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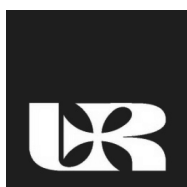
# Physical activity and health of the students from Carpathian Euroregion

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## Introduction

In the European Union occurs more and more serious challenges related to society's health and its solutions require new, strategic approach e.g. demographic changes, including ageing of the society. Supporting healthy ageing means both health promotions thru life, aiming to health problems and disability prevention from an early childhood, as well as health's inequality, related to social, economic and environmental factors.

In Western Europe countries since 70's as total mortality due to cardiovascular disease constantly decreases both in the average and in older age. Decreasing tendency in Central-east Europe has started yet in the last years. Also in Poland and Slovakia since the beginning of 90's negative trend first had slowed down, and then reversed. However, in both countries mortality coefficients due to cardiovascular disease, including pre-mature mortality are definitely too high in comparison to "old European Union countries".

Lack of physical activity is an essential public health problem in Europe. In the majority of countries including Poland and Slovakia frequency of sitting life among adults values 40-70%.

Low physical activity is one of the most important risk factors regarding cardiovascular disease. In results from the studies that results of effort tests among people with negative cardiological interview are the prognosis factors. That is way one of the most important tasks of public Health is to work out and implement effective methods of physical activity improvement.

At present, country, European and international health programs, which formally section increasing need of health priority are the proof of importance and prestige of physical activity to strengthen health.

Effectiveness in health promotion is determined by numerous groups and social sectors' activities and puts next to family, school, health care, politics and economy also physical activity. Effects of integrated pro-health activities of those sectors contribute to quality of life improvement in individual and public dimension.

Modernity carries new phenomenon and a need for new approach to essential social issued and a supply for new solutions. In the last decades a term of civic society has been popularized and next to other tasks also takes up activities focused on health development.

Modern informative society creates new possibilities to improve health care both from the health care system point of view, as well as its functioning improvement. In the document „e-Europe-An Information Society for All” from 2000 it was clearly and officially determined a direction of on-line health in Europe, and the document itself was a major step forward in e-health development.

Physical education classes realized at universities are often an only form of students’ physical activity. Media campaigns experiences carried out in Poland show that they have an positive impact on active life promotion among the society.

Physical Education and Students’ Health Promotion Platform ([www.studentfit.eu](http://www.studentfit.eu)) writes oneself on concept of activities based on Health Related Fitness idea and Health Literacy and might be a helpful tool in shaping physical efficiency of academic students.

A contact of student with a teacher-health educator and via Internet (even after graduation) with the platform dedicated to health and physical education is about to activate students and make them the object of that system.

A subject included in the monograph’s title demonstrates a natural need to combine physical activity with health in the education process and arose on the base of physical education state analysis at higher schools in Poland and Slovakia, as well as results of studies conducted within the scope of Cross-boarder cooperation program between The Republic of Poland and the Republic of Slovakia 2007-2013, which was co-financed by the European Union from the European Regional Development Fund as well as from government budget thru Euroregion Carpathia. A project included selected higher schools located in Euroregion Carpathia (University of Rzeszow, University in Preszov, University, Technical University, State Higher Vocational School in Krosno, School of Law and Public Administration in Przemysl.

Authors

CHAPTER I

**Physical activity in the life  
of contemporary man**

**Movement and children**

What are the benefits of movement in the life of contemporary man? Why should physical education (generally referred to as physical activity) become a permanent part of our lives? Should schools be held responsible only for instruction of subjects or also for personality formation within the phase of children's biological development? What is the function of the state in this matter? Why do children, who have nothing to do with the issue, have to pay for the mistakes of others? These are only some questions I am asked every single day and which I am trying to find answers to as well.

We will try to find answers to the aforementioned questions from different aspects. The current reform of the school system, which in its national educational program, fails to address basic biological needs of children, increases the number of mainly mental competences of pupils, manifests care and interest in the level of literacy, contrasts sharply with lack of interest in the organism itself, the essence of being. However, we all know that if one wants to achieve something, they have to exist, to be, whether we view our position in the world from the aspect of evolution theory or creativistic theory. The theory also holds that God created man, who was given body and soul. Why then do we consider human body the gift of God and try to permanently cultivate our souls? And the answer and solution is so simple – to perceive man as a whole and care about both his components!

Evidence relating to the life of our predecessors confirms dominant status of physical activity in terms of development and formation of man throughout phylogeny. This statement is consistent with the analysis of the nature of activities performed by man to meet his basic needs in all social and economic formations including those dating back to the first half of the 20<sup>th</sup> century. This paradigm, which is no longer valid at present, made the sociologists and educators reassess the

content of the leisure time, within which people would compensate physical activity and movement by mental activity, or passive rest and regeneration. However, history has confirmed the exact opposite. Despite the fact that man was an active component when manufacturing the basic means and ensuring every day life needs, physical activity still made a standard part of people's leisure time (a few years later the paradox became scientifically explicable using the paradigm of Secenov aimed at ***the positive benefits of active rest for the refreshment and regeneration of effort exerted for other type of workload***).

As an example of interest in physical activities may serve the preference of competitions and games in ancient Greece and Rome, the structure of seven feudal knight virtues, 5 of which were of physical nature. Similarly, the origination of organized gymnastic groups going by the collective name of Turnen, the Swedish gymnastics and the English system of sports and games fall into the first phase of the development of capitalism. This period characterized by the onset of industrial revolution and the resulting effort of manual workers to fight for their leisure time with its restorative and later entertaining function, created space for enormous development of physical and sporting activities.

Despite presented effects of the listed aspects and more convincing facts related to the need and benefits of regular physical activity in the lifestyle of man, which grew stonger in the second half of the 20<sup>th</sup> century, we do not witness considerable changes in the lives of contemporary people. This period, which is characteristic of the onset of scientific and technical revolution, triggered changes regarding the status of the labour force outside the epicentre of the manufacturing process with lower energy expenditure and increased spiritual tension.

However, at present for the first time in the history of mankind man has failed to substitute and eliminate lack of physical activity induced by changes in the manufacturing proces and lifestyle in general.

This led and still leads to gradual disturbance of natural balance of man in terms of particular vital functions. Well-known American doctor *K. H. COOPER* commented on the situation using the following words: ***„One of the great principles of the universe is the principle of balance. The human body is just another part of the universe that is meant to be in perfect balance. We have been constructed in such a way that we need just so much exercise, no more and no less. We need just so much food of certain types. And we need just the right amount of sleep and relief from the tensions and stresses of daily life. If a person goes too far in either direction - too little or too much exercise, food, or rest - then his or her entire physical and psychological system gets out of kilter. And where there is a lack of balance, there is also a lack of personal well-being. By the same token, on the positive side, where there is balance, there is a sense of well-being“***.

We suppose that as an example of going far in either direction are the key competences for lifelong learning, which formed the base for defining the competences included in the educational program ISCED 0:



1. Psychomotor competence
2. Personal (intrapersonal) competence
  - a) Fundamentals of self-awareness
  - b) Basics of involvement
3. Social (interpersonal) competence
4. Communicative competence
5. Cognitive competence
  - a) Fundamentals of problem solving
  - b) Fundamentals of critical thinking
  - c) Fundamentals of creative thinking
6. Instructional competence
7. Information competence

More detailed analysis would lead to the conclusion that a basic element is missing. This was also discussed at the European Congress of FIEP (International Federation of Physical Education), which took place in Bratislava in 2007. Prolific discussion resulted in a proposal to complement the existent competences with the „movement competence“. Such competence should be understood *as the competence to perform particular movements in an appropriate form in relation to actual or future indicators in the lifelong development of an individual*. However strange this may sound, children at present are incapable of acquiring the movements included in the locomotor fund at an appropriate level. It is these skills that are necessary for the healthy development of children. There is evidence that the end of the infant period is characterized by the flight phase, which is at the same time the criterion of child's maturity. This means that the child who fails to acquire bipedal locomotion until three years and five months of life, or is taller than 106 cm or weighs more than 15 kg when asked to perform the task is regarded to be motorically retarded!

The fundamental and irreplaceable means for the development of the motor competence is physical exercise, which represents the oldest natural physical activity of man. The educational system employs sport as a developmental tool. Unfortunately, it is its status in the structure of the educational programs that worries me the most. Most of us recognize the benefits and importance of physical activity for healthy development. However, upon completion of the compulsory school attendance, within which the pupils have the possibility to engage in regular exercise during the physical education classes, we record radical decrease in the interest in regular physical and sporting activity. Few of us are worried that this way does not correspond with the phylogenetic development of man and at the same time denies the relevance of the inherited motor traits such as *upright stance, bipedal walk, fine motor skills of hands, reversed finger*, etc. **As we refer to a long-term developmental process, whose changes are not registered during the ontogeny itself, we forget that lack of developmental stimuli fails to induce positive responses, which are usually degenerative and destructive. Few of us realize that man within his development has become independent of the power**

of nature, but not of the effects of some laws of nature. The biological norms, formed throughout phylogeny, are encoded in the genetic make-up and have not changed in course of several generations.

Let's not forget that ancient medicine thanks to the works of Hippocrates pointed to the functions of movement and its irreplaceability. This father of medicine literally stated: „*an organ designated for its function must be active, otherwise it loses its function*“.

The National educational program is legally the most important curricular document, which represents the binding document for the creation of school educational programs – curricular documents specific to the content of education in kindergarten schools in relation to their local conditions. This document is supposed to define the way and the obligation to take care about one's body and motor competence of children. Seven aims of preschool education demonstrate only limited participation in the motor development in the aim no. 4, which orders educators **to develop the child's personality in a conscious, systematic and creative atmosphere and at the same time in the psychomotor, cognitive, social, emotional and moral sphere.**

Figuratively speaking, single field is aimed at the development of half of our existence, literally our being, and that is the psychomotor field. Despite the fact that all aims are directed at the acquisition of miscellaneous competences, which from the global point of view enrich the life of the child, the authors of the document considered it irrelevant to devote a single aim to the motor functions of the child to ensure his/her healthy development. More detailed characteristic will be presented in the next part of the paper. Furthermore, some competences representing the psychomotor field have nothing to do with motor skills at all. For instance, a child on the completion of the pre-primary education is according to ISCED 0 able to:

- use all senses when performing an activity,
- manifest the desire and willingness to move,
- manifest graphic-motor proficiency,
- behave to his/her health and to the health of others in a considerate way,
- manifest positive attitude to a healthy lifestyle.

It is this analysis that makes us wonder that our remarks would be irrelevant unless the authors of the education program perceived the formation of the child more from the perspective of the difference between informing and forming. That would separate what can be and should be acquired from what must be developed and formed.

According to ISCED 0, the educational process uses **the principle of the activity of children.** The extension of opportunities for activities of children does not predetermine the teacher to be passive. The activity of the teacher in a non-directive and democratic leadership of educational activity **lies in the detailed creation of conditions for an effective self-development of the child's personality,** which is impossible to accomplish without his/her own activity. The teacher within

the educational process assumes the role of the **facilitator and manager of the educational activity, counsellor and consultant**. This conclusion presents next controversial topic. How to accept the organizational structure of activities in kindergartens is contrasted to the unpreparedness and inability of children to select activities included in the educational program. Yet, it is known and also confirmed by research that the selection of activities carried out by the preschool children is dependent on adults, parents, kindergarten teachers, and so forth.

The structure of the daily activities, which repeatedly occur in a particular kindergarten, is processed in the form of the daily regimen. The daily regimen according to the Manual should be flexible enough to meet the needs and interests of children.

The daily regimen includes:

- games and game-based activities,
- physical and relaxation exercises,
- staying outdoors,
- activities emphasizing adequate lifestyle (personal hygiene, eating habits, dining).

**Physical and relaxation exercises** include health-promoting exercises and relaxation and breathing exercises. They are to be performed **at a specific time during the day** adhering to the psychohygienic principles (prior to meal consumption/never immediately after a meal, in an aired room, or outdoors, etc.). They represent activities prepared in advance.

**Staying outdoors** includes physical activities, walks, educational activities, etc. In order to ensure **healthy psychosomatic development** of children, it is **not recommended to exclude staying outdoors**. **Staying outdoors should take place every day**. The exception to the rule is unfavourable weather conditions, strong head wind, freezing weather, rain (not drizzle). In the spring and summer months the outdoor stays are dependent on the intensity of the sunshine and take place twice a day both in the morning and in the afternoon.

So far everything seems all right. However, the Manual for the design of school educational programs for kindergartens supplements new possibilities. The authors added also **educational activity** if the activity from the standpoint of content includes for instance getting familiar with nature and natural phenomena. Outdoor stay should definitely include activities using sand, ball games and other motor, sports, and music-motor games such as chalk drawing on a concrete sidewalk. I consider this supplement a direct manual for teachers that prevents complications during an outdoor stay, which during promoted activity places higher demands on the attention of the pedagogues and higher risk of injury in children. Our longitudinal researches aimed at the preference of educational, and physically undemanding activities in female teachers have confirmed this assumption.

The integration of the national educational program for pre-primary education ISCED 0 into four topics **I am, People, Nature, Culture** and educational standards

(content and performance) is quite interesting and deserves to attract more attention. Also through cooperation with other fields, which may assist in defining the final requirements from the viewpoint of developmental potential, experience and cognition of children. In terms of perceptual and motor standards, this would address especially the topic of People and Culture.

Meeting the educational standards is proportionate to the selection and the manner of execution of educational diagnostics as a fixed part of the educational process. From the temporal point of view, planning and organization of educational diagnostics determines the classification of diagnostics into types (kinds): baseline, continuous, and outcome diagnostics. Their characteristics show that somatometric and motor development of the child, which are in this developmental phase one of the few criteria for the assessment of children's development, receive little attention (growth network, right hand grasps left ear, flight phase and so forth).

It is due to the same reason why these methods are not listed among the methods of educational diagnostics similarly to motor tests and tests of functional fitness. Despite the fact that the principle of observation lies in observing every child as a part of the educational diagnostics in order to prevent exposure to low or high-intensity activities that do not correspond with child's individual competences. How then do they want to prove their point without exact methods?

We all know that movement, from the verbal point of view, represents one of the **basic human needs** just like food, drinking and sleep. Man evolved through movement. How can we do without a biological need? Why not try it with food or drinking?

The outcome of such attitude, present at the majority of Slovak schools evidently arising out of the disturbance of life balance, results in poor body posture of children as early as preschool age, increase in the number of children with physical impairments, lower performance capacity and the transfer of fully recognized benefits of physical education and sport into the verbal level at the expense of practical involvement in physical activity. To defend the teachers and partially parents it should be noted that their initiative is marked by their own childhood experience and to this day hold the opinion that children have positive attitude towards physical activity, which they perform in their leisure time. However, they have not noticed the situation has changed. Children themselves prefer mainly informal social activities, passive rest, or other forms of entertainment.

These are only a few examples confirming that the accompanying characteristics of a lifestyle lacking movement are becoming an issue on a whole-society scale. However, the findings of experiments conducted on people and animals in laboratory-based conditions have before long shown that long-term absence of physical activity is the source of a variety of health disorders and impairments. Hypodynamia impairs metabolic processes, induces muscle dystrophy, changes functional state of organ systems, especially the central nervous system, lowers resistance and working capability, etc.

On the other hand, there are studies documenting the benefits and irreplaceability of physical activity in the life of children and its positive effects on the development and functions of other systems. Among the most interesting arguments related to the need to participate in regular exercise belongs the evidence about its positive effect on knowledge acquisition and learning process. The benefit of movement for children is then twofold. The first benefit is enhanced performance capacity and physical fitness, which positively affect the health status. The second benefit is the enforcement of cognitive functioning. The principle is quite simple. The blood, which is transported to the brain faster due to involvement in physical activity, supplies the brain with oxygen and glucose, the latter being the same as petrol for the car. When breathing normally, which occurs every day during most low-intensity activities, man is able to exchange as little as 10% of oxygen in the brain. This state induces disorientation, stress and concentration and memory disorders. Physical activity also enhances the secretion of endorphines, hormones supporting relaxation and awakening state and reducing symptoms of depression. By exceeding the medial axis, physical activity integrates the activity of the brain hemispheres and in this way creates conditions for optimal learning. Through its content, physical activity strengthens oculomotor muscles, which may improve peripheral vision and reading. Research on brain activity and physical activity conducted in 250.000 children has shown that students who intentionally move when learning theoretical terms are capable of storing more information. Most physical activities are carried out at elevated emotion, which subsequently results in attention and self-discipline improvement. There is majority of evidence confirming the benefits of movement on other systems and especially health status of an individual (*Dobry, 2006, Krejčí, 2008, Krejčí et al.*).

Despite these generally known and empirically confirmed conclusions, physical fitness and performance capacity associated with active lifestyle in the middle and late adulthood, decline gradually. Therefore, it is important to focus on the prevention of the most frequent lifestyle diseases, which result in the inability to work, disability and mortality. They are commonly referred to as „**chronic non-infection diseases**“, among which belong neuroses, ischaemic heart disease, metabolic disorders, allergies, dorsalgies and degenerative diseases. These diseases share a common feature, which is **maladaptation** to life conditions in the world at present.

The problem is that mankind evolved over thousands of years in a relative deficiency of food performing high volume of physical activity. That resulted in adaptation to lower energy intake and higher energy expenditure. At present, the situation is quite contrary to the situation in the past, but the adaptation ability of man to such a state has not evolved. Lifestyle change, nutrition and especially regular implementation of physical activity into the daily regime have been so far and have always seemed to be the most effective solution based on the preservation of phylogeny-determined traits and on the restriction of effects of magnifying

retardation. At all times, every day and at every opportunity man has to learn to use the advantages of civilization in order to resist it under the cover of personal hedonism. And the society, where man lives and creates, must help him to act this way by means of appropriate legislative norms, the creation of educational programs, the support of institutions and entrepreneurship aimed at sport for all, by manufacturing financially advantageous material and by supporting multifunctional sports facilities and outdoor areas.

As we have mentioned several times, one of the effective determinants inducing positive changes is physical activity, which is said to be beneficial for the promotion of active health and which should become a permanent part of our lifestyles. Active health is understood as a broader concept, not only as an absence of disease, physical defects and impairments. The health-care system may affect one's health status by 10-20 per cent, whereas lifestyle may be four times as effective. The meaning of prevention and health protection is encoded in each of us. Active health is not to be taken for granted, but as a gift, which we do not receive free of charge and which deserves our whole-life attention.

The minimal volume of physical activity is defined by the so-called threshold value. Threshold value refers to the volume of physical activity necessary for the healthy development of an organism. The threshold value changes relative to person's age. The research has shown that despite effects of factors listed in the previous part of the paper, hypokinetic lifestyle prevails and the related problems are evident in all age categories.

Typical example of the refusal of basic human needs is the lifestyle in preschool children despite referring to a period, within which originate the basics for the healthy development of human organism. Scientific research has shown that preschool children should involve in physical activity, whose volume equals 60 per cent of the time in the awakening state. At least 3 hours of activity should reach the intensity consistent with the minimum average zone of 150 bpm required to stimulate the circulatory system. The standards elaborated at our faculty, have shown that 5–6-year-old children reach the resting pulse frequency of almost 100 bpm. This means that in order to promote healthy development based on the minimum of developmental procedures, the child should be active at the intensity of 150 bpm for three hours approximately (*Belej – Junger, 2000*).

Our long-time research experience based on weekly time records of preschool children have shown that children attending kindergartens are physically active for over three hours.

The children perform mostly organized low-intensity activities. We find it alarming that at present there is no activity in the kindergarten programs, which would guarantee the required load on children's organisms. Despite this the creators of primary educational and methodology materials and the kindergarten teachers themselves do not confine sufficient attention to this issue. It is often the case that

female teachers perceive physical education of children as their own rest from their demanding job or as other components of the educational program, which require organization and discipline.

**Tab. 1** Approximate aerobic zones for 5-6-year-old children (AAZ)

RHR	AAZ	RHR	AAZ	RHR	AAZ
115	200–175	104	197–170	93	196–166
114	199–174	103	197–170	92	196–165
113	199–174	102	197–169	91	195–164
112	199–173	101	197–169	90	195–164
111	198–173	100	197–168	89	195–164
110	198–173	99	197–168	88	195–164
109	198–172	98	197–168	87	195–163
108	198–172	97	196–167	86	195–163
107	198–171	96	196–167		
106	198–171	95	196–166		
105	198–170	94	196–166		

**Legend:** RHR – resting heart rate (per minute)

AAZ – approximate aerobic zone (range max. – min values of heart rate during workload)

In their home environment, children are physically active for less than 2.5 hours during the working week and during the weekend for almost 5 hours excluding the time spent in the kindergarten (*Junger, 2001*).

In addition to hypokinetic lifestyle the comparison of data from particular years show certain heterogeneity in the physical development of children. While the children who lived in the 1960's and 1970's showed similar growth, 1980's were characterized by an evident change. Slovak children compared to their counterparts are taller (boys: 1.4 cm and girls 1.2 cm) and heavier. This state, generally referred to as the **secular trend**, includes in addition to acceleration also body growth of adults and delayed onset of involution tendencies in organisms of adult people. Analysis of the causes of the secular trend reveals more significant effect of environmental conditions on the physical development of man. Therefore, the children living in industrial countries are taller and heavier compared to children from developing countries.

In terms of growth spurt in children, considerable gains in weight and height have been for long considered a positive phenomenon especially from the viewpoint of improving life conditions. However, detailed analyses have shown that such a conclusion cannot be generally accepted. Studies have confirmed that functional fitness, especially in terms of cardiovascular function and muscular strength, did not increase. This means that both body weight and the number of fat cells increased. Some time ago, this process was beneficial for the health protection of children from various infectious diseases. Today, as a consequence of improved health conditions and personal hygiene, it is becoming irrelevant. On the contrary, increased volume of adipose fat is considered a negative factor associated with elevated blood cholesterol.

This state, commonly known as **obesity**, is nothing else but disproportion between weight gains and body fat percentage. It is most frequently explained on the basis of imbalance between increasing energy intake and decreasing energy output.

Physical development of children is assessed also by their **body posture**. The research has shown that lack of physical activity, which is one of the most characteristic attributes of the present day, negatively affects the body alignment of children. The results have not demonstrated the generally accepted premise, that wrong body posture occurs as a result of entering school.

On the contrary, comparisons of data between 4-year-old children and 6-year-old children showed deterioration in neck posture, abdominal cavity, shoulders and shoulder blades. There were also mild thoracal deformations, which caused inappropriate ventilation in some parts of the lungs. This, together with low level of resistance to cold, induced by lack of physical activity performed outside and in bad weather, leads to frequent respiratory diseases, which may cause allergies (Pařízková, 1994).

The assessment of the level and dynamics of the **development of motor abilities and skills** in preschool age children provides information not only on motor development itself, but also on somatomental balance in the development of children's personalities and their health (Kučera, 1985). So far, cross-sectional research has dealt with the assessment of the state of physical development and motor performance capacity in preschool children (Prukner 1993, Dvořáková 1998, etc.). However, there is paucity of longitudinal research studies on the dynamics of the development of children's motor predispositions (Rajtmajer 1993, Bartošík 1994, Junger 1997, etc.). As a result of the absence of relevant data, we have resolved to collect data on the dynamics of the development of selected motor abilities in 4 to 6-year-old children. We conducted a 2-year longitudinal research study (Belej – Junger, 2000).

There was a significant increase in motor abilities assessed using 5 motor tests in 4-6-year-old children. This accelerating dynamics of the motor abilities development may be attributed to genetic predispositions, natural maturation of organism, movement stimuli in kindergartens, spontaneous physical activity and actual motivation at the time of measurement.

The test results on locomotor speed, running speed with changes of direction, lower-body explosive strength and hand-grip strength showed similar linear and homogeneous increase in both sexes. Most significant increases were recorded between the 1<sup>st</sup> and the 2<sup>nd</sup> measurement and naturally also between the 1<sup>st</sup> and the 4<sup>th</sup> measurement.

The findings demonstrate that speed-strength abilities are determined generally. We hypothesize that their identification requires the use of standing broad jump as the simplest test of lower-body explosive strength.

Unlike speed-strength abilities, the greatest gains in aerobic-anaerobic abilities were registered during holidays, which may be attributed to higher volume of spontaneous physical activity and positive motivation.



Therefore, we recommend to engage children in physical activity aimed at the development of coordination and speed-strength abilities using body-weight exercises and the development of aerobic endurance by excluding monotonous prolonged work.

