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*Dorota Sadowska, Rafał Stemplewski, Janusz Maciaszek*

### **The influence of local physical effort on postural sway and limits of stability in young males**

**Material and method.** 16 healthy, physically active males aged  $\bar{x}=21.25\pm 0.77$  years were examined. Measurements of postural sways (under static conditions) and limits of stability (under dynamic conditions) were carried out on the basis of the center of pressure (COP) displacements with the use of the AMTI platform. The tests of postural stability under static conditions were made in bipedal posture with open eyes and closed eyes. The tests under dynamic conditions consisted of maximal forward, backward, and sideways body sways (with open eyes). The measurements were carried out before and after physical exercise. The physical exercise consisted in repeated heel rises until the subjects refused to repeat the exercise. To compare differences Wilcoxon signed-rank test was used.

**Results and conclusion.** In the case of postural sways after physical exercise it was observed the increase of the range of maximum sway of the COP in the medio-lateral (ML) and anterior-posterior (AP) directions, the total path length covered by the COP and the sway area of the COP both with open and closed eyes. It was also noticed the larger increase of the COP sways during measurements with open eyes than with closed eyes.

In the case of post-exercise measurements of limits of stability no statistically significant changes of any tested parameters were observed in comparison to pre-exercise values. Probably physical exercise used in the study wasn't strong enough to interference functioning of the whole posture-stabilizing muscle system and did not lead to a restriction of the postural stability area of the body.

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*Tadeusz Rynkiewicz, Natalia Niewolna*

### **The level of maximum strength and strength accuracy in chosen motor tasks in men**

**Aim of the study.** In contemporary football, motor conditioning requirements are becoming stricter and stricter. The significance of knowledge about the manifestation of strength and strength accuracy in football players in sports theory and practice has inspired the research in order to: (1) evaluate the level of global strength accuracy in relation to the value of strength employed – accounting for the part of maximum global static strength; (2) determine the level of strength accuracy of the lower limbs in relation to the value of strength employed – referring to maximum static strength of the lower limbs.

**Material.** Research was carried out on 45 students of Physical Education Academy in Gorzów Wielkopolski. The subjects were from 23 to 30 years of age and average being  $23.6 \pm 1.14$  years.

**Results.** The average value of maximum global force equaled  $1166.5 \pm 251.0$  N. The global strength accuracy for the 10% of the maximum strength value amounted to  $32.6 \pm 21.1\%$ . The subjects obtained the highest accuracy in the test drawing on the 90% maximum force –  $7.7 \pm 7.6\%$ . In the measurements of maximum local static strength of the lower limbs the results were similar to those obtained in the measurements of global strength. The average value of maximum static strength of the lower right limb equaled  $253.2 \pm 53.5$  N. The accuracy at the level of the 10% of maximum strength reached  $44.78 \pm 16.24\%$ . In an attempt to reconstruct the accuracy equal to the 90% of maximum strength, accuracy amounting to  $8.5 \pm 8.5\%$  was obtained. The average value for the lower left limb equaled  $239.9 \pm 49.4$  N. The accuracy at the level of the 10% of maximum value reached  $49.1 \pm 15.8\%$ , while at the level of the 90% of maximum value equaled  $7.8 \pm 8.4\%$ .

**Conclusions.** It was affirmed that the level of strength accuracy connected with the reconstruction of the demanded value of static strength – global and that of lower limbs, went up alongside with an increase in the value of the demanded strength.

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*Joanna Gradek, Edward Mleczko, Sebastian Swoboda*

### **Training for men and women at the biological stage of meso- and kataphase, and some health indicators**

**Aim of the study.** Evaluation from normative and holistic perspectives the effect which systematic sports training has on some health indicators in the group of Krakow Running Paths Programme participants. Measuring how the extensive increase in the training load affects the subjects' improvement.

