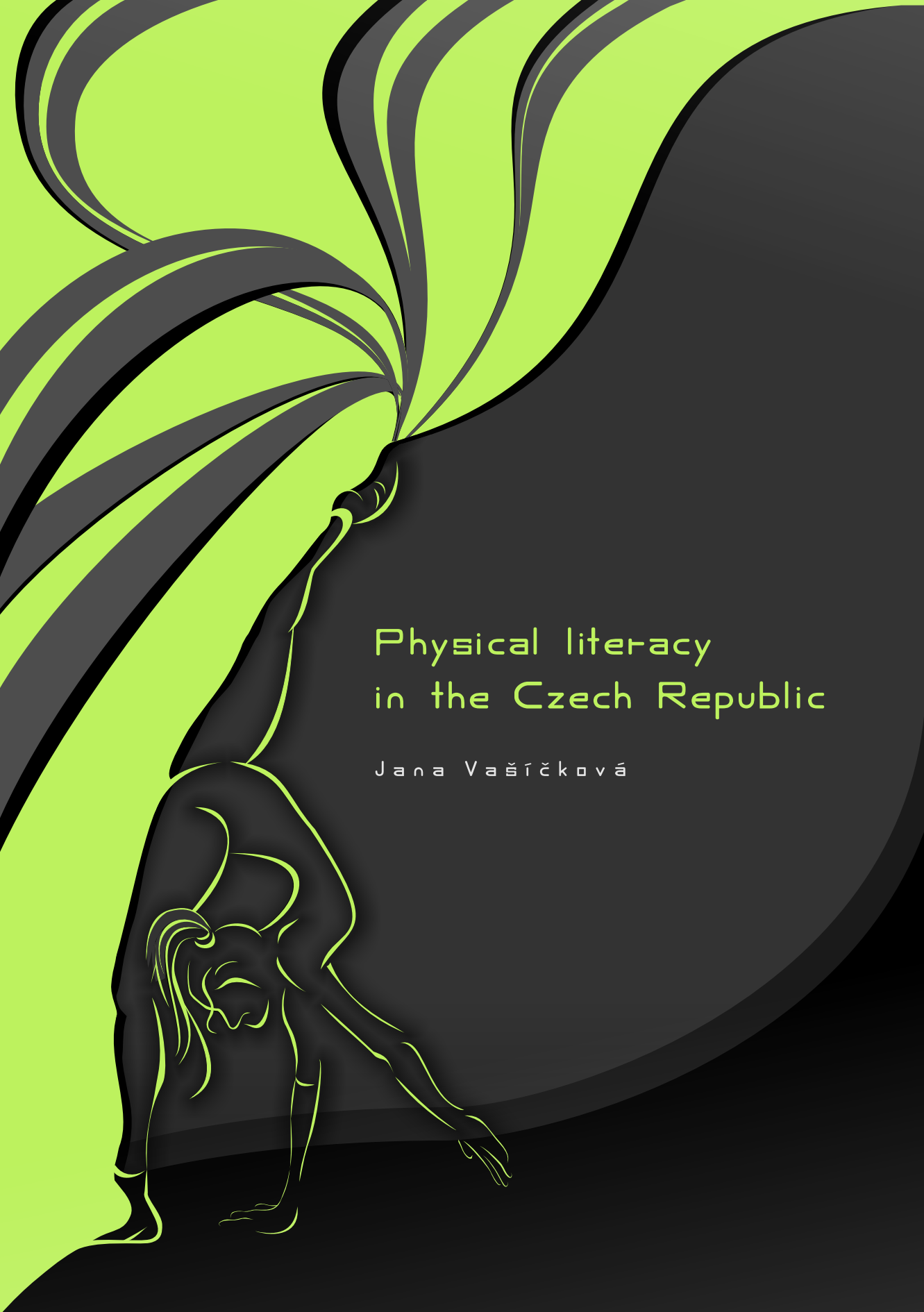

# Physical literacy in the Czech Republic

Jana Vašíčková

Reviewers:
Assoc. Prof. PaedDr. Branislav Antala, Ph.D.
Assoc. Prof. PaedDr. Vladislav Mužík, CSc.

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# FOREWORD

The concept of physical literacy has not been thoroughly studied and clarified in the Czech Republic yet. Reading literacy, numeral, financial and computer ones that belong to functional literacy are the most frequently mentioned literacies both by media and public. Physical literacy is, however, just as important, especially when it comes to establishing the habits of physically active lifestyle that improves life with less frequent occurrence of illnesses and prolongs one's independency on their surroundings. The development of physical literacy should be natural and not forced so that a person can use benefits of physical activities through the whole life span, not only while attending school.

This publication was inspired by a meeting with Ms. Margaret Whitehead, a great promoter of physical literacy in Great Britain as well as worldwide through her work. Great thanks for his support when writing this work go to the head of our department (the Institute of Active Lifestyle, Faculty of Physical Culture) and a "guru" of methodology, professor Karel Frömel, for his precious advice and stimuli. I would like to thank to my colleagues I work with and who published their journal articles that are referred to in my work. I would like to name (without titles) colleagues from our cooperating universities who participated in the data collection: Jiří Nykodým (Brno), Ladislav Bláha (Ústí nad Labem), Hana Klimtová and Igor Fojtík (Ostrava), Zdeněk Šebrle and Emil Řepka (České Budějovice), Dana Feltlová (Hradec Králové), Tomáš Klobouk, Marie Lukavská and Petr Valach (Plzeň). I would like to further thank to methodology consultants and supporters Vladislav Mužík (Brno), Branislav Antala (Bratislava), Jaromír Šimonek (Nitra), and Ingrid Ružbarská (Prešov) and to students of the master degree programme at the Faculty of Physical Culture of UP in Olomouc who participated in the data collection and arranged the cooperation with schools.

