

THE INFLUENCE OF SOCIAL-ECONOMICAL FACTORS ON THE MORPHOFUNCTIONAL GROWTH OF CHILDREN CONSIDERING THE URBANISATION FACTOR ASPECT

Zofia Ignasiak, Teresa Sławińska, Jaroslaw Domaradzki

University School of Physical Education, Wrocław, Poland

Submitted in August, 2002

We tried to prove that living conditions have a significant influence on somatic and functional development of children in Poland. We examined 331 11-year-old children (boys and girls) from the small town of Polkowice and villages in south-west Poland. Basic somatic traits were examined: body height, body weight and body fat. Functional traits were examined through motor trials from Eurofit test: hand grip, standing jump, ball throw, shuttle run and a tapping test of the upper arm. Additionally, psychomotor trials were performed: reaction time and eye-movement coordination. Children from the town and villages were divided into two groups on the basis of a social-economic factors – “the number of children in the family”. Four groups of children (boys and girls separately) were compared: urban children from families with 1–2 children, urban children from families with 3 or more children, rural children from families with 1–2 children and rural children from families with 3 or more children. We tried to estimate a hierarchy and directions of this environmental factor’s influence on body dimensions, conditional abilities and coordinational abilities. We used cluster analysis as a statistical method towards fulfilling this aim. The results showed that both factors analysed in elaboration are significant modifiers of somatic and functional traits. Boys seem to be, as a sex, more ecosensitive than girls.

Keywords: social-economical factors, environmental conditions for growth, children’s development, morphofunctional traits.

INTRODUCTION

People’s life conditions are strongly connected with the degree of urbanisation of their living area. So, a lot of research has shown differences in the speed of the biological growth of children among children from big cities, towns and villages and inform us of differences in the quality of life of those populations. Providing such research is socially justified because we can show in which kinds of areas the national program of “social differences reduction” should be implemented. It concerns education as well as the biological development of young people.

In our work we checked to see if there was any distance between rural and urban children in morphofunctional development. Additionally we took into consideration the number of children in each family. It’s a social-economical factor diversifying parameters of somatic and functional growth of children in Poland (Hulanicka et al., 1990; Ignasiak et al., 1996; Sławińska, 2000). Our examinations were provided in industrial areas in the south-west part of Poland in the Copper Mine District. The industry factor had impact on the regional economical situation and on what could modulate differences in the examined groups.

MATERIAL AND METHODS

The material used were the measured data of children received during complex research provided by the Department of Human Anatomy, University School of Physical Education in Wrocław. It was done in September 1998 in six villages: Kotla, Kromolin, Rosochata, Rzeszotaryn, Brzeg Głogowski and Nie-lubia situated in the Copper Mine District and in September 1999 in the town of Polkowice – also situated in the Copper Mine District. All areas had a lot of air pollution, but they had, on the other hand, a high economic level. It was because of the copper industry, which not only caused environmental pollution, but it was the reason for changes in the social-economic environment as well. It changed the structure of employment in the region, which was transformed from a typical rural area into a high industry region. So the source of the livelihood of families were both work in the copper industry as well as in agriculture. This kind of situation created a special system of common relations of environmental factors of development. The hierarchy, directions and strength of the effects on the human organism is other than what is usually observed.

In our work we chose 11-year-old children. We qualified the children between 10.50 and 11.49 years old children for inclusion in this group. We examined 177 boys and 154 girls.

The body height, body weight and sum of three skin-folds (on the triceps, on the scapula and on the abdomen) were measured.

To diagnose the level of motor development we chose some trials from Eurofit test (1989). They were:

- handgrip (static strength of hand),
- standing jump (explosive strength of legs),
- 1 kg ball throw (explosive strength of arms),
- shuttle run 10 × 5 m (agility),

which measure conditional abilities, and also the following:

- tapping test (speed of movement of the arm),
- reaction speed,

and

- eye-movement coordination,

which measure coordinational abilities.

