



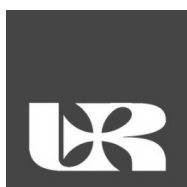
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Physical activity and health of the students from Carpathian Euroregion

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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) 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 20th 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 20th 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 1st and the 2nd measurement and naturally also between the 1st and the 4th 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 23rd meeting held on October 25th 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 1st 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
Comenius University in Bratislava				
Mathematics, Physics and Informatics	1	4	N	2
Faculty of Medicine in Martin	1	4	2	1
Prešov University in Prešov				
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
University of Matej Bel in Banská Bystrica				
Faculty of Economics	1	2	N	3
Faculty of Humanities	1	0	0	0
Faculty of Law	1	6	1	2
Constantine the Philosopher University in Nitra				
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
University of P. J. Šafárik in Košice*				
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 2nd 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 1st 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
Slovak University of Technology in Bratislava				
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
Technical University in Košice				
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 1st 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
Slovak Technical University in Bratislava				
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
Technical University in Košice				
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
The University of Zilina				
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 2nd 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 - Doležalová, 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).

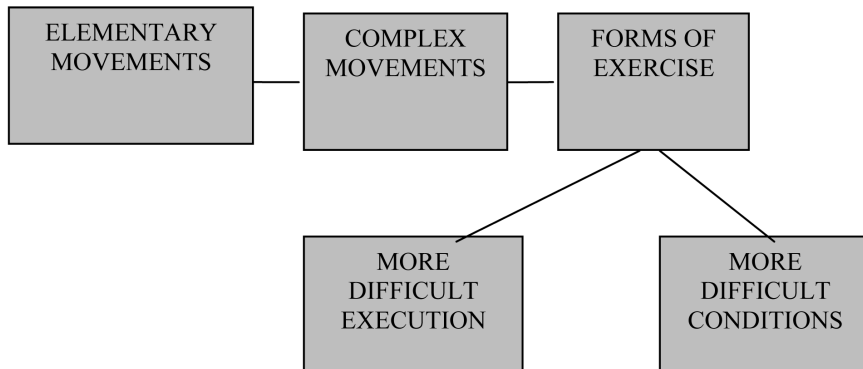


Fig. 1 Training principles for coordination abilities development (Roth according to Zháněl - Zlesák, 2001)

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 ± 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

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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 12th September, 1990¹. 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 appear². 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 places³.

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 teams⁴. 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 parties⁵.

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).

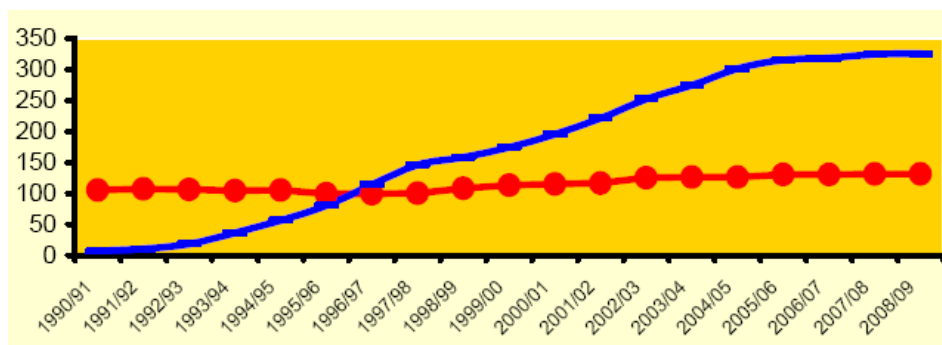
The principle of making detailed regulations concerning obligatory physical education and its time-frame in higher schools at the central level was abandoned, instead the authority to decide about its shape was passed on to the collective bodies of particular higher schools⁶. This regulation was confirmed by the law on higher education of 12th 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

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 29th 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 18th 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 Education⁷. The time of deciding about this subject through administrative channels, above the academic community, was irrevocably gone⁸.

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 27th 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 12th September 1990 on higher education and the law of 26th 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”⁹, 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”¹⁰. 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 achievements¹¹. 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 30th March 2010, being at the legislation stage, include any mention of physical culture in higher schools, limiting itself to the statements concerning the scholarship¹². So the only legal acts concerning

9 Law on higher education of 27th 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 25th 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 27th 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 30th 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