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# 1 INTRODUCTION

Physical education in the Czech Republic is compulsory throughout obligatory school attendance and in adolescents also during the study at a secondary school. This fact presents an advantage in international comparison, however, it is not fully used in promoting physically active lifestyle in children and youth, in promoting lifelong physical activities (PA) and in risk prevention of lifestyle and chronic diseases (especially obesity) and in influencing physical and psychosocial health (Dobbins, Husson, DeCorby, & LaRocca, 2013). Physical education (PE) has a great potential to enhance and promote healthy lifestyle, but it is not its only priority many times, because PE has many other goals (McKenzie & Lounsbery, 2009). With two PE lessons per week, it is apparent that the PE lesson content aims at practicing physical exercise and students are less frequently informed about the importance of PA for their present and future life.

Therefore, it is a challenge to use existing time and space at school (e.g. PE) when students can be physically active (e.g. in active transportation to school, using school yards or using recesses for PA) (Pavelka, Sigmundová, Hamřík, & Kalman, 2012). Regular PA is positively reflected not only in study results (Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Keeley & Fox, 2009; Singh, Uijtdewilligen, Twisk, van Mechelen, & Chinapaw, 2012; Trudeau & Shephard, 2008), especially due to its effect on cognitive functions in the organism, concentration and alertness (Budde, Voelcker-Rehage, Pietraßyk-Kendziorra, Ribeiro, & Tidow, 2008), but also in healthy lifestyle and prevention of diseases (Blair, 2007; Fuchs, 2015; Hills, Dengel, & Lubans, 2015). Because if a person is not healthy, he/she cannot show a quality performance at school or at work. Moreover, insufficient physically active lifestyle is also reflected in the costs of health insurance companies in their care about ill people and it brings higher risks of death (Marešová, 2014).

Physical literacy is closely associated with the educational process. Education and PA are an area that is important due to at least three reasons. Firstly, small children learn movements since birth. It begins when babies are rising their heads, straightening their arms, turning around while lying, when children make first steps, walk, and run. These are motor phases of individual developmental stages, when each stage is linked with certain characteristics. Later, learning movements and movement skills continues as an intentional and conscious activity, for example learning how to ride a scooter and bicycle, swim, ski, skate, etc. These are activities that a child or a parent chooses. Not everyone knows how to ride a bicycle or ski. Therefore, we speak about education in PA that becomes a part of physical education at schools since young school age, or that becomes a part of one's individual physical routine, leisure time activities or sports trainings.

Secondly, in PE lessons, students should learn also about the importance of PA and their use in everyday life or obtain information about different sports events, their rules and possible modification of rules, their history, and Olympic movement. Further, they should obtain information about physical fitness, physical regime, basics of first aid in case of injuries, etc., as it is stated in the educational framework programmes and present

curricular goals (Výzkumný ústav pedagogický, 2007a, 2007b). Overall, it is education about physical activities.

Thirdly, through PA in PE, we learn cooperation and communication in team, with individual actors, team-mates, opponents, and referees. We acquire knowledge about basics of rules and thus we acquire the principle of "fair play", which is subsequently reflected in one's social life. We can respect individual actors, use their abilities and skills or support them. Through regular PA, children and young people also acquire the habits of hygiene and the rules that come along with physical fitness and performance not only in training sessions and matches. Further, through PA they also learn about muscle imbalances, corrections and compensations of one-sided strain or about PA safety in non-standard conditions. Therefore we speak about the education through physical activity.

The result of learning should be education that an individual obtains throughout his/her school attendance, which means also in physical education that should also develop one's physical literacy. Physical literacy is a new concept that we would like to explore in this work and that is gradually becoming a part of knowledge in wider population. An Australian study has found a positive association between the development of physical literacy and school results in pupils at elementary schools (Telford, Cunningham, Abhayaratna, Telford, & Olive, 2014). A physical literate person should be responsible for one's health, should have sufficient knowledge about PA, skills in PA and positive attitude to PA. Physical literacy should become an inseparable part of PE standards and at the same time PE should adopt a more important role in supporting public health (Castelli, Centeio, Beighle, Carson, & Nicksic, 2014) in terms of educating physically literate individuals.

The aim of this work is to describe the concept of physical literacy in Czech environment and to analyse its individual attributes that we consider important. On the basis of this knowledge and on the basis of research results regarding this area, we aim to clarify the aspects of motivation to primary PA in adolescents and their knowledge of health and PA as one of the key attributes of physical literacy in students of secondary schools, universities and colleges. Further, we are interested in finding out whether there is an association between a knowledge level and an amount of performed PA in adolescents and identifying that role students' relationship to PE lessons plays in the concept of physical literacy. The aspect of the effect of a month-long intervention on the amount of PA in adolescents is also addressed as well as the association between PA and the education level in the inhabitants of the Czech Republic. The applied terms and concepts are clearly explained in Chapter 8.

# 2 THE CONCEPT OF PHYSICAL LITERACY

In order to address the topic of physical literacy, it is essential to mention the importance of physical education at the highest level, i.e. at the international level. The international support of all involved organizations mentions the right for humans to have access to PE, PA and sports without limitations and also within their individual abilities and opportunities in their documents. In international documents sport is understood "as all forms of physical activity which, through casual or organized participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels" (Committee of Ministers, 1992). In our work, however, we use the term sport within the constraints of the term as it is defined in Chapter 8.

## 2.1 The international importance of physical education and sport

Already in November 1978 at the UNESCO General Conference in Paris, "the International Charter of PE and sport" (UNESCO, 1978) was published. Since this organization adheres to the international declaration of human rights, the right for physical, intellectual and moral development is also addressed in this charter. The access to PE and sport should be provided and guaranteed to all people (sport is here understood as PA, but due to the translation from the original, we left the original term, furthermore we use the term PA). PE and PA enhance better harmoniousness between people, between individuals, solidarity, friendship, mutual respect and understanding. Performing PE and PA in nature can moreover enrich and evoke respect to natural sources and their preservation. The Charter reflects the diversity of different forms of training and education in PA that exist in the world, but despite the differences between traditional sports of different nations, it is apparent that PE and PA relate not only to the physical feeling of well-being, but also contribute to the whole and well-balanced development of an individual.

