SELECTION OF YOUNG ATHLETES

By Rein Aule, Jaan Loko

The authors discuss simple selection procedures to guide young athletes, based on model anthropometric measurements and physical performance characteristics. Several sample tables of norms, accepted as models for a particular age range, are included. The article is translated and condensed from Kehakultuur, No. 16, 1982, Estonia, U.S.S.R. and re-printed here with permission from Modern Athlete and Coach.

Contemporary performance demands are so high in track and field that athletes with average ability are not going to succeed, even if the best training methods are employed. This stresses the importance of correct selection procedures for a particular event. Unfortunately the procedures are not always efficient in our sports schools, reflected in a high drop-out rate and studies showing that 50% of those accepted fail to achieve the expected results.

In order to succeed it is important that all young athletes train for an event they are best suited for. This is achieved only when the performance capacities and potential can be accurately determined, based on the recently developed so called model characteristics. The model characteristics are divided into three categories:

- General to all sporting events.

- General to a particular group of events.

- Specific to a particular event.

General to all sporting events is the morphological model, as physique, height and weight are important factors in several activities, particularly at record breaking levels. Numerous studies have shown the advantages of particular body measurements to a certain event, allowing to direct young athletes to the correct activity.

The height of an athlete is often an important factor in the selection. However, coaches frequently prefer shorter athletes because they are usually better coordinated, learn the techniques faster and produce better short term results than their tall counterparts. It happens regardless of the fact that the taller youngsters have a much better potential.

Analysis of the physical development of young athletes has shown that a particular physique depends, besides morphological characteristics, also on the activities performed during the developmental years. Narrow specialization can therefore badly influence the development of physique, particularly when it begins at a young age.

Body proportions can often be decisive in establishing the work capacity of an athlete. The relative upper body and leg length, for example, is important in running events. Runners should therefore have a short trunk and long legs.

Studies have shown that physique and certain performance capacities are inherited and genetically established. Inherited characteristics that react poorly to outside influences are physique, flexibility, aerobic capacity, reaction time, co-ordination, agility, speed characteristics and relative strength. All these are classified as being largely inherited. In contrast, only two characteristics react easily to outside influences - body weight and absolute muscle strength.

An exact selection criterion must be applied to events that require predominantly inherited physique and functional characteristics. Training brings here only limited improvement because the changes to the genetic structure are extremely restricted. Talent for these events should be found from a large mass, attempting to discover young athletes who have a suitable genetic structure for a particular event.

Table 1: Model Anthropometric Measurements

	100-200m		400m		110mH	100mH	3000m St.
	M	W	M	W	M	W	M
Age (yrs)	23 ± 1	22 ± 1	25 ± 1	23 ± 1	24 ± 1	24 ± 1	24 ± 2
Height (cm)	180 ± 2	170 ± 2	185 ± 2	170 ± 2	186 ± 2	170 ± 1	182 ± 2
Weight (kg)	73 ± 3	60 ± 3	77 ± 2	57 ± 2	80 ± 1	61 ± 2	66 ± 2
Height/Weight Index (g/cm)	401	348	402	335	430	358	362

	800-1500m		5000-10,000m	Multiple Events	
	M	W	M	M	W
Age (yrs)	24 ± 1	25 ± 3	25 ± 2	26 ± 2	25 ± 2
Height (cm)	185 ± 2	168 ± 2	178 ± 3	189 ± 2	176 ± 1
Weight (kg)	70 ± 3	50 ± 2	62 ± 2	87 ± 2	69 ± 2
Height/Weight Index (g/cm)	370	297	359	468	403

	Shot		Discus		Javelin		Hammer
	M	W	M	W	M	W	M
Age (yrs)	26 ± 2	25 ± 2	28 ± 2	25 ± 2	26 ± 2	24 ± 2	26 ± 2
Height (cm)	198 ± 3	180 ± 2	198 ± 2	179 ± 2	187 ± 2	176 ± 3	187 ± 2
Weight (kg)	127 ± 3	92 ± 3	122 ± 3	90 ± 3	96 ± 3	74 ± 4	115 ± 3
Height/Weight Index (g/cm)	638	511	616	503	524	420	622

	High Jump		Long Jump		Pole Vault	Triple Jump
	M	W	M	W	M	M
Age (yrs)	20-26	20-25	21-26	20-25	22-27	22-27
Height (cm)	190-195	177-185	185-190	173-178	240-245**	185-192
Weight (kg)	78-83	62-69	78-81	57-62	73-77	76-80
Height/Weight Difference#	10-12	11-13	9-10	10-12	7-8	8-10

\# Height/Weight Difference = height (cm) — (100 + weight)
** Height with raised arms

The variety of track and field events sets different demands to participants. The tallest are the throwers, followed by the hurdlers, high and long jumpers, sprinters and middle distance runners. Long distance runners are the shortest. This indicates the importance to take into consideration model anthropometrics already in the early stages of selection (Table 1). Particularly important is to observe the development of height and weight. As far as the physique is concerned, lean and long legged youngsters are best suited to middle distance running, high and long jumping. Tall, broad shouldered and muscular youngsters have the makings of throwers and multiple event exponents.

It is easy to observe that each group of events has morphological characteristics. Morphological indicators for high-class performers are relatively constant, fluctuating within optimal limits that allow the establishment of models. Height, for example, belongs to these indicators and can be predicted with reasonable accuracy. According to the studies by Sins, boys grow 26 to 33cm taller in the l0 to 15 years age range, girls 24 to 26cm. This means an average of 4 to 6cm a year. The growth slows down considerably in the next three years, contributing 5 to 11cm to the height of boys and 1 to 2cm to girls, before it comes to a virtual stand-still at the age of 19 to 20 years. The first selection criteria (11 to 12 years), based on height and weight, is presented in table 2.