Additionally, inquiries concerning the socio-economic situation of families were received. Information received from inquiries let us put the families into two groups on the basis of the “number of children in family” factor:

- 1–2 children in family: a family with comparatively few children,
- 3 and more children in family: a family with comparatively more children.

To estimate differences in morphofunctional growth between children from all groups we used cluster analysis. The unweighted pair-group average method of agglomeration was used (UPGMA – Sneath & Sokal, 1973). The distance between clusters was computed as a mean distance between all pairs of objects in two different clusters. Euclid’s distance was measured. It’s a geometrical distance in multidimensional space.

ANALYSIS

Multidimensional research on conditions of children’s development is provided in many European centres (Bláha & Vignerová, 2002; Eiben et al., 1991; Hulanicka et al., 1990; Ignasiak et al., 1996; Lindgren, 1976). In our work we focused on estimating the influence of two kinds of socioeconomical factors: the degree of urbanisation of living area and number of children in family on biological development of children. The number of children in family factor was treated as a marker of the economic possibilities of the family. The degree of urbanisation of the living area determines better education, medical care and more diversified food. These factors, through biological incentives, affect the human organism and can positively stimulate as well as negatively influence growth. Most frequently, they didn’t have an effect singly, but connected with each other, creating interactions. So to estimate the influence of both already-

described socioeconomic factors on the growth of children, our analysis was provided based on four groups of children of both sexes. Both urban and rural children were divided into groups living in families with a smaller number of children and those with a greater number of children. The same legend exists on all figures: MP1–2 – urban boys from families with 1–2 children, MP ≥ 3 – urban boys from families with 3 and more children, MW1–2 – rural boys from families with 1–2 children, MW ≥ 3 – rural boys with 3 and more children, KP1–2 – urban girls with 1–2 children in family, KP ≥ 3 – urban girls with 3 and more children, KW1–2 – rural girls from families with 1–2 children, KW ≥ 3 – rural girls from families with 3 and more children.

The analysis of single somatic and functional traits gives a lot of information about the human organism, but it’s not a mirror of structure and the functional complexity of the human organism. But the human body isn’t only a simple sum of single parameters, but is made up of complex components making complicated connections and interactions.

Comparing the created clusters of boys to girls we observed little sexual dimorphism in connections and linkages of environmental groups.

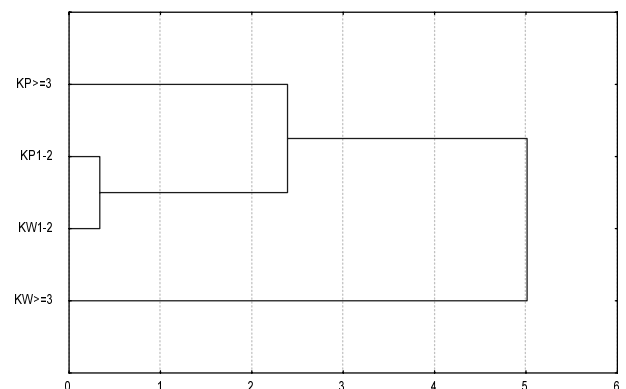
Clusters on the basis of somatic traits (body height and weight and sum of 3 skin-folds)

Boys

The social-economic situation, defined by the number of children in a family, was a relatively stronger factor diversifying the basic somatic traits of boys than the degree of urbanisation of the living area (Fig. 1). This scheme was similar to girls but more strongly marked. Two clearly created clusters proved it. One of them was made up of groups of rural and urban boys from children families with a smaller number of children and the second one was made up of groups of rural and urban boys from families with a greater number of children.

Fig. 1

The clusters of rural and urban boys from families with a smaller or larger number of children per family on the basis of somatic traits



We thought that such a scheme and hierarchy of factors indicating domination of the number of children in family factor could be explained by social-economic specifics of the region, which had a generally high level of economic well-being tied up with the copper industry where people both from villages and towns work. It reduced inter-environmental differences so, in such a situation, the factor of the number of children in a family became more important. It was associated with the economic possibilities of a family, independent, at this moment, of the area of living of that family. A clearer character connection could be seen between boys as opposed to girls in that we could see the result that boys are more eco-sensitive of boys. Perhaps environmental incentives affect the male organism more strongly, increasing diversification.