With regard to the degree of development of individual systems, which affect the motor functions of the child's organism at preschool age, the most developed system at this age period is the central nervous system. CNS is the basis for the enhancement of child's **coordination abilities**. Considerable plasticity determines the formation of complex motor programs. Quality of exercise is affected by joint flexibility of children. The growth and development of the nervous system with respect to sensorimotor functions is finished around the fifth year of age (*Havlíčková, 1998*). The muscular system is fit to meet the requirements of a particular type of physical activity. Findings of various authors have shown that the development of coordination abilities improves proportionately to the increasing age of the child (*Raczek - Mynarski, 1992, Feč - Junger-Belej, 1995, Šimonek a kol., 2000 a další*). At the end of the preschool age, children have the predispositions to acquire combined activities, which form the basis of their future sporting activities. Havlíčková (1998) states that the most sensitive period for the development of coordination abilities is the period of postpubescence.

Research findings (*Junger, 1999*) and subsequent overall assessment of coordination abilities have shown that girls recorded higher scores at both measurements in five tests: single-leg stand, walking on the beam, grasping, catching and throwing and 50 per cent estimate of vertical jump. The girls compared to boys scored higher in the tests of general coordination and forward roll test at the outcome measurement.

With respect to the place of living, higher scores at the baseline measurement were recorded in city-dwelling compared to village-dwelling children in the measures of single-leg stand and grasping. At outcome measurement village-dwelling children scored higher in four tests compared to their city-dwelling counterparts: walk on the beam, catching and throwing, 50 per cent estimate of a vertical jump and forward roll.

The intercorrelation of variables showed higher number of correlations, which points to the general character of their motor functions, i.e. all-round motor proficiency.

The strongest correlation regardless of sex was recorded in the single-leg stand test. In boys, strongest correlation was found in the test Walk on the beam and Forward roll in girls.

Generally, the sooner children start acquiring certain motor programs, the easier and faster the acquisition. Of course, we have to take account of the physiological principles of children's development that concern the ligament elasticity and preference of dynamic, all-round development physical activities to static activities that load children one-sidedly.

At the end of the preschool age children have predispositions to acquire combined activities, which are the basis of their future sporting activity. Furthermore, this period is appropriate for the formation of the relationship of children to physical activity and their system of values.

### **Physical activity in university students**

If in the broader context physical education and sport are to become a permanent part of lifestyle of man, beginning from pre-school children, continuing with the primary school students and ending with university students as mature people, all educational factors and institutions have to make effort in order to create a positive attitude of the educated individuals towards this activity. As we speak about a lifelong process, it is never too late. Gone are the times when the children threw away their school bags and told their parents: We are going out! Nowadays their interest focuses on various videogames, films, internet, etc. It is alarming that only 10 per cent of children involve in physical activity in their leisure time despite they positively incline towards sport.

The paper is the outcome of the research conducted within mutual Polish-Slovak platform of physical culture and health promotion in students.

If we take into consideration the three-dimensional structure of attitude, that is the affective, cognitive and behavioral component, we get the following:

In the **affective area**, achievement orientation related to exercise should change to movement-induced positive experience. Situations lowering self-confidence, destroying human dignity and methods bringing about repeated feelings of unsuccessfulness or inferiority should be avoided. Assessment of changes in performance capacity may induce a positive experience when compared to the previous state of training. If physical activity provides joy and entertainment by content variety, it creates enough room for recognition and self-efficacy and for meeting one's needs, which make part of the intrinsic motivation of exercisers and athletes. Such state forms a positive attitude towards physical activity.

Both basic educational documents and our experience have confirmed that trend in the orientation of physical education is being accepted and applied at all types of schools. The response of pupils, students, but also teachers is contrary to the present trends. Analysis of the situation at universities in Slovak Republic may serve as an example. Till 1989 it was unnecessary to deal with the benefits of physical education at the university level. The situation was affected by the state policy, which required compulsory military service supported by a strong lobbyist – army. This function of the state slowly diminished due to social changes, unfortunately at the expense of health benefits of physical activity. By incorrect interpretation of democratic principles, the issue of health became a personal value, i.e. personal matter and interference in the private matters is unacceptable (*Hrubý, 2005*).

In the **cognitive area**, information coming from family environment, teaching process, institutions and media form an opinion about the benefits of movement for life. Upon completing compulsory school attendance every person should be acquainted with the benefits of regular physical activity, forms of performing physical activity with regard to its content, intensity, volume and frequency. Consequently, each person can choose sport and physical activity of their liking on the basis of their own decisions.

This pattern should be evident in the instruction at universities as well. The implementation of the **credit system of study** and reduction in the direct-contact classes have led primarily to elimination of physical education from the basic program, a trend already present at universities abroad. However, foreign students are informed about the benefits of a healthy lifestyle (forgetting about and omitting an important factor is not financially rewarding ) and schools have material and technical equipment for the implementation of this optional subject.

The justification of those in charge at universities lies in the preference of other „more important“ disciplines, which broaden the mind. Despite the fact that kalokagathia has been historically confirmed as a positive harmony of body and mind, it is being explained within the framework of a theoretical subject, which was implemented into the basic program at the expense of physical education. It is of no interest that the developmental processes of the basic organ systems reach their peak in university students and the consequences of hypokinetic lifestyle do not surface. Probably the worst is that such attitude hinders complex personal development, because every person possesses certain level of physical basis closely connected with their mind. The physiological basis of mind has been scientifically documented. Its vitality depends on the vitality of whole organism. State of mind is manifested in the functioning of organism and vice versa. Organism impairments may result in impairments of mind. The body simply cannot be separated from the soul. An excellent psychologist Jaroslav Hlavsa, who paraphrased Descart's classic statement „Cogito ergo sum“ to „Moveo, ergo cogito, ergo sum“, has come to identical conclusion.

It is interesting that issues regarding the benefits of movement for human life, the issues concerning the instruction of physical education arise at the time of every school reform. As an example may serve the response to the contents of curriculums for city schools that were produced 70 years ago: *“A new school has to emerge. The child is going to be active. The child will actually deal with programs within each subject from 5 to 8 hours a day at school and for several hours at home. The one and only movement will be the transition from classroom to classroom and a 15-minute break, during which the child is supposed to go to the restroom and prepare for next classes. As the city schools are attended by children mostly from poorer families who are prone to suffer from spine curvature deviations due to poor nutrition, the children are not going to be helped by constant order to sit straight.*

*They simply will not be able to maintain the weight of the trunk in an appropriate position” (Těl. Vých. Sport. Mlád., 2001).*

What an incredible coincidence with the present situation. The issue of nutrition does not primarily lie in poverty, but in preference of unhealthy food or diets targeted at weight loss especially in girls. How many girls know that good figure is dependent on muscular activity or movement? The opinions of not only the laic public define movement as dynamic motor activity characterized by isotonic muscle action. This issue is being discussed and attracts attention. Its effect on the functioning of human organism has been and still is scientifically confirmed from the aspect of health, functionality, sociology, psychology, etc. However, just few people are aware that when attempting to maintain the desired body posture the second form of muscle activity is necessary – isometric muscle action of postural muscles. Its presence or absence immediately reflects in the feedback afferent influence on the subcortical area of the central nervous system as well as on other systems and organs. Through its direct effect the static contraction influences the overall state of organism, which is evident in the case of bedridden patients, in whom even intensive rehabilitation does not prevent the development of osteoporosis, the atrophy of postural muscles and the vegetative system impairment. The consequences of this state appear later, when the patient gets better and is capable of elementary locomotion (*Radvanský - Kučera, 1999*).

The present issue confirming formally and officially the previous statements is the involvement or non-involvement of children in school physical education. The medical examinations have confirmed that most frequently children's non-involvement in exercise occurs due to impairment of the motor system. There still are a lot of general practitioners who decide to prevent children from participation in physical education classes in case of any slight deviation from the norm. Despite the fact that one-sided static load with long-term maintenance of posture poses higher risk as compared to dynamic physical activity. Imbalance worsens most of both structural and functional disorders of the motor system.

It is incredible that a similar problem due to a different reason may be found in the past. The writer Jaroslav Žák in his work: “The Route into the Depth of a Student's Soul” from 1938 states: “How moving, when parents support their children in the fight against physical educators and are willing to get a medical report to prevent their children to get muddy like pigs. If a physical education enthusiast tries and loads children with 10-minute run, the second day half of young sportsmen will bring a letter of excuse saying that their child did not prepare for the subject due to physical and mental exhaustion during the physical education class” (*Procházka, 2001*).

From the standpoint of the contemporary lifestyle, the most crucial area is the **behavioral aspect**, which represents involvement in physical and sporting activity in every day life. Most of us recognize the benefits of physical activity for the healthy development of an individual, but on the completion of the compulsory school attendance, which offers participation in exercise, the interest in regular

physical and sport activity in all age groups and especially schoolchildren decreases radically. The absence of the behavioral component arises from the issues of the previous components of attitude formation. No one cares that this way does not correspond with the phylogenetic development of mankind and denies the relevance of inherited motor characteristics such as *upright posture, bipedal walk, fine-motor hand skills, reversed thumb*, etc.

The supplement of the daily newspaper SME contained alarming examples regarding interests of pupils in physical activity in the school environment. J. Slezák, employee of the National Educational Institute has documented that 50 per cent of boys and 40 per cent of girls attending secondary schools do not participate in physical activities. Secondary students decide to become university students and the volume of physical activity decreases proportionately to the year of study (Sme, 2005).

What are the consequences of such attitude at universities?

- ***Academic senate at the university/faculty decides to drop physical education out of the basic study program***
- ***Academic senate is obliged to control the rector/dean in terms of the use of published finances***
- ***The same academic senate decides that constant budget reductions disable to support participation of students in optional subjects (it is only the student that is interested!?)***
- ***The finances cannot be used for the reconstruction of existing and deteriorating sports facilities***
- ***And such facilities are a financial burden to the university...***

Due to the fact that such threat is no longer a chimera, the problem of physical education at universities was discussed at the Slovak Rectors' Conference (SRC). Taking into consideration material prepared by the Association of Physical Education Teachers at Slovak universities, SRC at the 23<sup>rd</sup> meeting held on October 25<sup>th</sup> 2002 has enacted a specific decree, which includes the following recommendations:

- to ensure implementation of physical activities (in line with students' preferences) into compulsory subjects within the whole bachelor study at faculties preparing future physical educators,
- to recommend implementation of physical activities into the first two years of study at other universities according to the model of Czech Republic,
- to implement physical education among optional subjects upon completion of bachelor study.

Despite the fact that SRC's decree took effect long time ago, most universities, especially those oriented at humanities, did not follow the SRC recommendations. Therefore, we decided to document the status of physical education at universities several years after the recommendations took effect.

The purpose of the research conducted in 2007 was to extend and actualize information on interest and status of physical education instruction at Slovak universities. The research sample consisted of 20 public universities and one

state university. The total number of 17 universities comprised 101 faculties. The data were collected using a questionnaire, which was distributed via email to departments and institutes of physical education and sport. The questionnaire was sent via website of Association of Physical Education Teachers at universities in Slovak republic (referred to as Association).

Out of the basic sample of 20 public universities and one state university, 9 universities participated in the research (including the state university), which equals 40 per cent expected participation. The research was conducted at 41 faculties. It is important to note that departments of physical education do not operate at all universities. In such case, it could be theoretically assumed that physical education is not included in the university study program. Unfortunately, it is impossible to state that only universities without departments of physical education failed to participate in the research. The data were not collected from two faculties specifically targeted at physical education – Faculty of Physical Education and Sport UK in Bratislava and Faculty of Sport in Prešov, where the study of physical education is implemented in the study programs themselves.

Universities, which provided the required data, were classified into three categories on the basis of their study orientation. The classification itself is of orientational character only, because it is based on the specific studies offered at the faculties. This fact disabled to divide for instance the first group due to the fact that all universities have faculties offering study programs in humanities and natural sciences.

The group of universities with **study programs in humanities and natural sciences** consisted of: Comenius University in Bratislava (13 faculties, but only 3 provided information), University of Matej Bel in Banská Bystrica (7/3), University of Pavol Jozef Šafárik in Košice (5/5), Constantine the Philosopher University in Nitra (5/5).

**Technical universities:** Slovak Technical University in Bratislava (6/3), Technical University in Košice (9/8) and University of Žilina in Žilina (7/7).

The group of universities included a **specific university** represented by the Academy of Armed Forces of M. R. Štefánik in Liptovský Mikuláš, which is not divided into faculties.

From the standpoint of interest and participation in physical education in the group of humanities and natural sciences The Faculty of Mathematics, Physics and Informatics UK has included 2-semester and non-credit compulsory participation in physical education as a part of teaching and technical study programs. At the Faculty of Medicine UPJŠ, which also included a 2-semester compulsory physical education course, students attend 2 classes of physical education per week awarded by credits. Both faculties offer physical education only as an optional subject. In the bachelor study, Faculty of Economics UMB in Banská Bystrica offers a 4-semester physical education course as a compulsory optional subject not awarded by credits.

Physical education is at this faculty also ranked among optional subjects. Other faculties of this group offer physical education course as an optional subject in the range from 1 to 6 semesters (tab. 2).

**Tab. 2 Instruction of physical education at the 1<sup>st</sup> degree of university study in the school year 2006/07 (humanities and natural sciences)**

University, Faculty	Degree of study	Optional		
		Number of semesters	Hours /week	Credits
<b>Comenius University in Bratislava</b>				
Mathematics, Physics and Informatics	1	4	N	2
Faculty of Medicine in Martin	1	4	2	1
<b>Prešov University in Prešov</b>				
Faculty of Arts (teacher training)	1	4	1	1
Faculty of Humanities and Natural sciences (teacher training)	1	4	1	1
Faculty of Greek-Catholic Theology (teacher training)	1	4	1	1
Faculty of Orthodox Theology (teacher training)	1	4	1	1
Faculty of Management	1	0	0	0
<b>University of Matej Bel in Banská Bystrica</b>				
Faculty of Economics	1	2	N	3
Faculty of Humanities	1	0	0	0
Faculty of Law	1	6	1	2
<b>Constantine the Philosopher University in Nitra</b>				
Faculty of Arts	1	1	2	2
Faculty of Natural Sciences	1	1	2	2
Faculty of Central European Studies	1	1	2	2
Faculty of Social Sciences and Health Care	1	1	2	2
<b>University of P. J. Šafárik in Košice*</b>				
Faculty of Medicine	1	4	1	0
Faculty of Natural Sciences	1	2	2	1
Faculty of Law	1	4	2	2
Faculty of Public Administration	1	2	2	4
Faculty of Arts	1	2	2	2

\* **Note** – UPJS also offers physical education as a facultative subject in each year of study  
 – N – number of classes/week not entered

Specific position is held by Faculties of Education, where the study programs require instruction of physical education within particular methodologies. This fact should be taken into consideration in relation to the number of classes and especially in relation to the „choice“ of the faculty authorities to implement physical education into the content of the study program. Similar situation has been documented in the Faculties of Health Care. Therefore, both types of faculties were eliminated from the assessment of general physical education within our research.

The instruction of physical education at universities of technical type is totally different from the universities offering study in humanities and natural sciences.

Out of three universities, physical education has been implemented as a compulsory subject at two of them (tab. 3).

Physical education at all three universities of technical type is implemented as an optional subject. Most importantly, students at the 2<sup>nd</sup> degree of study have the possibility to enroll in a physical education course as well (tab. 4).

The instruction of physical education at the Academy of Armed Forces of gen. M. R. Štefánik is compulsory during 8 semesters, 4 classes per week, without credits within the bachelor degree of study.

The instruction of physical education during the semester may take place also in form of **winter and summer outdoor courses**. Their status in the first group of universities (humanities and natural sciences) was as follows:

**Tab. 3 Instruction of physical education at the 1<sup>st</sup> degree of study in the school year 2006/07 – compulsory (technical universities)**

University, Faculty	Degree of study	Compulsory		
		Number of semesters	Number of classes	Number of credits
<b>Slovak University of Technology in Bratislava</b>				
Faculty of Chemical and Food Technology	1	6	2	0
Faculty of Civil Engineering	1	4	1	0
Faculty of Electrical Engineering and Information Technology	1	6	2	0
<b>Technical University in Košice</b>				
Faculty of Aeronautics	1	4	2	1
Faculty of Civil Engineering	1	0	0	0
Faculty of Arts	1	0	0	0
Faculty of Mining, Ecology, Process Control and Geotechnology	1	4	2	c
Faculty of Mechanical Engineering	1	2	2	c
Faculty of Metallurgy	1	6	2	c
Faculty of Economics	1	4	2	c
Faculty of Electrical Engineering and Informatics	1	OO 2	2	c

**Note:** OO – compulsory-optional, c – credit

The study program of the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava offers winters and summer outdoor course awarded by 2 credits. Four faculties of the University of Prešov in Prešov: Faculty of Arts, Faculty of Humanities and Natural Sciences, Faculty of Greek-Catholic Theology and Faculty of Orthodox Theology offer one optional outdoor course awarded with one credit.

The University of Matej Bel offers both winter and summer physical education courses within the study program of the Faculty of Law.

Constantine the Philosopher University in Nitra offers neither winter nor summer outdoor courses.



**Tab. 4 Instruction of physical education at the 1<sup>st</sup> degree of study in the school year 2006/07 – optional (technical universities)**

University, Faculty	Degree of study	Optional		
		Number of semesters	Number of classes	Number of credits
<b>Slovak Technical University in Bratislava</b>				
Faculty of Chemical and Food Technology	2	1	4	0
Faculty of Civil Engineering	1	6	1	0
	2	4	1	0
Faculty of Electrical Engineering and Information Technology	2	4	1	0
<b>Technical University in Košice</b>				
Faculty of Aeronautics	1	2	2	1
	2	5	2	z
Faculty of Civil Engineering	1	5	2	z
	2	3	2	z
Faculty of Arts	1	5	2	z
	2	3	2	z
Faculty of Mining, Ecology, Process Control and Geotechnology	1	1	2	z
	2	1	2	z
Faculty of Mechanical Engineering	1	3	2	z
	2	3	2	z
Faculty of Metallurgy	1	3	2	z
	2	3	2	z
Faculty of Economics	1	1	2	z
	2	3	2	z
Faculty of Electrical Engineering and Informatics	1	3	2	z
	2	3	2	z
<b>The University of Zilina</b>				
Faculty of Management Science and Informatics	1	6	2	1
	2	6	2	1
Faculty of Mechanical Engineering	1	3-4	2	1
	2	4	2	0
Faculty of Electrical Engineering	1	1	2	2
Faculty of Civil Engineering	1	2-8	2	1
	2	2-4	2	1
Faculty of Special Engineering	1	2-4	2	2
	2	2-3	2	2
Faculty of Operation and Economics of Transport and Communications	1	3-5	2	1
	2	3	2	1
Faculty of Science	1	3	2	1
	2	1	2	2

The University of Pavol Jozef Šafárik offers summer and winter physical education courses at the Institute of Physical Education without credits, except the Faculty of Natural Sciences, where students receive 1 credit for participation in one of the courses.

**At technical universities**, the course form of physical education is offered at Slovak Technical University both at the Faculty of Chemical and Food Technology and Faculty of Civil Engineering. The students of the Faculty of

Electrotechnical Engineering and Informatics are offered as much as 3 physical education courses.

At Technical University, all faculties offer both winter and summer outdoor courses as an optional credit-awarded subject.

University of Žilina in Žilina has included course forms (awarded by 1 credit) of physical education in the study program of the Faculty of Operation and Economics of Transport and Communications. The students attending other faculties may choose only from the offer of the Institute of Physical Education.

In the third group of universities, that is **state universities**, represented by Academy of Armed Forces of gen. M. R. Štefánik, two winter and two summer outdoor courses are included in all study programs.

The results have fully confirmed our hypothesis suggesting that physical education is offered in the study programs of state universities the most. The 2<sup>nd</sup> place was taken by Technical universities, where despite their professional orientation the students have certain possibilities to compensate the mental effort through optional physical activity. Universities offering study programs in humanities and natural sciences placed third. We have documented low status of physical education at these universities. The number of physical education classes is too low to bring about positive effects on young people. The worst is that it regards mostly teaching study programs, whose candidates will educate future generations.

Due to the complex and social nature of the issue, the solution may be viewed at three levels:

The first level is the **national policy**, which ranges from the governmental promulgation, preparation of legislative norms, management of physical education and sports movement to the creation of appropriate spatial and material conditions. We find it irresponsible to let unincorporated associations take charge of the concept of sport. We refer to the function of the state, which through specific governmental departments, can consult intentions related to the concept with unincorporated associations, but cannot deny liability for their elaboration and practical implementation.

The second level is represented by **preparation of physical educators**. The preparation of physical educators is to be performed from the viewpoint of their future life-long mission, not just work. As early as their studies, the students have to be reminded that indifferent attitude of physical education teachers to instruction

of physical education negatively affects the attitude formation in pupils, who are later going to become professionals in different fields, even state representatives with low opinion about the benefits of physical education in our lives. At the same time, such approach impairs the status of physical education teacher in both the teaching community and the whole society.

The third level lies in determining the **status and functions of physical education in the study programs of all schools**. With respect to the faculties in charge of preparation of teachers and in order to get rid of the discussion about the benefits and status of physical education within the study programs of universities, we recommend the following:

the profile of a future teacher must definitely include the complex character of his/her functions, which are one of the basic requirements related to his/her personality, but also to the personality of the pupil, his/her health status, enhancement of physical fitness and motor development.

to define physical education in the teaching plans of the general study program as a basic human need bearing irreplaceable developmental and compensatory benefits. Therefore, physical education should not be implemented among other subjects, which aim to develop the cognitive nature of students. Physical activity is targeted at humans. Physical activity itself is „only“ a means for a healthy, happy life richer in its content. That is why physical activity should hold an unchallenged status both within the education system and in every day life.

*With regard to the proposals, we recommend that physical education and sport at all types of schools – from kindergartens to universities – be understood as a process of meeting the socio-biological need to move, development of motor abilities and acquisition of basic motor skills. Physical activity should be considered an irreplaceable part of harmonious and healthy development of children, including children with physical impairments.*

School physical education, understood and practiced this way, represents the first and at the same time the decisive prerequisite for the formation of values and positive attitude to involvement in one of the most important human needs. Taking into account the fact that during our lives each of us, both a healthy individual and an individual with physical impairment, completes compulsory school attendance, then the acquired system of values is transferred into families, whose establishment does not require any qualifications and education, but which play an important role in the education and upbringing of children.

Using the language of young people – unless young people start taking care about their physical condition, their excellent knowledge will become useless. If we do not invest into hardware (the physical aspect), the mechanics and subsequently any software in our brains will go dysfunctional!

### Elderly people on the move

Aging is an inevitable process that concerns every individual. Despite certain general principles, this process is highly individual. This means that just as life of every person is unique in its expression, so does aging process manifest differently in people. Aging process consists of causal complex of biological, psychological and social factors. The activity of these factors cannot be perceived separately, but in their mutual interaction. Therefore, the study of aging requires bio-psycho-social approach.

Fundamental questions, which the field of gerontology has addressed in connection with aging are according to *Spirdušo - Francis - MacRae (2005)* as follows: (1) What is aging? (2) How is aging described? (3) What causes aging? (4) Can the aging process be slowed? (5) What is the relation between the quantity and quality of life? The authors define aging as a process or a group of processes occurring in living organisms that with the passage of time lead to a loss of adaptability, functional impairment, and eventual death. On basis of this definition we distinguish between primary and secondary aging.

**Primary aging** refers to universal age-related changes within a species that are independent of environmental influence or disease (e.g. maturation, or menopause in females).

**Secondary aging** refers to clinical symptoms (syndrome of aging) and includes the effects of environment and disease.

This classification based more or less on endogenous and exogenous determinants is generally acceptable, understandable, but from the viewpoint of the functional system of human organism too general and trivial. This reason probably made *Jones - Rose (2005)* approach the definition of aging relative to the selected criterion.

**Chronological aging** is based on the criterion of age. Even though the definition of aging according to one's age is used most frequently, it does not take account of its complexity. *Stuart-Hamilton has stated (1999, p. 19)* "the number of rotations of the Earth around the Sun, calculated from the moment of birth does not reveal anything about the person, unless this time reference is correlated with other, more functional data", while "... chronological age correlates with other measures, but the measure of this correlation is sometimes very low". Several authors incline towards the following age classification (*Spirdušo - Francis - MacRae, 2005; Jones - Rose, 2005*):

- age 65-74 years – "young-old",
- age 75-84 years – "old-old",
- age 85 years and more – "oldest-old".