Table 2: Anthropometric Selection Criteria for 11 to 12 Yrs.

	Very Big	Big	Average	Small
Boys				
Height (cm	155-165	145-155	135-145	130-135
Weight (kg)	50-55	35-40	25-30	25-30
Foot Length (Shoe size)	40-42	37-40	36-37	34-35
Girls				
Height	150-160	140-150	130-140	125-130
Weight (kg)	50-55	35-40	25-30	25-30
Foot Length (Shoe size)	38-40	37-38	35-36	33-34

Table 3: Selection Criteria for Young Sprinters (Boys 11-16 Yrs)

Age (yrs)	Height (cm)	Weight (kg)	60m (sec)	100m (sec)	300m (sec)	St. Long Jump (cm)	5-Hops (m)	Back Dyn (Kg)*
11	148.5	37.9	9.8	15.9	58.4	180	9.25	73.5
12	153.8	41.4	9.3	15.0	54.2	191	9.84	87.6
13	160.3	47.0	8.8	13.9	49.9	209	10.74	112.2
14	168.2	55.6	8.1	12.9	49.2	233	12.00	135.6
15	172.8	60.7	7.7	12.3	42.8	249	12.75	148.7
16	176.7	65.6	7.2	11.9	40.4	261	13.70	157.6

*Dynamometer

The second model, applicable to all events, is the physical performance capacities model. As already mentioned, several physical performance capacities are genetically determined measurements and there is a correlation between the

initial level and the end results already at the age of 11 to 13 years for boys and 10 to 12 years for girls. Development is unlikely to occur if the required level for a particular event is not present at the age of 13.

Table 4: Selection Criteria for Young Throwers and Jumpers

Age (yrs)	Height (cm)	Weight (kg)	30m Flying (sec)	60m Standing (sec)	St. Long Jump (cm)	St. Triple Jump (cm)	Shot Throw (m)*
Boys							
11	165	50-55	4.3	9.4	210	600	10.50
12	170	55-60	4.1	9.2	220	630	11.50
13	175	60-65	3.8	8.9	230	680	13.00
Girls							
11	160	45-50	4.5	9.8	200	520	10.50
12	168	50-55	4.2	9.4	210	650	11.40
13	170	55-60	3.9	9.0	215	680	12.50

* Over the head backwards (B — 4kg, G — 3kg)

Table 5: Selection Criteria for Physical Capacities (11 to 12 Yrs)

	Boys 11 Years			Boys 12 Years		
	Satisfactory	Good	Excellent	Satisfactory	Good	Excellent
Back dynamometer (kg)	60-70	72-85	Over 85	63-75	76-89	Over 89
Vertical jump (cm)	35-41	42-47	Over 47	37-42	43-48	Over 48
St. Long jump (cm)	160-176	177-192	Over 192	165-182	183-199	Over 199
Pull-ups (x)	2-3	4-5	Over 5	2-3	4-5	Over 5
5-Hops (m)	7.2-8.0	8.1-8.9	Over 8.9	7.6-8.5	8.6-9.5	Over 9.5
30m Sprint (sec)	5.7-5.5	5.4-5.2	Over 5.2	5.6-5.4	5.3-5.1	Over 5.1
Forward bend (cm)	0-3	4-10	Over 10	0-4	5-11	Over 11

	Girls 11 Years			Girls 12 Years		
	Satisfactory	Good	Excellent	Satisfactory	Good	Excellent
Back dynamometer (kg)	50-60	61-71	Over 71	56-76	68-80	Over 80
Vertical jump (cm)	33-39	40-45	Over 46	36-42	43-40	Over 49
St. Long jump (cm)	158-174	175-190	Over 190	167-185	186-203	Over 203
30m Sprint (sec)	5.5-5.8	5.4-5.2	Over 5.2	5.4-5.6	5.3-5.1	Over 5.1
Forward bend (cm)	1-7	8-13	Over 13	3-8	9-15	Over 15
5-Hops (m)	7.4-8.3	8.4-9.3	Over 9.3	8.0-8.9	9.0-9.8	Over 9.8

Two methods can be used to establish reasonably reliable information on physical performance capacities. It can be based on the initial level, or the rate of improvement that occurs over a period of 18 months. We discovered that the level of several physical performance capacities stabilizes at a certain age. This age was 13 years for speed and power and 14 years for absolute strength, endurance and flexibility. The use of both methods obviously produces the most reliable results.

Several specialists believe that the rate of improvement is particularly important to predict the performance potential of young athletes. This has been confirmed by experimental studies, showing that youngsters who made fast progress during the first 18 months of training were most successful also later. Athletes, whose initial performance levels were only average but who improved at a rapid rate,

often passed those with excellent initial levels. It is generally considered that the improvement rate in speed and power events is good when it reaches 10.5 to 12.5% at the end of 18 months.

Finally, there are several norms available to be used in the selection. Alabin, who studied the growth and development of more than 1200 boys presents his criteria for selection of potential sprinters in table 3. Suggested norms for young throwers and jumpers, whose performance depends largely on speed and power indicators, are presented by Komarova and Ruderman in table 4.

In summary we recommend the following selection procedures:

1. Selection during the basic and early specialization stages should be based mainly on anthropometric and physical performance capacity models.

2. Selection of 10 to 13 years girls and 12 to 15 years boys should, in addition, be based on the rate of growth in anthropometric measurements and physical performance capacities. Those, who have been left short of the model characteristics, should be guided to another sport.

3. The norms used in table 5 by the authors can be recommended for selection procedures.