**Material.** The study was carried out at the University School of Physical Education in Krakow sports facilities in June 2010. The research group consisted of 63 subjects (22 women and 41 men) involved in the training classes programme. The average age of men was 45.6 years with a relatively large range of variability (30–70 years), and 40.1 years of women, with a smaller range of variation (30–55 years). All the subjects trained regularly 2–3 times a week carrying a volume of training of 120 km per month and above this range.

**Methods.** To analyse the research material with the help of *Eurofit for Adults. Assessment of health-related fitness test* [1], the method of level development observation in terms of H-RF was used. The data was checked against the nationwide and Cracovian standards for youth at the age range of 19–21-years with the use of basic statistical characteristics and indicators of standardized differences. The significance of differences was tested with Student's  $t^{\circ}$ -test or the Cochran-Cox  $C^{\circ}$  test, depending on differences in variance.

**Results.** Comparative analysis revealed that training of people in their meso- and kataphase stadium of biological development can meet the health functions. This was confirmed by the comparison of health indicators, in terms of normative and holistic classification, according to the H-RF convention. In addition, recreational training can make a stronger impact on health indicators, causing much more positive changes in women than in men, in whose it may produce on the smaller scale the expected effects on the morphological components of physical fitness according to the H-RF convention.

**Conclusions.** In terms of H-RF it is possible for physically active men and women in their meso- and kataphase to achieve the level of motor components typical for subjects at the age range of 19–21 years. Regular running of women at comparable to men level of training load may give better results in female than in male runners, which reflects more in the morphological components of motor fitness measured according to the H-RF convention.

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*Paweł Chmura, Marek Zatoń*

### **Changes in maximum phosphagen power and selected physiological traits during repeated efforts in young soccer players**

**Aim of the study.** To compare the maximum anaerobic power together with physical and biochemical indicators in repeated maximal efforts to exhaustion.

**Material and methods.** A group of 10 younger juniors, soccer players from Sport Club Silesia Wrocław, was formed to participate in exertion test, which consisted of obtaining the maximum power by each subject in the shortest time. After each exertion trial 3-minute passive rest break took place. The task was to make the largest number of possible trials. Before, during and after each trial heart rate and blood lactate concentration were measured.

**Results.** According to research, every subject performed a different number of trials. The recorded exertion test results proved that the average maximum power in young soccer players ranged from 10.3 to 10.6 W/kg. A statistically significant increase in lactate concentration in the seven subsequent trials comparing to the state of rest ( $p \leq 0.001$ ) was observed. Heart rate difference between the mean value recorded at rest, and the values in each subsequent recurrence was statistically significant at  $p \leq 0.001$ .

**Conclusions.** It was found that the maximum phosphagen power rose up to a third trial, and after that in four consecutive exertion trials this variable was reduced, indicating a probable low tolerability of the subjects to short-term anaerobic efforts. Linear increase in lactate concentration in the seven subsequent trials com-

pared to the resting state ( $p \leq 0.01$ ) indicated a deeper participation of anaerobic glycolysis in the energetics of short-term phosphagen efforts. In seven subsequent trials the maximal heart rate increased significantly ( $p \leq 0.01$ ) comparing to resting values, which suggested that 3-minute passive rest break was too short for full recovery.

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*Zbigniew Barabasz, Emilian Zadarko, Maciej Huzarski, Mariusz Ozimek*

### **An assessment of the motor fitness abilities of a selected group of 11-year-old boys, members of the provincial football team of the Podkarpacie Football Association**

**Aim of the project.** Evaluating the level of chosen physiological and fitness skills in 11-year-old boys with the aim of working out fitness assessment norms for this age group.

**Material and methods.** The research covered 53 11-year-old boys selected by 16 clubs affiliated to Podkarpacie Football Association. The tests were carried out on a sunny day on a grass football field. Evaluation of body height, chest and abdomen circumference, body weight and its components was carried out together with a speed test in the 5 m, 10 m, 15 m, 20 m, 30 m and 50 m runs. Endurance was tested in a 20 m shuttle-run test, and explosive leg power by means of a standing long jump test. The data was processed by means of descriptive statistics.