Marketing aspect, which may become relevant in the following years in the field of physical activities of seniors, was used by *Šabat - Velíšek (2004)*. The authors interconnected the criterion of age and entering retirement. They list the following groups:

- age 50-62 years (pre-retirement age), which includes people still actively involved in the working process,
- age 63-74 years (active retired people), who are in the near future going to be numerically prevalent in terms of sociodemographic development of the population.
- age 75 and more (“true seniors”), who have their own priorities especially in the field of their own health care and family relationships.

In addition to age, every person is most frequently perceived through **biological aging** of his/her organism. This state of organism corresponds with a group of body processes, which according to Chodzko-Zajko (1998) lead to loss of adaptability, functional impairment, and eventual death. There are several biological theories of aging, which explain mechanisms underlying the structural and functional changes characteristic for older age. The author refers to three main groups of changes:

1. *Cellular Theories of Aging*, which focus on the degenerative changes that occur at the level of an individual cell. The most commonly proposed mechanism of cellular aging is free-radical oxidation.
2. *Genetic Theories of Aging* focus on the role of heredity in the regulation of senescence. According to the theory aging is the result of a breakdown in the integrity of DNA nucleotid sequences. This loss of nucleotid sequences disrupts the ability of the cell to reproduce.
3. *Control Theories of Aging* explain aging in terms of function of specific systems known to be vital for the control of physiological functioning.

Biological aging is often described as an index of **functional age**, which is associated with functional fitness of an individual and the comparison of the fitness level with others the same age and sex. These may differ profoundly. *Spiriduso - Francis - MacRae (2005)* list five groups of seniors depending on the physical fitness level:

1. *Physically elite* – able to participate in sports competition, high-risk and power sports and Senior Olympics,
2. *Physically fit* – able to perform moderate physical work, endurance sports, games and hobbies,
3. *Physically independent* – able to perform light physical work, hobbies and light physical activities,
4. *Physically frail* – able to perform light housekeeping, cooking, shopping and other basic activities of daily living,
5. *Physically dependent* – unable to perform some or all basic activities of daily living such as walking, showering, dressing up, eating, moving from one place to another and requiring home or institutionalized care.

*Jones - Rose (2005)* refer to **pathological aging** as aging in individuals with genetic predisposition to certain disease or to a high-risk negative lifestyle (e.g. poor eating habits, smoking, excessive alcohol consumption), which lead to premature disability or death.

The inner world of a person is based on his/her spiritual sphere. According to *Stuart-Hamilton (1999)* **psychological aging** is associated with the ability of an individual to function at a spiritual and cognitive level, including self-confidence, self-efficacy as well as learning process, memory and perception.

The interconnection of personality characteristics of an elderly person with outer environment is from the standpoint of time defined by the combination of social changes or meeting a certain requirement – most often by reaching specific age, at which people have the right to retirement. **Social aging - eldering** is determined by the changes of roles, lifestyle and economic background. In this sense is aging perceived as a social event (*Mühlpachr, 2005*). Seniors adapt to such changes in a variety of ways using several strategies. *Langmeier - Krejčířová (1998)* document five adaptational strategies to cope with aging: (1) constructive strategy, when an individual constructively adjusts to aging, its negative and positive features, (2) dependence strategy, when an individual resigns and becomes dependent on other people, (3) defensive strategy, when an individual attempts to hide his/her problems and fear of aging by denial or strenuous activity, (4) hostility strategies, when an individual ascribes the causes of his/her problems to other people, (5) strategy of self-hatred, when an individual refuses to reconcile with his/her own aging, is self-critical and becomes estranged.

In addition to sex, social class, race and ethnicity, variability of adaptational techniques induces considerable heterogeneity in elderly population. Social aging forms a part of socialization. According to *Macionis (1989)* old age differs from earlier stages in the life course. Growing up typically means entering new roles and taking on new responsibilities, but growing old is the opposite experience – learning roles that provided both satisfaction and social identity. Like any life transition, retirement demands learning new patterns while at the same time letting go of habits from the past.

Individual definitions of aging show that purposeful change in the lifestyle of an elderly person may influence most of the listed systems and tasks (in addition age and genetics). The outcome may be the so-called **successful aging**. When defining successful aging many authors emphasize the issue of multiseptic character of the term successfulness itself. In general, it may be stated that successful aging would from our point of view represent a state, when an individual benefits from enhanced motor, physiological, psychological and social parameters compared to general population.

The feeling of quality of life is dependent on three factors, i.e. health, fitness and well-being, the later being satisfaction with life and the feeling of well-being. Physical health consists of three components (*Spirdušo, 1995*), which are closely associated with the quality of life. Therefore, we may refer to physical, functional and subjective health status. Physical status refers to the number of health problems, which an individual suffers from and perceives. The functional status refers to the state of limitations in an individual when executing the activities of daily living.

The third component of physical health includes the subjective health status of an individual, which means evaluation of one's own health. Fitness refers to having adequate level of physical qualities, abilities and experience in relation to one's age. Well-being includes self-satisfaction, optimism as well as prevalence of positive feelings over the negative ones. Relations between objective physical status, subjective health and satisfaction with life or well-being are quite complex. Optimal health and physical fitness of an elderly person induce three positives, two of which relate to an individual and the third is society-related. Firstly, there is high probability that optimum health and physical fitness will contribute to the feeling of well-being and the feeling of satisfaction with life, which will finally reflect in the quality of aging. Secondly, there is higher probability that a healthy and fit person will be able to sensefully communicate with his own family and in company as well in a way by which he supports his own well-being and that of others. Thirdly, higher number of optimally aging people will exert positive effect on the overall expenses of society, which are to be covered for health care. The last years of life of a physically dependent person cost the society eight times more when compared to a person aging successfully (*Spirdušo, 1995*).

**With regard to motor functions**, old age is a period of decline not only in motor parameters, but also in joint flexibility, motor memory, reaction ability and dynamic balance. Joint flexibility is determined by anatomical dispositions of articulations and their positions, which are most frequently assessed in an upright stance (*Štilec, 2004*). Old age is characterized by degenerative changes in ligaments and articulations, which decreases range of movement and motor functions in general. It is important to note that coordination and joint flexibility are generally viewed as a common manifestation of good motor memory (*Měkota – Novosad, 2005*).

Motor memory refers to the ability to memorize, store and subsequently retrieve all movements in the prescribed order after a practical demonstration. Older adults have been shown to have decreased ability to perform such tasks, which may be explained in many ways. According to one of the theories, elderly people tend to mangle movements or even totally forget them. Elderly people compared to their younger counterparts probably lack the capacity for mental procession of data and do not have enough memory space to manipulate with such type of information. Prior to or throughout the execution of the activity the information either gets lost or older people do not store the information correctly.

Old age is known as the period of involution characterized by uncoordinated movement. Movements of elderly people are clumsy, slow and non-rhythmical. These aging-associated changes are inevitable, but may be offset by physical exercise. It is known that aging magnifies the effects of disorders and impairments, which induce decline in sensitivity, muscular strength, vision and range of movement. This leads to unstable stance and general deterioration in coordination. The decline in coordination abilities is caused by aging organs and tissues, decreasing elasticity of

the musculoskeletal system and lower plasticity of neural processes, which diminish the ability to receive and process information. The decline in motor control is characterized by slow, clumsy, stereotypical and decreased rhythmicity of movement (Štílec, 2004).

Szopa – Mleczko – Zak state that involution present in the fifth decade of life induces regressive trend especially in balancing ability, spatial orientation and simple reaction time (according to Osinski, 2003).

The decline in motor abilities in late life is undoubtedly associated with morphological and functional changes in the central nervous system. The reduction of synapses induces changes in the functions of the nervous system, which resembles reversed sequence of maturation in childhood (Langmeier, 1998).

Older people who fall into the category of old age (65/70-years old and older) show decline in overall motor proficiency, which is evident especially in untrained individuals. The execution of movements is slow and uncertain. They demonstrate body rigidity and stereotypical movements. There is increased control of movement and the effort to avoid mistakes. Elderly people lack simultaneous combination (age-related loss of practice). The limitations in the functions of the musculoskeletal system result in hypokinesia, lack of physical activity and monotonous life in general. Schaller – Wernz (2000) and Bischops – Gerards (2001) assume that decline in adaptation capacity and its negative effect on the level of coordination abilities may be attributed to the following factors:

- Declined functioning of the sensory organs,
- Declined functioning of the musculoskeletal system (strength decline),
- Declined functioning of the articulatory system (flexibility),
- Neural changes,
- Metabolic changes,
- Lack of physical activity in childhood and adulthood.

Krempel states that decline in coordination abilities manifests in fast onset of fatigue, decreased reaction ability, clumsiness of movements and slower pace and execution of movement (according to Heidemann, 2006).

Weineck (1994) assumes that decline in coordination abilities is associated with decrease in factors underlying performance capacity, or the quality of motor coordination and regulatory processes. Decline in performance capacity in the area of coordination abilities is probably induced by physiological factors such as aging tissues and organs, decreased joint flexibility, declining elasticity of active and passive musculoskeletal system. In addition to that, diminished neural plasticity and decreased ability to receive and process information play an important role (Meinel – Schnabel, 1987).

Van Norman (1995) concluded that declines in reaction time, movement time, predictive control, and sensory perception appear to be responsible for the decline of coordination, balance, and agility associated with aging.



Nevertheless, the solution to the offset of involution present in coordination of elderly people is despite its complex nature a relevant issue of their lives. Each positive change facilitates and enhances life of elderly people when performing the activities of daily living. The benefits of particular coordination abilities for the daily life of elderly people have been summarized by German authors *Schaller – Wernz (2000)* into the following principles:

- coordination abilities help to regulate body posture (upright stance),
- elimination of incorrect movements reduces the risk of falling (falling prevention),
- damaged organs (joints) are not exposed to excessive load,
- fewer problems when performing the activities of daily living (for instance (rising from a chair, sitting down on a chair, getting on and off a vehicle in rainy conditions or on a slippery surface, fastening a seatbelt, crossing the street, using an escalator or climbing stairs, using orthopedic prostheses as walking assistive devices, dressing and undressing clothes, and personal hygiene),
- improved coping with unusual and surprising circumstances (unexpected slipping, tripping or dropping objects),
- improved execution of successive movements,
- positive effect on physical and motor independence, self-confidence and health status.

*Hirtz (2002)* by summarizing views of Israel, Pfeiffer and *Schaller – Wernz* has confirmed the benefits of the so-called „coordination competence“ for health. The author states that coordination competence ensures successful execution of movement demands at work or in daily life especially through improved perception and interaction of senses and movement. The competence also enables to use adequate number of muscle innervations, lowers oxygen uptake, unloads metabolism and facilitates activity, which results in full use of energetic potential. Appropriate level of coordination competence prevents older people from excessive loading and weakening and shortening of muscle groups, assists in compensating activity of other systems, which are weak or weakened. The ability to move in a harmonious way and appropriately to one’s age induced by adequate level of coordination competence yields profound psychological benefits and helps to increase self-confidence, self-esteem, social well-being and facilitates independent life at old age.

*Schaller – Wernz (2000)* and *Kirchner (2006)* point to the following benefits of particular coordination abilities for elderly people:

### **Balancing abilities**

Maintaining balance plays an important role in a variety of situations. To stand and walk without balancing ability is impossible especially when complications occur such as standing in a moving bus, carrying dishes and plates, picking up small objects, working in the garden, climbing the stairs and rotating around

one's own axis. Good balance prevents elderly people from falling under unusual circumstances.

### **Kinesthetic-differentiation abilities**

Elderly people benefit from economization of strength performance. The ability to avoid the use of excessive or little force results in its sensible usage. Therefore, training of kinesthetic-differentiation ability in exercisers forces them to assess their own strength-based performances in relation to environmental conditions. Correct estimate of distance and speed as well as height and depth in relation to sureness at old age plays an important role. This definitely holds true in traffic situations, when climbing stairs or when walking in rough terrain. Exercise promotes self-confidence and enhances motor control and prevents potential dangers in late life.

### **Reaction abilities**

Elderly people may benefit from well-developed reaction abilities in a variety of situations. In traffic people have to react by making a sudden side jump or a sudden stop. Falling object may be caught only using fast reaction. The selection of appropriate response, that is the decision making process, plays an important role (choice reaction time).

### **Reorganization abilities**

There are a lot of situations that require reorganization ability in the home environment, garden or traffic. People have to get used to a new phone, bike or even a new apartment very quickly and attain the best possible comfort despite the changes. In situations occurring in traffic, people are obliged to stop crossing the street or choose another crossing due to construction on the road.

### **Spatial-orientation abilities**

Performing activities of daily living definitely requires spatial-orientation ability. Activities such as being in the traffic (pedestrian, cyclist or driver), shopping in a supermarket, orientation in an unusual or unknown setting, orientation in one's own apartment (in the dark) benefit from a well-developed orientation ability. Activities of daily living may also benefit from temporal orientation.

### **Coupling abilities**

There are a lot of situations, which require well-developed coupling ability:

- after a long bedrest caused by disease, gait or walking using both lower and upper limbs or walking assistive devices benefits from a coupling ability,
- if an elderly person wants to go for a walk with a partner and talks without stopping while avoiding obstacles,
- when crossing the street elderly person is able to orientate in the traffic without stopping,
- pushing the shopping trolley in a narrow corridor and loading the trolley with groceries at the same time,
- if an elderly person uses a walking stick without problems keeping the walking rhythm,
- using the escalator and seeing to the baggage at the same time,

- looking for a vacancy on a bus holding a shopping bag,
- getting off the bus holding an umbrella and a handbag,
- rushing to the phone with a cup of coffee in one's hand,
- climbing the stairs and search for the apartment key at the same time,
- giving an arm signal as a cyclist.

The level of coordination abilities does not only determine the *scope of daily living*, but well-developed coordination abilities are beneficial also for *sporting elderly people*. They facilitate acquisition of motor skills and enable the elderly sportspeople to do the particular type of sport with high rate of success and perspective. The higher the level of coordination, the less strength, endurance man needs to perform movements. Good coordination unloads organ systems, especially the cardiac muscle and cardiovascular system (Meusel, 1988).

Schaller – Wernz (2000) assume that the association between coordination abilities and successful sporting activity in elderly people is based on the following principles:

- compensations of deficits in speed, strength and endurance to a certain level,
- execution of complex movements in a facilitated manner,
- faster acquisition of new motor skills,
- purposeful use of motor skills,
- change in motor skills according to changes in circumstances,
- improved adaptation to unusual circumstances,
- lowered risk of tripping using fast reactions,
- later onset of fatigue,
- more joy related to sporting activity as a result of enhanced level of coordination abilities.

Kirchner (2006a) states that in the period of late adulthood (45/50-65/70 years of age) sport-motor functions in untrained individuals demonstrate great interindividual differences. This holds true also for motor abilities, which show gradual decline.

The issue of aging society and physical activity in elderly people and its effects on the aging process has attracted a lot of research attention of foreign experts. On the contrary, in Slovakia the issue of aging has received little attention. There is paucity of information on the assessment of motor parameters in older adults. **The diagnostics of motor parameters** in elderly people is important in terms of health- and physiology-related differences, wide range of performance capacity in elderly people and absence of standardized techniques in line with this ontogeny period (Bös - Tittlbachová, 2001). The classic form of testing motor abilities known from schools and sports facilities, which is based on the use of motor tests and test batteries, is inappropriate for the assessment of motor predispositions of elderly population. Most motor tests include physical activities requiring agility, speed, vigorous coordination exercise and complex movement sequences, which should be avoided at older age. Therefore, there are fewer tests for elderly people as compared to their younger counterparts (Belej, 2005).

*Kasa - Mikuš - Krišanda (1999), Kasa (2006)* state that coordination abilities include complex internal qualities, which manifest in different ways. Therefore, their assessment is more complex compared to the assessment of conditioning abilities. Some of them are identical to the ways of measurement of other motor abilities and skills. For instance, accuracy of movement is assessed together with skill efficiency, time to reorganize movement is determined together with complex reaction speed, etc. The assessment of coordination abilities usually includes the following motor characteristics – accuracy and range of movement, time deficit, unusual positions, sudden situational changes, and so forth. The execution of complex movements brings about the so-called mental stress. The research documents that coordination abilities similarly to other motor abilities are not directly measurable. The diagnostic issues are associated with imperfections of motor tests, which results from the character of coordination abilities. The complexity and variety of coordination abilities and the absence of objective and unitary methods for identification of their internal predispositions and external manifestations has been documented by *Belej - Junger et al. (2006)*.

The tests for the measurement of motor abilities in elderly people must be applicable and usable. The usability of the test usually includes health screening, time needed for application and evaluation of the test, personal staff for testing, material and spatial conditions for testing, rate of fatigue induced by particular tests or a single test item and also the social acceptability of the test itself.

Despite complicated applicability of diagnostic means in elderly people, the use of motor tests represents one of few ways of determining and controlling workload and quality of exercise in natural conditions. Motor tests point to the developmental processes in this period of ontogeny and the benefits of physical activity in terms of independent living. This enables the elderly people to monitor the progress or stagnation in their performance capacity (*Kirchner – Langová, 2006*).

The **development and enhancement of coordination abilities** is based on the use of a variety of non-specific and specific exercises that expand motor experience of exercisers. According to *Kasa (1995)* physical exercises are the underlying factor of the development of coordination abilities. Improvement of coordination requires an array of training means and devices. The exercises must be alternated and complemented with various motor tasks, must be performed with and without visual control, which results in gradual increase in the level of coordinative complexity. According to experts intentional development of coordination abilities should adhere to the following principles:

1. The improvement in functions of all analyzers, which function as internal regulatory mechanisms in individual regulatory areas. The improvement in differentiation abilities is possible only from „gross“ presentation to „fine“ presentation (*Kasa, 1995*),
2. The enhancement of individual sensorimotor characteristics (regulators) and improvement of musculoskeletal functions (*Čelikovský - Chytráčeková according to Lednický - Doležajová, 2002*),

3. Targeted development of individual abilities (reaction speed, adaptation to changing conditions) that ensure the highest level of coordination proficiency (Kasa, 1995),
4. Technically proficient acquisition of motor skills (Kasa, 1995),
5. The increase in coordination complexity of the physical exercises used, which is possible to achieve through changes in spatial, temporal and dynamic parameters (Sýkora, 1989; Šimonek, ml., 1993; Kasa, 1995).

In addition to the listed principles, Blume and Matvejev emphasize the principle of *variability of movements execution* (variation of movement phases, change of rhythm, range of movement) and the principle of *changes in external conditions*. Schnabel has documented the following possibilities related to changes in external conditions: restricted area, time limitation, limitation (no visual control, stimulation of vestibular apparatus using rotations, physical load prior to exercise, change of environment (exercising in sports halls, on the sand, water or snow), change in the surface area (decrease, increase), exposition to higher risk or adaptation of partner, implementation of motor tasks during exercise, use of various implements (of miscellaneous shapes, sizes and weights) and equipment (take-off, Reuters springboard, small trampoline) (according to Lednický – Doležalová, 2002).

Kasa (1995) also considers it important to change the spatial outlay of apparatus, equipment, to increase the surface area during balance exercise, to combine different movement patterns (combinations of walking and jumping, running and catching objects), execution of a motor task according to a signal, or in a limited time span. Special effectiveness is determined by the image of additional information. Partial or total exclusion of vision (glasses, eye cover) significantly decreases the quality of performed activity. Further principles include *exercising at maximum pace*, which is not consistent with the training principles of elderly organism, also *variation in information* – reception and procession of visual, acoustic, kinesthetic stimuli, *exercising after prior loading* (repeated stimulation of vestibular apparatus and subsequent balance performance), *application of unusual positions*, *mirror-like execution of exercises*, *change in speed or pace of movements*, *increase in demands related to motor coordination using tasks such as juggling with balls, cones*, *change in the manner of execution*, *competition during exercise*, *implementation of a freshly acquired game element*, *use of complementary objects and signals, which require instantaneous response*, *the use of various material, technical and natural conditions to increase the variability of motor skills*, *change in spatial area, which determines the execution of exercise*, *intentional change in external loads, which requires exact differentiation of exerted effort* (Kasa, 1995).

Zháněl - Zlesák (2001) emphasize that fundamental training principle of coordination abilities is the variability of all training means, the so-called *method of exercise variability*. The method includes both variation of elementary movements (various forms of running, walking, jumping, etc.) and their execution under more difficult conditions (change in pace, frequency, direction, type of surface, spatial

conditions, equipment, etc.). The authors also emphasize that the development of general coordination abilities must follow the principle from „easier to more difficult“ and „from simple to more complicated“ and make an effort to attain permanent enhancement of movement quality. The authors list the schematic hierarchy of training principles for the enhancement of coordination abilities according to Roth (fig. 1).

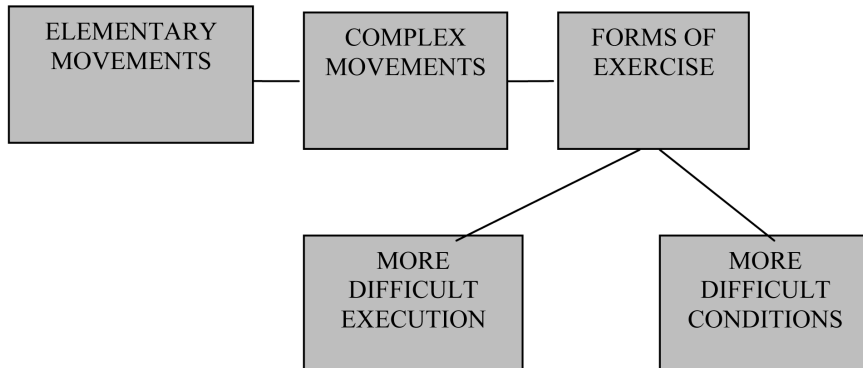


Fig. 1 Training principles for coordination abilities development (Roth according to Zháněl - Zlesák, 2001)

Ljach stresses that development of coordination abilities requires the method of targeted exercise, the method of generalized exercise, the method of standardly repeating and changing exercise and competition-based and game-based exercise (according to Lednický – Doležajová, 2002). Moravec (2004) lists the following **methods** for the development of coordination abilities:

- method of repetition,
- method of exercise variability (performed under more difficult conditions),
- graded increase in movement speed,
- method of contrast: e.g. alternation of slow and fast tennis shots,
- effect coupled with perfection of sports technique and tactics,
- **and forms:** game-based, competition-based and group-based.

Organization forms used to develop coordination abilities include frontal exercise usually performed in the preparatory or final part of the lesson, station exercise with complementary tasks, group form in the main part of the teaching or training unit (Šimonek, ml., 1997).

Coordination exercises should be included in the first half of an exercise session or training unit due to increasing rate of fatigue. Rest periods or intervals should include recovery. The volume of exercise is irrelevant, therefore, it is compensated by frequent use in a series of sessions. Exercises targeted at the development of coordination abilities are effective unless performed automatically. If so, coordination training is useless.

Even top level athletes implement acquisition of new movement patterns into time-restricted parts of exercise sessions, during which they have to focus on the quality, accuracy, movement variability and creative solutions to the tasks, which is impossible to perform following severe physical load, in a state of fatigue, with short rest periods between exercises and with number of repetitions more than 6-12. More significant adaptational changes have been documented after a longer period of training (*Moravec, 2004*).

Krempel and Neumaier state that coordination training at old age, as a part of an exercise program, should be performed in a rested state. Therefore, exercises should not be performed under fatigue due to high risk of injury. In addition to that, insufficiently mastered exercises lead to overloading and frustration or riskier movements. Training should be terminated at the earliest symptom of fatigue. In general, exercises aimed at the development of coordination abilities should be of high concentration and lower volume (*according to Heidemann, 2006*).

Practical verification of theoretical knowledge about the assessment and development of coordination abilities in elderly people took place in form of research conducted at the Faculty of Sport in the years 2008-2009.

The experimental group consisted of 17 elderly women with average age  $62.06 \pm 2.59$  years. The subjects participated in a supervised exercise program ProSenior at the Faculty of Sport in Prešov. From the standpoint of engaging in physical activity, most of the program participants engaged in regular exercise only within the project ProSenior and did not perform sports at a competitive or top level at younger age. Despite certain health problems the participants represented a group of females performing the activities of daily living without limitations.

