap in confidence intervals for the jump.

Results of comparisons of athletes 14-15 years by track and field discipline are included in Table 2. Male and female participants in general light athletics do not differ in body weight, the BMI, the 2 kg ball throw and 20 m sprint. Females have thicker skinfolds and a greater % Fat, while males perform better in grip strength and standing long jump. Confidence intervals of the grip and jump do not overlap, while those for the throw and sprint overlap considerably.

In contrast to general athletics, male and female sprinters and male and female middle distance and distance runners differ significantly in all variables except the BMI. Males in the respective disciplines are significantly taller and heavier than females, and perform better in the four functional tests, while females in the respective disciplines have significantly thicker skinfolds and % Fat than males. Confidence intervals for the performance items do not overlap between male and female sprinters.

Results are variable comparisons of the small samples of jumpers. Males are taller and heavier, while females have thicker skinfolds and greater % Fat. Males perform better in the standing long jump, although this is some overlap in confidence intervals. The BMI, grip strength, 2 kg ball throw and 20 m sprint do not differ between male and female jumpers.

Discussion

Sex differences in the motor performances of the general population of youth are rather small during childhood and early adolescence and become established in mid-to-late adolescence. With the exception of flexibility, males tend to attain, on average, higher performances than females in standard tests of speed (dashes), power and coordination (vertical jump, standing long jump, throw for distance), muscular endurance (flexed arm hang) and agility (shuttle runs) from about 8 years of age on and the difference between sexes increases during adolescence (Malina et al. 2004). As a group, male track and field participants <13 years and 14-15 years perform better than females in the four functional tests. The sex difference between age groups based on age, height and weight adjusted means for each functional test are shown in Figure 1. The magnitude of the sex difference in each performance item is greater among 14-15 year old athletes. On the other hand, sex differences are more variable within discipline. Allowing for smaller sample sizes, differences by sex within sprinters and middle distance and distance runners are greater in athletes 14-15 years compared to athletes <13 years. However, among youth participants in general light athletics, the magnitude of the sex difference in grip strength is similar in the two age groups, greater in younger participants for the 2 kg ball throw, and greater in older participants for the standing long jump and 20 m sprint.

