

THE INFLUENCE OF SOCIOECONOMIC STATUS ON THE LEVEL OF EARLY-SCHOOL-AGED CHILDREN'S MOTOR ABILITIES – BLURRING OF DIFFERENCES IN THE ECONOMICALLY UNDERDEVELOPED AREAS

Podstawski Robert¹, Boryslawski Krzysztof², Kajmowicz Bartosz²

Department of Physical Education & Sport, Department of Tourism & Recreation, University of Warmia & Mazury in Olsztyn, Poland¹

Department of Anthropology, Wrocław University of Environmental and Life Sciences, Wrocław, Poland²

Annotation. *Aim:* The aim of the study was to determine differences in the level of motor abilities of 7-9-year-old girls and boys in relation to the socioeconomic status of their families. *Material and Methods:* The research was conducted in 12 primary schools in two regions of Poland namely of Warmia & Mazury and Pomorskie voivodeship, on the total of 1205 pupils (584 boys and 621 girls) aged 7-9. Selected economic factors such as the type of school (public or private), monthly income per household member, and the number of children in a given family were accepted as the independent variables. The factors behind social status included the place of residence and parents' educational background. In order to determine the level of motor abilities, 13 motor tests were applied. *Results:* The research revealed that motor tests such as 1 and 3 min. Burpee test and medicine ball throws (forward and backward) appeared to show the biggest differences in the level of motor abilities of the children whose social and economic status varied. The results of these tests as well as those of the shuttle run were significantly higher for the girls from the families of high social status than for the boys of low social status. Social status to a greater extent than economic one differentiated the tested motor abilities, especially in the case of the girls from families marked by high social status, who scored better than boys. The exception is the skipping with clapping of hands – 8 s trial, which differentiated only the tested categories of economic status, especially when referred to the girls. *Conclusions:* Owing to the small number of significant differences between high and low social and economic status in both sex groups in the motor tests applied, it can be assumed that in the less developed, agriculture and tourism-oriented areas there has occurred blurring of the differences in the level of children's motor abilities depending on their social and economic status.

Key words: children, motor fitness, status, social, economic.

Introduction

A child's lifestyle is a type of a cultural modifier which is influenced by a range of both endogenic (temperament, sensitivity, needs) and exogenous factors such as customs, traditions and values combined with social-economic and environmental conditions. Physical activity occupies a special role among various elements of lifestyle. Numerous studies have confirmed the existence of positive relationships between physical activity and motor fitness (1), the intensity of which in the case of children was found to be only low or moderate (2). People who possess a higher level of motor fitness are more likely to be engaged in physical activity, which in consequence significantly decreases their proneness to illnesses such as: cardiovascular disease, type 2 diabetes, and all-cause mortality (3) in adults. The changes induced by physical exercise are mostly adjustable and disappear gradually once the stimulus is removed. On the whole, males tend to be more ecosensitive in terms of their sensitivity to the effect of physical and environmental factors and lifestyle (4).

It is common knowledge that the influence of socioeconomic status on the physical development of children is extensive. The analysis of the influence of socioeconomic modifiers on an individual's motor fitness typically takes into account the size and type of social environment (village, town, city, degree of industrialization, etc.) as well as the subject's financial situation (income, household wealth, number of family members) (5).

Adequate fulfillment of every person's basic needs largely depends on the income per family member (6). A lower monthly income per household member generates additional obstacles against undertaking physical activity due to, for example, difficulty in paying transport fares or trainers' fees, necessity to purchase sports facilities and equipment, or inability to secure safe neighborhood (7). By way of contrast, children from affluent families and whose parents are well-educated are characterized by accelerated biological development when compared to children growing up in less-educated, lower income families (8, 9). In the main, there exists a kind of socio-cultural code in a society to value people predominantly according to their educational background. Interestingly enough, the children raised in the families of the intelligentsia tend to grow taller. Moreover, they exhibit a higher level of motor fitness (10). This can be explained by the fact that physically fit and active parents, who frequently come from well-educated backgrounds themselves, emulate educational patterns of their parents and bring up their offspring(s) alike (11). Because of this, there is a strong likelihood that habits promoting active lifestyle will be formed and cultivated throughout the child's developmental period (12).

Physical development is largely determined by the place of residence, be these villages, towns or cities (13). The accelerated growth and development of children living in an urban environment seems to be caused by better care and living conditions (nutrition, hygiene, health care). Apart from this, the influence of stimuli affecting the nervous system and sensory organs such as television, cinema, and advertisement should not be underestimated. Moreover,

children growing up in urban environments have easier access to sporting facilities, which undoubtedly exerts a positive influence on their motor fitness (14).