The design of the exercise program ProSenior adhered to the recommendations of the American Council on Exercise (1998), American College of Sports Medicine and American Heart Association (*Nelson et al., 2007*). We attempted to devise a multimodal program to include resistance exercise (circuit training performed on weight machines, body weight exercise and dumbbell exercise), aerobic exercise (aerobics, taebo, Latino dance) and flexibility exercise (stretching exercise in the warm-up and cool-down phase and spinal exercise). The program did not include specific exercises aimed at development of coordination, as we hypothesized positive synergic effects of resistance, aerobic and flexibility exercises on the development of coordination abilities.

The exercise program was held twice a week in form of 60-minute exercise sessions performed in the morning (9 a.m.). With regard to senior exercise, morning hours are more appropriate due to the fact that seniors have more time for other activities and duties. At the same time, morning exercise creates positive mood for the rest of the day. Tuesday's exercise session included especially aerobic-resistance exercise. The structure of the exercise session consisted of warm-up in form of step variations and stretching exercise. The main part of the session comprised aerobic exercise in form of low aerobics and resistance

exercises. The final part was aimed at cooling down using stretching, breathing and relaxation exercise. Thursday's exercise session included resistance exercises performed on weight machines in form of circuit training. The warm-up consisted of light stretching and basic step variations. The main part included resistance exercise on weight machines and the final part was targeted at cooling down by use of stretching and relaxation exercise.

As the participants adopted a positive attitude to organized exercise in course of training, the exercise program continued throughout the rest of the year. On its completion, tests of psychological states and general motor performance capacity were applied using the Senior Fitness Test, which represented the third measurement.

The level of coordination abilities in seniors was assessed using the following motor tests of selected coordination abilities:

- Dynamic balance: Walking along the line. Source: Meusel (1996), p. 111.
- Balancing with an object: Balancing with a gymnastic stick. Source: Schaller - Wernz (2000), p. 66.
- Coupling ability: Lateral carrying. Source: Měkota - Blahuš (1983), pp. 172-173.
- Frequency ability: Plate tapping. Source: Belej - Junger et al. (2006), p. 167.
- Kinesthetic-differentiation ability: Ball throwing. Source: Schaller - Wernz (2000), p. 90.
- Reaction speed: Stick grasp test. Source: Měkota - Blahuš (1983), p. 203.
- Reorganization ability: Glued tubes. Source: Schaller - Wernz (2000), p. 159.
- Spatial-orientation ability: Leading a ball. Source: Schaller - Wernz (2000), p. 104.
- Rhythmical ability: Arrhythmical tapping. Source: Měkota - Blahuš (1983), pp. 185-186.

Employed motor tests represent appropriate and applicable diagnostic means of coordination abilities in elderly population. The tests were selected in line with the specific aspects of motor functions of elderly females.

*General motor performance capacity or functional fitness* was assessed using the **Senior Fitness Test** (Rikli - Jones, 2001) (SFT). The test is the measure of lower- and upper-body strength, aerobic endurance, lower- and upper-body flexibility, agility and dynamic balance. SFT is a standardized test, which defines physical fitness as the ability to perform activities of daily living in a safe and independent manner without undue fatigue.

We have selected the following results related to the positive effects of the exercise program on the coordination abilities in elderly women:

#### **Dynamic balance**

Comparison of baseline and outcome measurement has shown improved scores in 15 participants. The exercise program did not positively influence the level of dynamic balance in 2 participants. The negative tendency, however, did not yield great differences following the comparison of first and second measurement. The differences between measurements were not statistically significant  $p < 0.05$ .



**Balancing with objects**

The balancing ability is not determined only by body control, but also by the ability to maintain an outer object in a state of equilibrium (*Měkota - Novosad, 2005*).

On completion of the exercise program positive changes in dominant-hand test were observed in 10 and negative changes in 7 participants. The results of the non-dominant hand tests were even less significant. Most participants achieved lower scores at the outcome measurement. The insignificance between measurements may be explained by the fact that the development of the ability to balance with an object requires long-term specific training aimed at special stimulation of strength parameter of upper-body kinesthetic-differentiation ability, sense for balancing and fine motor skills of hands.

**Coupling ability**

The variety of exercise content of the program was expected to positively influence the level of coupling ability. Our expectations were confirmed at a statistically significant level. One participant had to be excluded due to health problems. Lower test scores at the outcome measurement were recorded in 2 participants. We assume that positive effects were registered especially due to the inclusion of low aerobics, which is appropriate and highly recommended for elderly participants.

**Frequency ability**

The results of frequency ability measurements have confirmed our assumption that movement frequency is highly influenced by concrete practical activity, which was included in the exercise program. On its completion, there were statistically significant improvements in all participants. Regular exercise increased the ability to alternate muscle contraction and relaxation, which are the underlying factors of the frequency ability.

**Kinesthetic-differentiation ability**

Hitting a target indirectly by throwing a tennis ball against the wall has demonstrated the complexity of the development of the kinesthetic differentiation in the investigated age period. While there was no change in 2 participants, 7 participants improved and 8 participants achieved lower test scores. These changes were not statistically significant. Lower scores were registered when conducting the non-dominant hand version of the test. Positive effects of the program were observed in 3 participants. Throwing for accuracy executed at a fixed target is based on the use of exact rate of strength maintaining the throwing accuracy, which may cause problems in late life.

**Reaction speed (simple reaction time)**

Similarly to the frequency ability, the assessment of simple reaction time has showed positive effects of the exercise program in 15 participants. No change was observed in one participant and one participant showed stagnation in the level of reaction speed. Positive changes were statistically significant.

### **Reorganization ability**

Statistically significant differences were observed also in the assessment of exercise program effects on the reorganization ability. Despite performance stagnation in three participants and lower scores in the same number of participants, the outcome scores in 9 participants were higher compared to their baseline scores influencing overall assessment of the whole sample.

### **Spatial-orientation ability**

Similar to previous coordination abilities, which are characterized by complex movement structure, the level of spatial-orientation ability did not significantly change on the completion of the exercise program. An interesting research finding is that in both dominant and nondominant hand version of the test, improvement was observed in 9 participants, one participant achieved identical score and seven participants scored lower compared to the baseline scores.

### **Rhythmical ability**

At outcome measurement 11 participants achieved higher test scores and 4 participants scored lower when compared to the baseline data. We assume that the improvement may be attributed to high number of repetitions of rhythmical movements within low aerobics and basic step variations during the warm-up period of the preparatory and main part of exercise sessions.

Mean test scores in tests of **functional fitness**: T2 – Test of upper-body strength, T3 – 2-minute Step test, T5 – Test of upper-body flexibility have shown that the sample falls within the above-average category. Scores of the tests: T1 – Test of lower-body flexibility, T4 – Test lower-body flexibility, T6 – Test of dynamic balance fall within the average category. Baseline and outcome BMI index score, which indirectly measures the amount of fat and is generally accepted as the best indicator when compared to one's body weight, fall into the overweight category.

Following 6-month exercise, the sample progressed from the above-average category also in T1 – Test of lower-body strength. The BMI index score fell within the overweight category despite improvements in obtained scores.

As the exercising elderly women showed interest in further participation in exercise, the next measurement was carried out following a one-year period. The results have shown that prolongation of regular exercise by 9 months classified the sample into the above-average category in two more tests: T4 – Test of lower-body flexibility, T6 – Test of dynamic balance. Despite longer participation in exercise the BMI score again classified the sample as overweight. These findings are not surprising because the content, intensity and frequency of the exercise program could not exert sufficient effect on body composition. The elderly women who attempted to lose weight were recommended to increase the volume of aerobic exercise in addition to participation in the exercise program. In case of swift walk, the participants were illustratively demonstrated (a walk into the country using the heart rate monitor for heart frequency monitoring in a selected participant) the intensity necessary to achieve a positive physiological response emphasizing not

only the type of activity, but especially intensity, duration and frequency needed to elicit positive effects. The aforementioned use of pedometers as an illustrative aid is executed as late as the current project, which is conducted in cooperation with the Faculty of Physical Culture UP in Olomouc. On the other hand, we realize that we could have focused on this issue in a seminar form targeted at healthy nutrition and lifestyle. This would provide elderly participants with more practical advice for combating obesity not only through physical activity, but also by means of eating habits adjustment.

Overall, the assessment of general motor performance (functional fitness) following 12 months of exercise demonstrated significant changes in the parameter of lower- and upper-body strength, but there were also significant gains in aerobic endurance, flexibility and dynamic balance.

Results relating to coordination abilities of movement regulation of the complex “a” (Belej, 2001), have shown that the exercise program consisting of aerobic-resistance exercise positively affected dynamic balance, frequency ability and coupling ability, but did not affect the ability to balance with an object. The complex of coordination abilities of complex “b” connected with movement adaptation was positively affected in both coordination abilities of the complex: reaction speed and the reorganization ability. In measures of spatial-orientation ability and rhythmical ability, i.e. the abilities of the coordination complex underlying both movement regulation and movement adaptation “a + b”, positive effects were demonstrated only in rhythmical ability.

With regard to general motor performance capacity (functional fitness), improvement was recorded in all examined parameters, but more significant changes were found in the lower- and upper-body strength.

Despite having examined a non-representative population sample, positive effect of regular physical activity on motor abilities following a relatively short 2-month period was observed. Only the slightest rate of development, even the stabilization of motor predispositions of seniors considerably enhances their life competences associated with independence and self-reliance, which in addition to health status represent the most important components of lifestyle of an elderly organism. Therefore, the creation of conditions for regular exercise especially in social facilities is one of the effective steps for the improvement of physical and spiritual life of senior population, which subsequently brings highly valued social effect for the whole society.

### **Abstract**

Evidence related to the life of our predecessors confirms dominant status of physical activity in terms of development and formation of man throughout phylogeny. However, at present for the first time in the history of mankind, man has

failed to substitute and eliminate lack of physical activity induced by changes in the manufacturing process and lifestyle in general. As an example of such extreme may serve the key competences for lifelong learning included in the educational program ISCED 0. We all know that from the verbal aspect **movement is one of the basic human needs** just like eating, drinking and sleep. Man has evolved phylogenetically through movement. Why is movement being eliminated from the official national educational program? Such attitude arising out of life imbalance, which is evident at most Slovak schools, results in impaired body posture as early as preschool age, increase in the number of physical impairments, lower performance capacity and physical fitness and the transfer of the fully-recognized benefits of physical education and sport to the verbal plane at the expense of practical involvement in physical activity.

If in the broader context physical education and sport are to become a permanent part of one's lifestyle, ranging from preschool age to adulthood period, all educational authorities and institutions have to attempt to create a positive attitude of educated individuals towards this kind of activity.

If we take into account the three-dimensional structure of attitudes, then we must look for the solution in its affective, cognitive and behavioral component.

Due to the fact that the issue of involvement in physical activity is considered a complex problem regarding the whole society, the solutions may be found at three levels: national policy, preparation of physical educators and the status of organized physical activity in the study programs of all types of universities.

In line with the intensions of the listed recommendations, we recommend that physical education and sport at all types of schools – ranging from kindergartens to universities – be regarded as an irreplaceable means necessary to meet the social and biological need to move, to develop motor abilities, to acquire basic motor skills and to ensure harmonious and healthy development of children and youth, including children with physical impairments.

The level of motor functions in elderly people is determined by the level of reduction in physiological and motor mechanisms. Well-developed motor abilities determine the quality of life in elderly population and positively affect the execution of the activities of daily living.

The results of our research showed that relatively short 2-month participation in exercise positively affected motor abilities in elderly people. Even the slightest rate of development, or the stabilization of motor predispositions in elderly people, enhances the level of life competences associated with independence, which in addition to health status is one of the most important components of the lifestyle in aging organism. Therefore, creating conditions for regular exercise, especially in social institutions, is one of the effective steps for the improvement of both physical and spiritual life in elderly people, which is highly beneficial for the whole society.

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program and Polish-Slovak platform for physical culture and health promotion in students “Active throughout the whole life”.

Key words: physical culture, students, physical activity, health

## References

1. American College Of Sports Medicine 1998. Position Statement: The Recommended Quantity And Quality Of Exercise For Developing And Maintaining Cardio Respiratory And Muscular Fitness An Healthy Adults. *Medicine And Science In Sports And Exercise*. No. 30. S. 975 – 991.
2. American Council On Exercise. 1998. Exercise For Older Adults. *Human Kinetics*. ISBN 0-88011-942-X.
3. Bakalár, P. 2009: Vplyv Pohybovej Aktivity Na Zmeny Vybraných Psychických Aspektov Staršieho Veku. Dizertačná Práca. Fakulta Športu Pu V Prešove. 2009, 140 S.
4. Bartošik, J.: Vývoj Základných Motorických Zručností U Detí Predškolského Veku. In: Zborník Pob. Ved. Spol Pre Tvsš Nitra. 1994. 34 S.
5. Belej, D. 2005: Diagnostika Motorických Schopností U Seniorů. Bakalárska Práce. Brno: Fspš Mu V Brně, 2005. 35 S.
6. Belej, M., 1999: Rozvoj Koordinačných Schopností Detí Mladšieho A Stredného Školského Veku. In Zborník Identifikácia A Rozvoj Pohybových Schopností Detí A Mládeže. Fhvp Pu V Prešove, 1999, S. 75-82.
7. Belej, M.-Junger, J.: Dymanika Rozvoja Pohybových Schopností 4-6 Ročných Detí. In: Zborník Z Medzinárodnej Vedeckej Konferencie Č. 5 „Motorika Detí Predškolského A Mladšieho Školského Veku“ Prešov, Fhvp Pu, 2000, S. 60-67.
8. Belej, M.- Junger, J.: Aeróbná Vytrvalosť 5-6 Ročných Detí. *Tel. Vých. Šport.*, 2000, Č.1, S.5-10.
9. Belej, M. 2001. *Motorické Učenie*. 2. Vyd. Prešov: Fhvp Pu, 2001. 198 S. ISBN 80-8068-041-8.
10. Belej, M. - Junger, J. Et Al. 2006: *Motorické Testy Koordinačných Schopností*. Prešov: Fš Pu V Prešove, 2006. 177 S. ISBN 80-8068-500-2.
11. Bischops, K. - Gerards, W. 2001. *Koordinations Training. Beweglich – Fit – Vital Ein Leben Lang*. Aachen: Meyer & Meyer Verlag, 2001. 144 S. ISBN 3-89124-819-9.
12. Blahuš, P. – Měkota, K. *Motorické Testy V Tělesné Výchově*. Praha: Spn. 335 S.
13. Bös, K. - Tittlbach, S. Development And Use Of Health Related Fitness Tests In Longitudinal Research. In *Sborník Pohyb A Zdraví, Olomouc 15.-18. Zář 2001*. Olomouc: Ftk Up Olomouc, 2001. ISBN 80-244-0322-6, S. 18-20.
14. Cooper, K.H.: *Aerobický Program Pre Aktívne Zdravie*. Šport, Bratislava, 1990, ISBN 80-7096-073-6.
15. Dobrý, Lubomír: Vliv Správné Výživy A Pohybové Aktivnosti Na Studijný Prospěch. *Těl. Vých. Sport Mlád.*, 2006, Č.8, S. 41-43.
16. Dvořáková, H.: *K Někteřým Problémům Tělesné Výchovy V Současné Mateřské Škole*. Karalimum Nuk, Praha, 1998.
17. Feč, K.- Junger, J.- Belej, M., 1995: Entwicklung Der Motorischen Koordination Und Kinetisch Differenzierenden Fähigkeit Von 5-8 Jährigen Kindern. In: *Science In Sports Team Games*. Biala Podlaska. Poland, 1995, S. 532-536.

18. Hajdúková, V. A Kol.: Príručka Na Tvorbu Školských Vzdelávacích Programov Pre Materské Školy. Mpc Bratislava, 2008, ISBN 978-80-8052-324-4.
19. Havlíčková, Ladislava, 1998: Biologie Dítěte. Rané Fáze Ontogenéze. Uk Praha, Karolinum, 1998, ISBN 80-7184-644-9.
20. Hirtz, P. 2002. Co-Ordinative Competence And Health. In Journal Of Human Kinetics, 2002, Vol. 7, Pp. 23-28. ISSN 0860-9853.
21. Hrubý, Martin: Proč Je Tělesná Výchova Na Vysoké Škole Potřebná? Těl. Vých. Sport Mlád. 71, 2005 Č. 1. S. 9-12.
22. Chodzko - Zajko, W.J. 1998: Physiology Of Aging And Exercise. In: American Council On Exercise. 1998. Exercise For Older Adults. Human Kinetics. ISBN 0-88011-942-X.
23. Jadvidžák, I. – Kopřivová, J. Vliv Roční Pravidelné Pohybové Aktivity Na Změnu Psychických Funkcí A Koordinačních Schopností Seniorů. In: Sport A Kvalita Života. Brno: Fsp Mu V Brne. 2005. ISBN 80-210-3863-2
24. Jones, J.C., - Rose, D.J. 2005: Physical Activity Instruction Of Older Adults. Human Kinetics. ISBN 0-7360-4513-9.
25. Junger, J. - Belej, M.: Príspevok Ku Koncepcii Učebných Plánov Štúdia Telesnej Výchovy Na Pedagogických Fakultách. In: Zborník Z Vedeckej Konferencie “Technológie Vzdelávania Tretieho Tisícročia”. Nitra, Medacta 1995, Č. 1, S. 279-285
26. Junger, J.: Dynamics Of The Development Of Co-Ordination Skills In 5-6-Year-Old Children. In: Otrok V Gibaniu: 2 Nd International Science

**Website**

27. Heidemann, K. 2006. Bewegungskoordination Im Alter. Eine Experimentelle Studie Zum Training Der Gleichgewichtsfähigkeit. [Online]. Kiel: Universität Kiel. [Cit. 2008-02-20]. Portable Document Format. Dostupné Na Internete: <Http://Eldiss.Unikiel.De/Macau/Servlets/Mcrfilenodeservlet/Dissertation\_Derivate\_00001919/D1919.Pdf;Jsessionid=2db6510bdef97d590a5dd8ac46e30025?Hosts=>

CHAPTER II

**Physical education and sport  
in polish higher schools. Diagnosis of the condition  
and prospects for changes**

Over 20 years have already passed since the times when, in 1989, a political and economic breakthrough happened in Poland. Since that time, since the beginning of the 90s, also higher education has been undergoing radical changes, the legal basis for which was created by the Act on Higher Education of 12<sup>th</sup> September, 1990<sup>1</sup>. Non-public higher schools have come into being and developed, and since 1998 also higher state vocational schools (able to grant only the bachelor or engineer degree) have started to appear<sup>2</sup>. A two-cycle system of education has been introduced. Studies under the auspices of the Polish Academy of Sciences have been created. In some higher schools there are regular courses conducted in the English language.

**Historical outline of social and economic changes.**

In the period of the social transformation of Poland and Central European countries, in the moment when laws lifting limits concerning civil and economic rights were being passed, new institutions were coming into being. Relatively small disproportions were revealed in the sphere of culture and recreation. Prestigious public cultural institutions, both of the non profit type and the ones commercially oriented became stronger. The market of private companies functioning in the recreation sphere was developing. The demand for recreational services, in particular in the field of organised holiday recreation, was increased by the subsidies from the employee benefit funds in work places<sup>3</sup>.

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1 Dz. U. (Journal of Laws), No 65, item 385 with further amendments

2 Dz. U. (Journal of Laws) No 96, item 590 with further amendments

3 Golinowska S.: *Zmiany instytucjonalne w sferze społecznej. (Institutional Changes In The Social Sphere) in „Polityka Społeczna”, 1994 no 10, p. 10.*

The withdrawal of the state from the sphere of physical culture and professional sport took a different form in different countries of the Eastern Block. The process was marked the least noticeably in the area of the countries which had come into being from former Soviet Union republics. Nevertheless, also in Poland the state retained its governing and coordinating role, most of all in the fields of physical and health education, motor rehabilitation, sport of children and youth as well as professional sport at the level of national teams<sup>4</sup>. The aim was to achieve a more balanced sport policy, treating all forms of sport activity equally, at the expense of unconditional preference for professional sport as a place for political rivalry. Some hope for the improvement of the situation in Poland was brought by the law on physical culture of 1984, allowing for private persons' services in the sphere of recreation and motor rehabilitation. The economic crisis and, in consequence, a deteriorating financial situation of the country resulted, however, in the growing decrease of the expenses in the public sector, within which physical culture functioned. Physical culture organisations from outside the association sphere were coming into being, working on the basis of commercial law, as well as funds, cooperatives and associations other than physical culture associations and political parties<sup>5</sup>.

### **Structural changes within higher education and physical culture**

In 1989 changes took place which did not remain without an effect on the shape of obligatory physical education in higher schools. The amendment to the law of 1982 (with the changes from 1985) led to a substantial increase in the autonomy of higher schools in Poland.

In 1991, a new subject in the Polish education system came into being on a large scale – non-public higher schools. Their development and the number of their students are not unimportant as far as student physical culture is concerned (Figure 1).

The principle of making detailed regulations concerning obligatory physical education and its time-frame in higher schools at the central level was abandoned, instead the authority to decide about its shape was passed on to the collective bodies of particular higher schools<sup>6</sup>. This regulation was confirmed by the law on higher education of 12<sup>th</sup> September 1990. However, not much results from the legal regulations, that is art.3, paragraph 2 point 2 “The care about health and physical development of

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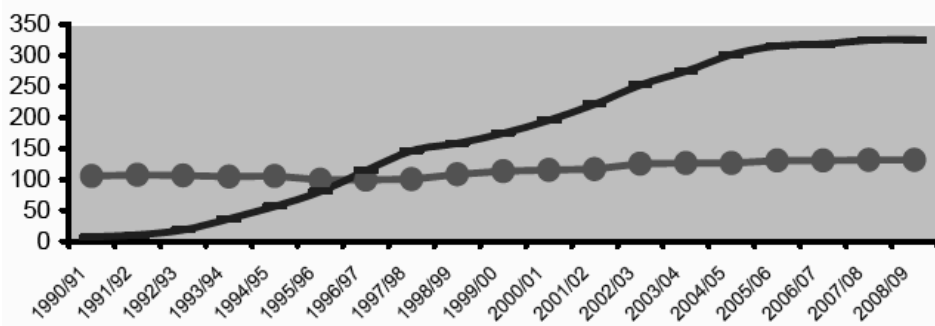
4 Krawczyk S.: *Sport w zmieniającym się społeczeństwie. (Sport In the Changing Society)* AWF. Warszawa 2000, p. 136.

5 Jaczynowski L., Zysko J.: *Przekształcenia w systemie organizacyjnym kultury fizycznej w Polsce w dobie transformacji ustrojowej. (Changes In the Organisational System Of Physical Culture In Poland In the Time Of Political Transformation.)* in „Poradnik Menedzera Sportu”. Warszawa 1994, issue no 8.

6 Law of 29<sup>th</sup> of May 1989, DzU (Journal of Laws) 1989 No 34, item 181.



the students” and art. 13.7 which states that one of the basic aims of a higher school is to ‘create conditions for the development of physical culture’ as far as the shape of students’ physical culture is concerned, and the law itself does not say much about students’ physical education. Nevertheless, it maintained the obligation to organise physical education in higher schools, regardless of their profile and form of ownership.



Legend: ● non-public schools, - public schools

**Figure 1. The number of higher schools in the years 1990–2009 (public and non-public schools)**  
 Source: *Szkoły wyższe i ich finanse (Higher Schools and Their Financing)*. GUS. Warszawa 2009

Democratisation of universities became a reason for numerous organisational changes, which also included physical culture of academic youth. The law of 18<sup>th</sup> January 1996, in art. 19.1 obliged higher schools working in the day time program to conduct physical education classes. That statement, however, was quite laconic and it did not specify the form nor the time-frame of the classes, leaving it up to the decision-making organs of the schools, that is to the senates and the boards of faculties. It obliged the higher schools, however, to conduct physical education classes, without saying anything about the obligatory or non-obligatory form of participation in those classes. The minimal conditions of the time-frame of physical education classes were ceded to the main body of the local government - Council for Higher Education<sup>7</sup>. The time of deciding about this subject through administrative channels, above the academic community, was irrevocably gone<sup>8</sup>.