Table 1

Characteristics of track and field athletes 11-13 years by sex for the total sample and within discipline

Total Sample	Males (n=32)[1]		Females (n=81-85)[2]		F[3]	p	Adjusted Means and Confidence Intervals[4]			
Variable	Mean	SD	Mean	SD			Mean	95% CI	Mean	95% CI
Age, yrs	12.2	0.9	12.2	0.9	0.14					
Height, cm	155.6	11.1	156.2	8.1	0.12					
Weight, kg	42.7	11.0	43.3	7.6	0.11					
BMI, kg/m^2	17.4	2.5	17.6	1.9	0.30					
Sum skinfolds, mm	22.1	6.2	25.5	7.3	5.51	<0.05				
Fat, %	16.5	6.1	19.4	5.5	4.97	<0.05				
Sum R+L grip, kg	53.7	19.9	46.1	12.1	6.07	<0.05	53.5	50.4 - 56.5	46.1	44.3 - 48.0
Standing long jump, cm	178.3	23.6	162.8	17.3	15.07	<0.001	178.6	172.8 - 184.5	162.6	159.0 - 166.3
2 kg ball throw, m	5.8	1.8	4.9	1.1	8.81	<0.01	5.8	5.5 - 6.1	4.9	4.7 - 5.1
20 m sprint, sec	3.15	0.24	3.29	0.21	9.45	<0.01	3.15	3.08 - 3.23	3.29	3.25 - 3.34
General Athletics[5]	(n=12)		(n=43)							
Age, yrs	12.5	0.7	12.5	0.7	0.07					
Height, cm	163.0	11.6	159.5	6.9	1.75					
Weight, kg	50.3	13.3	45.7	7.5	2.39					
BMI, kg/m^2	18.6	3.2	17.8	2.0	1.05					
Sum skinfolds, mm	24.9	8.0	26.4	8.8	0.27					
Fat, %	17.9	8.5	21.3	5.4	1.82					
Sum R+L grip, kg	68.5	23.1	49.1	11.7	22.58	<0.001	64.0	58.9 - 69.1	50.3	47.7 - 53.0
Standing long jump, cm	186.9	21.4	167.5	19.7	5.85	<0.05	183.7	172.6 - 194.8	168.4	162.6 - 174.2
2 kg ball throw, m	7.2	2.0	5.3	1.2	17.23	<0.001	6.8	6.2 - 7.3	5.4	5.1 - 5.7
20 m sprint, sec	3.08	0.20	3.24	0.21	5.57	<0.05	3.07	2.96 - 3.20	3.24	3.18 - 3.31
Sprints	(n=8)		(n=13)							
Age, yrs	12.3	0.9	11.9	0.9	1.28					
Height, cm	151.4	8.3	153.5	9.6	0.28					
Weight, kg	38.3	4.6	41.8	8.9	1.03					
BMI, kg/m^2	16.7	1.5	17.5	2.3	0.89					
Sum skinfolds, mm	19.6	3.3	24.8	6.3	4.81	<0.05				
Fat, %	15.2	4.9	18.7	5.0	2.56					
Sum R+L grip, kg	47.0	11.7	45.1	13.1	1.70		48.5	43.1 - 54.1	44.1	39.9 - 48.3
Standing long jump, cm	179.9	22.1	156.5	13.9	6.30	<0.05	178.7	165.1 - 192.3	157.3	146.9 - 167.6
2 kg ball throw, m	5.1	0.8	4.7	1.3	1.24		5.1	4.5 - 5.7	4.7	4.2 - 5.1
20 m sprint, sec	3.14	0.31	3.32	0.23	0.52		3.21	3.03 - 3.38	3.28	3.15 - 3.41
Middle Distance and Distance Runs[6]	(n=10)		(n=16)							
Age, yrs	12.0	1.1	12.0	0.9	0.02					
Height, cm	151.3	9.2	152.2	8.8	0.07					
Weight, kg	37.7	7.4	41.5	6.9	1.68					
BMI, kg/m^2	16.3	1.6	17.8	1.5	5.78	<0.05				
Sum skinfolds, mm	19.7	3.7	25.6	4.9	10.86	<0.01				
Fat, %	15.0	3.4	18.0	6.5	1.79					
Sum R+L grip, kg	44.2	8.3	41.6	13.4	0.00		42.6	37.0 - 48.3	42.7	38.3 - 47.1
Standing long jump, cm	174.5	22.5	156.7	12.1	10.58	<0.01	174.0	166.0 - 182.0	157.1	150.4 - 163.7
2 kg ball throw, m	4.9	1.3	4.5	1.0	1.88		5.0	4.4 - 5.5	4.4	4.0 - 4.9
20 m sprint, sec	3.19	0.20	3.33	0.16	2.59		3.19	3.07 - 3.31	3.32	3.22 - 3.43