Analysis of linkages of distances in both clusters suggested that the urbanisation of living area factor generally had less of an effect compared to the family having a lot of children. The result is more similarity of the body dimensions of boys from town and villages in the cluster of children from families with a greater number of children in the family.

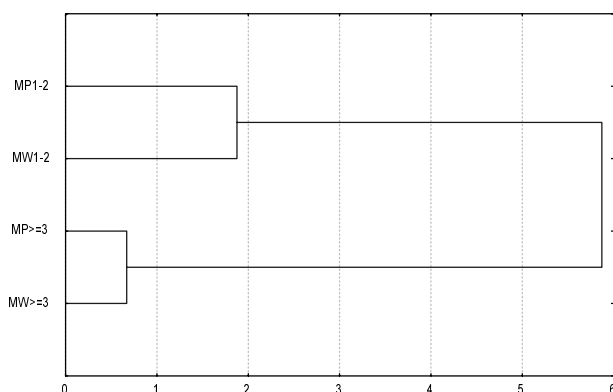
Girls

There were changes associated with sexual maturity in girls between 10.5–11.5 years old. Individual differences in their hormonal systems caused some of the girls to start growing up faster. Earlier research had shown that the sexual maturity rate depends on, among other factors, the degree of urbanisation of the living area and the social-economic status of the family. The most sensitive indicators of the social-economic situation of each family were body height and menarche (Bielicki, 1986; Bielicki et al., 1986).

Comparing basic growing parameters of the somatic development of rural and urban girls, divided into two groups according to the number of children per family aspect, it was shown that the number of children per family factor strongly modified girls' development rate. Girls from families with a smaller number of children were similar to each other independent of living area (Fig. 2).

Fig. 2

The clusters of rural and urban girls from families with a smaller or larger number of children per family on the basis of somatic traits



This factor didn't affect boys so clearly, so there wasn't a single second cluster, and the rest of the girls' groups were connected to clusters of the girls from families with a smaller number of children independently. From among both remaining groups, urban girls were most similar to girls from families with fewer children. So, from among all four groups, more similar to each other were rural girls. Knowing the results of other authors who proved special gradients of body height (the best parameters were had by children from big cities, next – towns, and the least – villages) we suggest that dissimilarity was associated with the lowest level of somatic development tied up with the fact that the worst conditions for girls' growth are created in rural families with relatively more children (Hulanicka et al., 1990; Ignasiak & Janusz, 1992; Jedlińska, 1985).

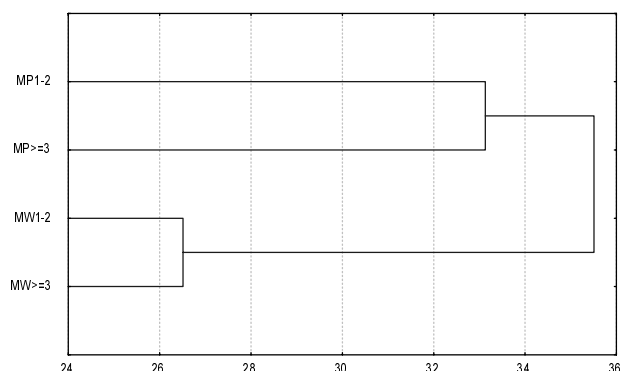
Clusters on the basis of conditional abilities (handgrip, standing jump, ball throw, shuttle run)

Boys

Functional traits, being the basis of conditional abilities, reacted differently than somatic traits. The primary factor affecting conditional abilities was the degree of urbanisation of the living area. In this case, the scheme was similar between boys and girls but more strongly marked. The effect was created by two clusters. One of them was a group of boys from towns living in families with more or fewer children per family, the second one was a group of rural boys living in families with fewer or relatively more children (Fig. 3).