The Charter declares that it is the right of all to perform PE and PA.

- Every person should have the right of access to PE and PA that is necessary for the development of his/her personality. This right should be guaranteed both within the educational system and other areas of social life.
- Every person should have the opportunity to develop his/her physical fitness in concordance with his/her talent.
- Also people with special needs have to have the opportunity to participate in PE and PA, as well as people of different age, with a handicap, in a way that meets their special needs.

Apart from the emphasis on PE and PA, the right to participate for everyone, we also stress that PE and PA have to meet individual and social needs (e.g. institutional, cultural,

socioeconomic, and climatic of a given country). The top sports should not be at any case influenced by commercial and business interests.

The concept pays attention to the importance of professionals who concentrate on PE and PA. They should have profound professional qualification to do this work, and they should further educate themselves to specialise for the required needs. A great importance is also given to volunteers who invaluably contribute to the overall development of sport and stimulate to participation in PA.

The international charter also mentions the need of adequate infrastructure and equipment that are an essential condition to perform quality PE and PA. The responsibility here belongs to governments, authorities, schools and particular private organisations at all levels that should cooperate when planning activities and show maximum will to install the facilities and equipment for PE and PA. They should also use all opportunities that are provided by natural sources.

Research and development are also an essential part of the development in the area of PE and PA as they should bring improvement in areas of health and safety of participants, and further in the areas of training and teaching methods and organisational and management procedures. The education system should benefit from the development of better teaching methods and unified standards. The Charter in compliance with the research results in the area of PA and PE stresses the need to publish and disseminate the information in order to promote PA and healthy lifestyle.

The protection of ethical and moral values in PE, PA and sport has to be permanent in all people. Threats such as violence, doping or commercialisation are attacking the moral values of PE, PA and sport and disturb the genuine essence of PA and health enhancement and change the educational role of PA. Not only top and recreational sport people should advocate against the misuse of PA, but also authorities, volunteer sport associations, specialised government agencies, Olympic committees, teachers, parents, sport clubs' sponsors, coaches, sports managers and media should be involved in this process. It is important for sport values and related consequences of the linkage of sport, society and culture to be a part of the curricula at school. Sport people and sport public need to be aware of the risks of impulsive and inappropriate training and psychological pressure of any kind. The fight against doping needs to be supported by national and international authorities that should assure the observance of International Convention against Doping in Sport (UNESCO, 2005b).

In June 2015, the Charter (UNESCO, 2015) was revised. We can point out the inclusion of physical activities into PE and sport in a way that addresses a wide spectrum of activities that cannot be a part of PE and sport, especially health oriented PA and their benefits. The revised version then specifically talks about gender equality, quality PE as a basic component of governmental educational and sport obligations and further about a wider spectrum of integration.

It is therefore apparent that the international support of PE and PA is based on a global institution and the final document is agreed upon by all national representatives. Yet, the International Charter is not the only document discussing this area.

In 1992, the Committee of Ministers (Committee of Ministers, 1992) published the European Sports Charter which defines sport as "all forms of physical activity that aim at manifesting or improvement of physical and mental condition, social relations

development or reaching results in competitions at all levels through non-organized (natural) or organised participation". It understands sport in a wider sense as a means to reach maximal performance with the goal to succeed in competitions in a given sport field, but also as a general means in the development and maintenance of health of an individual and society.

## 2.2 International institutions supporting physical education

Mužík and Krejčí (1997) assumed that PE should have adopted a different role at school according to the then emerging new concept as opposed to the past and they pointed at the conclusions of the 5th international congress ICHPER-Europe (International Council of Health, Physical Education and Recreation – at present ICHPER.SD) that took place in 1990 in Linz. They state:

1. The aim of physical education is a happy person experiencing movement and communication in the movement.
2. Correctly understood physical activity always heads towards human health.
3. Physical activity needs to be a part of everyday life of each person and help him or her to live happily and enthusiastically (Mužík & Krejčí, 1997, p. 18).

A summit on PE was another important event associated with the support of PE in Berlin, Physical Education World Summit, in November 1999 that concluded that PE at schools had become a marginal thing in many countries, and the time devoted to it and its role among other subjects are inadequate. Moreover, quality material, financial and human resources were not provided at schools in many countries. The summit resulted in the document Agenda for Action that asks for joint cooperation of six major international organizations in the International Council of Sport Science and Physical Education – ICSSPE and for the support of quality PE under the leaderships of the International Committee of Sport Pedagogy (ICSP; part of ICSSPE). This committee includes representatives of the following international associations:

- The Association Internationale des Ecoles Supérieures d'Education Physique (AIESEP),
- The Fédération International d'Education Physique (FIEP),
- The International Association of Physical Education and Sport for Girls and Women (IAPESGW),
- The International Federation of Adapted Physical Activity (IFAPA),
- The International Council for Coaching Excellence (ICCE),
- The International Society for Comparative Physical Education and Sport (ISCPES).

The Committee as a whole is charged with leading international research projects concerning the state and role of PE in the world. The tasks it is responsible for are:

- increasing the awareness about positive effects of PE,
- informing public about the worldwide state of PE using media, and both governmental and non-governmental sector,
- providing a platform for organisations and institutions to present the activities they guarantee,

- collecting results of current research, memoranda, and declarations,
- identifying areas that require cooperation,
- enhancing networks of cooperating organisations and coordinating their activity plans and their fulfilment.

There are two major problems that the representatives of 8 countries agreed unanimously:
1. Physical education is the right of all children and an essential part of their development and education.
2. Strategies and measures are necessary that would secure that quality physical education is carried out and supported in the world.