Nonetheless, there has been observed a negative phenomenon of a steadily decreasing level of children's physical activity, particularly noticeable in the societies of highly developed countries and regions. Health care programs applied worldwide seem to have been ineffective in bringing the expected results as the research on the health status of children and adolescents presents a very worrisome outcome (15-Chiodera, 2008). This dangerous phenomenon bears special significance when pertaining to children because a poor level of physical activity during the formative stage results in a low level in adult life (16). This is often parallel with the tendency to overweight or obesity, which are the main causes behind numerous civilization diseases (17). In view of the above, motor fitness is an important measure of human health, and for this reason researching its level has become particularly significant in today's postindustrial societies.

The aim of the study was to determine any possible differences in the level of 7-9-year-old girls and boys' motor abilities in relation to the socioeconomic status of their families.

Material and Methods

Ethical consideration

The research was carried out with prior approval of the Ethical Committee of UWM, and the volunteers willingly agreed to participate in the study, which they confirmed by signing a written consent form.

Material

The research was conducted in 12 primary schools in north-eastern Poland (the voivodeship of Warmia & Mazury – 6 schools, and Pomorze – 6 schools) and was composed of over 97% of the students attending 1st, 2nd and 3rd grades at these institutions. The schools in which the research was conducted were randomly selected across the region of western part of warmińsko-mazurskie voivodeship and eastern part of pomorskie voivodeship adjacent to Warmia & Mazury. Such a selection of the research area was due to practical reasons (immediate environs). Apart from this, both regions are believed to be similar in terms of socioeconomic status.

A total of 1205 students (584 boys and 621 girls) aged 7-9 participated in the studies. The motor tests were conducted during obligatory P.E. lessons between September and October 2008. In order to provide a wide range of the socioeconomic statuses, the schools located in villages as well as small, medium, and large cities were selected for the research. Therefore, taking into account a big number of participants, a homogenous (narrow) and relatively developmentally stable age group and diverse urbanization statuses, the study group can be considered representative for this type of research.

Methods

Selected socioeconomic factors, which are most often accounted for by research, were accepted as the independent variables. These factors constituted the following: the type of school (public or private), monthly income per household member, and the number of children in a given family. The independent variables connected with social status were the following: the place of residence and parents' educational background. Each category of the analyzed factors was given a set number of points (Tab.1)

Table 1

The number of points in each SE and SS category

Economic status – total : min - 3, max – 10		Number of points
Type of school	Public	1
	Private/	2
Income per one person in a family [PLN]	x – 800	1
	801 – 1600	2
	1601 – 2400	3
	2401 – 3200	4
	3201 – x	5
Number of children in a family	1 – 2	3
	3	2
	4 and more	1
Social status - total: min - 3, max – 10		
Place of permanent residence	Village or town up to 20 000	1
	Town up to 50 000	2
	Small city 50 - 100 000	3
	City over 100 000	4
Father's educational background	Primary and secondary vocational	1
	Secondary	2
	Higher education degree (BA/BS; MA/MS)	3
Mother's educational background	Primary and secondary vocational	1
	Secondary/high school	2
	Higher education degree (BA/BS; MA/MS)	3

A bigger number of points awarded for the material status of families of the children attending private schools is based on the assumption that such families are better-off. On the other hand, the bigger the number of children in a given family, the stronger the likelihood that they are characterized by a lower economic status (18). The point system was developed in such a way that the maximum (10 pts) and minimum (3 pts) number of points awarded for economic (ES) and social (SS) status was the same. As a result, ES and SS were divided into two subcategories: lower status (3-6 pts) and higher status (7-10 pts). This division was conducted on the basis of the median so that the number in each group would be similar in the individual age and sex categories (Tab. 2).

Table 2

Numbers of individuals in established categories of sex, age, and economic and social status

Sex	Age [years]	Number (N)	Economic status		Social status	
			Low	High	Low	High
Boys	7	186	88	98	118	68
	8	200	101	99	112	88
	9	198	90	108	124	74
	7-9	584	279	305	354	230
Girls	7	207	80	127	125	82
	8	187	82	105	75	112
	9	227	101	126	129	98
	7-9	621	263	358	329	292

The results obtained by the children in the individual motor tests constituted the dependent variables. Eleven motor tests were used to precisely assess the level of motor abilities, namely: the standing long jump [cm], the 4x10 m shuttle run [s], the skipping with clapping of hands – 8 s [number of claps], sit-ups – 30 s [number of sit-ups], the medicine ball (2 kg) forward throw [cm], the medicine ball (2 kg) backward throw [cm], the bent arm hang on bar [s], the downward bend from standing position [cm], the sit and reach [cm], and the 1 and 3 min. Burpee test [number of cycles]. The accuracy and reliability of these tests have been confirmed by Pilicz (19). Prior to performing the actual trials each participant took part in a 10-minute warm up. The children taking part in the experiment were instructed how to perform each motor task and provided ample time to execute it properly. In order to gather the information concerning the socioeconomic status of the children examined in the research, their parents were surveyed by a questionnaire.

