URBANIZATION STATUS AND LEVEL OF SPEED AND STRENGTH ABILITIES IN POLISH BOYS AGED 17-19

by

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The material comprised of 362 randomly selected boys from representative towns and villages of "Westpommeranien" region of Poland. Town-country stratification of somatic development (body height and weight) as well as 6 motor tests from ICSPFT were applied.

Relatively clear, statistically significant differences in all variables were found in the village-town comparison, especially at the age of 17 years. These differences diminished and were reduced in older groups what was probably the result of developmental retardation of boys from the villages. The differences disappeared in comparison to Polish developmental norms calculated in relative values (age categories). The authors pointed the necessity of relative treatment of physical fitness as a function of body development performed in relation to the whole period of somatic and motor development.

Key words: motor abilities, social stratification, west Poland

Introduction

The human body is exposed to many environmental factors, which – together with genetic ones – form the "developmental course" of particular features, including motor abilities. Among these factors – as in anthropology – very important role is assigned to social and economic status (SES) of families, however sport scientists suggest, that the most important role is attributed to physical activity (Bouchard et al. 1996, Szopa et al. 1996).

The problem of fitness differentiation of country and town children (urbanization degree) has a long tradition (from early 60's) in Poland in

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regional aspect (Szopa et al. 1985, Dutkiewicz 1990, Januszak and Ignasiak 1994, Eider 2000, Mleczko et al. 1999) as well as in national one (Przewęda and Trześniowski 1996, Pilicz et al. 2002). The acquired results seem to suggest that the level of motor abilities is higher in country children in comparison those living in cities, at least the profile of abilities is relatively different (predominance of speed and coordination in cities), what appears on the basis of whole complex of factors characterizing this ecological niche.

For many years researchers (Szopa and Sakowicz 1987, Żak 1991, Szopa et al. 1996) turned their attention to erroneousity of such reasoning, emphasizing two facts:

1. Motor fitness (through testing motor fitness the abilities are relatively determined) is not an independent and separate property of the human body, but is a significant measure of the function of developmental advancement, especially the somatic one. These two groups of factors develop in the same direction (especially in progressive period), and the elements of SES (including urbanization) influence directly the level of somatic development (the retardation of country population equals 1.5-2 years). This may be the reason of differences in level of motor fitness. This fact concerns especially motor abilities with structural and energetic background (Osiński 1988, Szopa et al. 1996, 1998). The stratification of these abilities may be (and probably is) the indirect outcome of somatic development stratification.

2. The relations between the level of motor abilities and somatic development (measured by i.e. morphological age) are significantly stronger (Żak 1991), than with calendar age (excluding co-ordination abilities with different predispositions). These relations are not identical (linear, non-linear) what was clearly shown by Osiński (1988).

It arises that evaluation of social stratification of motor abilities has to include the subjects or population somatic development advancement what has not been taken into account in ICSPFT and "EUROFIT" proposals for example. The first attempt of relative standpoint was presented by Szopa and Sakowicz (1987) and Żak (1991), and lately Pilicz et al. (2002). These authors proposed the evaluation of ICSPFT in points in relation to body height, treated as the developmental advancement variable.

This point of view was used in this research, which was performed to evaluate the level of female youth motor abilities from Westpommeranien in the light of Polish national data and country-town stratification. It was also assumed that the relativization of motor fitness tests would decrease the absolute differences.

Material and methods

The research was conducted on 362 randomly chosen boys (stratified randomization according to age and school type) aged 17-19 years, including 192 from city and 170 from urban area from Westpommeranien. The research was conducted in April and May of 1997. The choice of subjects' age was not accidental, because the majority of earlier research was conducted on subjects aged 7-15, excluding the puberty acceleration period, when most of the differences may be equal because of country children's developmental retardation. The characteristics of subjects' somatic development is presented in table 1.

Table 1. Somatical characteristics of examined subjects

Variable	Env	Age											
		17				18				19			
		n	$\bar{x}$	SD	d	n	$\bar{x}$	SD	d	n	$\bar{x}$	SD	d
Body height [cm]	T	68	175,9	7,35	7,5***	65	175,0	6,62	2,8	59	176,5	5,8	0,2
	C	59	168,4	9,41		57	172,2	8,01		54	176,3	5,43	
Body weight [kg]	T	68	67,1	8,79	-7,8***	65	67,8	12,8	4,4	59	70,4	8,69	0,5
	C	59	59,3	9,81		57	63,4	12,9		54	69,9	6,94	

Legend: Env – environment, T – town, C – country; *** – p≤0,001

The level of motor abilities was determined with the use of 6 tests from the ICSPFT test battery evaluating different elements of speed (50 m run, standing broad jump, 4x10 m shuttle run) and strength abilities* (grip strength, pull-ups, sit-ups). The chosen tests were simple, easy to perform in conditions of physical education lessons and additionally "related" with somatic development.