Immediately after the world summit, there was the 3rd Conference of Ministers - MINEPS III – Ministers and Seniors Officials Responsible for Physical Education and Sport – organised by the UNESCO in Uruguay in Punta del Este that included participants from 62 member countries, 3 observing countries and 38 inter-governmental and non-governmental organisations (UNESCO, 1999). This third meeting was a follow-up of the two previous meetings, MINEPS I in Paris (1976) and MINEPS II in Moscow (1988) (Table 1). Physical education became a key topic of this conference and in the final declaration the participants emphasized the importance of PE and sport as a fundamental and integral part of the continual process of education and human and social development. Apart from that, it is essential to stress that time reserved for PE at schools is not respected and in some countries it is even reduced due to changes in priorities. The reduction of time aimed for PE and its programme then contributes to the increase of delinquency and violence in youth and increases the medical and social expenses of the state. According to the declaration, studies show that 1 dollar invested into physical activity results in saving 3.2 dollars in medical costs (UNESCO, 1999). The final meeting of MINEPS V took part in May 2013 in Berlin and the main topics were: the access to sport as a fundamental right for all, especially with the accent on the possibilities for girls and women and people with special needs; promotion of investments into PE programmes and sport aimed at quality of physical education and organization of sport events; protection of the integrity of sport and its values (Antala et al., 2014).

The European Physical Education Association (EUPEA), which unites the profession of PE teachers from the EU countries, points at the importance of PE. In 1991 in Madrid, the association published a declaration "No Education without Physical Education", which was complemented in Brussels in 2011 e.g. with parts on the importance of PE and international cooperation. According to the declaration, PE is an inseparable part of education since kindergarten throughout the entire educational system. PE teachers should be qualified at all levels of the education system and further education of PE teachers should be obligatory. Students should have more opportunities to engage in PE at higher levels of education. Further, EUPEA appeals to governments to provide conditions for effective implementation of PE curricula and for their cooperation with national associations.

The support of PE and sport goes across world and different organizations that advocate for the importance of PE and sport and address responsible persons in governments in participating countries and up to community organizations. Moreover, we need to mention the event at the highest level that calls for discussion of teachers, health professionals,

businessmen, government representatives, researchers, scientists, politicians and students so that they can discuss future direction of health and physical education. We speak about the Global Forum for PE Pedagogy organized every other year (there have been four meetings since 2010). Other selected and important events with different fields of focus and importance are listed in Table 1 below.

**Table 1:** *Overview of selected important and mainly international and European events supporting PE and sport since 1978*

| Year | What | Where | Who |
|---|---|---|---|
| 1978 | International Charter of Physical Education and Sport | Paris | UNESCO |
| 1988 | Conference of Ministers and Senior Officials Responsible for Physical Education and Sport (MINEPS II) | Moscow | MINEPS |
| 1990 | Conclusions of 5th International Congress | Linz | ICHPER |
| 1991 | Declaration of Madrid: "No education without physical education" | Madrid | EUPEA |
| 1992 | European Sports Charter | Brussel | Conference of ministers |
| 1995 | Charter for Sporting Rights of the Young | Avignon | International Congress of Panathlon |
| 1999 | Berlin Physical Education World Summit (Agenda for Action) | Berlin | ICSSPE, MOV, UNESCO |
| 1999 | Conference of Ministers and Senior Officials Responsible for Physical Education and Sport (MINEPS III) (Declaration of Punta del Este) | Punta del Este (Uruguay) | MINEPS |
| 2000 | The World Manifest of Physical Education | Foz de Iguazzu, South America | FIEP |
| 2003 | UNESCO Round table communique "Quality of Education" | Paris | UNESCO |
| | Resolution 58/5, 59/10 and 60/9 "Sport as a means to promote education, health, development and peace" (United Nations General Assembly, 2003a, 2004, 2005b) Resolution 58/6 and 60/8 „Building a peaceful and better world through sport and the Olympic ideal" (United Nations General Assembly, 2003b, 2005a) | | UN |
| | Recommendation of the Committee of Ministers to member states on improving physical education and sport for children and young people in all European countries (Council of Europe, 2003) | | Council of Europe |
| 2004 | MINEPS IV Athens Declaration | Athens | MINEPS |
| | Global Strategy on Diet, Physical Activity and Health | | WHO |
| 2005 | UN Year of sport and Physical Education Bangkok Agenda for Actions on Physical Education and Sport in School | Bangkok | UN |
| | 2nd World Summit on Physical Education | Magglingen (Switzerland) | UNESCO, IOC, GAISF, WHO |
| 2007 | Resolution of European Parliament on the role of sport in education | Strasbourg | European Parliament |
| 2008 | 1st Ibero American Summit on Physical Education and School Sport | Havana (Cuba) | AIEFDE |

| Year | What | Where | Who |
|---|---|---|---|
| 2010 | Health and Physical Education Pedagogy in the 21st Century – A statement of consensus | Northern Iowa | GOFPEP |
| | International Position Statement on Physical Education | | ICSSPE |
| 2012 | International Benchmark for Physical Education Systems | | ICSSPE |
| 2012 | Revitalising Health and Physical Education through Community based Networking | Velen, Germany | GOFPEP |
| 2013 | MINEPS V Declaration of Berlin | Berlin | MINEPS |
| 2014 | Physical Education and Health: Global perspectives and best practices | Potchefstroom, South Africa | GOFPEP |
| 2016 | Technology, Networking and Best Practice in Physical Education and Health: Local to Global | Ankara, Turkey | GOFPEP |

*Notes (unexplained abbreviations in the text above):* IOC – International Olympic Committee; GAISF – General Association of International Sport Federation); AIEFDE – Asociación Iberoamericana de Educación Física y Deporte Escolar (Ibero American Physical Education and School Sports Association); GOFPEP – Global Forum for Physical Education Pedagogy.