Statistical analysis

The results of the studies were calculated using the Statistica software package. The arithmetic mean and standard deviation were calculated for each of the three age categories and both sexes as well as the indicated social and economic status categories. The Shapiro-Wilk test was used to assess whether the distribution was normal and revealed no significant deviations from normality. Based on this data, the position of each participant in his or her category was additionally calculated in the Z scale (0;1 normalization). The Z value constitutes the quotient of how much a given individual's result differed from the average of the category and the standard deviation calculated for the category. By this, all age categories could be combined into one and the analysis to be carried out only on the more numerous sex categories. Therefore, average Z and SD_Z values were calculated for both boys and girls. The t-Student test was used to calculate the differences between higher and lower ES and SS categories of average arithmetic absolute mean values of the analyzed motor abilities as well as average Z value.

Results

Table 3

Differences in motor fitness of the boys and girls from the families of low and high economic and social status

Sex	Age [years]	Motor test	Economic Status	
			Low (3-6 pkt)	High (7-10 pkt)
Boys	7	Medicine ball backward throw	+	-
		3 min. Burpee test	+	-
	8	Flexed-arm hang on bar	-	+
	9	Skipping with clapping of hands	-	+
	7-9 (Z-scores)	No differences		
Girls	7	4x10 m shuttle run	+	-
		Skipping with clapping of hands – 8 s	-	+
		Downward bend from standing position	+	-
	8	Skipping with clapping of hands – 8 s	-	+
		1 min. Burpee test	+	-
	9	4x10 m shuttle run	+	-
		1 min. Burpee test	+	-
7-9	4x10 m shuttle run	+	-	

		(Z-scores)	Skipping with clapping of hands – 8 s	-	+
			1 min. Burpee test	+	-
Social Status					
Boys	7		Sit-ups - 30 s	+	-
			Downward bend from standing position	-	+
			Medicine ball backward throw	+	-
			Medicine ball forward throw	+	-
			1 min. Burpee test	+	-
			3 min. Burpee test	+	-
	8		Medicine ball backward throw	+	-
	9	No differences			
	7-9 (Z-scores)		Medicine ball backward throw	+	-
			Medicine ball backward throw	+	-
Girls	7		Standing long jump	-	+
			Medicine ball backward throw	-	+
			Medicine ball backward throw	-	+
			1 min. Burpee test	-	+
			3 min. Burpee test	-	+
	8		4x10 m shuttle run	-	+
			1 min. Burpee test	-	+
			3 min. Burpee test	-	+
	9		Flexed-arm hang on bar	+	-
			1 min. Burpee test	-	+
			3 min. Burpee test	-	+
	7-9 (Z-scores)		4x10 m shuttle run	-	+
			1 min. Burpee test	-	+
		3 min. Burpee test	-	+	

Note: Only the features showing statistically significant differences ($p \leq 0.05$) were included, marking better results with (+), and worse results with (-).

The motor tests which most significantly differentiated the children in the analyzed ES and SS categories were the 1 and 3 minute Burpee test. The number of cycles performed during these time limits was significantly bigger in each of the three analyzed age categories as well as the combined age categories (Z-scores) for the girls raised in the families characterized by high social status (SS) (Tab. 3). The opposite was observed among 7-year-old boys, as the children from low SS families were characterized by a smaller number of performed cycles. Economic status (ES) influenced the number of cycles conversely and to a lesser extent, as the children from the families of low ES achieved better results, although only in the case of 7-year-old boys (3 minute Burpee test) and 8- and 9-year-old girls (1 minute Burpee test). This effect remains detectable when the impact of age is eliminated in the case of girls (1 minute Burpee test).