In order to prepare the fitness norms for young footballers, methodology suggested by Zaciorski was used. Basic numerical characteristics of the variables under investigation, that is arithmetic means, standard deviation, minimal and maximal values, were established, and the sums of all the test results for each player were calculated.

**Results.** The average length of the training period for the group of footballers under investigation was  $2,6 \pm 1,2$  years, body height  $146,3 \pm 5,8$ , body weight  $37,7 \pm 7,5$ , BMI  $17,7 \pm 2,4$ , Fat%  $12,2 \pm 4,5$  and abdomen circumference to chest circumference  $65,1 \pm 6,8/68,9 \pm 6,0$ . The results of speed run tests were as follows (in seconds): 5 m ( $1,11 \pm 0,05$ ), 10 m ( $2,04 \pm 0,08$ ), 15 m ( $2,86 \pm 0,13$ ), 20 m ( $3,71 \pm 0,17$ ), 30 m ( $8,47 \pm 0,40$ ), the 20 m shuttle-run test (shuttle)  $8,20 \pm 1,8$  and standing long jump (in cm)  $169 \pm 16,87$ . Results of goalkeepers were singled out. The arithmetic mean distribution of the results of the fitness tests was used to create selected norms of fitness training of 11-year-old footballers.

**Conclusions.** The group under investigation was characterised by a large range of values of the somatic features tested. The level of speed abilities of the 11-year-old boys is high in comparison with other norms. Significantly lower values of arithmetic means were found in the group of goalkeepers in comparison with outfield players. No significant correlation between the length of the training period and the fitness abilities was found.

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*Marek Popowczak, Andrzej Rokita, Ireneusz Cichy*

### **Physical ability of secondary school students who take part in physical classes with the ball that arouse empathy**

**Introduction.** Secondary school students are in the period of adolescence, which is a particular stage of human development. In its final part, this period is characterized by the formation of full motor abilities of a young person. While preparing classes, the physical education teacher ought to take into consideration first of all the process of development or maintaining physical ability of his students as well as building appropriate interpersonal relations based, among other things, on empathy.

**Aim of research.** To check whether the process of implementing our own education program with the ball exercises and games that support the growth of empathy once a week in the experimental group ( $E_1$ ) could determine changes in physical ability in the scope which is at least the same as in the case of implementation

of the programs based on exercises and games without the ball but also arousing empathy (control group  $K_1$ ) and the traditional education program in the control group ( $K_2$ ).

**Material and methods.** We analyzed changes in the particular constituents of physical ability [1] which were selected by the Committee of Experts on Sport Research at the Council of European Committee of Development of Sport (body suppleness, explosive strength of legs, strength of arms, body strength, functional strength, agility) and changes in the level of empathy revealed in physical education. The examinations were carried out in the years 2005–2007 in the Agnieszka Osiecka Secondary School no. 17 in Wrocław.

**Results and conclusions.** It turned out that the process of implementation of our own education program in the experimental group ( $E_1$ ) determines physical ability in a similar way as it is in case of classes in the control groups ( $K_1$  and  $K_2$ ). In the experimental group ( $E_1$ ) the implementation of our own education program of physical classes with the ball as well as in the control group ( $K_1$ ) without the ball directed at the development of 'empathy' constitute an effective method of enhancing this personal feature.

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*Edward Mleczko, Czesław Szmiąg*

### **Overweight and obesity in children and adolescents from Krakow in comparison with results from other peers populations**

**Introduction.** Diagnosis of obesity and overweight (with special emphasis put on the population of Polish children and adolescents) for years has been in the centre of auxologic study. It is difficult to carry out a comparative analysis of the obesity epidemic spread in the world, due to the use of diverse diagnostic criteria. In Poland, the main interest has been centered on the study of genetic and environmental determinants, including the role of modifiers and, first of all, on socio-economic gradients in shaping the development of social phenomenon of excess body weight.