[1]% Fat, n=27

[2]% Fat and grip strength, n=83; standing long jump and ball throw, n=82; sprint, n=81

[3]ANOVA for age, height, weight, BMI, skinfolds, % Fat; ANCOVA for functional indicators, age, height and weight as covariates

[4]Means and confidence intervals are adjusted for age, height and weight

[5]General athletics: % Fat, n=7 males, 30 females; jump, throw, sprint, n=42 females

[6]Middle distance and distance runs: grip, n=9 males, 14 females; jump, throw, n=14 females; sprint, n=13 females

The male and female track and field athletes in this sample had reasonably similar experience in the sport, about 2 years in the younger and 2.4 years in the older age groups, and just ≤ 2 hours training per week. Although the training and performance demands of the sport or specific disciplines are similar for both sexes, they were probably not of sufficient intensity and duration to modify changes associated

Table 2

Characteristics of track and field athletes 11-13 years by sex for the total sample and within discipline

Total Sample	Males (n=104)		Females (n=88)		F[1]	p	Adjusted Means and Confidence Intervals[2]			
Variable	Mean	SD	Mean	SD			Mean	95% CI	Mean	95% CI
Age, yrs	14.5	0.5	14.5	0.5	0.03					
Height, cm	172.2	8.7	164.1	5.6	56.31	<0.001				
Weight, kg	57.1	10.3	50.6	6.1	26.43	<0.001				
BMI, kg/m^2	19.1	2.4	18.8	1.9	1.19					
Sum skinfolds, mm	22.8	7.9	28.7	7.7	27.94	<0.001				
Fat, %	11.2	5.3	23.2	4.3	281.21	<0.001				
Sum R+L grip, kg	80.3	17.7	61.2	9.4	83.24	<0.001	76.3	74.4 - 78.2	65.9	63.8 - 68.0
Standing long jump, cm	206.5	25.4	176.3	17.7	88.22	<0.001	202.9	198.5 - 207.2	180.6	175.8 - 185.4
2 kg ball throw, m	8.3	1.7	6.5	1.1	75.11	<0.001	7.9	7.7 - 8.1	6.9	6.7 - 7.1
20 m sprint, sec	2.90	0.33	3.21	0.41	33.91	<0.001	2.91	2.83 - 2.99	3.20	3.12 - 3.29
General Athletics[3]	(n=31)		(n=15)							
Age, yrs	14.4	0.6	15.5	0.5	0.26					
Height, cm	171.6	7.9	166.6	5.5	4.99	<0.05				
Weight, kg	57.8	11.2	54.6	8.1	0.97					
BMI, kg/m^2	19.5	3.0	19.6	2.3	0.02					
Sum skinfolds, mm	24.3	9.9	31.6	7.8	6.18	<0.05				
Fat, %	12.2	6.9	25.0	4.3	42.57	<0.001				
Sum R+L grip, kg	84.1	17.2	64.8	11.9	15.59	<0.001	82.2	78.5 - 86.0	68.6	63.1 - 74.2
Standing long jump, cm	205.3	25.9	176.1	17.1	7.29	<0.01	202.0	194.3 - 209.7	183.0	171.7 - 194.4
2 kg ball throw, m	8.2	1.7	6.9	1.5	2.20		8.0	7.6 - 8.4	7.4	6.9 - 8.0
20 m sprint, sec	2.99	0.45	3.32	0.44	3.23		3.01	2.84 - 3.17	3.28	3.03 - 3.53
Sprints	(n=28)		(n=22)							
Age, yrs	14.6	0.6	14.4	0.5	1.46					
Height, cm	174.7	9.9	164.3	6.1	18.32	<0.001				
Weight, kg	59.8	9.8	51.0	5.1	14.42	<0.001				
BMI, kg/m^2	19.5	2.0	18.9	1.4	1.61					
Sum skinfolds, mm	23.5	7.3	30.7	6.7	12.77	<0.001				
Fat, %	10.8	4.6	23.3	3.5	109.42	<0.001				
Sum R+L grip, kg	84.0	16.8	61.3	10.8	12.25	<0.01	78.9	75.0 - 82.8	67.8	63.4 - 72.4
Standing long jump, cm	216.5	27.0	175.1	14.8	19.60	<0.001	210.9	203.0 - 218.8	182.3	173.1 - 191.4
2 kg ball throw, m	8.8	1.7	6.4	1.0	17.61	<0.001	8.4	7.9 - 8.8	6.9	6.4 - 7.4
20 m sprint, sec	2.85	0.25	3.15	0.41	8.62	<0.01	2.83	2.70 - 2.97	3.17	3.01 - 3.32
Middle Distance and Distance Runs	(n=33)		(n=41)							
Age, yrs	14.5	0.5	14.5	0.5	0.38					
Height, cm	168.6	8.0	162.8	5.4	13.61	<0.001				
Weight, kg	51.9	8.4	48.8	5.6	3.73	=0.05				
BMI, kg/m^2	18.2	1.8	18.4	1.9	0.29					
Sum skinfolds, mm	20.0	3.6	26.5	7.7	19.79	<0.001				
Fat, %	10.2	3.8	22.2	4.6	145.43	<0.001				
Sum R+L grip, kg	71.8	16.9	60.2	7.7	11.36	=0.001	69.5	66.3 - 72.6	62.1	59.3 - 64.8
Standing long jump, cm	198.1	22.3	174.7	18.9	18.11	<0.001	197.5	190.1 - 205.0	175.2	168.6 - 181.8
2 kg ball throw, m	7.6	1.4	6.3	0.9	22.88	<0.001	7.4	7.1 - 7.8	6.4	6.1 - 6.7
20 m sprint, sec	2.91	0.29	3.26	0.36	19.46	<0.001	2.89	2.77 - 3.01	3.27	3.17 - 3.39
Jumps	(n=8)		(n=9)							
Age, yrs	14.5	0.4	14.3	0.6	0.44					
Height, cm	177.4	4.5	165.4	4.7	29.43	<0.001				
Weight, kg	59.0	4.9	51.0	3.8	14.25	<0.01				
BMI, kg/m^2	18.8	1.6	18.7	1.4	0.02					
Sum skinfolds, mm	20.1	4.0	28.6	8.1	7.35	<0.05				
Fat, %	9.3	4.7	23.6	4.4	41.99	<0.001				
Sum R+L grip, kg	80.1	7.7	59.0	8.5	3.75		76.1	67.0 - 85.2	62.6	54.3 - 70.9
Standing long jump, cm	208.7	10.9	183.9	19.2	4.38	=0.05	212.4	192.7 - 232.0	180.7	162.7 - 198.6
2 kg ball throw, m	8.4	1.3	6.6	1.2	0.60		7.8	6.8 - 8.7	7.2	6.3 - 8.1
20 m sprint, sec	2.70	0.16	3.03	0.52	0.01		2.85	2.37 -3.33	2.89	2.45 - 3.34