## 2.3 Literacy and its general meaning

Under the term literacy, many people understand primarily the ability to read and write. Yet, at present due to the development of schooling and erudition, we can view literacy from different perspectives. Literacy thus receives new attributes and we speak of for example financial or computer literacy (Výzkumný ústav pedagogický, 2010). In the present society of knowledge (information society) the term acquired a new meaning and therefore, the term is in some field understood not only as the knowledge of terms in the particular field, their understanding and comprehension in a context, but also the ability to use them in practical life. Literacy is defined mainly as the quality of the state to be literate, which means the ability to read and write, or it is also defined as the knowledge of a certain field or an area (Dictionary.com, 2014). Literacy should also result from education, because the United Nations Resolution 56/116 from 2002 discusses the decade of literacy ("Education for all") and says that:

> We are convinced that literacy is crucial to the acquisition, by every child, youth and adult, of essential life skills that enable them to address the challenges they can face in life, and represents an essential step in basic education, which is an indispensable means for effective participation in the societies and economies of the twenty-first century (United Nations General Assembly, 2001, p. 1).

The world organization UNESCO (2005a) accomplishes this definition in its ten-year project of the enhancement of literacy and says:

> Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy

> involves a continuum of learning in enabling individuals to achieve his or her goals, develop his or her knowledge and potential and participate fully in community and wider society (Richmond, Robinson, & Sachs-Israel, 2008, p. 18).

Following these steps that United Nations made in 2003–2012 ("the decade of literacy") the effort to increase literacy focused mainly on the poorest and the most marginal social groups (including women) and the aim was to reduce poverty. In order to survive in current global world, it is important that everyone learns new forms of literacy and develops his/her own abilities to find, assess and use information effectively and in different ways. Literacy (here meant as the ability to read, write, and count) is the basic for all levels of education, using all available means. Literacy is a concept that applies to all. A literate person means it is a person who is a cultural and educated person in a given field.

## 2.4 Physical literacy

In present educational system, there is an emphasis put on five kinds of literacy that were selected as the most frequent ones in international comparative studies. They are reading, mathematical, science literacy and then literacy financial and computer as those very topical in relation to the current social situation (Výzkumný ústav pedagogický, 2010). Literacy in this context is understood not only as knowledge of individual terms of a certain field but mainly also as understanding their content, and understanding of the terms not only in the context of a certain field but also in a wider spectrum of knowledge and at the same time as the ability to use this knowledge in practical life to a greater extent.

The concept that does not appear in the list of literacies above, yet is also very important mainly in the field of kinanthropology, is "physical literacy". Margaret Whitehead (2001), a British philosopher, PE teacher and professor brought this term into existence. Although this term appeared already in 1991, not much attention was paid to it. It was thanks to professor Whitehead who published articles first with a philosophical view of the concept (Whitehead, 1990) and then later also articles aimed at physical literacy in a certain concept (Whitehead, 2007a, 2007b, 2008, 2009; Whitehead & Murdoch, 2006) that this term received more attention. She collected the articles later in a book "Physical literacy throughout the lifecourse" (Whitehead, 2010b). Other professionals in the areas of PE, sport, dance activities and others, later followed upon her articles, mainly in the Anglo-Saxon countries (e.g. Sullivan, Whitaker-Campbell, & MacKay, 2010; Taplin, 2011; Temertzoglou, 2010; Tremblay & Lloyd, 2010). The term has been paid attention to in the Czech Republic mainly in recent years (Čechovská & Dobrý, 2010; Čechovská, Chrudimský, Novotná, & Vindušková, 2011; Nováková & Čechovská, 2012; Šafaříková, 2010; Šimůnková, Novotná, & Chrudimský, 2014; Šimůnková, Novotná, & Vorálková, 2010; Vašíčková, 2011; Vašíčková & Hřibňák, 2013a, 2013b).

Physical literacy can be understood as a capacity and motivation to use one's own physical potential and thus extensively contribute to quality life with culture and society the person is a part of still playing their distinct role and at the same time forming the person. Further, physical literacy is the potential to actually use one's physical capacities.

The concept of physical literacy denotes more the level of education in this area, which means it is not only the type of activity, but also the level (quality) of physical skills and abilities, knowledge about movements, physical fitness, etc., and it includes to a certain extent also attitudes and physical behaviour of an individual. It is not possible to learn or study it as physical literacy relates more to a qualitative level that is obtained through physical and knowledge learning in the course of life. We cannot talk only about physical literacy and schooling as a certain stage in life, but we need to talk about a lifelong value that each person uses.

Due to the concept of "physical literacy" we can

- Identify the intrinsic value of PA;
- Overcome the need to justify PA as a means to other ends;
- Underwrite the importance and value of PA in the school curriculum;
- Refute the notion that PA is an optional extra of only recreational value;
- Justify the importance of PA for all, not just the most of able in this field;
- Spell out a case for lifelong participation in PA;
- Identify the range of significant others who have a part to play in promoting PA (Whitehead, 2010b, p. 5).

### 2.4.1 Philosophical background of physical literacy

Physical literacy is not a philosophy, but rather a concept that enables an individual to "earn" or benefit from a basic dimension of human nature – that is own physical dimension.

Often, our physical dimension is in western societies perceived as something concrete, in an observable form, as a thing or a physical object. In relation to this dimension, we than talk about his/her physical condition or his/her physical performance. This "automatic" approach then determines the start and the end of our embodiment which is a result of dualistic approach. The importance of PA is then perceived through manual work, participation in culturally specified environment for PA usually at a high level and often contributing to physical fitness. It is not surprising that physical dimension in education and life is perceived as a working tool, for elite participation in sport and health maintenance. Other kinds of participation of our embodied dimension are perceived as inadequately important (Whitehead, 2010b).

Many philosophers, psychologists and sociologists now perceive all aspects of our embodiment as a body that lives or as a living embodiment. Physical literacy is then a human capacity which has its roots in nature and as embodied being. It is a potential that includes embodiment that lives and at the same time embodiment as an object.

