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INTERNATIONAL COMPARISON OF RUNNING PERFORMANCES IN NON-ATHLETIC BOYS AGED BETWEEN 10 AND 13

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Abstract: *The aim of the study was to compare two running performances of prepubertal boys living in different cultural, socio-economic and geographic regions. Data collection was carried out in 3,850 volunteer, non-athletic schoolboys aged between 10 and 13 in four countries (Cyprus, Egypt, Hungary and Malaysia) between May of 2000 and October 2001. Relative body fat content was estimated by the skinfold technique of Parížková(1961) Running performances were measured by 30 m dash and 1200 m run. The mean relative body fat content ranged between 18.50 and 23.31%, however, no significant age dependence could be observed. The lowest averages refer to the Hungarian boys, and the means of Indian children were the highest. The European boys performed significantly better than the Egyptians and Malaysians in 30 m dash by 0.20 seconds and the mean differences varied between 20–40 s in 1200 m run. All the performances can be evaluated as mediocre and poor. The weak performances do not predict good the future health of growing generation.*

Keywords: *30 m dash; 1200 m run; Relative body fat content.*

Introduction

A low level of habitual physical activity and consequently, a low or moderate cardiorespiratory performance are one of the leading risk factors for the development of fatness and obesity and their unfavourable health consequences both in childhood and adulthood. A lower than required cardiorespiratory performance has a significant role on current and future health status (Malina and Bouchard 1991, Prentice and Jebb 2000). Tests of sprinting, distance running, jumping and throwing are most commonly used in assessing physical fitness. Since the most important determinant of cardiorespiratory endurance in healthy individuals is habitual physical activity, the differences in middle- or long-distance running times may characterise the life style in general. The general perception is that children and youth of the economically developed societies are less active and physically fit than is recommended for the optimal protection against future chronic disease (Ross and Pate 1987, Bergstrom et al. 1997, Othman et al. 2002). The level of habitual physical activity in children can be different in a given geographical region (Armstrong 1993), however, the generation differences within one country are also marked (Mészáros et al. 2001). Further Wolanski (1978), analysing the possible consequences of secular trend, has predicted this unfavourable phenomenon by theoretical considerations nearly 25 years ago.

The aim of the study was to compare two running performances of prepubertal boys living in different cultural, socio-economic and geographic regions.

Subjects and Methods

Data collection was carried out in 3,850 volunteer, non-athletic schoolboys aged between 10 and 13 in four countries (Cyprus, Egypt, Hungary and Malaysia) between May of 2000 and October 2001. The classes were selected randomly in all the available schools. Frequency distribution of subjects by calendar age and nationality can be seen in Table 1. The Cypriot (CY) boys were living in the capital and in its suburbs. All of them were of Greek origin (the children of Turkish and Russian minorities were excluded from this comparison). The Egyptian (EG) children were the inhabitants of Banha (the city is the capital of Banha County in north-east Egypt). All the Hungarian (HU) subjects were of Europid origin (this sample does not contain the children of Gipsy families for instance) living in the capital city (Budapest) and in the suburbs. The Malaysian boys represent the children of town Ipoh (the settlement is the capital of Perak State, in central-north Malaysia). The Malaysian samples were divided into three groups by the dominant nationalities. Both parents of the children belonged to the same nationality, namely, Chinese (CH), Indian (IN) and Malay (MA). All the six samples represent the middle socio-economic class of the respective country.

Table 1. Frequency distribution of subjects by calendar age and nationality.

Age/Nationality	Cypriot	Chinese	Egyptian	Hungarian	Indian	Malay
9.51–10.50	162	158	148	173	157	152
10.51–11.50	152	167	151	180	158	158
11.51–12.50	152	167	152	183	158	156
12.51–13.50	154	150	152	195	163	152

Height, body mass and 5 skinfold thicknesses (biceps, triceps, subscapular, suprailiac and calf) were measured according to the suggestions of the International Biological Program (Weiner and Lourie 1969). Body fat content expressed as a percentage of body mass was calculated by the description of Parížková (1961). Sieber-Hegner anthropometer, the same calibrated digital weight scale (its reading accuracy was 0.1 kg) and Lange skinfold caliper were used in all four countries.

Running speed was measured by 30 m dash. Three attempts were performed on the same day (reading accuracy = 0.01s), and the best result was used. Cardiorespiratory endurance was estimated by the results of 1200 m run (reading accuracy=1s). Data collection was carried out by the same team in all the 4 countries. The different running tests appear as constant material during the PE classes.

Differences between the means were tested by F-test following one-way ANOVA at 5% level of random error. In case of significant F-value, the Tukey post-hoc analysis was used.