7 Nowakowski A., Podobinski S.: *Rola Rady Głównej Szkolnictwa Wyższego w limitowaniu zajęć wychowania fizycznego studentów (The Role of Council for Higher Education In Limiting Physical Education Classes.)*[in] Maksimowska B., Nowakowski A., Rodziewicz-Gruhn J., (ed.): *Z zagadnień akademickiej kultury fizycznej. Na dziewięćdziesiątą rocznicę sportu akademickiego w Polsce. (From the Issues of Academic Physical Culture. For the Ninetieth Anniversary of Academic Sport in Poland.)* Czestochowa 1999, pp. 61–66.

8 Dziubinski Z.: *Tendencje zmian uczelnianej kultury fizycznej w 10 lat po przełomie. (Tendencies in the Changes of University Physical Culture 10 Years After the Breakthrough.)* „Przegląd Naukowy Instytutu Wychowania Fizycznego i Zdrowotnego WSP w Rzeszowie” 2000, issue no 1–2, pp. 63–64.

Often, however, universities determined by the financial situation minimise the number of hours devoted to the realisation of physical education.

Against the above mentioned background of the changes happening in Poland in the recent years, the Law on higher education of 27<sup>th</sup> July 2005 is significant. It promotes adjusting our system of education to European standards. It is a step towards regulating higher education in Poland through combining the issues comprised in the law of 12<sup>th</sup> September 1990 on higher education and the law of 26<sup>th</sup> June 1997 on higher vocational schools. Some of the regulations included in it concern the sphere of physical education in higher schools. Article 13.1 point 7 states that the basic aim of a higher school is to “create conditions for the development of physical culture of students”<sup>9</sup>, and article 106 states that: “Conducting by a university a didactic, scientific, research, experimental, artistic, sports, diagnostic, rehabilitating or therapeutic activity does not constitute a business activity”<sup>10</sup>. That is definitely too little for the expectations of the circles of employees associated with studies or sports and recreation centres in higher schools. It is not enough in the light of constantly worsening health condition of the Polish society, including academic youth.

Created in the year 2010, legal acts concerning the circles associated with academic physical culture marginalise its importance. The law on sport speaks only about the possibility of financial support for the development of sport in the academic environment provided by the Ministry of Higher Education and about the possibility to grant scholarships to students for their sports achievements<sup>11</sup>. And only several months ago, one of the drafts included an obligation to care about the physical fitness of children and youth, from the kindergarten age up to the time of university. Nor does a currently drawn up draft of the Law on higher education of 30<sup>th</sup> March 2010, being at the legislation stage, include any mention of physical culture in higher schools, limiting itself to the statements concerning the scholarship<sup>12</sup>. So the only legal acts concerning

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9 Law on higher education of 27<sup>th</sup> July 2005, art. 13.1: „The basic aims of a higher school, with the provisions of paragraphs 2 and 3, are: point 7) creating conditions for the development of physical culture of students.”

10 Dz.U. (Journal of Laws) 2004 No 173, item 1807 and No 281, item 277 as well as from 2005 No 33, item 289.

11 Law on sport of 25<sup>th</sup> June 2010. Art.29.2. Minister in charge of education and the minister in charge of higher education may support, also financially, the development of sport in the school and academic environment respectively. Art. 13a. 2. Schools, with the exception of schools for adults, are obliged to conduct physical education classes (...). In the law of 27<sup>th</sup> July 2005– Law on higher education (Journal of Law, No 64, item 1365, with further amendments 26) and article 181 paragraph 5 shall read: “5. A student may get a scholarship for sports achievements, as mentioned in art.173 paragraph 1 point 3, or the minister’s scholarship for exceptional sports achievements as mentioned in art. 173 paragraph 1 point 5, or a scholarship granted on the basis of art.31..”

12 Draft of a law on higher education of 30<sup>th</sup> March 2010r. Art. 181 a. paragraphs 1 and 2 shall read: “1. The rector’s scholarship for the best students can be granted to a student who obtained for

the physical education of students are today the minimum curricula published on 19.02.2007. *The Teaching Standards For Particular Fields Of Education* included therein state that 'Curricula should provide physical education classes in the time-frame of 60 hours, for which up to 2 ECTS credits can be granted; foreign language classes – in the time-frame of 120 hours, for which 5 ECTS credits are granted; information technology classes - in the time-frame of 30 hours, for which 2 ECTS credits are granted'. That statement is also unfavourable for the academic physical culture, as it states that in comparison with other subjects, for which a given number of ECTS credits should be granted, in case of physical education these credits 'only' can be granted.

### **Obligatory physical education classes**

Physical education as a subject for students appeared in Polish universities in 1817 when the authorities of Jagiellonian University introduced bodily exercises into the general curriculum. As part of the curriculum it entered Polish higher schools in 1938 as obligatory for medical and teaching studies, in the time-frame of 90 hours a year. After the war it was introduced in the form of obligatory classes for students of 1<sup>st</sup> and 2<sup>nd</sup> year<sup>13</sup>. Since that time it has been a subject of a heated debate of theoreticians and practitioners, concerning both the core curriculum, the form, and, first of all, the aims and methods of its realisation.

The regression of physical education has been going on since the beginning of the 90s. The savings made at the expense of physical culture have had a negative effect on fitness and health. The attempts at counteracting it came in the form of *The Program for the Development of Sport in the Academic Circle*, introduced by the Office for Sports and Tourism in 1996.

The Program suggested:

- a) stopping the decreasing tendency in the physical fitness of university youth, connected with the shortage of physical activity;
- b) creating the need to participate in all forms of physical activity, consisting of maintaining or developing new habits in practising sport and physical recreation;
- c) increasing the commonness and accessibility of participation in physical culture through creating the conditions for the quantitative development of sports

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the school year a high average of the marks and besides has scientific or artistic achievements or good sports results in the international or national competition. 2. The minister's scholarship for high achievements can be granted to students who distinguish themselves in studies and have exceptional scientific, artistic or sports achievements."

13 Obodynski K., Ewolucja programu nauczania wychowania fizycznego i sportu w szkołach wyższych w latach 1953-1978 (The Evolution Of the Physical Education and Sport Curriculum In Higher Schools In the Years 1953-1978) [in:] Obodynski K. (ed.): *Kultura fizyczna studentów. (Physical Culture of Students)* Warszawa 1983, pp.321-353.

clubs, sections functioning in higher schools and sports-recreational events organised by those clubs;

d) caring about a higher level and expanding professional sport.

The very ambitious aims of that program encountered an obstacle in the form of financial difficulties. The office for Sports and Tourism undertook to provide some means for its realisation, however a part was supposed to be coming from the own means of the organisations realising these suggestions. Regardless of many financial sources, basic units of university physical culture had to conduct business activity in order to maintain the base and the staff.

Ministerial minima obliged higher schools to provide at least 60 hours of the subject in question throughout the education, however these directions were sometimes of the postulatory character, and final decisions were in the hands of decision-making authorities of particular higher schools.

In teacher education schools that led to a situation when, in different schools, students of the same faculties did not have physical education classes at all or had them for three years. The majority of physical education departments tried, however, to realise the curriculum in the time-frame of 120 hours during the whole course of studies.

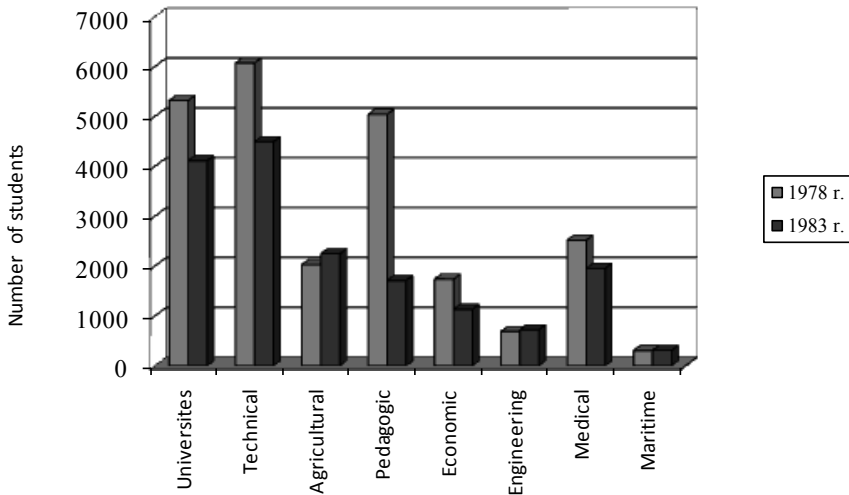
Among the obligatory physical education classes in teacher education schools at that time, the highest number of groups dealt with general physical education. Only two schools had an obligatory swimming course and only in three schools were the students able to participate in groups with sports specialisations, within the obligatory classes.

The teachers employed in the physical education departments tried to meet the needs of the disabled students or the students unable to participate in standard classes of physical education. The organisation of this type of training groups was a particularly important issue in the light of constantly worsening health condition of university youth. The number of people exempted from physical education or requiring rehabilitation was constantly growing.

The systematically decreasing number of hours devoted to obligatory physical education and the deteriorating health of academic youth determined the physical education teachers, responsible for the university physical culture, to provide a higher number of optional courses. The cooperation with Academic Sports Association (AZS), which supported the activity of the sports departments, turned out to be exceptionally helpful. It helped to complement the obligatory physical education with the classes in sports sections and physical recreation groups.

For a long time a constant regression in the activities related to camping has been observed. For the first time that phenomenon was noticed during the research in 1983 (Figure 2). In comparison with those, already unsatisfactory, results, the current condition presents itself even worse. In the 80s, all pedagogical universities organised, within obligatory or optional courses, summer and winter camps. Among several reasons for the current state of camping, one, namely lack of

subsidies, can be distinguished, however there are also cases of the lack of students' interest in the participation in such camps.



**Figure 2. Students' camping before the political transformation in different types of universities**  
 Source: Obodynski K.: *Kształtowanie się kultury fizycznej młodzieży akademickiej w Polsce..(Shaping of Physical Culture of University Youth in Poland).., quoted*

In the academic year 2002/2003 a questionnaire – based researched was carried out in selected higher schools of different types. The research covered the following schools: 10 medical schools, 17 universities, 15 higher technical schools, 11 economic schools, 6 pedagogical schools, 7 agricultural schools, 13 'licenciate' higher state vocational schools and teacher training colleges, 3 artistic schools – 82 public schools in all. Approximately 580 thousand people studied in them, while in 30 non-public schools there were about 26 thousand students at that time. Just like now, universities were absolutely in the lead in terms of the number of students (approximately one university had 28 265 students), followed by polytechnic universities (18 560 students on average).

Physical education, as an obligatory subject, was realised in the majority of higher schools. Only one private school and a language college (which did not have university rights) did not have such classes. The time-frame of the classes in particular schools varied and it often depended on the authorities of a given school. Unfortunately, more and more often comments appeared that it equalled the „curriculum minimum for the standards in a given field of studies”.

An even number of hours for all faculties in one university was rarely practised. Warsaw School of Economics was an exception, where physical education was not an obligatory subject, but it was taken into consideration as a subject adding up

to the credits needed for completing a semester, for which 2 ECTS credits were granted (currently it is again an obligatory subject).

The number of classes of physical education amounted to 90 hours within three semesters on average. Polytechnic universities and artistic higher schools are worth mentioning where the mean number of hours amounts to 120 (within 4 semesters) and sporadically even 8. Unfortunately, in those universities there were also faculties where physical education classes were not conducted at all. In the majority of cases, those classes took place in the first two semesters. And already then, suggestions appeared, and accompanying them actions, to move those classes to the further or any semesters during the course of studies (it was justified by the financial considerations – savings at universities).

Table 1. Physical education classes in Polish universities in the academic year 2002/2003

Optional sports, recreational, rehabilitation, corrective classes (on average per universities)										
Name of the higher school		Medical	Universities	Technical	Economic	Pedagogic	Agricultural	Colleges	Artistic	Private
Are optional classes conducted in this school?	sports	100%	100%	93%	90%	100%	100%	54%	33%	82%
	recreational	70%	77%	73%	80%	50%	57%	54%	0	52%
	rehabilitation	33%	38%	35%	55%	33%	71%	15%	0	0
	corrective	40%	33%	17%	33%	50%	28%	23%	0	7%
The number of training groups (on average)	sports	11	21	19	82	10	11	4	2	5
	recreational	6	6	37	3	2	8,	2	0	2
	rehabilitation	0,6	3	1	1,2	1,3	2,3	0,2	0	0
	corrective	1,1	3	0,8	0,5	2	1,7	0,4	0	0,1
The number of people participating in classes (on average)	sports	220	408	317	185	199	190	72	azs	159
	recreational	138	172	840	128	38	118	82	0	31,2
	rehabilitation	13	27,7	21	18	18	25	0,5	0	0
	corrective	19	49	7	7	22	17	10	0	1,6
How many times a week do the particular groups have their training?	sports	2	2	3	2-3	2	2	2	1-5	1-2
	recreational	1-2	1-2	2	1-2	1-2	1-2	1-2	bd	1,2,4
	rehabilitation	nd	1-2	1-2	1-2	2	2	1	nd	nd
	corrective	1	2-1	1-2	2-1	1-44	2	1	nd	1-2

Source: Own research, 2003.

More and more often physical education existed also as an optional course (Table 1) in the form of sports or recreational sections, optional courses for students at further years of studies, after the completion of obligatory courses (for example in medical schools in the 5<sup>th</sup> -6<sup>th</sup> year, in polytechnic universities in the

4<sup>th</sup> -5<sup>th</sup> year). Sporadically, optional courses appeared in higher state vocational schools, artistic schools while in private schools they were mostly conducted by local clubs of Academic Sports Associations. Exercising groups were often coming into being there at the initiative of the students themselves.

The majority of higher schools maintained the form of the grade and the teacher's signature in the index book (though generally it depended on the authorities of particular faculties), for example in polytechnic universities, agricultural schools and higher state vocational schools, this form of certifying the completion of the course amounted to over 90%, a bit less at universities (70%), economic schools (64%), private higher schools (55%) and medical schools (40%), while at pedagogical schools it amounted only to 17%. In artistic schools the completion of this course was certified with the teacher's signature, without a grade in 100% cases.

What is more important, however, is the inclusion of the subject of physical education into ECTS credits. It happened in Warsaw School of Economics. It is that university, among others, one of the most expansive ones, that sets trends for other universities in Poland which, in the non-distant future have to turn into the ECTS credit system.

Curriculum planned classes were mostly conducted in the researched higher schools in the traditional time-frame of 2h per week (or, for example, in case of swimming – 1h per week), and tourist-recreational classes, realised outside the venue of the higher school were carried out according to other, most often varied time-frames. Among the optional courses, which took place in most public and non-public universities, classes of a sports character dominated (table 1), followed by recreational activities, which were conducted in 50-80% of higher schools; similarly with corrective-rehabilitation classes which were present in almost every higher school. Such classes were most often organized in polytechnic universities (52%), higher state vocational schools and teachers training colleges (38%), and least often in non public schools (7%) and artistic schools (0%).

### **Environment analysis**

In the recent years, we have been observing a very dynamic increase in the number of young people studying. Currently, according to the data provided by the Main Statistical Office, in the public and non-public higher schools in Poland there are almost 2 million students (1927.8 thousand), among which there are 506.3 thousand in year one. While students constituted (according to the scholarisation ratio) only 9.8% in the academic year 1990/1991, in the year 2008/2009 this number was already 40.6%<sup>14</sup>. The main focus of the current work is on the young people

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14 Main Statistical Office data 2009.

studying in public technical schools (polytechnic universities) and universities. They constitute almost half of all the students. (Figure3)

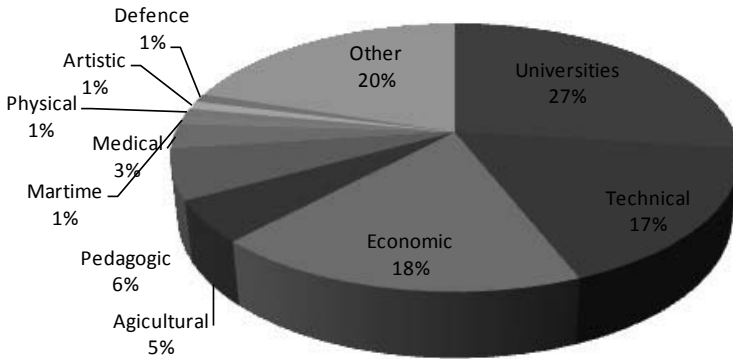


Fig.3. Students studying at particular types of higher schools. Main Statistical Office 2009.

As our own research shows, the participants in obligatory classes of physical education are recruited mostly from students of year 1<sup>15</sup>. There are currently almost 0.5 million of them. For the vast majority of these students, the university time is the last stage of organized education, in which they can be influenced in an ordered and systematic way, through which their attitudes and interests can be shaped, also those concerning the aspects of taking care of one's own physical fitness and health. This is the time when the minimal knowledge about pro-health behaviours can be passed on, the diversity of sports disciplines and forms of exercises can be shown, basic technical, tactic skills can be taught and students can be familiarised with the basics of training (mostly health-oriented).

University time is the time of shaping needs and physical habits (encountered at the earlier stages of school education), in which the student takes part as a participant of the process, demanding the treatment of the subject, instead of being treated like an object. Students want to have an influence on their interests and passions. Being aware of the negative stimuli affecting them, such as for example excessive mental stress, stimulants (cigarettes, alcohol, drugs), environmental pollution and a wrong life style, they notice that physical activity, practised systematically, in the forms they prefer, may be a chance to balance this negative condition. The system of physical culture in Polish schools is not always consistent and meeting the students' expectations. After all, the changes have been taking place for several years only and they are conditioned on one hand by rules and legal

15 Barabasz Z., *Kultura fizyczna studentow w dobie transformacji systemowej po 1989 roku w uniwersytetach polskich*, mps rozprawy doktorskiej, (Physical Culture Of Students In the Time of Political Transformation After 1989 In Polish Universities, PhD thesis mps) Gorzow Wielkopolski 2007.



regulations, and, on the other, by the influence of market economy on autonomous higher schools, often facing financial problems.

Academic circles, in particular their decision-making centres, often show an indifferent attitude towards physical culture and an inadequate understanding of its needs. It is revealed in a notorious decrease in the financial means devoted to that aim and in the tendency to lower the number of hours for its obligatory realisation. In most cases, only few people are involved in the sports and recreational events organised for university staff. These are worrying symptoms. They are, after all, employees of a higher school, an institution in which the issue of promoting health and versatile education, including the physical one, should be appreciated. Because they are educating future intellectuals, teachers and educators, one of whose main tasks will be taking care of the intellectual and health development of young people, the means in which could be directed physical activity, used consciously by its participants.

### **European attitudes towards physical education, sport and health**

European Union devotes a lot of attention in its desiderata and legal acts to the issue of broadly understood physical activity, health as well as counteracting obesity and compensating for the sitting lifestyle. One of such actions is setting up a EU Working Group 'Sport and Health', which is open to participation for all member countries and which, at a meeting held in November 2006 during Finnish presidency, got a mandate from the ministers of sport of the member countries to work out the guidelines concerning physical activity at the EU level<sup>16</sup>. The central issue was to work out guidelines describing priorities of policies which would promote increased physical activity.

Physical activity is usually defined as "any form of bodily activity, caused by muscular contractions, during which energy consumption exceeds the levels of resting energy"<sup>17</sup>. This broad definition covers all forms of physical activity, that is recreational physical activity (including most sports disciplines and dancing), professional sport, physical activity at home and in its vicinity as well as physical activity related to transport.

The main reasons are of strategic character, including the preference in the system of legislature and the organisation of administration for spectacular aims and generally short-term aims (in education – educating rather than upbringing, in physical culture – sport and competition rather than tasks belonging to general physical activation).

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<sup>16</sup> Suggested political actions supporting physical activity, positively affecting health, Fourth consolidated draft. Accepted by the EU Working Group "Sport and Health" at the meeting on 25<sup>th</sup> September 2008.

<sup>17</sup> For example: France: Ministère de la Santé et de la Solidarité (2005): Programme Nutrition Santé: Activité physique et santé. Arguments scientifiques, pistes pratiques.

Ministry of Education – or even our whole system of education – also under the pressure of the parents is focusing on teaching, to prepare a person for a full, active fight for a place in life, for the ability to win in the competition in the social hierarchy. In that process, the upbringing aims, including the use of systematic physical activity to build the readiness to face life problems, are neglected. It would be very much welcome to break the department-Poland syndrome and build a long term, substantial cooperation of the departments of health, education and sport to build and support the programs of promoting rules of a healthy lifestyle as an important condition of the national success. This point of view agrees with the guidelines included in *EU Guidelines for Physical Activity* issued in Brussels on 10<sup>th</sup> of October 2008. There is a fear that in the recent years the physical activity of children and youth has been replaced by the sitting lifestyle. And with age the abilities to undertake physical activity are smaller and smaller<sup>18</sup>. This is the main reason why it is necessary to create national plans supporting physical activity with the aim to stimulate the change of unhealthy habits and promote the awareness concerning the benefits of physical activity for health. Such plans should take into account environmental and cultural considerations. It is mainly thanks to many small changes that (...) our societies may become friendlier towards physical activity.

With reference to healthy adults aged 18-65, the aim recommended by WHO is to achieve practising moderate physical activity for at least 30 minutes 5 days a week or very intensive for at least 20 minutes 3 times a week. For young people the dose of moderate activity should amount to at least 60 minutes in right forms, for example aerobics, strength and coordination training, flexibility and motor development.

There is an encouragement for inter-ministry cooperation, especially between the subjects responsible for health, transport and education with the aim to promote participation in sport and physical activity throughout the whole life<sup>19</sup>. In order to do that, creating partnerships between local authority and universities and experts from the sector of healthcare is recommended, aiming at creating centres of support, advice and guidance in the sphere of promoting physical activity.

There is also room here for Academic Sports Association as well as research and scientific centres: the guidelines 9-13 mention financing the science of sport and discovering the knowledge about active behaviours, prevention of any forms of racism, supporting sports organisations by higher schools in the sphere of developing training programs and educating the staff. It is also suggested that sports organisations and their potential should be used for the money-saving activity in the realm of prevention and health promotion<sup>20</sup>.

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18 *ibid*, p. 4.

19 *Ibid*, p. 14.

20 Directive 9- Sport policy should be based on evidence and public financing of the sports science should encourage the research aiming at discovering new knowledge on forms of activity enabling the whole society to preserve physical activity. Directive 10- Sports organisations should

Promoting physical activity is probably one of the most effective and efficient – also profitable – ways of preventing illnesses and providing a good disposition<sup>21</sup>.

The system – Connection between the sector of education and physical activity is characterised by three separate aspects: physical education in schools, physical activity in local communities (for example sports clubs) and education, trainings for teachers, instructors, coaches and healthcare specialists.

The suggestion is to increase the number of physical education classes in school from one to several. It should not necessarily happen in the form of obligatory classes, but also outside lesson hours, which should not generate additional costs. Physical education should be also to a large extent promoted through offering access to school sports objects after lesson hours and through establishing partnership. Teachers should be encouraged to use the technology which allows for personalisation of curricula, that is monitoring of heart work, digital cameras and camera-recorders, computer software and others.

### **Analysis of physical culture in selected higher schools**

In the years 2006/2007, within our own study, a research was carried out, concerning the realisation of activities of the broadly understood physical culture in Polish universities (n=18) and state higher technical schools (n=20)<sup>22</sup>. In the research concerning the totality of issues connected with physical education of students, a questionnaire was used, including questions of detailed character. The answers were mostly given by an administrative body: the office of the sports centre

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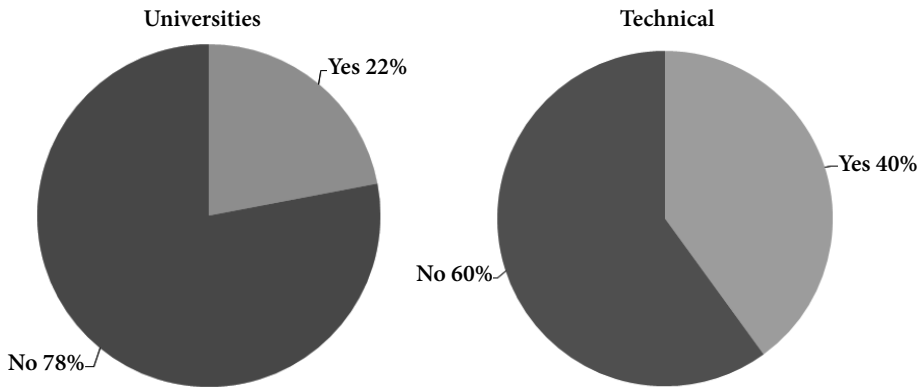
organise various forms of activity and events attractive for everybody as well as encourage interpersonal contacts between people from various social groups, of different abilities, regardless of their race, ethnic origin, religion, age, sex, nationality and physical and mental health. Directive 11 – Sports organisations should cooperate with universities and higher vocational schools in the sphere of developing training programs for coaches, instructors and other professionals from the sports field, whose aim is to recommend physical activity to people leading a sitting lifestyle, physically and mentally disable, who would like to take up a particular physical ability. Directive 12 - Programs of pro-health exercises of high availability, aimed at the possibly highest number of social and age groups and comprising the highest possible number of sports disciplines (athletics, jogging, swimming, ball sports, strength and cardiovascular training, courses for elderly people and youth) should be an integral part of the offer provided by sports organisations. Directive 13 – Sports organisations have a unique potential in the sphere of prevention and health promotion, which should be used and further developed. Sports organisations obtain a special meaning for sports policy if they are able to offer economical programs of the proved quality concerning prevention and health promotion.