Fig. 3

The clusters of rural and urban boys from families with a smaller or larger number of children per family on the basis of conditional abilities



The fact that different directions of environmental factors affect functional traits towards somatic traits was generally known and we confirmed it too in our work. The urbanisation factor dominated the number of children in family factor. The sexual dimorphism related to a clearer scheme in boys' groups. Analysing the dissimilarity degree in the level of conditional

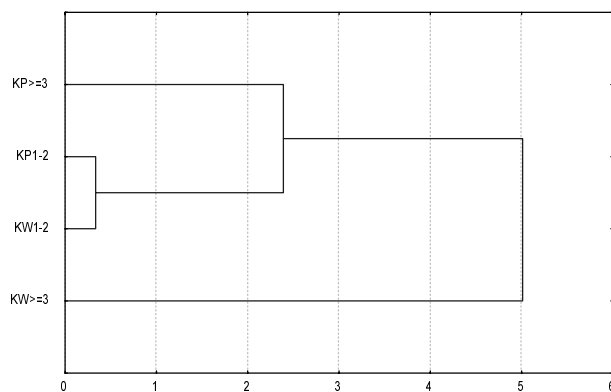
abilities development in every cluster – which means that in every kind of locality we observed more similarity among rural boys. It suggested that living in a rural environment made more uniform conditional abilities development and the number of children per family had no importance. The reverse was true in an urban environment.

Girls

The influence of the factors described on the motor development of girls wasn't so strong as on somatic traits. The "meaning" of factors was changed too. Urban girls were most similar to each other (here were the closest linkages in cluster) (Fig. 4). Both groups of urban girls created a single cluster and the rest of the groups connected independently.

Fig. 4

The clusters of rural and urban girls from families with a smaller or larger number of children per family on the basis of conditional abilities



It seemed that the number of children per family factor had less weight in urban environment than the urbanisation factor. In a rural environment, the reverse is true. The girls from families with a smaller number of children had a higher level of conditional abilities than girls from families with a larger number of children. The last one, similar to somatic traits, was closer to the other groups. The social-economic factor diversified motor abilities, and there were gradients similar to somatic traits. Our observations were the same as observations by other authors. The social-economic factor diversified children independent of their area of living, and the children from families with a lot of children had a lower level of conditional abilities. That factor had a less serious effect in urban locations (Osiński, 1988; Przewęda, 1985; Szopa & Sakowicz, 1987).

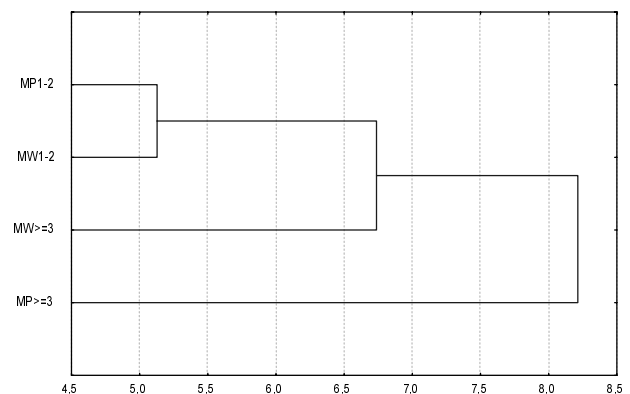
Clusters on the basis of coordinational abilities (tapping test, speed of reaction, eye-movement co-ordination)

Boys

Analysis linkages of boys on the basis of their coordinational abilities suggested no clear effects of both described factors. There was one cluster of boys from families with a smaller number of children as well as from villages and a town as a result of that (Fig. 5).