The results of the medicine ball forward and backward throws as well as the 4x10 m shuttle run displayed a similar, though not as clear, tendency. Significantly better results in the medicine ball throws were observed among 7-year-old girls from the families with the highest SS, 7- and 8-year-old boys as well as 7-9-year-old boys from the families with a lower ES. As far as the 4x10 m shuttle run test is concerned, the whole group of 7-9-year-old girls (Z-scores) and 8-year-old girls from the families marked by a high SS as well as the whole group of 7-9-year-old girls from the families characterized by a lower ES scored significantly better. The results above revealed no significant differences as regards the boys from the families in different ES and SS categories. It is worth noting that SS differentiated the analyzed motor abilities more than ES (25 significant differences as opposed to 11). The only motor test which was found to be unaffected by any SS in any age or gender category was the skipping with clapping of hands – 8 s. The same trial, however, was characterized by higher results obtained by the children from the families of higher ES in four separate categories: 9-year-old boys, 7- and 8-year-old girls, and 7-9-year-old girls (Z-scores). Both SS and ES failed to clearly differentiate the remaining motor tests. The observed individual differences can be treated as coincidental.

Discussion

In order to make sense of the relationships between socioeconomic status and the level of motor abilities of early-school-aged children, it is necessary to interpret these dependencies in terms of cause and effect. According to Krombholz (20), children falling into the lower categories of socioeconomic status are exposed to fewer stimuli which could encourage them to be involved in a physical activity. As a result, they lead a more sedentary lifestyle and tend to consume unhealthy foods and drinks. This, in consequence, makes them prone to becoming overweight. Overweight individuals, in turn, tend to be even less physically active and gain more weight, which over time can lead to obesity

(21). Since there is a positive correlation between physical activity and physical fitness, overweight and less active individuals usually perform worse in motor tests (especially involving aerobic efforts) (2, 15, 22).

The way socioeconomic status affected the level of physical development of Polish children in the 1980s was presented by Wolański et al. (23). In the case of psychomotor traits, females from rural areas showed greater muscle strength and shorter reaction time than those living in cities (13). Other research by the same author, focused on the effect of family types under different cultural and economic conditions in Poland, Bulgaria, Japan, Korea, and Mexico. It provided evidence for civilization-related distinction of families creating an environment for child's development (8). It should be noted, however, that the Polish socioeconomic situation of the 2000s differs significantly from the socioeconomic conditions of the 1980s. On the other hand, the research conducted over the past two decades has shown that the phenomenon of the negative impact of low physical activity of children on their motor abilities occurs in both developed areas (15, 24) and those of low socioeconomic status (20, 21).

Our research showed that out of 11 motor tests, in the majority of cases there were no significant differences between children representing low or high SES. With regard to the factors included in the SS (place of residence and parents' educational background), 25 cases of significant differences were found in the level of motor abilities in the tests applied. Taking into account the factors of SE (type of school, monthly income per family member, and the number of children in a family) only 9 differences occurred. Therefore, it can be assumed that in the case of early-school-aged children from the regions of Warmia & Mazury and Pomorze, the factors determining SS differentiated the level of children's motor abilities to a greater degree than those of SE.

No significant differences in most of the motor tests may indicate blurring of the differences between developed and economically poor areas, which may be accounted for by several reasons including: the improvement of the living conditions of the populations in rural areas and the deterioration of these conditions in the urban agglomerations. In general, stronger impact of socioeconomic factors is more noticeable in the case of economically underdeveloped areas where unemployment is very high (25). Warmia & Mazury is one of the most underdeveloped regions in Poland, with the highest unemployment rate (>25%), and most of its land zoned for agriculture and tourism. In consequence, the financial situation of families living in urban areas (the vast majority of 20 up to 50 thousand of inhabitants) is similar in respect of socioeconomic status to those living in the country. Moreover, a marginal number of larger agglomerations (only two 150-180-thousand inhabitants large) is strongly influenced by the surrounding agro-tourism-oriented environment. This assumption is confirmed by the survey carried out with the students at the UWM in Olsztyn, which showed no influence of socioeconomic status on the results obtained in the motor tests by the students living in Warmia & Mazury (26). Even though the region of Pomorze is characterized by a higher level of development and the unemployment rate there is relatively low, the schools involved in the research were located either in the country or in the small towns across the area which lies in the immediate environs of Warmia & Mazury. That is why their socioeconomic status was similar to that of the children living in warminsko-mazurskie voivodeship.

