Age Changes in the Speed of Running during 30 meter Sprint Running

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Abstract

The purpose of the present study was to determine age changes in various biomechanical variables such as stride length, stride rate and 30m sprint performance in boys from age 8 to 16 years. The speed of running in general exhibit a general trend of increase with age as well as with the course of running. Phase by phase analysis of change in speed during the course of running in 8 to 12 years age groups reveal that increase in the speed of the running from one phase to the next is mainly brought about by increase the stride length while increase in stride frequency are used by the subjects in varying manners.

Key Words: Stride Rate, Flight Time, Contact Time, Stride Cycle, Age Changes

Introduction

Review of studies in general suggests a comprehensive analysis of strength, spatial and temporal characteristics of adult sprinters *(Mann & Hagy, 1980; Mann & Herman, 1985; Adellar, 1986; Mann, 1986; Mero, 1988; Chelly & Denis, 2001)*. There seems to be a void regarding such evaluation in boys during growth period. Such attempts are necessary in view of the recent emphasis to catch the athlete at young age and provide scientifically oriented training backup. It is unfortunate that despite poor record of India in various international competitions the requisite attention on these lines has not been paid. In order to keep pace with the global trends, for spotting sports talent at young age and develop it, and also orient the training programme on scientific basis for the full realisation of sporting talent, the present study has therefore been conducted to report age changes in biomechanical correlates of sprint running in boys from age 8 to 16.

Materials and Methods

The present investigation was conducted on 180 male school going boys of Patiala district and were divided into 9 yearly age groups (N=20 in each age group) as per *Weiner and Lourie (1981)*. To measure speed and stride characteristics during running, 30m sprint test was administered to each subject on a sandy track and cinematographic recording was done by a video movie camera (Panasonic) running at 60 frames/sec. Recording of video film was analysed on high quality Panasonic playback system. Contact time, flight time, stride length, stride rate and total time of 30m run time were measured for the analysis. For the purpose of analysis the first twenty strides taken by the subjects for running 30m sprint have been divided into four phases viz phase 1 (P 1), phase 2 (P 2), phase 3 (P 3) and phase 4 (P 4) respectively. Each phase comprised of five strides.

Results & Discussion

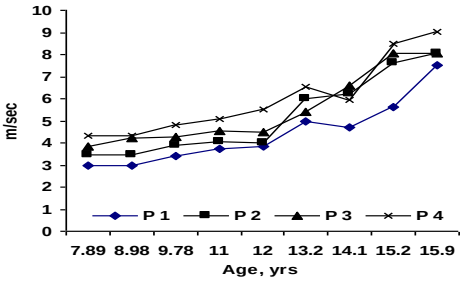

Figure 1. Age changes in the speed of 30 meter running

The age changes in the speed of running in general exhibit a general trend of increase with age as well as with the course of running. The age changes in the speed characteristics of boys during the various phases of running (Table 1) reveal that (i) boys belonging to age groups 8 to12 & 15 years exhibit a continuous increase in speed of running from phase one to phase four. (ii) 13 years old boys demonstrate an alternating phase of increase and decrease in speed of running from phase 1 to phase 4. (iii) 14 years age group show a marked increase in speed of running from phase one to phase two followed by small increase and then decrease in velocity during 4th phase of running (iv) Boys belonging to 16 years age group recorded an initial increase followed by maintenance of speed of running and then a marked increase in the speed in the P 4 of the running.

Table 1. Stride length (cms) with respect to age and phase of running 30m distance in boys

Age (yrs)	Phase 1		Phase 2		Phase 3		P 4	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
7.89	88.4	16.9	116.3	7.7	123.6	1.7	132.2	4.7
8.98	90.5	16.2	114.0	6.3	127.6	3.4	133.3	1.0
9.78	99.7	13.3	122.3	2.6	133.0	3.6	143.6	4.4
10.98	102.8	10.6	12.66	5.6	140.1	4.6	149.5	3.5
11.99	103.5	8.4	124.5	6.4	138.4	2.8	148.8	2.8
13.15	119.6	25.4	159.3	8.6	173.2	2.3	182.2	2.8
14.12	116.7	21.1	151.8	3.0	159.0	3.5	164.4	4.2
15.21	121.0	22.9	161.2	7.0	176.7	4.4	189.0	4.4
15.92	124.8	21.3	165.0	8.0	182.8	6.3	202.1	4.3