Fig. 5

The clusters of rural and urban boys from families with a smaller or a larger number of children per family on the basis of coordinational abilities



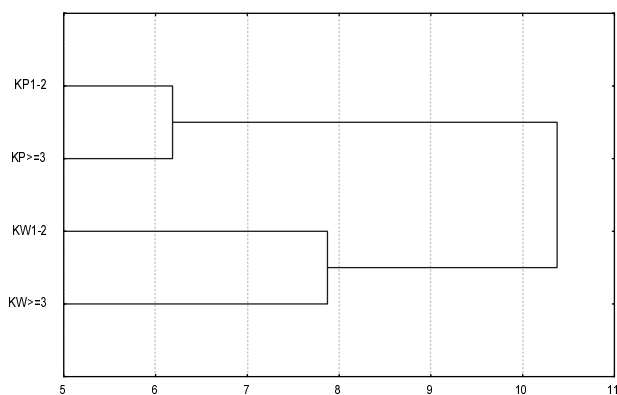
It suggested a stronger effect of the factor of the number of children per family than the urbanisation factor. The remainder of the two groups connected independently to the cluster. Rural boys from families with more children per family were more similar to groups in the cluster. Urban boys were the most dissimilar. The sexual dimorphism was very clear. The degree of urbanisation of living area factor had a stronger effect than the number of children per family factor in girls' groups.

Girls

Both described factors affected girls. But primary was degree of urbanisation of living area factor. It was the reason that two clear clusters were created. There were girls from the town Polkowice (independent of the number of children per family) in one of them, and there were rural girls in the second one. Urban girls were different than rural girls (Fig. 6).

Fig. 6

The clusters of rural and urban girls from families with a smaller or a larger number of children per family on the basis of coordinational abilities



It was worth it to demonstrate that girls from town were more similar. Other authors suggested that there might be more stimulation of the nervous system in a city or town than in a village. We supposed that rural girls had a lower level of coordination ability than rural girls from families with more children.

RESULTS

1. There was sexual dimorphism in the structure of linkages of factors: urbanisation degree of living area and the number of children per family. The influence of both factors is stronger and more noticeable in boys' groups than in girls'. Coordination abilities had the parameters where differences were biggest.
2. The number of children per family factor affected somatic traits more strongly than the urbanisation factor. Urban and rural children from families with a smaller number of children were similar each other; the second cluster consisted of urban and rural children from families with a larger number of children. More similarity concerned boys from families with a larger number of children, and vice-versa among girls.
3. The urbanisation factor affected conditional abilities more strongly. Children from families with a smaller or larger number of children per family living in the town Polkowice were similar each other; children from families with a smaller or a larger number of children per family living in villages were similar to each other too. More similar among boys were rural children; urban children – among girls.
4. The number of children per family factor affected coordination abilities stronger than the urbanisation degree factor affected the coordination abilities of boys. Boys from families with a smaller number of children were more similar to each other.

The rest of the groups didn't create a separate cluster. The urbanisation degree factor affected coordination abilities of the girls more strongly. Urban girls from families with fewer or relatively more children were similar to each other, as well as rural girls from families with a larger or smaller number of children. But more similar were urban girls.