Results

The height differences (Table 2) were significant in all four age groups compared. The Hungarian children were the tallest, and the Egyptians the shortest. The mean height of the other European nationality (Cypriot-Greek) was also significantly taller than those of

the Egyptians and Malaysians. The inter-Malaysian comparison was also significant, but only the Chinese boys were slightly taller than the Malays. Race differences had no effect on mean related standard deviations.

Table 2. Descriptive (means ± SDs) and comparative statistics for height (cm).

Age	CY (1)	CH (2)	EG (3)	HU (4)	IN (5)	MA (6)	Tuckey post-hoc
10	138.75 ±5.79	138.02 ±6.15	134.83 ±8.29	143.23 ±6.20	138.05 ±7.08	135.46 ±6.92	1=2=4=5 > 3=6
11	145.12 ±7.52	144.69 ±7.22	139.99 ±7.86	148.39 ±6.59	143.45 ±7.59	140.19 ±7.05	4>1=2=5> 3=6
12	150.83 ±7.79	150.15 ±8.19	146.01 ±7.62	153.76 ±7.72	149.49 ±8.03	148.44 ±8.73	4>1=2=5=6>3
13	157.69 ±7.89	155.78 ±7.30	152.39 ±7.09	159.84 ±7.82	155.04 ±8.55	154.23 ±9.10	4>1=2=5=6>3

Marked ethnic and inter-racial differences were found also between the body mass means (Table 3). As one of the consequences of significantly taller stature the Hungarian boys were the heaviest in absolute terms. However, the body mass means relative to height (body mass × 0.01height^{-1}) were the smallest in the Hungarian sample. The greatest relative body mass and the most expressed intra-group variability refer to the Malaysian-Indian boys.

Table 3. Descriptive (means ± SDs) and comparative statistics for body mass (kg).

Age	CY (1)	CH (2)	EG (3)	HU (4)	IN (5)	MA (6)	Tuckey post-hoc
10	35.73 ±7.92	34.42 ±8.44	34.32 ±8.92	37.06 ±7.51	35.08 ±8.94	34.57 ±8.30	4>1=2=3=5=6
11	42.57 ±8.41	41.56 ±8.05	38.11 ±8.44	39.91 ±8.63	39.11 ±9.86	38.03 ±9.12	1=2>3=4=5=6
12	46.83 ±9.26	47.01 ±9.60	42.78 ±9.61	45.18 ±8.59	44.13 ±9.27	42.79 ±9.74	1=2=4=5>3=6
13	53.51 ±9.91	48.32 ±9.77	46.87 ±9.96	50.44 ±8.82	49.08 ±9.72	49.38 ±9.70	1>2=4=5=6>3

The inter-race differences in relative body fat content (Table 4) were not as obvious as they were in the height or body mass. The means of relative body fat content of the four age groups in the six nationalities were high with marked intra-group variabilities. By the determination of Lohman (1992) the observed mean relative body fat contents were greater by 3–7% than those biologically required. The Hungarian boys were the "leanest" and the other five samples could be evaluated as slightly fat, without consistent significant inter-race differences.

Table 4. Descriptive (means ± SDs) and comparative statistics for relative body fat content (%).

Age	CY (1)	CH (2)	EG (3)	HU (4)	IN (5)	MA (6)	Tuckey post-hoc
10	19.50 ±6.43	21.33 ±6.67	18.92 ±6.30	18.90 5.66±	21.67 ±6.53	20.48 ±7.09	2=5>1=3=4=6
11	21.50 ±6.10	22.71 ±6.45	20.22 ±6.51	19.09 ±5.75	23.03 ±6.23	20.79 ±6.81	1=2=5>3=4=6
12	22.28 ±6.59	22.45 ±6.21	19.92 ±6.34	18.75 ±5.55	23.31 ±6.02	21.08 ±6.09	1=2=5>3=4=6
13	21.98 ±6.47	20.49 ±5.78	21.05 ±5.39	18.50 ±6.34	22.11 ±6.09	21.14 ±6.85	1=5=6>2=3>4

By the results of 30 m dash means, the six investigated groups can be divided into two parts. The mean speed performances of the Cypriot and Hungarian boys were not different at 5% level of random error, in spite of the significantly greater relative body fat content of the Cypriot boys (Table 5). These performances are acceptable based on the evaluation of Hungarian PE teachers (Eiben et al. 1998, Othman et al. 2002). The subjects of three Malaysian ethnic groups and the Egyptian boys have performed in a similar level, but their mean running speed was significantly slower than that of the Hungarian and Cypriot boys in every age group.

Table 5. Descriptive (means ± SDs) and comparative statistics for 30m dash (s).