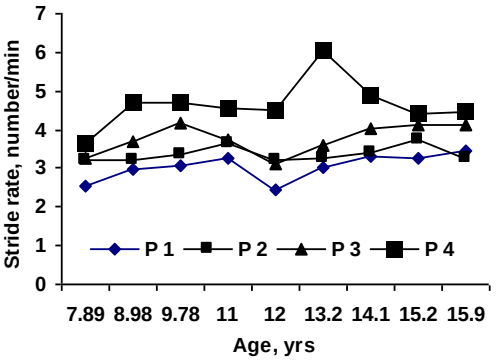

Figure 2. Age changes in stride rate

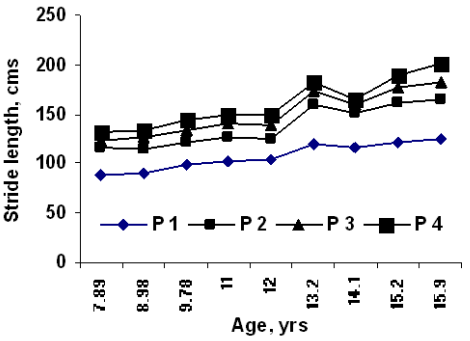

Figure 3. Age changes in stride length

Phase by phase analysis of change in speed during the course of running in 8 to 12 years age groups (Figure 1) reveal that increase in the speed of the running from one phase to the next is mainly brought about by increase the stride length while increase in stride frequency (Table 1) are used by the subjects in varying manners. For instance increase in speed of running from phase one to two has been brought about by increase in both stride length (Figure 3) & stride rate (Figure 2) by 8 and 9 years boys, while there is decrease in stride length in 10 to 12 year age groups but the net effect is of increase in speed during the corresponding phase of sprinting. During

the subsequent phase of running, the stride rate indicate a general trend of increase except for a decrease noticed in 9 years old boys from phase 3 to phase 3.

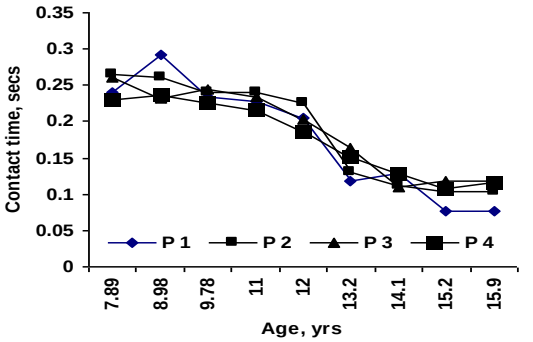

Figure 4. Age changes in contact time

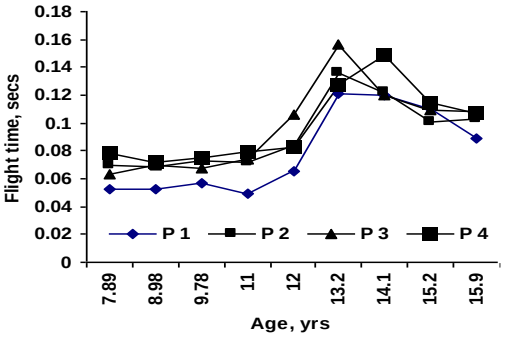

Figure 5. Age changes in flight time

Table 2. Contact time (Sec.) with respect to age and phase of running 30m distance in boys

Age (in years)	P 1		P 2		P 3		P 4	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
7.89	0.241	0.02	0.266	0.01	0.261	0.00	0.229	0.01
8.98	0.291	0.09	0.261	0.01	0.232	0.1	0.236	0.00
9.78	0.235	0.01	0.241	0.01	0.244	0.00	0.225	0.01
10.98	0.228	0.01	0.241	0.01	0.233	0.01	0.216	0.01
11.99	0.206	0.00	0.225	0.01	0.203	0.02	0.187	0.01
13.15	0.119	0.00	0.131	0.02	0.163	0.03	0.151	0.02
14.12	0.128	0.01	0.112	0.00	0.110	0.01	0.129	0.00
15.21	0.077	0.01	0.104	0.01	0.119	0.00	0.108	0.00
15.92	0.077	0.01	0.104	0.01	0.119	0.00	0.117	0.01

Table 3. Flight time (Sec.) with respect to age and phase of running 30m distance in boys

Age (in years)	P 1		P 2		P 3		P 4	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
7.89	0.053	0.01	0.070	0.00	0.063	0.00	0.078	0.00
8.98	0.052	0.01	0.069	0.00	0.070	0.00	0.072	0.01
9.78	0.057	0.01	0.073	0.00	0.068	0.00	0.075	0.01
10.98	0.049	0.01	0.072	0.01	0.074	0.01	0.079	0.00
11.99	0.065	0.01	0.084	0.01	0.106	0.02	0.083	0.01
13.15	0.121	0.00	0.136	0.02	0.156	0.04	0.127	0.01
14.12	0.120	0.00	0.122	0.00	0.120	0.00	0.149	0.01
15.21	0.110	0.01	0.101	0.01	0.109	0.01	0.115	0.01
15.92	0.089	0.01	0.103	0.01	0.108	0.01	0.107	0.01

Another interesting observation relates to the behaviour of contact time (CT) and flight tome (FT). Regarding CT a trend of decrease is observed in later phase of running (Table 2) (Figure 4). The FT on the other hand gives a quite variable picture but the net tendency of increase in FT needs mention (Table 3) (Figure 5).

Luhtanen & Komi (1972) reported a strong relationship between velocity of running and ground contact time. The results of the present study therefore support their view. Physiologically speaking the ground CT may be considered to reflect the force generating capacity of neuromuscular system i.e. the muscle fibre composition in terms of FT & ST fibres. Contact period is one of the most critical factor in the sprint running because it is during this phase that vertical fall generated the descent portion of the air phase must be reversed. In addition, it is during this time that any horizontal velocity that is lost due to air resistance and horizontal breaking is regenerated.

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