[1]ANOVA for age, height, weight, BMI, skinfolds, % Fat; ANCOVA for functional indicators, age, height and weight as covariates

[2]Means and confidence intervals are adjusted for age, height and weight

[3]General athletics: % Fat, n=27 males, 15 females

with normal growth and maturation. Sex differences are generally more apparent among athletes 14-15 years, which probably reflects the adolescent growth spurt in fat-free mass and specifically muscle mass, which is greater in males than in females (Malina et al. 2004). Maximal gains in upper body strength occur, on average, after peak velocity of growth in height (peak height velocity, PHV) in both sexes but gains in upper arm strength are about twice as large as in males compared to females Kemper and Verschuur 1985, Beunen et al. 1988, Carron and Bailey 1974). Corresponding data for lower body strength are limited to boys, among whom maximal gains also occur after PHV (Carron and Bailey 1974). The trend is similar to the medicine ball throw in boys, but corresponding data for girls do not indicate a clear adolescent spurt (Heras and de la Fuente 1998). Maximal gains in the vertical jump and standing long jump also occur after PHV (Carron and Bailey 1974, Beunen and Malina 1988, Heras and de la Fuente 1998)

Given the age range of the sample of track and field athletes, it is likely that most were past the age of maximal growth, females more so than males. This should be viewed in the context of sex differences in biological maturation. Female track and field athletes in the present study had a mean age at menarche of 13.08±1.14 years which was close to that for the general population (Malina at al. 2010). Thus, as a group they were on time or average maturity status. Menarche occurs, on average, after PHV (Malina et al. 2004) and limited data for female Polish athletes indicate an age at PHV that is also close to the average for the general population, 12.0±0.8 years in 23 girls involved largely in track and field, rowing and swimming sports school in Warsaw (Malina at al. 1997), and 12.3±0.8 years in 13 girls involved in several individual and team sports from the Wrocław Growth Study and Wrocław Longitudinal Twin Study (Malina and Bielicki, 1996).

Corresponding maturity information is not available for the male athletes, but adolescent male track and field athletes tend to be somewhat advanced in biological maturation compared to the general population (Malina 2006). Hence, it is likely that most of the male athletes were also past the age maximal growth. Longitudinal growth data for male Polish athletes are limited, but data for two small series suggest early maturation. Mean age at PHV in 21 boys from Warsaw who were involved largely in track and field, rowing and swimming was 13.1±1.0 years (Malina at al. 1997), while mean age at PHV among 25 boys from the Wrocław Growth Study and Wrocław Longitudinal Twin Study who were involved in several individual and team sports was 13.6±0.9 years (Malina and Bielicki, 1996).

The pattern of sex differences in the combined samples of middle distance and distance runners is similar to that noted in elite distance runners (Eisenmann and Malina 2003). Male and female runners did not differ significantly in the standing long jump and vertical jump before 14 years of age, but at older ages, males performed better. Male runners also performed better in the flexed arm hand, a measure of upper body muscular strength and endurance. In the present study, sex differences in the static strength, standing long jump, 2 kg ball throw and 20 m sprint were greater among 14-15 year old compared to 11-13 year old middle distance and distance runners (Figure 1). Although other functional items were not measured in the present study, elite male and female distance runners did not differ significantly in two measures of agility (quadrant jump and side leap) across all ages from 10 to 17 years, while a third measure of agility (figure-8 run) did not differ between male and female runners <14 years of age; at older ages, males performed better at older ages (Eisenmann and Malina 2003).

Among elite youth divers (national Junior Olympic), sex differences in performance varied among athletes in three competitive age groups: <13, 14-15 and 16-18 years (Malina et al. 2005). Sex differences in abdominal muscular strength and endurance (sit-ups) and in total body agility (quadrant jump) were not significant in each of the three age groups, while sex differences in upper body power (1 kg seated medicine ball throw) were not significant in the 13 and under and 14-15 year age groups. In contrast, male divers performed significantly better than female divers in explosive power of the lower extremities (vertical jump) in each of the three age groups, and significantly better in the medicine ball throw only in the oldest age group. On the other hand, female divers were more flexible in the lower back and upper thighs (sit and reach) than male divers in each age group.

The observations on elite young athletes in track and field and diving suggest that sex differences in motor performance are small and perhaps negligible until late adolescence, when the male adolescent spurts in muscle mass, strength and power contribute to greater sex differences in performance. The

observations should be expanded to other functional capacities (aerobic endurance, anaerobic capacity, agility, etc.), to more specific technical skills in the respective sports, and to young athletes in other sports. Such comparisons may shed light on the issue of sex differences in performance in the context of sport-specific training of boys and girls beginning at relatively young ages.

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