The following statistical methods were used:
1. Basic statistical characteristics were calculated ($\bar{x}$, SD, t0).
2. Inter-group and inter-population comparisons were performed on the basis of Z-normalization.
3. In order to demonstrate absolute environmental differences and differences with consideration to somatic development the results of diagnosed population were compared with national data in two variants. The first was based on raw data and the second was recalculated to points according to "body height category" proposed by Pilicz et al. (2002), considering to subjects morphological age.

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* Szopa et al. (1998) determines three speed abilities: non-lactacid maximal anaeobic power, lactacid maximal anaeobic power and ability of muscle mobilization as well as two strength abilities: absolute and local

Results

The statistical data of somatic characteristics are presented in table 1. The city population exceeds country boys in both body height and weight - what was expected, however these differences diminish with age: they are very high at the age of 17 and minimal at the age of 19.

The characteristics of particular motor fitness tests are presented in table 2. Statistically significant differences were not observed only in the grip strength test. These differences are characterized with the specific tendency: results of boys from city are better than those of boys from the urban area. The decrease of differences with age is also observable. These differences in a univocal scale (Z-normalized values) are presented in fig. 1 and it is clearly visible that, according to the scale and direction, they reflect the changes in body height. The values presented in figure 1 allow to confirm the above statement. It seems to be interesting that the greatest differences appeared in tests with a high load of relative strength (pull-ups, sit-ups and 50 m run) and susceptible to environmental influences of muscle endurance.

Table 2. Statistical characteristics of examined subjects motor ability tests

Variable	ENV	Age											
		17				18				19			
		n	$\bar{x}$	SD	d/Z	n	$\bar{x}$	SD	d/Z	n	$\bar{x}$	SD	d/Z
50 m run [s]	T	68	7,87	0,66	0,68**	65	7,84	0,63	0,50	59	7,81	0,62	0,15
	C	59	8.55	0,73	1,03	57	8,28	0,71	0,79	54	8,06	0,69	0,24
Standing broad jump [cm]	T	68	210,1	18,2	14,3**	65	198,5	17,9	2,5	59	195,8	17,6	0,2
	C	59	195,8	17,6	0,79	57	196,0	18,2	0,14	54	195,6	16,2	0,01
4x10 m shuttle run	T	68	11,14	0,71	0,65**	65	11,22	0,73	0,09	59	11,36	0,79	0,05
	C	59	11,89	0,82	0,92	57	11,13	0,74	0,12	54	11,41	0,81	0,06
Grip-strength	T	68	40,6	9,2	1,7	65	44,1	9,9	0,9	59	53,0	11,5	0,4
	C	59	38,9	8,3	0,18	57	43,2	9,2	0,09	54	52,6	10,8	0,03
Pull-ups	T	68	6,11	1,8	2,4***	65	6,2	1,9	1,64***	59	5,8	1,8	0,8
	C	59	3,7	0,8	1,34	57	4,5	1,0	0,86	54	5,0	1,1	0,46
Sit-ups	T	68	23,0	3,6	3,9**	65	20,8	2,5	1,2	59	21,8	2,8	0,9
	C	59	19,1	2,7	1,08	57	19,6	2,6	0,48	54	20,9	2,7	0,32

Legend: ENV - environment, T - town, C - country
Differences are statistically significant at p≤0,01 (**), p≤0,001 (***)