21 Ibid, p.22.

22 Niewczas M.: Physical Culture Of Students In the Time of Political Transformation After 1989 In Polish Universities, PhD thesis Gorzów Wielkopolski 2009.

manager or the physical education department. The comparative method was used, juxtaposing the results of a similar research in both types of higher schools.

The research revealed that only in some higher schools is the content of physical education adjusted to the field of studies. It happens more often in technical schools (n=8, which amounts to 40% of schools) than in universities, where the curricula are adjusted only in 4 cases (Figure 4). As a consequence, at universities, in almost 80% of cases, the courses conducted do not consider the specific character of the studies, for example nursing and medical or early education field, while in the future work, the graduates of these departments should be (according to the above mentioned EU guidelines) the advocates of pro-health attitudes, realised through physical activity. The situation is slightly different in the technical departments, where the knowledge, skills and habits gained should compensate during the course of the career the negative effect of the environment, for example in the case of computer workers or chemists.



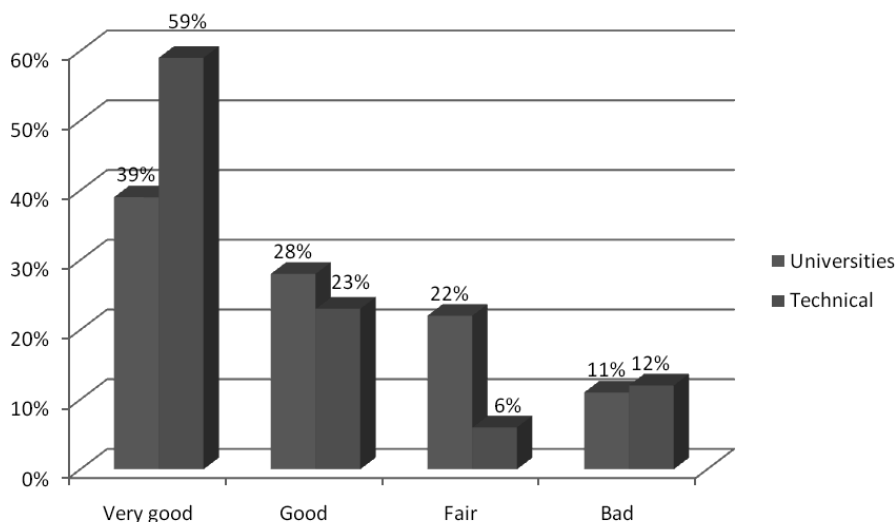
**Figure 4. Physical education classes adjusted to the field of studies.**

Source: Own research 2007. Niewczas M. 2007.

From the interviews conducted during the research it results that only few schools conduct a fully automatic and voluntary form of entering obligatory classes of physical education, while in many schools the traditional class-lesson system of their organisation still prevails. In Wrocław University of Technology, which, being a forerunner, several years ago introduced a complete freedom of choice of the form and type of classes, today the authorities are planning to limit it, justifying their decision with logistic problems. It is happening, despite the fact that the majority of bodies responsible for the shape of physical education in higher schools express a positive opinion about the relations with the authorities of that school and their attitude to physical culture (Figure 5).

According to the respondents, the cooperation of the physical education department with other subjects working in higher schools and having a meaningful effect on the physical culture also goes well. The main partners for the physical

education departments in the activities related to sport and recreation are Academic Sports Association Clubs and student governments (Table 2).



**Figure 5. The assessment of the attitude of the authorities of a higher school towards physical culture.**

Source: Own research. Niewczas M. 2007.

**Table 2. Cooperation of physical education department with organisations working in higher schools.**

Organisations	Universities	Technical schools
Student government	9	10
Academic Sport Association Club	7	7
Sailing Club	1	2
Other organisations	9	1

Source: Own research 2007, Niewczas M. 2007.

Positive relations between higher school authorities and the availability of obtaining European funds affects the improvement of the infrastructure of sports facilities available in higher schools. The number of new facilities is growing and general renovations of the existing ones are carried out. The number and quality of facilities have a decisive effect on the selection of classes offered to the students. Analysing the findings of the research<sup>23</sup>, it is possible to notice an analogy between

<sup>23</sup> Barabasz Z., *Kultura fizyczna w europejskich szkołach wyższych. (Physical Culture in European Higher Schools)* [in] *Akademicka kultura fizyczna na przełomie stuleci. Stan i perspektywa zmian. (Academic Physical Culture At the Turn Of Centuries. Current Situation And Prospects For Changes)* Warszawa 2009.

the condition of the infrastructure of the analysed schools and the condition observed in European schools. The main differences can be noticed in the equipment and the standard of the facilities. The majority have big sports halls, places for fitness, gyms, and adapted rooms for playing tennis. There is a shortage of open-air places (stadiums and football fields) and swimming pools. Unfortunately, there are Polish schools which do not possess any sports facilities. The majority of respondents assessed the condition of the infrastructure used for the physical education classes positively. The situation is definitely better in technical schools (Figure 6).

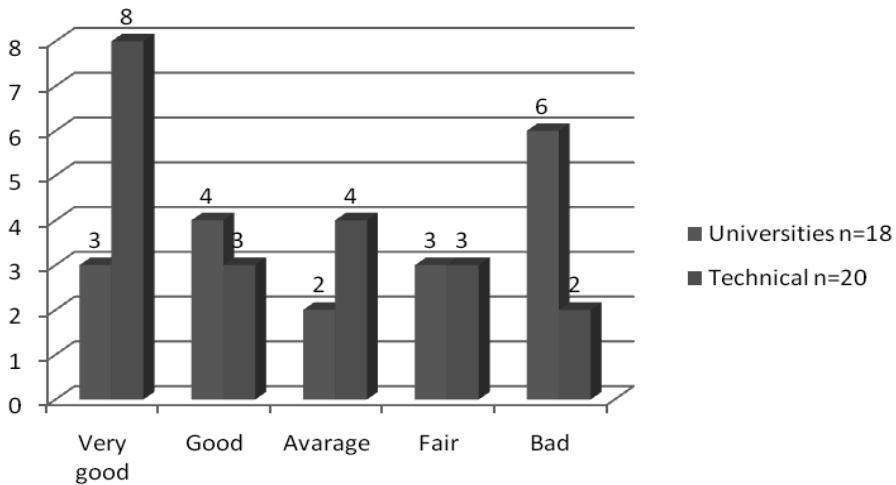


Figure 6. Assessment of the sports infrastructure in universities and technical schools.

Source: Own research 2007. Niewczas M.2007.

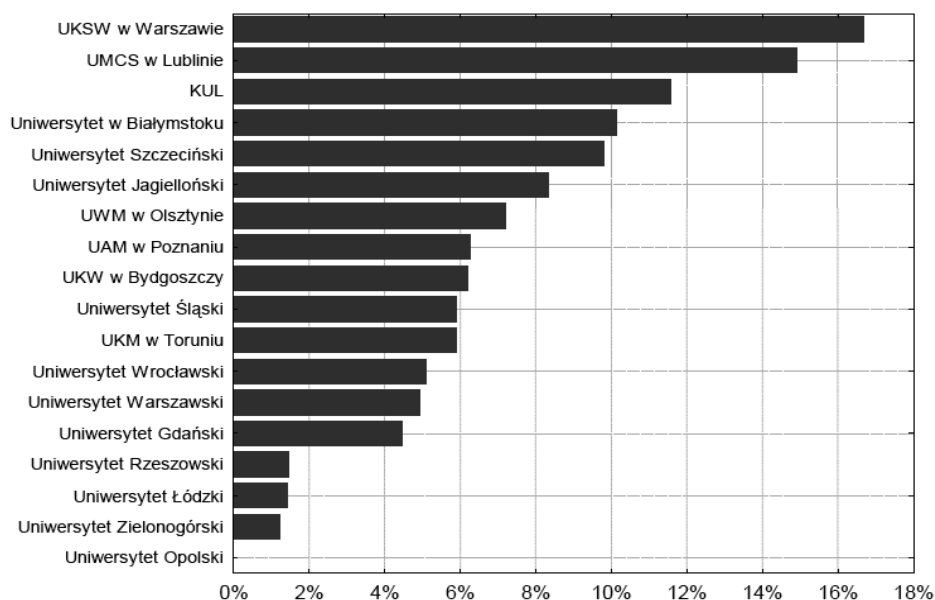
An important – according to some – the most important<sup>24</sup>- element of the university structure of physical culture is the teachers from the physical education department. The research shows that most of them have an employment contract (which is rare in the old EU countries), they have additional sport-instructor qualifications (over half of them have coaching qualifications of the 2<sup>nd</sup>, 1<sup>st</sup> and M class, and only 1% do not have additional qualifications). What can be a negative aspect of this situation is the age of the investigated group of department workers, among whom 2/3<sup>rds</sup> are 50 or over 50 years old (Table 3). Even though, according to T. Bielecki, this is not the main factor influencing the assessment of the relation between the students and the teacher in the process of school physical education,

24 Bielecki T., *Model akademickiego wychowania fizycznego w percepcji studentów wyższych uczelni Lublina. (Model Of Academic Physical Education In the Perception Of Higher Schools Students) PhD thesis. Lublin 2003.*

it can be a factor affecting it to a large extent. “Professional burnout” may limit professional training, affecting the lack of action aiming at self-education, and, in consequence, limit the skills and tools of the teacher. Because even though the specialised (one-track) qualifications are an important element of the process of physical education, with the appearance of newer and newer sports disciplines, with the changes in the interests of young people, connected, for example, with the extreme forms of activity, there is a necessity to adjust to those needs. And an “older” teacher may have problems with facing these challenges.

**Table 3. The age of physical education teachers working in the department.**

Age of teachers	under 31	31–37	38–45	46–54	> 55
at universities	8%	12%	16%	30%	34%
in technical schools	7.00%	12%	17%	33%	31%



**Fig 7 . Doctors' certificates exempting students of universities from physical education classes**

Source: Own research 2007<sup>25</sup>.

25 UKSW w Warszawie - University of Cardinal Stefan Wyszyński in Warsaw, UMCS w Lublinie – Maria Skłodowska-Curie University in Lublin, KUL – The John Paul II Catholic University of Lublin, Uniwersytet w Białymstoku – The University of Białystok, Uniwersytet Szczeciński – The University of Szczecin, Uniwersytet Jagielloński – Jagiellonian University, UWM w Olsztynie – University of Warmia and Mazury in Olsztyn, UAM w Poznaniu – Adam Mickiewicz University in Poznań, UKW w Bydgoszczy – Kazimierz Wielki University in Bydgoszcz, Uniwersytet Śląski – The University of Silesia, UKM w Toruniu - Nicolaus Copernicus University in Toruń, Uniwersytet Wrocławski – The

If we assume that one of the indicators of the attitudes of young people towards physical activity and physical education is the absence in classes caused by doctors' certificates, we should state that this situation demands a radical improvement. Figure 7 shows that, depending on the school, it varies between a few to a dozen or so percent, but the real absence noticed during the research in 2010 amounted often to 30-50 and more percent.

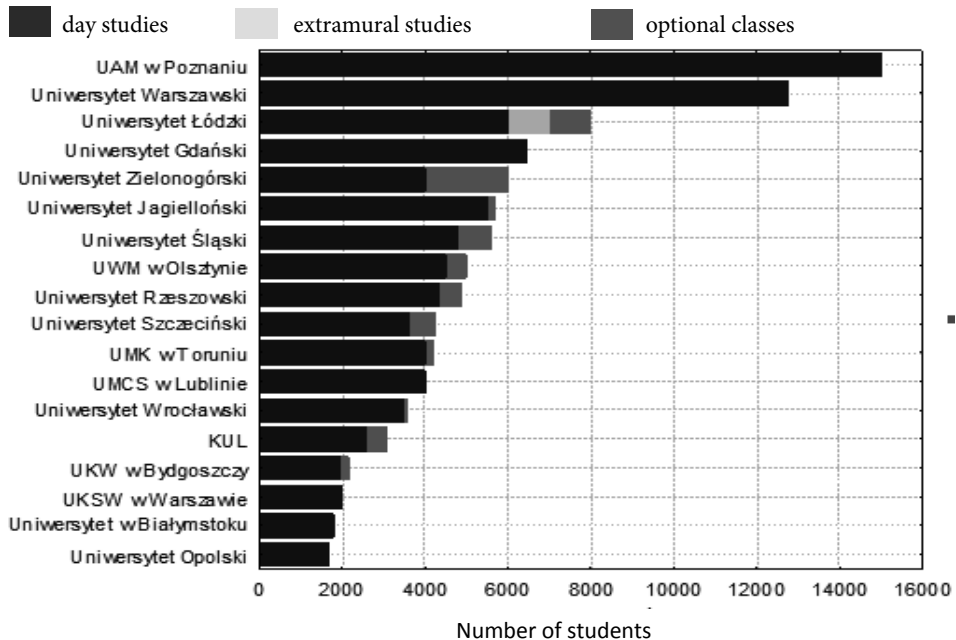


Figure 8. The number of university students attending obligatory and optional physical education classes. Source: Own research 2006.

In public higher schools there is an obligatory form of physical education (Figure 7). These classes are conducted in a vast majority in the time-frame of 60-90 hours during the course of the studies<sup>26</sup>. But the tendency lasting for the last

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University of Wrocław, Uniwersytet Warszawski – The University of Warsaw, Uniwersytet Gdański – The University of Gdańsk, Uniwersytet Rzeszowski – The University of Rzeszów, Uniwersytet Łódzki – The University of Łódź, Uniwersytet Zielonogórski – The University of Zielona Góra, Uniwersytet Opolski – Opole University.

26 Korpak B., Wychowanie fizyczne studentów. Bilans stanu perspektywa zmiąna (Physical Education Of Students. Balance Of the Current Condition, Prospects For Changes). [in] Obodyski K., Barabasz Z., (ed.) Akademska kultura fizyczna na przelomie stuleci. Stan i perspektywa zmian. (Academic Physical Culture At the Turn Of Centuries. Current Situation And Prospects For Changes). Warszawa 2009. pp.26-27.



three years has been aiming at setting the number of hours at the minimal level. In those schools, optional courses are commonly organised, having a sports character (conducted in 80% of universities), recreational character (Figure 9, conducted in almost 50% of universities) and corrective character. It is mainly those optional courses, organised in a way to meet the demand of the students, that show the trend of introducing the disciplines expected and the direction in which the courses of physical education should follow. These classes, as well as recreational and sports preparation disciplines, should, in the non-distant future, dominate in the curricula. As a result, we should approach the proportions existing in the EU countries, where apart from team sports, the dominant activities in the curricula are fitness, tennis, running, but also fencing, horse-riding, golf and rowing appear<sup>27</sup>.

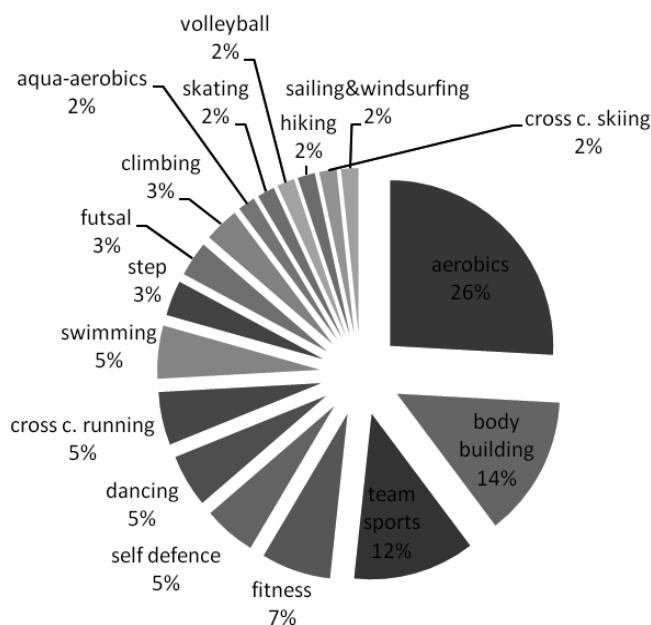


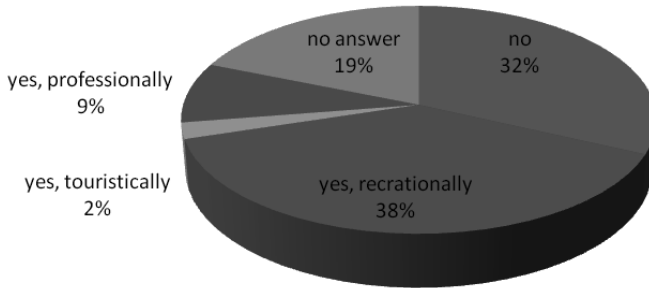
Figure 9. Popularity of recreational disciplines at universities

Physical education classes conducted in higher schools are often the only form of students' activity. As results from the research by A. Nowak, between 90 and 50% male and female students do not take up any physical activity in their free time<sup>28</sup>. That is

27 Barabasz Z. *Kultura fizyczna studentów w europejskich szkołach wyższych (Physical Culture Of Students In European Higher Schools)* [in] Obodyński K. Barabasz Z. (ed.) *Akademicka kultura fizyczna na przełomie stuleci. Stan i perspektywa zimna. (Academic Physical Culture At the Turn Of Centuries. Current Situation And Prospects For Changes)* AZS Rzeszów 2009, p.47.

28 Nowak A., *Aktywność fizyczna studentów Uniwersytetu Przyrodniczego w Poznaniu (Physical Activity of Students of Poznan University Of Life Sciences)* [in] Zadarko E.,

confirmed by our own research Euroregions of Eastern Carpathians including Polish and Slovak students (4002 people). In the group researched, almost one third did not participate in any physical activity outside physical education classes, what is more, almost every fifth person chose not to reply to that question (Figure 10).



**Figure 10. Physical activity of students in their free time**

Source: Research – Activity for life – health and students’ fitness under control – 2010.

### **Tendencies in the changes in physical education of students**

The tendencies present in academic physical culture correlate with the research conducted in July 2010 by Supreme Audit Office among the pupils of primary, junior-high and high schools. They show a critical, often negative attitude of the pupils towards the classes of physical education currently conducted. The opinion that these classes are not interesting was expressed in the questionnaires by almost one fifth of the pupils of the last classes of primary schools, one fourth of junior-high schools and one third of high schools. We observed similar opinions in our research and interviews carried out in 2010 within the program Activity for life – Polish and Slovak Platform for Physical Culture and Promotion of Students’ Health. The reason for this situation may lie in the lack of diversity in the course offer. According to the pupils researched, in physical education classes team sports and gymnastics are preferred too much, at the expense of poorly introduced modern forms of activity such as dance, aerobics, swimming or fitness games<sup>29</sup>. A similar situation can be also observed in higher schools.

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Barabasz Z., (red.) *Akademicka kultura fizyczna na przełomie stulecia. Sprawność fizyczna (Academic Physical Culture At the Turn Of Centuries. Physical Fitness)*. Wydawnictwo UR, Rzeszów 2009, pp. 116-119.

<sup>29</sup> Informacja o wynikach kontroli Wychowanie fizyczne i sport w szkołach publicznych. (Information On the Results Of the Physical Education And Sport In Public Schools Audit by Supreme Audit Office) Najwyższa Izba Kontroli. Warszawa 2010.

Zbigniew Cendrowski, Honorary Chairman of School Sports Association, notices that in Poland school physical education does not have a big influence on the condition of health of children and youth. School physical education does not currently respond to the basic civilization challenges, as written down in the new curriculum core, that is: preparing children and youth for life-long care about health and physical fitness. There are numerous reasons for that, some of which only are directly related to the quality of the work of schools and physical education teachers. A similar situation is also noticed in higher schools.

Can we then change this condition among the older youth, of university age, having negative experience from the previous periods of school education, often not having the right habits related to physical activity and taking care of health?

In the authors' opinion – yes, we can. However, for this change to be lasting and beneficial, several conditions have to be fulfilled:

- in spite of the – often difficult – financial situation of the higher school, creating an atmosphere which will be positive for sport and academic physical culture among the authorities of the school, the faculties and administrative and financial officials,
- changes (building or complete renovations) within the infrastructure of sports facilities, their equipment and accessibility for students,
- introducing additional motivation for the practising students through granting ECTS credits for sports classes,
- changing the awareness of the teachers-animators, creating the process of education, dropping the class-lesson system for the sake of optional and elective courses, including the option to choose the teacher,
- constantly increasing the competence of the teachers, most of all, those associated with new sports disciplines,
- what is necessary is subjectifying the students, through enabling them to choose consciously the best form of physical activity of their own accord,
- there must be a change in the system of physical education from lesson-based to optional, adjusted to the needs (perception, ability, health) of the student,
- implementing the curriculum resolutions and passing to the students the basic knowledge related to hygienic behaviours, physical activity and its positive effects,
- increasing the awareness of the students and providing them with knowledge, tools and means enabling them to control the condition of their fitness,
- changing the attitudes of the students towards physical activity,
- dropping the method of marking for attendance or achieving particular results, instead obtaining one's own aims – increased distance covered (increase in the endurance), decrease in obesity, improvement of general disposition, increase of immunity, inuring the body,
- teaching at least two individual favourite sports disciplines for the whole life (one summer, one winter) or one that can be practised all year round,

- changing the aims of student physical education and subordinating this process to the superior aim of the good health and development of good habits of looking after it<sup>30</sup>.

### **Abstract.**

When in the 50s, Physical Education Departments were being created in Poland, probably no one realised that it was the beginning of a campaign for the shape of not only the physical education, but also the whole system dealing with the aspects of fitness, hygiene and improvement or support of students' health. Universities and universities of technology, gathering almost half of all the students, were the leaders among Polish higher schools, not only due to their size, but also because of the organisation of their activity and financial means. They are also the schools which set the trends in transformations. Observing the changes in these universities, we are evaluating the changes taking place in the structure of academic physical education. The analysis comprised the condition of the base, curricula and the realisation of the classes, the condition of the teaching staff and the cooperation with Academic Sports Association. Modern times demand not only the diagnosis of the current condition of the student physical culture in higher schools, but also the setting of new directions of activity within its scope. There is a need to change the aims and means of influence of the academic physical education through affecting the awareness and the attitudes of the students towards their active participation in physical culture as well as inspiring higher schools' authorities to implement programs allowing for it. One of such suggestions is the Platform for Physical Culture and Promotion of Students' Health.

**Key words:** physical culture, health, students, platform.

### **References**

1. Barabasz Z.; *Kultura fizyczna studentów w dobie transformacji systemowej po 1989 roku w uniwersytetach polskich*, mps rozprawy doktorskiej, Gorzów Wielkopolski 2007.
2. Barabasz Z.; *Kultura fizyczna w europejskich szkołach wyższych*, w *Akademicka kultura fizyczna na przełomie stuleci. Stan i perspektywa zmian*. Warszawa 2009.

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30 Zadarko E., Barabasz Z., *Nowe spojrzenie na monitoring, sprawność i aktywność studentów – jako element systemu dbałości o zdrowie wyższych (A New Outlook On Monitoring Fitness and Activity of Students As an Element Of Caring After Health ...)* [in] *Obodyński K., Barabasz Z. (ed.) Akademicka kultura fizyczna na przełomie stuleci. Stan i perspektywa zmian. (Academic Physical Culture At the Turn Of Centuries. Current Situation And Prospects For Changes)* ZG AZS, Rzeszów 2009, pp.60-61.