The realisation and use of each aspect of human potential gives a person the opportunity to prosper and experience a more fruitful life. The opportunities that come along with the use of human capacity then bring a person the possibility to develop self-confidence, physical competency, and interpersonal tact and increase the level of health and well-being. Our embodiment is a key for human existence and for being of humans.

We can find the roots of physical literacy as of philosophical concept in several philosophical schools; there are existentialism, phenomenology and monism among them.

Existentialism deals with questions regarding human being – existence, questions of life and death (predecessors S. Kierkegaard, founders M. Heidegger and K. Jaspers). Phenomenology means in general precise exploration of phenomena, in a way that it deals with experience, how things show "themselves" to a person in his/her own conscious (representative E. Husserl). The founder wanted that phenomenology becomes fundamental for all scientific exploration of reality in general. According to monism (representative e.g. R. Steiner), the entire one comes from one essence of substance. The basis of monism is the fact that in order to explain functioning of world, it is not necessary to have spiritual or material principle, but that the world is united. Monistic approach, on which physical literacy is based on, perceives a human as an undividable whole. It is against the Cartesian opinion of dualism (body vs. soul).

Physical literacy can have its philosophical basis similar to human belief which contains certain values and influences personal priorities, perceptions and activities, and thus physical literacy could be also described as a certain type of "philosophy".

There are different definitions of the concept of a physically literate person in different countries. For example, for Canadian PE teachers it means "an individual, who is physically literate, moves with competence in a wide variety of physical activities that benefit the development of the whole person" (Mandigo, Francis, Lodewyk, & Lopez, 2009, p. 28). The flexibility in this definition gives space to a person's individual abilities to flourish while managing the process of adoption of physical skills. It also speaks about the development of "whole" person in relation to physical (bodily), cognitive, social and affective areas. From this viewpoint, many characteristics can influence the process of the development of physical literacy, for example motivation, variety of movements, self-confidence, competencies, creativity, strategy and ability to choose in relation to healthy active lifestyle.

According to Novotná (personal communication; 25. 9. 2014), a physically literate person "will use, on the basis of various knowledge of movement performance and of PA effects, adequately adopted physical skills to meet physical tasks and to meet the feeling of satisfaction of physical self-realization".

### 2.4.2 Attributes of physical literacy

**The motivation** to engage in PA belongs among the basic attributes of being physically literate. A physically literate person has usually a positive relation to one's own physical dimension, confidence in one's physical abilities, carries out everyday tasks with ease and usually participates in PA with confidence and with the assumption that it will be a positive and satisfying experience. To be physically literate prolongs active life and the engagement in PA contributes to the overall quality of life. Physically literate persons keep this positive approach to PA in the course of their life and engage in various and adequate forms of PA since adulthood to the old age. Older people who are physically literate maintain their independence longer that those who are less active.

Physical literacy is a lifelong positive that enriches life in every age. Physical literacy is a universal concept applicable to everyone regardless of time and place they live in. Specific character of physical literacy can be influenced by individual age, talent and scope of physical abilities, but also by the culture one lives in. A variety of opportunities, challenges and

situations appear in every culture depending on the requirements of everyday life and in relation to different forms of structured PA. The particular "world" people live in should contribute to the development of their embodied capacity. Yet, all people can develop and improve their physical literacy and benefit from the development of their capacity.

Physically literate individuals usually manage their embodied dimension with assurance and **self-confidence,** because they feel physically competent. Among the key abilities that manage the whole body, there are coordination and direction that can be applied in activities and shifts of the whole body (e.g. in walking, running, balancing and jumping) or also in gentler movements (e.g. in handwriting or playing a musical instrument). Physically literate individuals are also able to develop these activities based on physical abilities in different environments and conditions. Smooth **interaction with the environment** in the context of everyday life and PA is a sign of a physically literate person. Such a person is than able to "read" the difficulties of the surrounding environment and anticipate more easily which movement is appropriate, effective and necessary for the given conditions (e.g. water environment such as stream, river, weir, sea, requires different physical behaviour). Such experiences and also demanding positive experiences with movement can contribute to the development of positive perception of one's self and also the self-confidence of every person can increase. Moreover, thanks to ways that "embodied" abilities contribute to a wide spectrum of other human activities (language, cognition, and rationality), self-confidence and feeling of one's own value can globally develop in an individual.

### 2.4.2.1 Relations between the attributes of physical literacy

If a person has motivation (A) to PA and he/she will perform it, one's self-confidence (B) and trust in one's abilities (self-efficacy and self-confidence) will increase and at the same time one's physical competence, i.e. the improvement of one's physical skills. If a person has certain physical skills and self-confidence (B) to use them, then he/she will use them in different environments (C) that bring different challenges, and that simultaneously increase one's self-confidence and physical competence (B). A success in applying the skills in different environments (C) can increase motivation again. Motivation (A) can encourage the individual to try and explore the adoption of a given movement in different environments. These relations of attributes are described clearly in Figure 1.

There are further three other attributes that appear along the key attributes and that develop the main attributes of physical literacy in a specific way (Figure 2). They are the sense of self and self-confidence (D). If a person has a positive experience in performing PA, then he/she can positively experience one's self and increase one's self-confidence. Moreover, the awareness of own embodied dimension along with a certain level of self-confidence can support the person's self-expression and one's responsive and perceptive interaction (communication) with others (E). Knowledge and mastery (F) then will be enhanced by any participation in PA.