Figure 2 presents the comparison of raw data of particular motor fitness test in the light of their relative values expressed in points in body height category. In the opinion the authors, the relative values present real motor abilities differences, without the influence of somatic development.
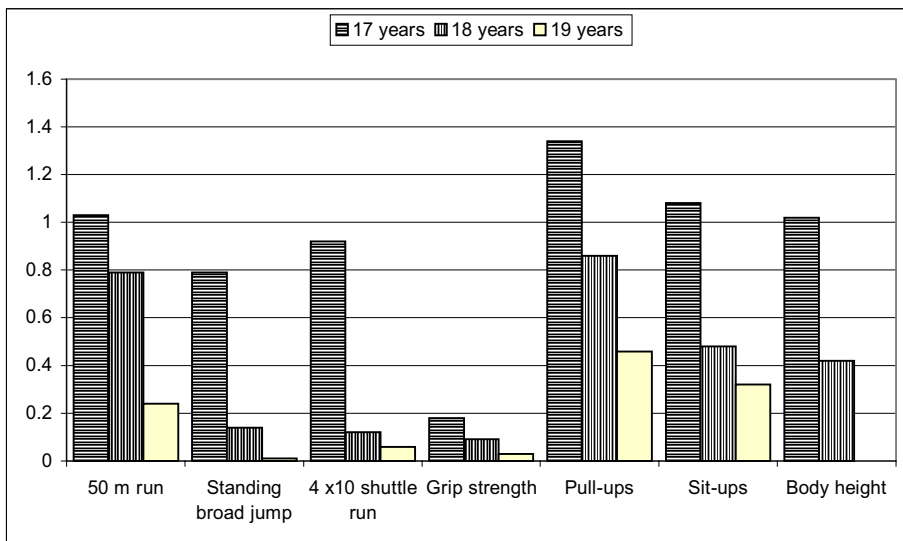
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Fig. 1. Z-normalized town-country differences of particular motor abilities in comparison to body height

The effect of this calculation is astonishing and very important from a methodological point of view. As it can be seen, the relative differences (excluding 50 m run) are minimal, and in some cases show a reverse gradient (standing broad jump, 4x10 m shuttle run). In relation to Polish national population (Pilicz et al. 2002) following tests: 4x10 m shuttle run, grip strength and pull-ups show a identical level, and test evaluating the non-lactacid maximal anaerobic power (50 m run and standing broad jump) as well as muscle endurance (sit-ups) should be treated as neglected.

Discussion

The researched population is characterized by significantly lower level of development than "expected values" calculated by Pilicz et al. (2002) on the basis of research from 1999. It seems, that during this research, the author committed some methodological or population mistake. Probably the randomization was not performed properly or some measurement errors occurred. The average body height, equal to 178,5 cm, seems to be so high in comparison with Polish population (national, and from Cracow, Szczecin and other large towns), that it should be treated as improbable. It does not change the effects of relativization, but clearly testifies that quantity of subject unnecessary automatically creates representativity: in so called "national samples" the researches are conducted professionally.

The level of Szczecin population motor abilities development may be objectively evaluated only in relative categories i.e. "age of body height category". As mentioned in analysis of results this level is similar in tests based on relative strength, and lower in case of the non-lactacid maximal anaerobic power and local muscle endurance. Simultaneously, the lack of diagnosis of co-ordination abilities tests and aerobic capacity unable complete evaluation of motor potential. That is the reason - in opposition to others (i.e. Charzewski and Przewęda 1988, Dutkiewicz 1990, Żak 1994, Przewęda and Trześniowski 1996, Eider 2000) - authors of this work would not attempt to formulate any specific conclusions about these problems. Only the need of intensified work with children in order to "equalize" and exhibit these abilities as elements of "health-related fitness" and statement, that the researched population has simply a different (not better and not worse) profile of fitness from the average one in Poland.

The answer for the main research question if motor abilities social stratification – in light of acquired data – is relatively simple. The clear predominance of boys from town vanishes completely (excluding 50 m run) after relativization of results. It confirms that the level of fitness of the tested population is similar, and differences – especially at the age of 17 years – are the effect of maturity. The developmental retardation of urban boys approximates 1,5 – 2 years, yet it is equalized among adults. The conclusions about lower level of motor fitness of urban populations or people with "with lower social status" formulated based on the anthropologists opinions (Przewęda 1997, and others) have no confirmation when any method of relativization is used in calculations of motor fitness tests results. It applies of course only to motor fitness treated as the ability to control own body (smaller or larger), but there is no data suggesting, from "health-related fitness", that fact of larger body possession is beneficial and what values of particular motor abilities are optimal.