3. Bielecki T.; Model akademickiego wychowania fizycznego w percepcji studentów wyższych uczelni Lublina. Praca doktorska, Lublin 2003.
4. Dziubinski Z.; Tendencje zmian uczelnianej kultury fizycznej w 10 lat po przełomie, w Przegląd Naukowy Instytutu Wychowania Fizycznego i Zdrowotnego WSP w Rzeszowie, Rzeszów 2000, nr. 1–2, s. 63–64.
5. Golinowska S.; Zmiany instytucjonalne w sferze społecznej, w „Polityka Społeczna”, 1994 nr. 10, s. 10.
6. Jaczynowski L., Zyśko J.; Przekształcenia w systemie organizacyjnym kultury fizycznej w Polsce w dobie transformacji ustrojowej, w „Poradnik Menedzera Sportu”. Warszawa 1994
7. Korpak B.; Wychowanie fizyczne studentów. Bilans stanu perspektywa zmian, w Obodynski K., Barabasz Z. (red.); Akademicka kultura fizyczna na przełomie stuleci. Stan i perspektywa zmian. Warszawa 2009.
8. Krawczyk S.; Sport w zmieniającym się społeczeństwie. AWF, Warszawa 2000, s. 136.
9. Niewczas M.; Kultura fizyczna studentów w dobie transformacji systemowej po 1989 roku w Państwowych Wyższych Szkołach Technicznych. Praca doktorska. Gorzów Wielkopolski 2009.
10. Nowak A.; Aktywność fizyczna studentów Uniwersytetu Przyrodniczego w Poznaniu, w Zadarko E., Barabasz Z. (red.); Akademicka kultura fizyczna na przełomie stulecia. Wydawnictwo UR, Rzeszów 2009, s. 116-119.
11. Nowakowski A., Podobinski S.; Rola Rady Głównej Szkolnictwa Wyższego w limitowaniu zajęć wychowania fizycznego studentów, w Maksimowska B., Nowakowski A., Rodziewicz-Gruhn J. (red.); Z zagadnień akademickiej kultury fizycznej. Na dziewięćdziesięciolecie sportu akademickiego w Polsce. Czestochowa 1999, s. 61–66.
12. Obodynski K.; Ewolucja programu nauczania wychowania fizycznego i sportu w szkołach wyższych w latach 1953-1978, Warszawa 1983, s.321-353.
13. Zadarko E., Barabasz Z.; Nowe spojrzenie na monitoring, sprawność i aktywność studentów- jako element systemu dbałości o zdrowie wyższych, w Obodyński K., Barabasz Z. (red.); Akademicka kultura fizyczna na przełomie stuleci. Stan i perspektywa zmian., Warszawa 2009, s.60-61.



## CHAPTER III

# Physical Education and Students' Health Promotion Platform [www.studentfit.eu](http://www.studentfit.eu)

### Introduction

A necessity to implement preventive actions is a result of the fact that cardiovascular diseases are still the main cause of death.

The first prospective study on that was carried out in 1948 and had examined features related to higher risk of cardiovascular disease. A term “risk factor” was introduced at the time for the first time and finally scientifically acknowledge in 1961 [Zdrojewski 2007]. Cardiovascular diseases prevention is about diagnose and risk factors modification of coronary heart disease, chronic hypertensive disease and cerebrovascular disease. Risk factors of mentioned diseases include factors, which presence in the organism or in organism's environment increases probability of disease to occur and its development. Results of studies carried out during the most important Polish epidemiological and preventive programs showed that a bad Polish residents health state is above all the result of low effectiveness to detect risk factors of cardiovascular diseases, as well as insufficient effectiveness of treatment already detected disorders. Among other reasons were the following: tobacco smoking, improper nourishing habits, low physical activity. Studies carried out in Poland such as: WHO CINDI, POL-MONICA and programs NATPOL I, II and III had unambiguously demonstrated that knowledge about risk factors among Polish society is definitely insufficient [Zdrojewski 2007]. That is why education with the use of media campaign e.g. POLKARD-MEDIA “Remember about heart” („Pamiętaj o sercu”), with Internet page [www.pamietajosercu.pl](http://www.pamietajosercu.pl)) with health information and advices, was appointed for an important aim of POLKAR Program. Similar educational activities aimed on increasing level of knowledge about health among children and youth with the use of Internet page [ww.sms.edu.pl](http://ww.sms.edu.pl) was carried out within the scope of the Program A Chance for Young Heart. Another Internet page was design within the scope of Program PP400M „Polish Project 400 Cities”

– [www.400miast.pl](http://www.400miast.pl), focusing on health education of adults and children in small town and rural areas. It should be here underlined that within the scope of Program PP400M activities were focused on mentioned small town and areas, due to results of epidemiological studies, which showed that uneducated people from rural areas have the lowest level of knowledge about risk factors and prevention [Zdrojewski 2007]. In Poland that is also completed a program „Keep Fit”, coordinated by Chief Sanitary Inspectorate. This program is focused on children and youth as well as their parents [www.trzymajforme.pl](http://www.trzymajforme.pl). Platform's project [zdrowiepolakow.pl](http://zdrowiepolakow.pl) was set up in connection with an increasing need for information considering health state, presented in a way enabling data aggregation from different sources and easy regional or international comparisons

An aim of prevention is to decrease frequency of first and the following disease occurrence related to ischemic heart disease, cerebral ischemic stroke, peripheral vascular disease, as well as to prevent disability and premature mortality. Knowledge development unambiguously that cardiovascular diseases occurrence is in a large measure related to lifestyle and physiological factors, which might be modified. It was showed that risk factors modification decreases incidence of disease and mortality due to cardiovascular diseases, and prevention's effectiveness is one of the best proved facts in medicine. It was demonstrated that in developed countries decrease of mortality due to ischemic heart disease might be in 70% the reason of incidence of disease decrease [Pająk 2007].

Health promotion and preventive medicine activities are also one of the main assumptions of National Health Program for 2007-2015 and National Health Plan 2004-2013.

Incidence of disease and mortality decrease due to cardiovascular diseases is the first strategic aim of National Health Program. As it is proved by empirical data presented in numerous professional literatures preventive medicine programs in a significant way have an influence on health state's disproportion compensation [Bryła 2009]

Lack of physical activity is an essential public health problem in Europe. Above all low physical activity is specified as one of the most important risk factor of cardiovascular diseases (CVD) [Kardiologia Polska 2008].

Meanwhile more than half of youth, when leaving school are physical inactive. Polish society is characterized by low physical activity. It might be estimated that only about 30% of children and youth and 10% of adults perform physical activity, which type and effort intensity meets physiological requirements [Narodowy Program Zdrowia 2007]. Regular physical exercises might effectively slow down ageing, improve functioning and prolong period of life without disease. Clinical studies regarding people systematically performing trainings showed central and periphery adaptation of circulatory system to physical activity, which includes hemodynamic, morphologic and metabolism changes of heart. Cardioprotection of systematic physical activity is also about its profitable impact on many risk factors



of ischemic heart disease, and that is arterial blood pressure decrease, lipids metabolism disorder modification, body weight reduction, subdermic fat reduction, insulin resistance decrease and glucose tolerance improvement. Physical activity efficiency, catecholamines concentration decrease during physical effort, antioxidant system activity, calming effects are also the benefits of systematic physical activity and essential in cardiological prevention [Drygas 2006]. Between 2003-2005 within the scope of WOBASZ Program (Polish Multicenter Health State Study) Cardiology Institute in Warsaw together with science-research center in Gdansk, Lodz, Poznan, Krakow and Katowice had carried out cross-sectional study on random sample of approximately 15,000 people in the age 18-74. Wide scope of risk factors, both classical and so called new one, as well as incidence of circulatory system diseases, diabetes, hypertension, and patients' knowledge on circulatory system disease we assessed. Regional evaluation was carried out for the first time in Poland. The study WOBASZ demonstrated high intensity and rather bad control of classical risk factors of circulatory system diseases among Polish population. Published study results showed strong dependency between risk factors occurrence and lifestyle [Drygas 2005]. In Poland, a percentage of people regularly performing physical exercises thus is higher than 10-15 years however 50-60% Polish adults is still characterized by low physical activity. Almost 35% of WOBASZ respondents (37% women and 32% men) do not perform any physical exercises longer than 30 minutes a day in a free time of work or study [Drygas 2005]. At schools more frequent from one education stage to another increases critical opinions of students about physical education classes. More and more discrepancy between physical education teachers' level of education (high percentages of them are certified teachers), their educational offer and expectations to take a part in motion activity, not only in preferred by teachers team games based on competition [[www.nik.gov.pl](http://www.nik.gov.pl)].

Increasing hypokinesia of children and youth is followed by obesity. Numerous prophylaxis programs occur, for example in the United States a government program Let's Move highly supported by the First Lady Michelle Obama. In Poland, there is a National Program of Overweight and Obesity Prevention and Non-infectious Chronic Diseases through Nourishing and Physical Activity Improvement, or champagne "Put your heart on feet" ("Postaw serce na nogi") realized within the scope of WHO Move for Health. All those programs similar as the European Union directives consider Physical Activity and try to use motion activity as a source in the fight with civilization diseases. With the use of tools such as guides promoting societies' activity and recreation activity, they have an impact on a positive evaluation of motion activity values e.g. HEPS guide (Healthy Eating and Physical Activity in Schools). In Poland, the assumptions of the program are adjusted to the situation and needs and would be implemented in 2011, starting first with school promoting health.

A dissonance between expectations of children and youth regarding physical education and that what is proposed had led to the situation when more and more

often there is a lack of physical activity habit and awareness, that such an activity is an essential element of healthy lifestyle and civilization diseases prophylaxis. Those facts were proved above all by results of Polkard Media Junio program, which showed that children and youth are aware that among spontaneously specified risk factors the first place took: tobacco smoking, alcohol drinking and drug use. At the same time Essential risk factors of ischemic heart disease were specified: improper nourishing, and Lack of physical activity was very rarely mentioned. It was the reason why authors of many reports and directives to promote so called "sports of the whole life", which might help to keep regular physical activity through the whole life. Of course "sports of the whole life" is a term already known from a long time, however at present it should be revitalized (with accordance to the European Union directives) and again should mark out the way of proceedings above all for the universities in promoting health among students. And what is important to promote not only an offer of sport centers or sport studium but also the way of education of future physical education teachers. It seems that study period is the last stage, when health education can be carried out on the large scale and focus on developing, maintaining and monitoring physical activity in order to prevent cardiovascular disease. Other authors also pay attention on that and in their opinion universities should not resign from an obligatory physical education classes, as a form of academic students activity, because it is an important factor having an influence on the level of physical efficiency within the scope of health concept. They propose to test physical efficiency in the convection of health tests based on the Health Related Fitness (H-RF), that might be conducted in the reality of physical education studium in Poland, putting attention so that the results of test would be used to assess the effects of pedagogical work [Mleczko 2007, Mirek 2008]. Very often a student does not identify with results of study, does not feel the subject, does not understand their aim [Byczański 2005]. Main assumptions were made in the concept of H-RF and have essential consequences for its diagnostics. The focus is shifted from commonly used in physical efficiency tests measures of effects in different motion test to health indicators diagnostics and biological abilities - Positive Health Wellness). Efficiency test aimed on health (H-RF) is about to measure those factors, which make it easy for individuals to fully use abilities, wellness. Cardiorespiratory Fitness and body components measure (mainly lipomatosis) are in general thought to be key in optimal health assessment [Mynarski 2009].

At present, many problems are related to the difficulty to determine aims of academic physical education. It should be complementary with aims realized by the university, and prepare the graduate to realize one's ambitious; get satisfactory and profitable job and competition in professional life. Of course, present universities are sovereign subjects and decide themselves on the faculties, educational programs and the scope of educational tasks, as well as on the shape of physical education. It should be noticed that an increase of physical activity is a

coexistence of couple sectors, which majority belongs to public sector (e.g. sport, education – including universities). In the European Union Directives regarding Physical Activity and related to public health sector it is stated that there should be implemented intervention activities or programs aimed on physical activity increase. An important task of public sector is to gain quality of physical activity measure improvement in health studies. Within the scope of social public sector there should be undertaken activities directed on changes regarding standards of physical activity and getting social support for implemented activities in the scope of beneficial for health physical activity in the society. Those standards might be determined as descriptive standards (promoting positive attitude toward physical activity), subjective standards (encouraging to social acceptance for physical activity) as well as personal standards (promoting personal engagement in higher physical activity).

An essence of Physical Education and Students' Health Promotion Platform is about to identify and modify (educational actions) selected risk factors of ischemic heart disease, such as: low level of physical activity and cardiorespiratory fitness, irrational nourishing, overweight, abdominal obesity, tobacco smoking as well as activities related to health education. Thanks to created data base placed on charge free platform, it is possible to compare dynamic and direction of changes over the years, as well as to analyze those results with reference to the whole students' society and taking into consideration for example: country, age, gender, somatic parameters, faculty of study, preferred physical education.

A Project „Activity for the whole life – Polish –Slovakian Physical Education and Students' Health Promotion Platform” was co-financed by the European Union from the European Regional Development Fund as well as from government budget thru Euroregion Carpathia within the scope of Cross-boarder cooperation program between The Republic of Poland and the Republic of Slovakia 2007-2013. Main beneficiary was State Higher Vocational School in Krosno. A Project was carried out with the cooperation with Physical Education Faculty of University of Rzeszow and Physical Presov.

#### Aim of the project:

- Determine and assess students' state of cardiorespiratory fitness
- Determine students' level of physical activity and factors shaping it
- Compare students' level of cardiorespiratory fitness with their physical activity
- Mark high, body mass, BMI, circumference of the abdomen
- Mark body mass components ( FAT, FFM, TBW)
- Prophylaxis of ischemic heart disease
- Health education. Implementing activities with the recommendations of national Health Program 2007-2015 and European Cardiology Association
- Inspire board of university to implement students's physical activity increase programs

- Motivate students to increase their own physical activity and shape habits to keep it
- Tight up science cooperation between universities, regions and institutions
- Compare achieved results in the international aspect

### **Methodology of study**

A standardized 20m shuttle run test (beep test version 3\_3) with PACER (Progressive Aerobic Cardiovascular Endurance Run, enabling indirect assess of VO<sub>2</sub> max was used to assess CRF - Cardiorespiratory Fitness. A test was conducted on the gym and was about 20m shuttle run back and forth increasing in intensity as time progress, announced by time signal till the refusal (tiredness) or run pace decrease in contradiction to time signal [Leger 1982, Shvartz 1990]. Test enables to test a large quantity of people and the reliability coefficient causes that it is recommended and willingly used tool in adult population studies ( $r=0,95-0,975$ ) as well as children and youth ( $r=0,89$ ) [FITNESSGRAM 1994, Kusy 2000, Chatterjee 2010]. At the end of test with the use of sport tester Polar there were marked maximum myocardial contraction frequency (HR max.)

Including criteria: negative interview of effort readiness after completing Physical Activity Readiness Questionnaire, written approval to take a part in the study and obtaining actual medical examinations.

Excluding criteria: positive interview of effort readiness (at least one positive answer in Physical Activity Readiness Questionnaire, lack of approval to take a part in the study and no actual medical examinations, bad general-feeling before or during exercise test.

Before exercise test body height was measured with the use of anthropometer and body mass and its components with the use of Tanita TBF 300 weight. Circumference of waist and hip was measured with the use of centimeters band, WHR – waist to hip ratio was also measured. In order to compare the level of cardiorespiratory fitness with declared physical activity the students were questioned with the use of Minnesota Leisure Time Physical Activities in six month version [Nowak 2008]

In order to collect environmental data as well as those including life style students were questioned with the use of environmental questionnaire, regarding Tobacco smoking prevalence, quality of nutrition and health behaviours.

### **Material**

The study included students in the age between 19-29 years old and was carried out at State Higher Vocational School in Krosno, University of Rzeszow, Technical

University in Rzeszow, School of Law and Public Administration in Przemysl, University in Preszov. The study included 5646 respondents, 4002 people took part in all study's stages (2362 women out of whom 397 from Slovakia and 1640 men out of whom 252 from Slovakia).

## Results

In the present publication would be presented results of students' cardiorespiratory fitness and a set of marked somatic features indicators such as: Body Mass Index (BMI), Waist to Hip Ratio (WHR), Body Fat% (BF%). Further detailed analysis of factors influencing on achieved results would be presented in the separated publications. Gained in Beep test results V<sub>O2</sub>max (ml/kg/min) were related to standards proposed adequately for men and women in the age of 20-29 by The Physical Fitness Specialist Certification Manual, The Cooper Institute for Aerobics Research, Dallas TX, revised 1997 printed in *Advance Fitness Assessment & Exercise Prescription*, 3rd Edition, Vivian H. Heyward, 1998.p48 (Tab. 1, Tab.2)

Tab.1. Female normative data for V<sub>O2</sub>max (ml/kg/min)

Age	Very Poor	Poor	Fair	Good	Excellent	Superior
20-29	<23.6	23.6 - 28.9	29.0 - 32.9	33.0 - 36.9	37.0 - 41.0	>41.0

Tab.2. Male normative data for V<sub>O2</sub>max (ml/kg/min)

Age	Very Poor	Poor	Fair	Good	Excellent	Superior
20-29	<33.0	33.0 - 36.4	36.5 - 42.4	42.5 - 46.4	46.5 - 52.4	>52.4

### 1. Level of cardiorespiratory fitness for studied group of students

In the studied group of 4002 people there are the following results (Tab.3, Figure 1)

Tab. 3 Level of cardiorespiratory fitness for studied group of students

Level	N	%
Very Poor	47	1,2%
Poor	303	7,6%
Fair	886	22,1%
Good	900	22,5%
Excellent	1037	25,9%
Superior	829	20,7%

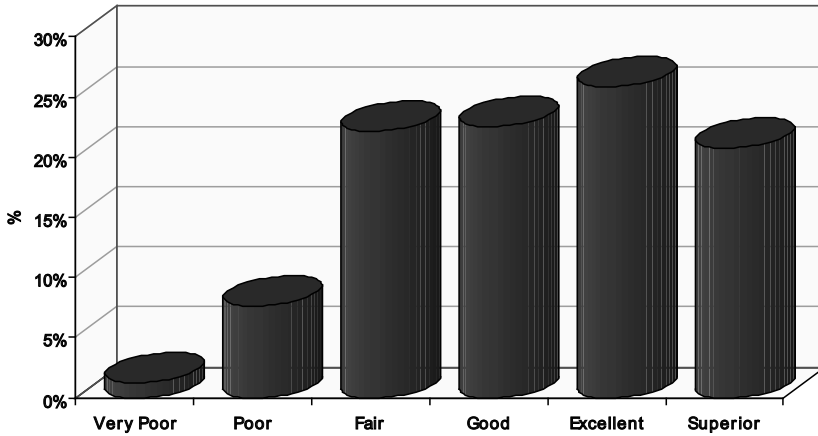


Figure 1. Cardiorespiratory fitness level for studied group of students

## 2. Level of cardiorespiratory fitness according to gender

Cardiorespiratory fitness of women and men is worst for the first one. Statistical differences is significantly high. Every eighth women had poor or very poor cardiorespiratory fitness or (11,4+0,7%) at the same time only every twenty-fifth man represented that of cardiorespiratory fitness (2,1+1,8%). Superior cardiorespiratory fitness had every eight women (13,6%) and almost every third men (31,0%) (Tab. 4, Figure 2).

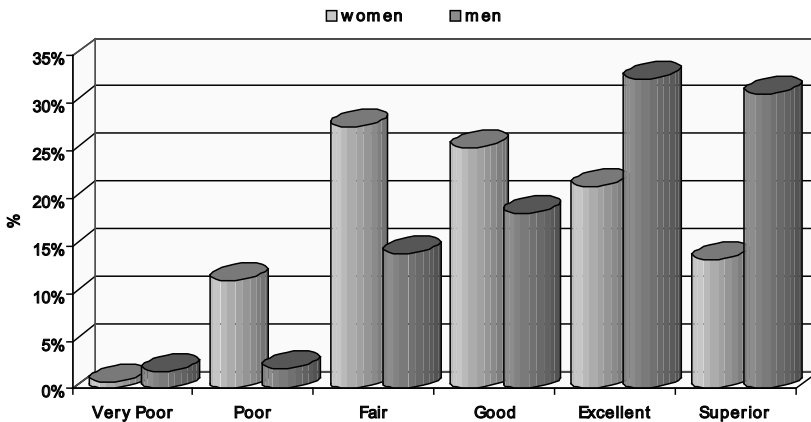


Figure 2. Cardiorespiratory fitness level of women and men

It is worth to remember that standards take into the gender so the metioned results could be comparable. Statistical significance was asses with the use of chi-square test.

Such a vast difference between genders suggest that all further comparisons should be carried out independly for women and man.

**Tab. 4. Level of cardiorespiratory fitness women and men**

Level	Gender (p = 0,0000***)		Total
	women	men	
Very Poor	17 (0,7% <sub>↓</sub> )	30 (1,8% <sub>↓</sub> )	47
Poor	269 (11,4% <sub>↓</sub> )	34 (2,1% <sub>↓</sub> )	303
Fair	653 (27,6% <sub>↓</sub> )	233 (14,2% <sub>↓</sub> )	886
Good	598 (25,3% <sub>↓</sub> )	302 (18,4% <sub>↓</sub> )	900
Excellent	504 (21,3% <sub>↓</sub> )	533 (32,5% <sub>↓</sub> )	1037
Superior	321 (13,6% <sub>↓</sub> )	508 (31,0% <sub>↓</sub> )	829
Total	2362	1640	4002

### 3. Level of cardiorespiratory fitness results comparison of Polish vs. Slovak students

General specification shows that there are no significant differences in cardiorespiratory fitness of students from Poland and Slovakia (Tab.5). However on account of gender differences comparisons between Poland and Slovakia should be conducted seperatly for women and men.

**Tab. 5. Specification of cardiorespiratory fitness according nationality**

Level	Nationality (p = 0,0652)		Total
	Poland	Slovakia	
Very Poor	39 (1,2% <sub>↓</sub> )	8 (1,2% <sub>↓</sub> )	47
Poor	248 (7,4% <sub>↓</sub> )	55 (8,5% <sub>↓</sub> )	303
Fair	720 (21,5% <sub>↓</sub> )	166 (25,6% <sub>↓</sub> )	886
Good	757 (22,6% <sub>↓</sub> )	143 (22,0% <sub>↓</sub> )	900
Excellent	870 (25,9% <sub>↓</sub> )	167 (25,7% <sub>↓</sub> )	1037
Superior	719 (21,4% <sub>↓</sub> )	110 (16,9% <sub>↓</sub> )	829
Total	3353	649	4002

**Tab. 6. Specification of cardiorespiratory fitness for women according nationality**

Level (women)	Nationality (p = 0,2224)		Total
	Poland	Slovakia	
Very Poor	14 (0,7% <sub>↓</sub> )	3 (0,8% <sub>↓</sub> )	17
Poor	220 (11,2% <sub>↓</sub> )	49 (12,3% <sub>↓</sub> )	269
Fair	526 (26,8% <sub>↓</sub> )	127 (32,0% <sub>↓</sub> )	653
Good	507 (25,8% <sub>↓</sub> )	91 (22,9% <sub>↓</sub> )	598
Excellent	421 (21,4% <sub>↓</sub> )	83 (20,9% <sub>↓</sub> )	504
Superior	277 (14,1% <sub>↓</sub> )	44 (11,1% <sub>↓</sub> )	321
Total	1965	397	2362

As it results from results analysis there are no significant differences in the level of cardiorespiratory fitness between male and female students from Poland and Slovakia (Tab.6, Tab.7)

**Tab. 7. Specification of cardiorespiratory fitness for men according nationality**

Level (men)	Nationality (p = 0,6122)		Total
	Poland	Slovakia	
Very Poor	25 (1,8% <sub>v</sub> )	5 (2,0% <sub>v</sub> )	30
Poor	28 (2,0% <sub>v</sub> )	6 (2,4% <sub>v</sub> )	34
Fair	194 (14,0% <sub>v</sub> )	39 (15,5% <sub>v</sub> )	233
Good	250 (18,0% <sub>v</sub> )	52 (20,6% <sub>v</sub> )	302
Excellent	449 (32,3% <sub>v</sub> )	84 (33,3% <sub>v</sub> )	533
Superior	442 (31,8% <sub>v</sub> )	66 (26,2% <sub>v</sub> )	508
Total	1388	252	1640

#### 4. Level of cardiorespiratory fitness results according faculty of study

In a similar way as nationality was examined an influence of faculty of study on the level of cardiorespiratory fitness.