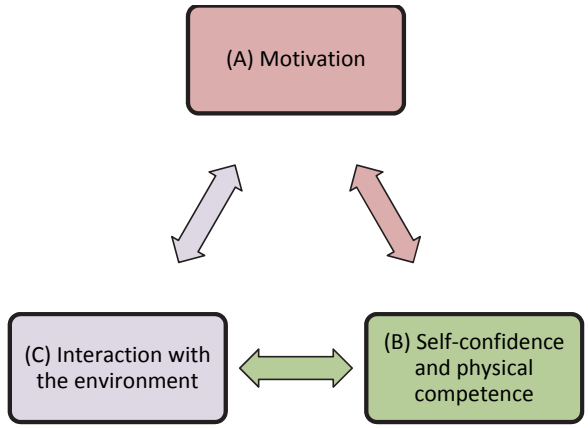



**Fig. 1:** *Relations between key attributes of physical literacy in an individual (adopted from Whitehead, 2010b)*

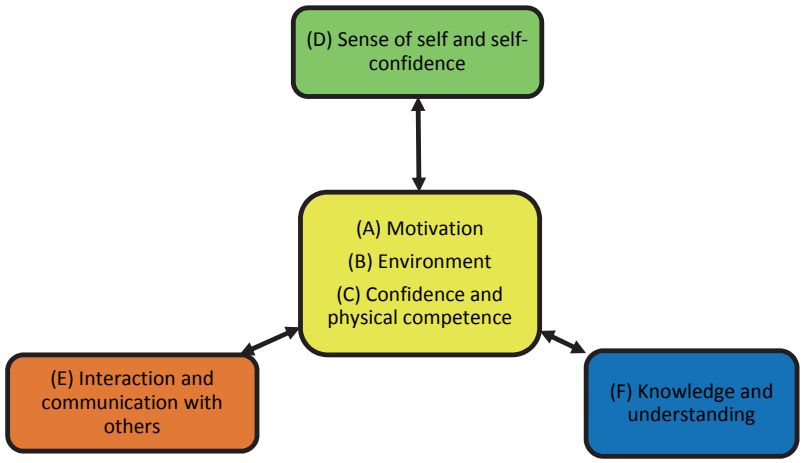



**Fig. 2:** *Other attributes influencing physical literacy in an individual*

The development of physical literacy in an individual is influenced by the individual's factors, but also by micro environment in which the person finds oneself (school, employment, family, surroundings, friends, etc.), and to a great extent by the macro environment (i.e. culture, society, politics in a given country, legislative aspects, etc.). These environments and their influence need to be in harmony and they should have cohesive goals so that successful development of physical literacy can occur. For example, such environment that supports passive transportation is rather contra productive in the enhancement of physical literacy.

### *Physical literacy and motivation*

The desire to be active, endure in an activity, to improve one's skills, develop abilities and try a new PA are in the core of physical literacy. However, it could not be possible unless there was motivation which we can perceive as the „power", willingness and excitement to participate in a given activity. A physically literate person is described with having a positive approach to the participation in PA and tries to be physically active every day or at least more times in a week. Physically active person will feel happy due to movement and can rely on one's physical abilities because he/she is aware that he/she can succeed.

One of the major reasons why people do not engage in PA is the lack of physical motivation. A situation can appear when a previous experience, especially in PE at school, leads to the development of physical skills but these skills do not lead to desire or interest to continue this PA. In relation to this, a question may arise: Why people do not have enough motivation to carry out PA?

A negative previous experience can be one of the reasons, as it discourages the individual from the ongoing participation in PA. For example, past experience did not provide enough satisfaction because the individual did not experience success. Or in a worse case, he/she experienced humiliation, critique or mockery from the surroundings, e.g. from parents, teachers or peers. That could interfere with one's self-confidence. In fact, the idea of participation in PA can evoke fear in such people. The development and maintenance of physical literacy is highly dependent on experience that the individual obtained while engaged in PA. This means in situations when effort and improvement are praised and in such that support the individual's motivation and this way the individual's self-confidence and self-value are increased. These situations, which can appear also in PE, are then a source of praise of individual physical skills and abilities and mutual respect between the involved actors (the teacher and pupils). Motivation appears basically on the basis of confidence in one's self and from self-respect gained from experience.

The motivation to engage in all forms of PA is inherent to every child as an expression of operational intentionality to engage in life in the world. In young children the engagement is genuinely natural, and a part of unsatisfied curiosity to explore and communicate with every aspect in their surroundings. This is the clearest and nicest example of "how to exist in the world", experience or create one's self due to the interaction with the surrounding. The ideal scenario would be if this natural individual motivation to explore and experiment with different ways of interaction with surroundings was not lost. In such case the individual would continue simply naturally in performing PA and their experiencing because of PA themselves, which is an important factor of inner motivation.

Several theories provide explanations for motivation to engage in any activity, especially motivation to PA (Vašíčková, Hřebíčková, & Groffik, 2014). In relation to the concept of physical literacy, there are two theories. I want to mention: the theory of self-determination or self-concept or auto determination (Deci & Ryan, 2012; Slepička, Hošek, & Hátlová, 2011) (self-determination theory = SDT) and the achievement goal theory. According to the self-determination theory by Ryan and Deci (2000), there is motivation to continuum (Table 2).

**Table 2:** *The continuum of motivation according to the self-determination theory (adapted according to Tod, Thatcher, & Rahman, 2012)*

| Amotivation | Extrinsic motivation | | | | Intrinsic motivation |
|---|---|---|---|---|---|
| | *External regulation* | *Introjected regulation* | *Identified regulation* | *Integrated regulation* | |

**Higher level of self-determination**

*Amotivation* means the absence of motivation, i.e. a person does not feel the need to engage in movement, he/she is amotivated.

*Extrinsic motivation* means to engage in an activity because of some external stimulus. There are four types of external motivation according to the theory:

*External regulation* – human behaviour is directed by an external reward or threat.

*Introjected regulation* – human behaviour accepts the result of behaviour, but in fact he/she does not identify with it or does not accept it because of its value.

*Identified regulation* – a person accepts the real value of behaviour and appreciates the rewards this behaviour brings.

*Integrated regulation* – the most internalized form of regulation when the person's behaviour is integrated also into other roles, and is motivated from the outside because of the appreciated reward.

*Intrinsic motivation* means to be motivated and perform an activity (e.g. sport) for the activity itself because it brings happiness, without outer rewards (Tod et al., 2012).