Conclusions

1. The influence of urbanization as one of the "environmental determinants" on somatical and motor development of boys from Westpommeranien aged 17-19 years is highly disputable: the differences in raw data seems to be the relative effect of differences in development dynamics and disappear with maturation.
2. Suggestions about the necessity of motor fitness relative treatment (evaluation in developmental age categories) and its diagnosis in whole progressive ontogenetical period (not only in easy accessible younger school age) was once again confirmed.
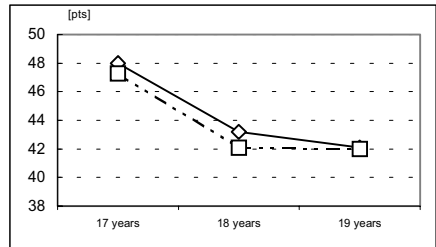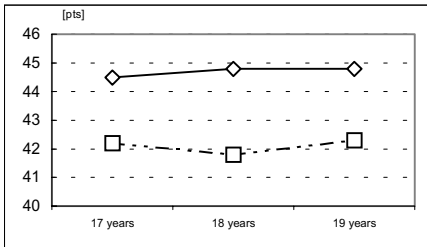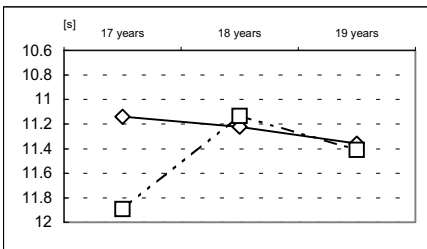
50 m run
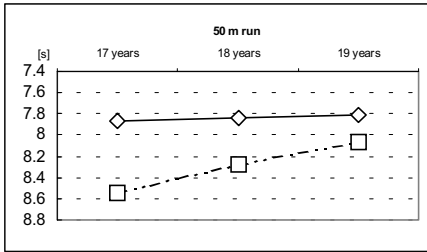
Standing broad jump
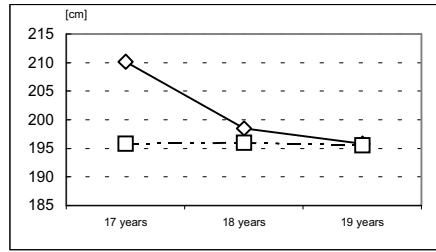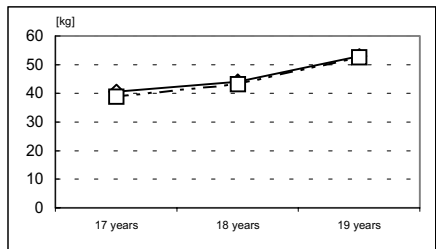

Relative values
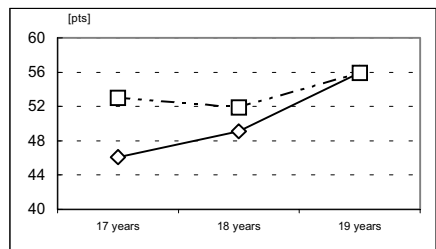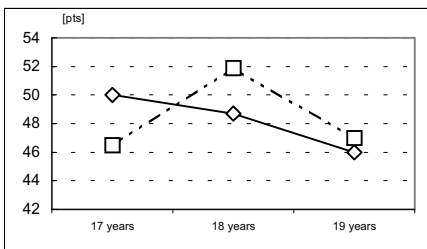

4x10 shuttle run

Grip strength
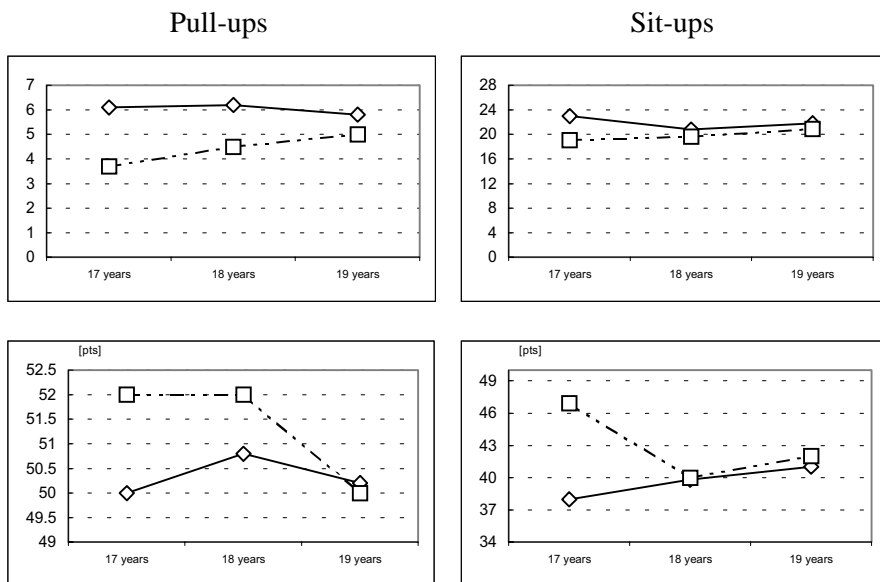

Relative values

Pull-ups

Sit-ups

Fig. 2. Town-country "raw" and "relative" values of particular tests (in "proper body height" category)

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