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GROWTH OF CHILDREN AND YOUTH FROM REGIONS OF POLAND WITH VARIOUS DEGREES OF ENVIRONMENTAL CONTAMINATION

INTRODUCTION

The topical scope of the following paper refers to some determining conditions of biological fitness of children and youth in Poland at the turn of the century. The elaboration is of diagnostic character and constitutes an update to a number of earlier studies in the field [1, 2, 4, 5, 6]. It is a continuation of various considerations on the subject of influence of natural modifiers on the growth of the young generation of Poles. The paper discusses the current state of biological condition of Polish schoolchildren in the regions of the country with different degrees of environmental contamination. It is not easy to define precisely the role of the ecological factor in the biological development of children. Opinions about the negative effects of environmental contamination on the process of growth of the youth have been frequently expressed. Many authors point to the lower body height and weight as well as indicate delays in sexual maturation of the population inhabiting ecologically degraded regions. A number of publications have confirmed the assumed thesis that it is the ecological contamination which is responsible for lower biological indexes of the population. Hulanicka et al. [3] demonstrate, however, that these are primarily research reports based on limited and randomly selected groups of individuals. Few authors indicate that the interpretation may be simplified and distort the real causes of the worsening condition of the population.

Having assumed the hitherto knowledge about the influence of the environment on human biological condition, I intended to bring about answers to questions still remaining unexplained. The following research hypothesis was formulated:

The diverse bio-geographical conditions of growth in areas of different degradation of the natural environment are not accompanied by significant differentiation of the level of the physical development of children and youth.

METHODS

The material used in this work is part of the material obtained as a result of the 3rd edition of cross-sectional research on the development of physical fitness of Polish schoolchildren in 1999. In the following work the different bio-geographical conditions were accepted as a basic criterion for selecting the areas of research. A total of 73,000 schoolchildren from Poland, including 16,717 children: 8,339 schoolgirls and 8,378 schoolboys from the Warmia-Mazury, Podlasie, Lower Silesia and Silesia Provinces, took part in the study. In the investigated population thirteen age categories, from 7 to 19 years, were distinguished.

The state of physical development of the population in consideration was defined according to the height and body mass as well as the ponderal index. In the analysis the following statistical methods were applied: basic somatic features, Student's t-test, standardization of data, global index of the social-economic status (SES), which is defined also as general index of the environment's kindness, 2-factor analysis of variance (MANOVA) and Scheffe's test.

RESULTS

Normalized values of body height and mass, as well as the ponderal index of the investigated population of boys failed to demonstrate statistically significant inter-regional differences in their physical development (Fig. 1).

Results of measurements showed statistically higher values of body height and slenderness indices of girls from regions with low environmental contamination (Fig. 2). The conducted analysis of variance, which took into account the subjects' socio-economic situation and their ecological conditions of growth, allows us to

recognize the effects of the natural and cultural modifiers on the growth of the selected population of school-children. The analysis of variance enables determination of the following regularities: lack of ecological determinants and (or) economic ones; the effect of one of these elements; parallel effects of both elements and their interaction with anthropometric measurements. I focused my attention on the results of such measurements, in which the dependence on factors of the natural environment was ascertained. Out of the examined features of somatic development, ecological determinants were observed only with regard to the body

height and ponderal index, but only among the girls under study (Tab. 1; Fig. 3). The body mass though, demonstrated an explicit connection with the socio-economic conditions of growth, both among boys and girls (Tab. 1). The height of the girl's body is an example of somatic feature, which exposed the influence of the ecological factor with the parallel impact of socio-economic factors. This interdependence is presented by the analysis of variance. The the subjects' body height increases along with more favorable bio-geographical and cultural conditions of their development (Fig. 3).