Age	CY (1)	CH (2)	EG (3)	HU (4)	IN (5)	MA (6)	Tuckey post-hoc
10	5.85 ±0.67	5.96 ±0.52	6.01 ±1.01	5.89 ±0.61	6.02 ±0.42	6.05 ±0.38	2=3=5=6>1=4
11	5.73 ±0.71	5.88 ±0.38	5.90 ±0.92	5.69 ±0.76	5.93 ±0.48	5.93 ±0.43	2=3=5=6>1=4
12	5.65 ±0.50	5.80 ±0.44	5.80 ±0.99	5.52 ±0.64	5.83 ±0.41	5.85 ±0.36	2=3=5=6>1=4
13	5.56 ±0.52	5.73 ±0.43	5.70 ±0.89	5.20 ±0.60	5.72 ±0.45	5.76 ±0.49	2=3=5=6>1>4

Descriptive and comparative statistics for the 1200 m running test are presented in Table 6. The running performances of the two European samples were not different statistically. The Malaysian and Egyptian boys performed statistically at the same, but at a very poor level. Nevertheless, the significantly better performances of the European boys can not be evaluated as acceptable compared to the available Hungarian standards (Eiben et al. 1998, Othman et al. 2002). The age dependent trend of increase in the endurance performance was significant only for the Europeans. The endurance performances were very heterogeneous, the standard deviations around the means were consistently greater than the differences between the successive means in all the six nationalities.

Table 6. Descriptive (means ± SDs) and comparative statistics for 1200m run (s).

Age	CY (1)	CH (2)	EG (3)	HU (4)	IN (5)	MA (6)	Tuckey post-hoc
10	384 ±51	403 ±45	439 ±58	382 ±59	408 ±41	412 ±35	3>2=5=6>1=4
11	370 ±55	399 ±41	421 ±51	373 ±65	398 ±41	403 ±33	3>2=5=6>1=4
12	356 ±47	395 ±42	415 ±58	359 ±58	385 ±42	400 ±28	3>2=5=6>1=4
13	350 ±42	390 ±41	409 ±56	346 ±56	380 ±53	386 ±53	3>2=5=6>1=4

Discussion

While the body dimensions and also the relative body fat content have more or less marked effects on physical performances (Mészáros et al. 1986), the racial differences among the respective means of height, body mass and relative body fat content may also have role in this respect. We have to note that only the height differences can be attributed to the racial or ethnic variability in this comparison, the body mass means and especially the relative body fat content are affected by the environmental factors dominantly.

Both running speed and running endurance of the investigated samples were at a moderate or poor level. Since no representative data are available from Cyprus, Egypt and Malaysia the mean performances and the standard deviations were compared to the Hungarian standards (Szabó 1977, Eiben et al. 1998, Othman et al. 2002). Although the performances of Hungarian boys were significantly higher than those of the Malaysians and Egyptians, these performances are lower than those which were characteristic 25 years ago, (Mészáros et al. 2001). The effects of obvious racial (biologically distinct groups) variability, as for instance the differences in physique characterised by the growth type indices (Mészáros et al. 2002) can be excluded in this comparison. The linearity component of physique has significant relationship with the used motor performances in this comparison, both in non-athletic and athletic samples (Mészáros et al. 1986). Nevertheless, there is a considerable overlap in mean motor performances of children from different racial groups of the same calendar age and living in similar socio-economic conditions as observed by Malina (1988). The slight or moderate effects of inheritance on speed and endurance (Chatterjee and Das1995) are also negligible because of the arrangement of this comparison and the performance level of our subjects. The relatively large number of the investigated subjects was not selected and they were definitely non-athletic. Malina and Bouchard (1991) indicate also the relationship, but do not imply the cause-effect sequence between rearing style and motor development.

Bouchard and Shephard (1994) have summarised the components and factors of health-related fitness. Though the effects of morphological, muscular, cardiorespiratory, peripheral metabolic etc. components are really important, the determinant factor in the running performances of these non-athletes is obviously their physical activity level.

The observed problem is multifactorial in all the four countries (Kemper 2000). The attitude and practice of educational policy in physical education and children's physical

activity out of school are very similar in spite of the marked geographic and cultural differences. The presently required level of habitual physical activity only reduces the available budgets, without any immediate benefit. Beyond that this attitude puts off the problem only, but it is false by all means. For the lack of required level of children's regular physical activity, the affected societies must repay the consequences with interest some years later. Interestingly, the best performers of this international comparison represent such population in which only 20% of the individuals have 4-hour regular physical activity out of school physical education (Armstrong 1993). By the more up-to-date Hungarian statistics the mentioned ratio is less than 10% at the beginning of the new millennium unfortunately (Laki and Nyerges 2000). When compared to the 50% active and moderately active ratio in the United Kingdom (Cale and Almond 1997) and Sweden (Ekelund et al 1997) the measured poor performances can easily be understood.

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