The analysis of the results by gender led to several surprising conclusions. Although boys tend to be more ecosenesitive than girls, fewer cases (13) of significant differences were observed in their motor tests when compared to the girls' (24). This effect may be explained by a different social acceptance for physical activity between girls and boys (27). Furthermore, Fisher et al. (28) suggest that the effect in question is not necessarily linear but rather prevalent at the extremes of the distribution. It is supposed that children with the poorest motor skills may be the most sedentary, whereas children who are the most coordinated may be the most physically active. However, the underlying mechanisms of the cause-and-effect chain in the relationship between physical activity – overweight – motor performance are not clear in the case of children (21, 28) because it is still undecided which aspects of children's physical activity are relevant in regulating body weight (29). For this reason the influence of socioeconomic factors on the level of children's motor abilities can be limited, as the studies in this field have been conducted mainly on adolescents rather than children (30). The research conducted with German (31) and Flemish children (32) revealed that the children of higher socioeconomic status performed better than the children of lower status, whereas the results of the children in Mozambique showed the reverse (25).

On the other hand, taking into account the number of significant differences that have occurred in the applied motor tests it was found that they appeared in large numbers but only in some tests, namely: the 1 minute Burpee test (8 cases), the 3 minute Burpee test (6 cases), the 4x10 m shuttle run (5 cases), the medicine ball backward throw and the skipping with clapping of hands – 8 s (4 cases), the medicine ball forward throw (3 cases), the hang on bar and the downward bend from standing position (2 cases), the sit up 30 s, and the standing long jump (1 case). The largest number of these cases have been observed in the 1 and 3 minute Burpee tests. Despite the fact that both trials refer to the same motor task, time is a distinctive factor which distinguishes them fundamentally. The effort carried out within the 1 minute Burpee test focuses mainly on anaerobic processes, whereas the 3 minute Burpee test – on aerobic ones (33). A similar number of significant differences that occurred in these trials may be associated with an integrating component of strength, which at the same time implies the hybrid nature of both motor tests (34). It is hard to explain, however, why the number of cycles performed within 1 minute Burpee test is higher as regards the girls in the higher category of SS, while lower in the higher category of ES. On the other hand, this effect when observed in the boys is maintained for socioeconomic status in the case of the 3 minute Burpee test. In addition, the boys in higher categories of SS achieved lower scores whereas the girls tended to score better in both tests.

For the whole group of girls, the results obtained in the trials such as 1 and 3 minute Burpee test are very consistent with those obtained in the trials attained by boys in the 4x10 m shuttle run for the SS and SE categories (with

the exception of 3- minute Burpee test), while the skipping with clapping of hands – 8 s shows a reverse trend for SE. Speed abilities demonstrated in the tests such as the 4x10 m shuttle run and the skipping with clapping of hands, are strongly positively correlated with strength abilities, which in some ways may be explained by the convergence of these trends with the speed-strength tests (1 minute Burpee test). In contrast, endurance abilities are negatively correlated with strength abilities so that the convergence of the 4x10 m shuttle run and the skipping with clapping of hands – 8 s is rather accidental, or due to other reasons.

On the basis of the above data it can be concluded that the obtained results failed to confirm these observed by many authors, which may stem from the economic specificity of the tested region. Motor fitness depends on the level of a child's physical activity and therefore has been shown to be influenced by multiple environmental, sociocultural, psychological, and biological factors (12).

Limitations

Although the findings of the research were very interesting they revealed the blurring of the differences in the level of motor abilities of the early-school-aged children living in poorly developed regions, it cannot be denied that the scope of the research, which was limited to only two voivodeships, was far from exhaustive. In order to confirm these assumptions the research should be conducted in other voivodeships or regions of Poland marked by analogous unfavorable socioeconomic conditions so as to compare them with the areas characterized by a high socioeconomic status.

Conclusions

Owing to the small number of significant differences between high and low SS and SE in both sex groups in the motor tests applied, it can be assumed that in the less developed, agriculture and tourism-oriented areas there has occurred blurring of the differences in the level of children's motor abilities depending on their social and economic status.

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Information about the authors:

Podstawski Robert: ORCID: 0000-0002-1492-252X; podstawskirobert@gmail.com; University of Warmia & Mazury in Olsztyn; Prawocheńskiego 7, 10-720 Olsztyn, Poland

Boryslawski Krzysztof: ORCID: 0000-0002-6290-1192; k.boryslawski_xl@wp.pl; Wrocław University of Environmental and Life Sciences; ul. Koźuchowska 6, 51-631 Wrocław, Poland

Kajmowicz Bartosz: ORCID: 0000-0002-4271-5018; kajmowiczb@gmail.com; Wrocław University of Environmental and Life Sciences; ul. Koźuchowska 6, 51-631 Wrocław, Poland

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