**Objective of research.** In our study, a comparative analysis of the progression scale of the epidemic excess body weight and its components (obesity and overweight) was carried out. Performed in the environment of Krakow and based on the body mass index (BMI), the measures took into account such factors as gender, age (6–14 years) and school education level (reception classes, primary school classes and I–II secondary school classes) of subjects as well as their parents' educational status and number of children in the family.

**Hypothesis.** In the period of political transformation, socio-economic factors observed in large Polish urban populations had a positive effect on slowing the progression pace of the epidemic excess body weight.

**Material.** 4441 participants (2283 boys and 2158 girls) at 6–14 years of age, the students of 21 elementary and secondary schools located in four Cracovian districts: Old Town, Podgórze, Nowa Huta and Krowdrza underwent the tests.

**Methods.** BMI was calculated according to the WHO instructions. The subjects' assignment to obesity and overweight groups was carried out with the use of centile charts developed by the Institute of Mother and Child. The following values of weight to height ratio were adopted: overweight – the interval between 90<sup>th</sup> to 97<sup>th</sup> centile and obesity – over 97<sup>th</sup> centile. The number of obese, overweight and suffering from excess body weight (overweight + obesity altogether), including the percent rate was calculated with regard to the age and gender of participants. In addition, in groups of gender, educational status and number of children in the family the arithmetic average of individuals with excess body weight was calculated.

**Results.** As in other contemporary populations, the obtained data revealed a curbing tendency in evolution pace of the overweight and obesity epidemic. With few exceptions, the ontogeny of investigated period showed a state of developmental relative stability in excess body weight and its components. Unique to other research, the study also revealed the direction of differences in favor of males. Inversely proportional relationships between the number of obese and overweight individuals and the education level of their parents as well as the number of children in the families were also observed.

**Conclusions.** (1) The results partially confirmed the environmental impact of Krakow on shaping healthy attitudes in families of the participants, which could favorably affect the deceleration of the evolution pace of

the overweight and obesity epidemic among children and adolescents. (2) In urban populations of Poland, the economic status of families is still the most important factor in the progression of the overweight and obesity epidemic and its constituents. (3) Therefore, in educators' tasks, biological welfare should go hand in hand with appropriately structured educational process.

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*Adam Haleczko*

### **Estimation criteria of the motor development of children aged 10–13 years**

**Introduction.** A survey of publications devoted to application of two- and three-factor indices of morphological age was presented in the 50<sup>th</sup> and 52<sup>nd</sup> numbers of "Antropomotoryka – Kiensiologia". That's why the author restricts himself to presenting only a few publications related to the topic. Among other things, he cites anthropologists who recognize index consisting only of the somatic age. However, in these publications chronological age is mentioned as one of the development elements. The author refers to his own article published in first number of "Antropomotoryka – Kiensiologia" and explains some formulations contained therein, which in his opinion were not properly understood. At the same time he emphasizes that his desire was and remains accurate assessment of children's motor ability.

**Aim of the work.** The main task of this paper is to verify the effectiveness of commonly used indices of morphological age and its components in assessing of the degree of motor development of children.

**Material and methods.** Two groups of children were chosen to study based on comments of authors who indicate the influence of chronological age on the results of tests conditioned by coordination abilities. First group was formed by boys and girls, the pupils of two Wrocław schools, where the recruitment for sport training was conducted, and applied motor tests were used mainly to evaluate the coordination capacity. The second group consisted of boys from school in Głucholazy, training track and field tetrathlon, which competitions have been classified as conditional capacities. Both groups were subjected to three-year continuous study. The material including several forms of indices of biological maturity and their components, and the results of motor tests from initial and final research was analyzed statistically. Numerical characteristics and correlations were presented in six tables.