Tables include two types of comparisons – dychotomic classification for physical education students and other faculties and detailed classification for different types of faculties.

##### 4.1. Specification of cardiorespiratory fitness according faculty of study

Introductory specification shows that physical education students represent much better cardiorespiratory fitness than other faculties students (Tab.8).

**Tab. 8. Level of cardiorespiratory fitness results' comparison between physical education and other faculties**

Level	Faculty (p = 0,0000***)		Total
	Physical education	Others	
Very Poor	4 (0,4% <sub>v</sub> )	43 (1,4% <sub>v</sub> )	47
Poor	11 (1,2% <sub>v</sub> )	292 (9,5% <sub>v</sub> )	303
Fair	79 (8,5% <sub>v</sub> )	807 (26,3% <sub>v</sub> )	886
Good	122 (13,1% <sub>v</sub> )	778 (25,4% <sub>v</sub> )	900
Excellent	322 (34,5% <sub>v</sub> )	715 (23,3% <sub>v</sub> )	1037
Superior	396 (42,4% <sub>v</sub> )	433 (14,1% <sub>v</sub> )	829
Total	934	3068	4002



Both male and female physical education students characterize much better level of cardiorespiratory fitness. It is interesting that cardiorespiratory fitness among female physical education students is similar to male results. Differences between women and men is showed up among other faculties students (Tab.9, Tab. 10, Figure 3)

**Tab. 9. Level of cardiorespiratory fitness women results' comparison between physical education and other faculties**

Level (women)	Faculty (p = 0,0000***)		Total
	Physical education	Others	
Very Poor	1 (0,4% <sub>↓</sub> )	16 (0,8% <sub>↓</sub> )	17
Poor	6 (2,3% <sub>↓</sub> )	263 (12,5% <sub>↓</sub> )	269
Fair	25 (9,4% <sub>↓</sub> )	628 (30,0% <sub>↓</sub> )	653
Good	39 (14,7% <sub>↓</sub> )	559 (26,7% <sub>↓</sub> )	598
Excellent	81 (30,5% <sub>↓</sub> )	423 (20,2% <sub>↓</sub> )	504
Superior	114 (42,9% <sub>↓</sub> )	207 (9,9% <sub>↓</sub> )	321
Total	266	2096	2362

**Tab. 10. Level of cardiorespiratory fitness men results' comparison between physical education and other faculties**

Level (men)	Faculty (p = 0,0000***)		Total
	Physical education	Others	
Very Poor	3 (0,4% <sub>↓</sub> )	27 (2,8% <sub>↓</sub> )	30
Poor	5 (0,7% <sub>↓</sub> )	29 (3,0% <sub>↓</sub> )	34
Fair	54 (8,1% <sub>↓</sub> )	179 (18,4% <sub>↓</sub> )	233
Good	83 (12,4% <sub>↓</sub> )	219 (22,5% <sub>↓</sub> )	302
Excellent	241 (36,1% <sub>↓</sub> )	292 (30,0% <sub>↓</sub> )	533
Superior	282 (42,2% <sub>↓</sub> )	226 (23,3% <sub>↓</sub> )	508
Total	668	972	1640

#### 4.2. Specification of cardiorespiratory fitness according faculty of study

Next specification focuses only on other faculties students and the aspects of cardiorespiratory fitness differences among them. Because the analysis of such complex results is not easy, and to to better assess cardiorespiratory fitness differences for thr following faculties results from table 11 and 12 were completed by a graph (Figure 3) presenting average level of  $VO_{2max}$  of following faculties of study (with gender division)

Tab.11. Level of cardiorespiratory fitness women results' comparison according faculty of study

Level (women)	Faculty (p = 0,0000***)							Total
	technical	humanistic	law and administration	medical	mathematic- sciences	tourism and recreation	othets	
Very Poor	1 (1%)	7 (1%)	0 (0%)	5 (3%)	2 (0%)	0 (0%)	1 (1%)	16
Poor	15 (10%)	119 (15%)	22 (8%)	26 (18%)	65 (14%)	7 (3%)	9 (9%)	263
Fair	36 (23%)	237 (30%)	101 (39%)	41 (28%)	155 (34%)	23 (11%)	35 (36%)	628
Good	38 (25%)	214 (27%)	74 (28%)	37 (25%)	112 (25%)	59 (29%)	25 (26%)	559
Excellent	40 (26%)	143 (18%)	45 (17%)	30 (21%)	76 (17%)	69 (34%)	20 (21%)	423
Superior	24 (16%)	64 (8%)	18 (7%)	7 (5%)	44 (10%)	44 (22%)	6 (6%)	207
Total	154	784	260	146	454	202	96	2096

Tab.12. Level of cardiorespiratory fitness men results' comparison according faculty of study

Level (men))	Faculty (p = 0,2246)							Total
	technical	humanistic	law and administration	medical	mathematic- sciences	tourism and recreation	othets	
Very Poor	9 (2%)	13 (6%)	2 (5%)	0 (0%)	1 (1%)	2 (2%)	0 (0%)	27
Poor	11 (3%)	8 (3%)	2 (5%)	0 (0%)	6 (5%)	2 (2%)	0 (0%)	29
Fair	74 (18%)	45 (19%)	11 (27%)	3 (9%)	23 (18%)	22 (18%)	1 (8%)	179
Good	95 (24%)	50 (22%)	13 (32%)	7 (21%)	25 (19%)	24 (20%)	5 (38%)	219
Excellent	119 (30%)	66 (29%)	7 (17%)	10 (29%)	46 (35%)	41 (34%)	3 (23%)	292
Superior	94 (23%)	49 (21%)	6 (15%)	14 (41%)	30 (23%)	29 (24%)	4 (31%)	226
Total	402	231	41	34	131	120	13	972

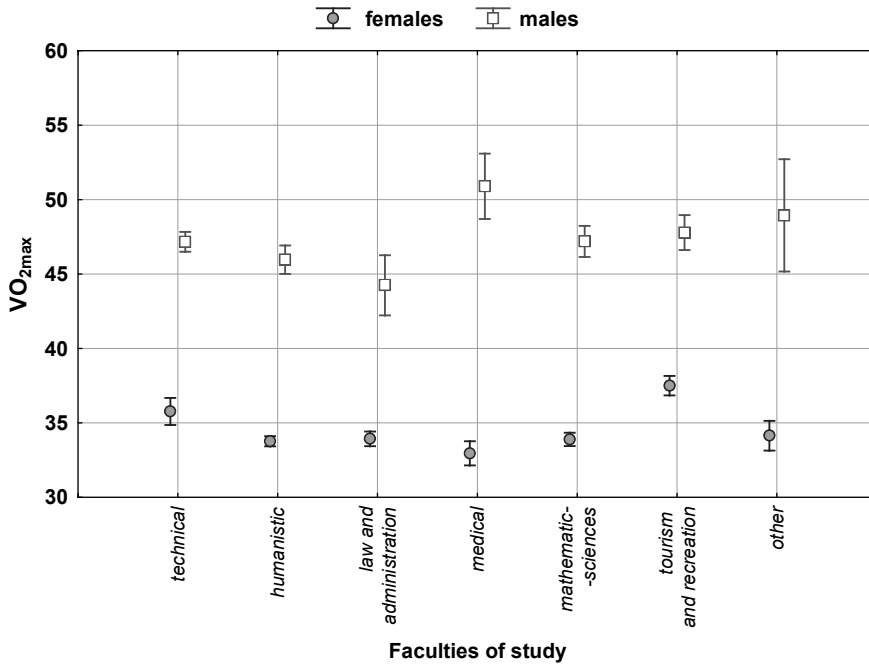


Figure 3. The average values with 95% range for the level VO<sub>2</sub>max ( ml/kg/min) according faculties

### 5. Cardiorespiratory fitness results' assessment measured with the use of shuttle run test [m] (Polish-Slovakian population from Euroregion Carpahtia)

Results of 20 m shuttle run test might be given in meters as a total run distance. Such an record is useful in results' statistical analysis of standards creation. What is more, results (run distance) given in meters is clear and understable for a student and enables to compare results with other studied population. It also helps to quickly find people with poor cardiorespiratory fitness efficiently compare present state. Run distance results specification of study sample was presented in the form of descriptive statistics.<sup>1</sup>

<sup>1</sup> Numerous characteristic of studied parameters were determined:

- arithmetic mean – an average level of variable;
- median (average value) – a half of results were below and the rest above the median;
- standard deviation (s) – an average standard deviation from average value;
- maxima and minima;
- percentile 25. and 75. – values of a variable below (above) which every fourth (25%) minima (maxima) is measured.

### 5.1. Women test results distribution ( $N = 2362$ )

An average obtained distance during effort test among women valued approximately 60 m. Median was slightly lower and valued 820 m, which means that every secondo women did not exceed this distance during effort test. Because arithmetic mean and median values are similar it might be assumed that their results distribution is similar to symmetric, which enables to use in the futher analysis parameters tests. Every fourth person run less than 660 m, from the other hand one-fourth of results were placed above 1000 m.

Tab.13. Women results distribution in Beep test

Test results	$\bar{x}$	Me	s	$c_{25}$	$c_{75}$	min-max
HR (max)	189,5	190,0	9,9	184,0	196,0	142-226
Dystans [m]	859	820	282	660	1000	240-2580
VO <sub>2max</sub> (ml/kg/min)	35,0	34,4	5,5	31,0	38,1	21,8-63,6

### 5.2. Men test results distribution in ( $N = 1640$ )

Results obtained by men are almost double higher than among women when it comes to run distance. Results distribution is much more similar to normal distribution than it was in the group of women.

Tab.14. Men test results distribution in Beep test

Test results	$\bar{x}$	Me	s	$c_{25}$	$c_{75}$	min-max
HR (max)	195,1	196,0	10,3	190,0	202,0	152-222
Dystans [m]	1621	1620	414	1340	1920	400-3140
VO <sub>2max</sub> (ml/kg/min)	48,7	48,9	7,0	44,3	54,0	25,5-71,5

### 5.3. Approximate statistical standards for students to assess cardiorespiratory fitness measured with the use of multistage fitness test [m] (Polish-Slovakian population from Euroregion Carpathia)

Based on results obtained in the study sample and in order to easily present and interpret level of cardiorespiratory fitness, 5 categories of cardiorespiratory fitness were proposed (Tab.13):

- students with very poor cardiorespiratory fitness:  $x_i < \bar{x} - 1,5s$  ;
- students with poor cardiorespiratory fitness:  $\bar{x} - 1,5s \leq x_i < \bar{x} - 0,5s$  ;
- students with fair cardiorespiratory fitness:  $\bar{x} - 0,5s \leq x_i < \bar{x} + 0,5s$  ;
- students with good cardiorespiratory fitness:  $\bar{x} + 0,5s \leq x_i < \bar{x} + 1,5s$  ;
- students with excellent cardiorespiratory fitness:  $x_i \geq \bar{x} + 1,5s$  .

**Tab. 15.** Approximate statistical standards for students to assess cardiorespiratory fitness measured with the use of multistage fitness test [m] (Polish-Slovakian population from Euroregion Carpathia)

Cardiorespiratory fitness (m)	Women	Men
Very Poor	<580	<1220
Poor	580-700	1220-1400
Fair	720-980	1420-1820
Good	1000-1140	1840-2020
Excellent	>1140	>2020

## 6. Somatic marked features specification in the study sample

**Tab.16.** Women results of marked indicators distribution

Indicators	$\bar{x}$	Me	s	$c_{25}$	$c_{75}$	min-max
Body mass	58,1	56,4	9,3	51,7	62,6	38,1-118,5
BMI	21,0	20,5	3,0	19,0	22,4	15,0-41,8
WHR	0,74	0,74	0,04	0,71	0,76	0,60-0,94
BF%	22,6	22,4	6,9	17,9	26,8	2,4-51,5

Arithmetic mean distribution of marked indexes BMI, WHR, BF% in both groups had proper values in comparison to standards (Tab. 16, Tab. 17)

**Tab. 17.** Men results of marked indicators distribution

Indicators	$\bar{x}$	Me	s	$c_{25}$	$c_{75}$	min-max
Body mass	75,1	74,0	11,3	67,4	81,7	48,3-126,7
BMI	23,2	23,1	3,1	21,2	24,9	16,1-36,6
WHR	0,85	0,85	0,05	0,82	0,88	0,65-1,10
BF%	14,2	13,8	5,0	10,8	17,1	1,7-34,4

## Summary

Modern social reforms present in many countries of the world commonly perceive physical activity popularization as an important element of national health promotion programs. It is a consequence of knowledge about the meaning of motion activity in health promotion.

It is stated in the scientific studies that:

- lack of regular physical activity might be the cause of an early cardiovascular diseases occurrence and its development.
- Almost each physical activity increase would bring healthy effects.
- Physical activity assessment is a key element of risk.

Modern solutions of XX century in the field of passing of information in with the use of picture and sound resulted with a new branch of medicine called

telemedicine. As a result of an intensive techniques development telemedicine idea was broadened and along with other changes is at present called as e-health. Among many definitions e-health is defined as a field, which was a result of cooperation of medicine informatics, public health and business, related with health care, information accessibility via Internet and other communication sources. With accordance to WHO e-health is a new term and includes electronic communication and informatics technologies use in the health care. In the Resolution 58<sup>th</sup> Health Congress in 2005 WHO urged their euroregion members to take up energetic steps in order to popularize e-health technologies use in health care. Modern informative society creates new possibilities to improve health care both from the health care system point of view, as well as its functioning improvement [Karski 2009].

Physical activity at universities might stimulate for the further physical development and continue previously gained motion and even hygienic habits. Because modern times raise in front of graduated high demands regarding specialistic preparation, availability and engagement must be accompanied by increased psychical resistance, balanced physical resistance [Bittner 1995].

Presented proposition of activities directed toward monitoring of conscious students' participation in physical education as an element of health care system, is a try to broaden proposed activities in the module of health education. A proposition considering platform dedicated to physical education of students includes presently so necessary values of self-evaluation and self-education, and thanks to the use of the Internet it might be used easily everywhere.

A contact of student with a teacher-health educator and via Internet (even after graduation) with the platform dedicated to health and physical education is about to activate students and make them the object of that system. Only then we may expect that activities in the scope of academic health education being a natural development of school activities would bring longterm effects, which thanks to creating proper health habits would not end along with the end of education at the university.

An essence of the project is about to identify and modify (educational actions) selected risk factors of ischemic heart disease, such as: low level of physical activity and cardio-respiratory resistance, irrational nourishing, overweight, abdominal obesity, tobacco smoking as well as activities related to health education.

In the project took a part students with negative cardiological interview, = and actual medical examination. Those are the people with whom mostly meet teachers conducting physical education classes at universities. With the help of Internet platform and collected results for cardiorespiratory fitness, systematized according to marked somatic features indicators such as: BMI, WHR, BF%, teachers might perform an early and based on easy methods of identification for people with low cardiorespiratory fitness, related to improper somatic features indicators (The present physical education and health care system in Polish higher school does not make it obligatory).

Health education should show the direction of undertaken activities Ahmed on a change of the present state (including referral for medical examinations those with cumulated risk factors). In the study students were asked a question if knowing their own level of physical efficiency in compare to pro-health standards and knowledge that it influences on cardiovascular diseases development, mortality in pre-retirement increase, would you like to take a part in university physical education classes focused on one's results improvement? A positive answer was given by 57,8% (56,4% women, 59,9% men). Negative answer was given by only 15,4%, and the rest had no opinion (26,8%). The answer to the question if students expect number of physical education classes increase, a positive answer was given by 42% respondents (33,8% women and 53,9% men) and negative by 36,1% (44,7% women and 23,7% men). It turned out that the students not really expect an increase of number of physical education classes, but implementing monitoring of the level of physical efficiency focused on health. A change of women attitude is particularly interesting, the more that their cardiorespiratory fitness were in a large measure below pro-health standards. A physical activity decrease is observed among youth in older age groups in many European Union countries. Particularly huge decrease occurs among young women, where in Poland every fifth in the age of 11 years old declares an average or high daily physical activity, and in the age of 15 years old it is declared by every tenth person [Wojtyniak 2008]. Women live in average 6 years longer than men, however for the majority of their lives their physical activity is limited due the bad health state [Karski 2009].

An essential element of POLKARD Program 2003-2005 was an education of decision-makers in the scope of modern cardiovascular disease prevention needs, which turned out to be important and effective. The assumptions of the program were accompanied by the International Science Conference „Activity for the whole life – health and students' physical activity under control” focused on promoting health among students.

Obtained data may be used to demonstrate the impact of focused physical activity, lifestyle on students' health state evaluation and might be an argument in discussions with university authorities and Ministry of Science and Higher Education with reference to physical education in higher schools. Those activities are aimed to create a program “cardio-protection” realized within the scope of faculty studies offered above all by Physical Education Study of Sport center and enabling students with increased risk cardiovascular diseases factors, which might be modified to focused on physical activity and change their lifestyle.

According to report Healthy People 2010 prepared by the U.S. Department of Health and Human Services health literacy are defined as: “degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions”. This definition refers to individuals needs and abilities in the aspect of ability to

make a choice and follow healthy lifestyle in the scope of e.g. diseases prevention (participation in control and diagnostic examinations), using information leaflets, examination's results interpretation, ability to determine risk degree, proceeding with accordance to doctor's recommendations. The main aim is to improve human knowledge about the full scope of possible to take up actions focused on health state improvement and creating conditions to make competent choices. Gained by people health literacy is thought to be one of the key elements of health strategy in the politics of the European Union. Within the scope of this strategy it is recommended to intensively promote education in different age groups [Kisilowska].

It is estimated that Europe's delay in popularizing H-RF concept values approximately 20 years in compare to the United States of America.

It is showed in the studies that cardiorespiratory fitness results among people with negative cardiological interview are forecasting factors to cardiovascular diseases [Myers 2002, Blair 2009].

Physical Education and Students' Health Promotion Platform is written in the concept of actions based on H-RF idea and health literacy and might be a helpful tool in shaping health efficiency of youth, and particularly morphologic and cardiorespiratory. Efficiency is thought to be directly related to high quality of life.

### **Abstract**

Decrease of morbidity and mortality due to cardio-vascular diseases is the first strategic aim of National Health Program.

The period of university study is the last stage when cardio-vascular diseases prevention can be carried out thru health education focused on development, maintenance, and physical efficiency monitoring.

An essence of Physical Education and Students' Health Promotion Platform is about to identify and modify (educational actions) selected risk factors of ischemic heart disease, such as: low level of physical activity and cardio-respiratory resistance, irrational nourishing, overweight, abdominal obesity, tobacco smoking as well as activities related to health education. Thanks to created data base placed on charge free platform, it is possible to compare dynamic and direction of changes over the years, as well as to analyze those results with reference to the whole students' society and taking into consideration for example: country, age, gender, somatic parameters, faculty of study, preferred physical education.

Physical Education and Students' Health Promotion Platform is inscribed to the concept of activities based on the idea Health Related Fitness as well as health literacy. It might be a helpful tool in shaping university students' health efficiency, and particularly morphologic and circulatory-respiratory. Mentioned efficiency is thought to be directly related to high quality of life.



**Key words:** students' physical education, health, platform, prevention, cardiovascular diseases

## References

1. Bittner J., *Kultura fizyczna jako sfera aktywności człowieka*. Uniwersytet Łódzki, Łódź 1995.
2. Blair SN. Physical inactivity: the biggest public health problem of the 21st century. *Br J Sports Med* 2009; 43:1-2.
3. Bryła M., Maciak A., Marcinkowski J., Maniecka-Bryła I.; Programy profilaktyczne w zakresie chorób układu krążenia przykładem niwelowania nierówności w stanie zdrowia. *Problemy Higieny i Epidemiologii*, 2009, 90 (1):6-17
4. Byczański J., Jarosz R.; *Oferta dydaktyczna SWFiS Politechniki Wrocławskiej w semestrze zimowym 2005/2006 (w;) Wychowanie fizyczne studentów- przeżytek czy konieczność*. AZS ZG, Warszawa 2005.
5. Chatterjee P., Banerjee A., Das P., Debnath P.; A regression equation for the estimation of maximum oxygen uptake in Nepalese adult females. *Asian Journal of Sports Medicine*, Vol 1, No 1, March 2010
6. Drygas W, Jegier A.; *Zalecenia dotyczące aktywności ruchowej w profilaktyce chorób układu krążenia*. W zbiorze : *Kardiologia zapobiegawcza*. Naruszewicz M ( red ), PTBNM, 2006.
7. Drygas W, Kwaśniewska M, Szcześniewska D i wsp; *Ocena poziomu aktywności fizycznej dorosłej populacji Polski. Wyniki Programu WOBASZ*. *Kard Pol* 2005, 63, supl 4, 636-640
8. Europejskie wytyczne dotyczące prewencji chorób sercowo-naczyniowych w praktyce klinicznej-wersja skrócona. *Kardiologia Polska* 2008; 66:4 (sup.1)
9. FITNESSGRAM—The Cooper Institute for Aerobic Research. *The Prudential Fitnessgram: Technical Reference Manual*. In Morrow, J.R., H.B. Falls, and H. Kohl. (Eds.). Dallas: The Cooper Institute for Aerobics Research, 1994.
10. Karski J.; *Promocja zdrowia dziś i perspektywy jej rozwoju w Europie*. Warszawa 2009
11. Kusy K.; *Rodzinne wyznaczniki aktywności fizycznej i sprawności fizycznej dzieci poznańskich*. Praca doktorska. AWF Poznań, 2000
12. Leger, L.A. & Lambert, J. (1982) "A maximal multistage 20m shuttle run test to predict VO2 max", *European Journal of Applied Physiology*, Vol 49, p1-5.
13. Mirek W., Mleczko E., Januszewski J.; *Aktywność ruchowa krakowskich studentów a ich sprawność fizyczna*. *Antropomotoryka*, Kraków, 2008, nr 41
14. Mleczko E., Januszewski J.; *Ewaluacja sprawności fizycznej krakowskich studentów: założenia teoretyczne, implikacje praktyczne*. *Antropomotoryka*, Kraków, 2007, nr 30
15. Myers, J., Prakash, M., Froelicher, V., et al., "Exercise Capacity and Mortality Among Men Referred for Exercise Testing," *New England Journal of Medicine*, 346(11), 2002, pages 793-801
16. Mynarski W., Tomik R.; *Koncepcja „sprawności fizycznej ukierunkowanej na zdrowie” jako podstawa edukacji fizycznej*. *Annales Universitatis Mariae Curie-Skłodowska VOL.LVIII, suppl. XIII, 168, Lublin 203*
17. *Narodowy Program Zdrowia na lata 2007-2015*. Załącznik do uchwały nr 90/2007 Rady Ministrów z dnia 15 maja 2007 r.
18. Nowak Z.; *Ocena przydatności prognostycznej kwestionariuszy aktywności ruchowej u chorych z wykonaną przezskorną angioplastyką wieńcową*. AWF Katowice 2008
19. Pająk A.; *Metody prewencji*. Zdrojewski T. i wsp. w Podolec P. /red/: *Podręcznik Polskiego Forum Profilaktyki*, Tom 1, s. 119-124, Kraków 2007

20. Shvartz E, Reibold R.C.; Aerobic Fitness Norms For Males And Females Aged 6-75: A review. *Aviation, Space and Environmental Medicine*. 61:3-11,1990
21. Wojtyniak B., Goryński P./red/; Sytuacja zdrowotna ludności Polski. Narodowy Instytut Zdrowia Publicznego. Państwowy Zakład Higieny. Warszawa 2008.
22. Zdrojewski T. i wsp.; Prewencja chorób układu sercowo-naczyniowego w Narodowym Programie POLKARD w latach 2003-2005 w Podolec P. /red/: Podręcznik Polskiego Forum Profilaktyki, Tom 1, s. 111-117, Kraków 2007

**Websites**

23. Kisilowska M.: Health information literacy. Biblioteki na zdrowie, [www.inib.uj.edu.pl/wyd\\_iiinb/s3\\_z5/kisilowska-n.pdf](http://www.inib.uj.edu.pl/wyd_iiinb/s3_z5/kisilowska-n.pdf); pobrano 14.10.2010
24. Informacja o wynikach kontroli „Wychowanie fizyczne i sport w szkołach publicznych”, [www.nik.gov.pl](http://www.nik.gov.pl); pobrano 14.10.2010