REFERENCES

- Bielicki, T. (1986). Physical growth as a measure of the economic well-being of populations. In F. Falkner & J. M. Tanner (Eds.), *Human Growth, Vol. 3* (pp. 283–305). N. York: Plenum Press.
- Bielicki, T., Waliszko, A., Hulanicka, B., & Kotlarz, K. (1986). Social-class gradients in menarcheal age in Poland. *Annals Human Biology, 13*, 1–11.
- Bláha, P., & Vignerová (Eds.) (2002). *Investigation of the growth of Czech children and adolescents*. Praha.
- Eiben, O. G., Barabas, A., & Panto, E. (1991). The Hungarian national growth study. *Humanbiologia Budapestensis, 21*.
- Hulanicka, B., Brajczewski, C., Jedlińska, W., Sławińska, T., & Waliszko, A. (1990). City – Town – Village. Growth of children in Poland in 1988. *Monographies of the Institute of Anthropology Polish Academy of Sciences, 7*.
- Ignasiak, Z., Fugiel, J., Sławińska, T., & Żurek, G. (1996). Stan rozwoju dzieci wiejskich z Zagłębia Miedziowego na tle innych populacji wiejskich w Polsce. *Pediatrics Polska, Suplement – Zdrowie dziecka w środowisku skażonym ołowiem, 4*, 121–126.
- Ignasiak, Z., & Janusz, A. (1992). Ocena różnic rozwojowych 7-letnich dzieci miejskich i wiejskich. In *Materiały Konferencyjne "Zdrowie i sprawność dziecka"*. Gdańsk: AWF.
- Jedlińska, W. (1985). Wpływ niektórych czynników środowiska społecznego na wysokość ciała dzieci szkolnych w Polsce. *Przegląd Antropologiczny, 1–2*.
- Lindgren, G. (1976). Height, weight and menarche in Swedish urban school children in relation to socio-economic and regional factors. *Annals of Human Biology, 3*, 6.
- Osiński, W. (1988). Wielokierunkowe związki zdolności motorycznych i parametrów morfologicznych. Badania dzieci i młodzieży wielkomiejskiej z uwzględnieniem poziomu stratyfikacji społecznej. *Seria: Monografie, 261*. Poznań: AWF.
- Przewęda, R. (1985). Uwarunkowania poziomu sprawności fizycznej polskiej młodzieży szkolnej. *Z Warsztatów Badawczych*. Warszawa: AWF.
- Sławińska, T. (2000). Uwarunkowania środowiskowe w rozwoju motoryczności dzieci wiejskich. *Studia i Monografie AWF we Wrocławiu*. Wrocław: AWF.
- Szopa, J., & Sakowicz, B. (1987). Zróżnicowanie relatywnego poziomu sprawności fizycznej krakowskich dziewcząt i chłopców w wieku 8–18 lat

w zależności od wybranych wskaźników społeczno-rodzinnych. *Wychowanie Fizyczne i Sport, 1.*

Prof. Zofia Ignasiak
University School of Physical Education
ul. Paderewskiego 35
Wrocław
Poland

**VLIV SPOLEČENSKO-EKONOMICKÝCH
ČINITELŮ RODINY
NA ÚROVEŇ MORFOFUNKČNÍHO
ROZVOJE DĚTÍ
V KONTEXTU STUPNĚ URBANIZACE
MÍSTA BYDLIŠTĚ**
(Souhrn anglického textu)

V práci jsme se zaměřili na hodnocení vybraných společensko-ekonomických ukazatelů (počet dětí v rodině a velikost místa bydliště) v kontextu dosažené úrovně rozvoje somatických a funkčních ukazatelů

11letých dětí. Zkoumali jsme 311 chlapců a dívek, bydlících na vesnici a ve městě Polkovice v jihozápadním Polsku. Měřena byla výška a hmotnost těla a dále tloušťka podkožní řasy. K hodnocení úrovně tělesné zdatnosti v oblasti kondičních a koordinačních schopností byly použity vybrané testy z baterie Eurofit: síla stisku ruky, skok do dálky z místa, hod plným míčem, člunkový běh, tapping horní končetiny, čas jednoduché reakce a test zrakově-pohybové koordinace. Všechny probandy z města i z vesnice jsme rozdělili na dvě skupiny podle počtu dětí v rodině, a to na rodiny s 1–2 dětmi a rodiny s 3 a více dětmi. Celkem tak vznikly čtyři soubory probandů. Na základě analýzy můžeme konstatovat významnější vliv činitele počtu dětí v rodině na somatické ukazatele a významnější vliv místa bydliště na kondiční schopnosti. Tato skutečnost je výraznější u chlapců. U koordinačních schopností působí činitel počtu dětí v rodině silněji u chlapců a velikost místa bydliště u dívek.

Klíčová slova: společensko-ekonomické činitele, rozvoj dětí a mládeže, oblast morfologická a funkční, podmíněnost rozvoje bydlištěm.