**Results.** Taking into account a small variability of chronological age compared with the somatic age and its impact on the correlations calculated on the basis of their values, a significant influence of this factor on the motility of girls can be concluded. In the group of boys, mutual reduction of positive and negative impacts of somatic traits on the motor efficiency does not distinguish any of the indices and their components as factors in motor development. Additional calculations on the group with higher variability give the arguments for preferring the three-factor index. Correlations calculated in the first study only indicates better performance of the younger tetrathlonists. But in the final measurements a marked effect of somatic factor on both evaluations of efficiency both in the indices and their components. Particularly interesting is, having a statistical significance, the correlation coefficient with " $I_{SBM}$ " – a measure of acceleration or retardation of biological development. Having regard to the value of the index itself one could expect a more motor capabilities in faster developing boys. The diagnostic value of this index was much higher than of the other three.

**Conclusions.** In motor tests conditioned mainly by coordination skills especially in girls, the chronological age as a factor of a development is more important than age due to somatic features. In the sphere of conditional motor activities its role is smaller, nevertheless in sets of tests comprising trials, where both types of motor abilities are manifested, use of the three-factor version of index seems more rational. Three components of indices make up the quotient index of biological maturity status ( $I_{SBM}$ ) in addition to its primary role as the development measure of biological advancement can be helpful in assessing the level of motor development of children.

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*Małgorzata Resiak, Józef Drabik, Aleksandra Niedzielska, Marek Jankowski*

### **Percentile values of height and body mass and the body mass index of children and youth aged 6–18 years from Gdansk including under- and overweight definition problem**

**Aim of the research.** Working out centile norms for height, body mass and body mass index (BMI) in school children and youth in the city of Gdansk as well as comparison of overweight and underweight criteria in population of Gdansk with reference values of International Obesity Task Force and norms which were elaborated by the Institute of Mother and Child on the basis of the examinations of children and youth from Warsaw.

**Material and methods.** The research included 25 124 children and youth, of which 12 813 were boys and 12 311 girls aged 6–18 years. Calculation of values of percentiles: 3, 5, 10, 15, 25, 50, 75, 85, 90, 95 and 97 in boys and girls was performed with consideration of calendar age.

**Results.** Similar curves run imaging criteria of overweight and obesity in boys and girls was noted in Gdansk and international research. In case of Warsaw research this accordance occurred entirely in younger children. Similar, however, were the values of 10 centile constituting cut-off point for underweight in Gdansk and Warsaw examinations in which this point corresponds to  $BMI = 18,5 \text{ kg/m}^2$  at the age of 18 years.

**Conclusions.** Individual diagnosis demands reference to national population, regional would be the best, including big research groups. On the other hand, determination of spreading obesity and overweight and underweight should be performed basing on agreed international standards, because only they give possibility of making comparisons.

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## **REVIEW PAPERS**

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*Wanda Pilch, Anna Piotrowska*

### **Families of heat shock proteins and their role in response to exercise Aim of the study. The evaluation of postural sway and limits of stability changes, in standing posture (bilateral stance), induced by the local physical exercise engaging muscles of ankle joint (mainly triceps muscle of the calf).**

Heat shock proteins (HSP) are important effectors of stress response in all living bodies. They are extraordinarily phylogenetically conservative since they have not changed their structure for three billion years of evolution. These proteins do not only constitute a new universal system of protecting cells from external effects but they also modulate a number of reactions under non-stress conditions, such as DNA replication and transcription and proteolysis. They are typically divided into 7 families, whose names refer to their average molecular mass. Apart from the stressors such as environmental stress or pathophysiological conditions, physical exercise is another factor which induces HSP synthesis in cells. Elevated aerobic metabolism, which is typical of physical exercise, leads to oxidative stress in muscle cells and other cells in body organs. In order to protect tissues from harmful effects of reactive forms of oxygen and nitrogen, endogenous protective mechanisms are initiated, which activate antioxidative enzymes, non-enzymatic antioxidants and heat shock proteins which belong to the families of HSP27 and HSP70 (HSP72 and HSP73). Intensification of synthesis of heat shock proteins observed after physical exercise depends mainly on its intensity and the type of muscle tissues activated during the exercise. Finding the mechanism of intensified synthesis of these proteins will allow for creation of new very interesting research areas. Exploration of these areas will improve understanding of sport physiology and biochemistry at the molecular level.

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