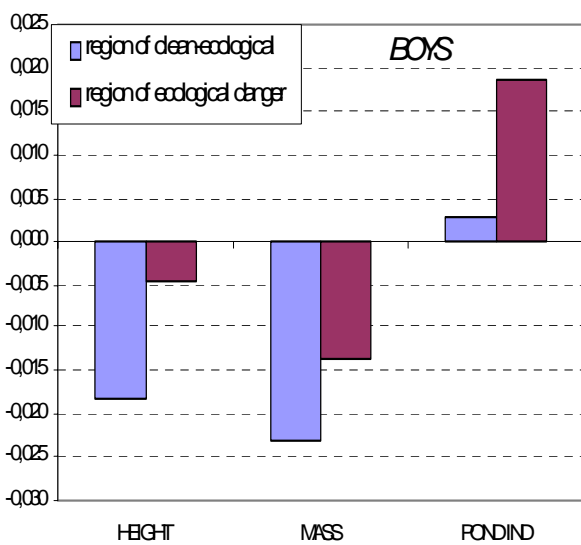


Figure 1. Normalized values of somatic features of boys

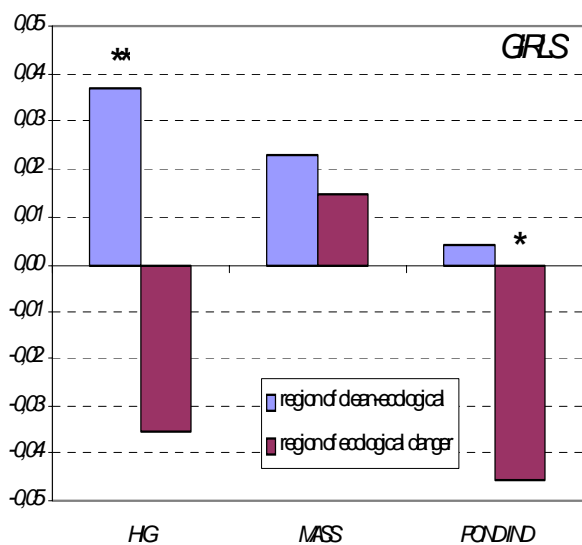


Figure 2. Normalized values of somatic features of girls

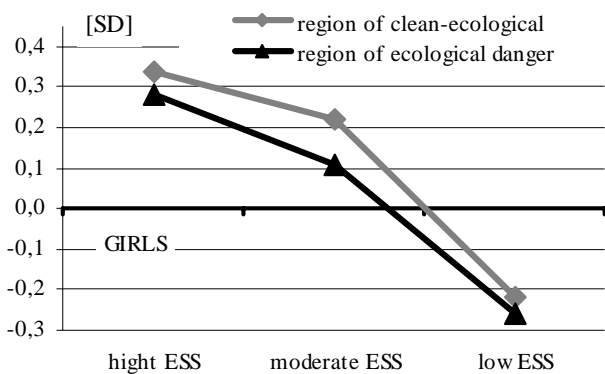


Figure 3. Normalized values of the body height of girls, taking into account the economic and social status ESS

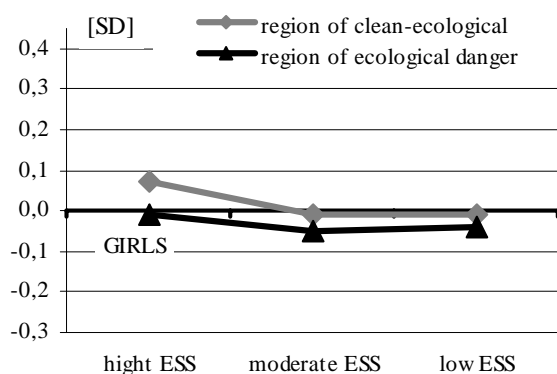


Figure 4. Normalized values of the body ponderal index of girls, taking into account the economic and social status ESS

Table 1. Schematic set of results of the analysis of variance of somatic development of children and youth

somatic feature	influence of listed factors (boys)	influence of listed factors (girls)
height	1, 1-2	1, 2
body weight	1	1
ponderal index		2

1 – social-economic factor, 2 – ecological factor, 1-2 – interaction

The ponderal index of the girls' bodies is an example of the anthropometric parameter, in the case of which the effect of ecological factors, with the exclusion of the socio-economic ones, was visible. Schoolgirls with a high SES index from ecologically safe regions were the slenderest (Fig. 4).

The analysis of the inter-regional differences in physical development of the youth examined in 1999, considering the index of the socio-economic status, makes it possible to state that in the population of boys no relationships between the bio-geographical conditions and the level of their growth was revealed. In the female part of the investigated population a visible effect of the ecological factor on the somatic development was recorded. More favorable bio-geographical conditions affect positively the body height and the slenderness index of girls. In the large majority of the obtained results, beside bio-geographical conditions, a parallel impact of socio-economic factors was also demonstrated.

DISCUSSION

The results of the research allow me to formulate the following hypothesis. The hypothesis claiming that there are no differences in the physical development of children and youth living in different bio-geographical conditions is subject to partial verification. No significant difference has been observed in the process of growth defined by the values of body height and mass, as well as in the ponderal index, among boys living in regions of low or high degree of ecological threat. In the female population though, higher normalized values of body height and slenderness index among girls from the northern-eastern region were ascertained. The obtained results are surprising. First and foremost, the discussed results do not confirm the generally accepted and confirmed opinions on the subject of sexual differentiation of eco-sensitivity. The development of girls is commonly considered to be more stable, and thus less affected by various external factors [2, 5]. In our study the interregional differences in the physical development were demonstrated in the population of girls. This phenomenon is difficult to explain. Regardless of

etiology, the above observation entitles us to ascertain that the female population from the "clean" regions possesses better somatic conditions of developing motor qualities than their peers from ecologically polluted areas, whereas boys from the selected areas possess similar structural-morphological predispositions to develop physical fitness. The performed analysis makes it possible to formulate the following conclusions:

1. Beside the obvious relationships between the degree of environmental contamination and the state of health of the inhabitants, differences in the fitness of the young people living in ecologically different regions can be also observed. Consequently, it seems that unfavorable bio-geographical conditions of growing up remain significantly related with the negative health image of the young generation, as well as with its positive standards, including their physical development.
2. In the interregional image of the biological condition of the population examined in 1999, slightly different tendencies in the somatic development were observed in boys and girls.
3. The results demonstrated a great significance of bio-geographical conditions of growth in the new Polish social, economic and political reality of the 1990 s.

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