Deci and Ryan (1985) formulated a partial theory of the SDT – cognitive evaluation theory that focuses on the satisfaction of three inherent psychological needs: the need for competence, harmony and autonomy. Deci and Ryan (1994) argue that people are in general motivated if others accept them and support them in their social surroundings to effective functioning in this surroundings (competence) and to a feeling of personal initiation and own will in what they do (autonomy). Internal motivation, performance and cognitive development are maximised in a social context that provides people with opportunities to satisfy these basic needs.

All events that influence the perception of competency of individuals and feelings of self-determination will also have the influence on the level of internal motivation. Intrinsic motivation is considered as the primary source of energy for human behaviour and its presence facilitates the adherence to a certain behavioural pattern. The variety and presence of recognition and appreciation from the surroundings i.e. from the outside, has a very strong impact on the decision to continue in a given activity. Alderman, Beighle and Pangrazi (2006) discuss strategies for the development of intrinsic motivation in PE. They are among them:

a) Offering pupils freedom in decision making
b) Modification of skills and activities and allowing the pupils to modify activities themselves
c) Provide each pupil with an adequately difficult task.

Apart from the development of intrinsic motivation, the authors recommend to focus on creating environment facilitating masterful performance of a skill and on widening the physical competencies of each individual.

In relation to the latter, the authors recommend these strategies:

- Sufficient time space,
- Providing positive feedback about the course of physical learning,
- The emphasis on personal improvement,
- Fast shift between groups (groups arranged according to performance not according to relations),
- Obtaining pupils' consent with performing an exercise in front of and for other class mates (not to stress one with orders).

The differences in achieving success are discussed among the most important topics in sport psychology that explain people's motivation and behaviour. According to the achievement goal theory (Nicholls, 1984; Roberts, 1993; Tod et al., 2012), there are three factors influencing motivation: goal achievement, perceived ability and behaviour leading to success. Individual meaning of success and failure and their interaction with individual perception of competence, self-respect and own abilities are key factors in this theory. Sport psychologists assume that successful achievement of goals happens thanks to internal motivation and positively influences the enjoyment from and interest in sport and in PA (Duda, Chi, Newton, Walling, & Catley, 1995). In children, the tendency to achieve success is developed in three stages: autonomous competent phase (which appears in children aged 4 years, when the child focuses on testing oneself and on managing or directing one's closest surroundings), socially comparable phases (which starts approximately at the age of 5, when the child compares his or her performance to others) and integration phase (which is described at the moment when ones integrates the socially comparative and autonomous strategies of goal achievement and knows when to adopt own standards) (Scanlan, 1988).

### *Physical literacy and physical competence*

Physical competence is understood as a set of physical abilities and skills that a person has at dispose in order to move economically and with confidence in different physical situations. Physical competence is a much wider term as it includes a range of separate physical skills based on individual's abilities (Bell, 1997). In relation to physical literacy, we understand physical competence as a person's predisposition to be physically literate. We can say that physical literacy is a term standing higher in the hierarchy because next to physical competence, there are also e.g. motivation, confidence, knowledge about PA and others. Physical competence cannot on its own create a single attribute of physical literacy, but it must be accompanied by a positive relation to PA and knowledge of PA and healthy lifestyle. A person needs to be competent and also self-confident in relation to movement and moreover motivated to use his or her own physical dimension. Individual elements of a physical competence can also provide the description of the natural path of each person towards the acquisition of physical literacy. This means the gradual acquisition

of movement since birth to specific physical skills applied in the context of different activities e.g. in sport games or in dance. In relation to this, we can observe four aspects of physical learning that we can identify in terms of an increasing need to use physical capacity (Whitehead, 2010a):

- a simple movement „register" in a small child,
- the development of physical abilities
- the acquisition of physical skills – general and concrete,
- managing specific physical skills that are „created" for activities in a certain environment.

The physical "register" in a small child is based on the competences that a child acquires in the course of first years of life, as he/she grows and develops. They are for example walking, rolling, crawling, grasping things, raising, waving, and clapping. The constant repetition of these movements leads to the creation of physical memory and this „register" is widened by using the movements in different context. The improvement of physical register of a small child is achieved by the acquisition and implementation of a range of physical skills, where there are:

- simple physical abilities – balance, coordination and flexibility,
- combined physical abilities – body posture (requires balance and stability) and skilfulness (the combination of flexibility, balance and coordination and correct timing),
- complex physical abilities – e.g. the ability of peripheral vision applied in physical expression (requires orientation in space, skilfulness, and handiness), which has a great contribution in regular life, e.g. in car driving.

Physical abilities develop from simple to more complex ones, yet in a small child we cannot say which abilities he/she can manage as it is mainly an exploration of a wide and unknown "territory" of possibilities. The development of physical abilities in individual categories does not have exactly stated order or hierarchy.

Another aspect is the development of general at first and later of concrete physical skills. General physical skills that a child acquires can include for example catching or throwing a ball. Concrete physical skills than can be based on the given physical activity in which they are used e.g. catching in a short distance or in running (e.g. handball) or a stroke with the ball with one hand or both hands (e.g. in volleyball).

In the last phase, it is the development of specific physical skills characteristic for a certain specific environment which means that concrete movements are involved into more complex activities such as handball or volleyball, where there are the skills applied (catching or stroke) with regard to the situation and rules. It is therefore application of physical abilities and skills in a more sophisticated technique.

When we have a look at the regular life, then physical abilities and skills are used constantly. For example, walking, running, carrying are everyday activities similarly to writing and using silverware. For example, in employment (e.g. as a waiter, painter or hairdresser, etc.), the person adopts certain physical skills that he/she uses in order to perform one's work and these are based on coordination, flexibility and direction and are improved by regular use. Physical competence, along with other attributes of physical literacy is apparent and has clear value for life regardless of apparent relation to PA.

It is necessary to mention that although physical competencies are common for all, their development is conditioned by the culture an individual is in. Physical literacy should be then based on the mentioned physical register of a small child, the development of all physical abilities into the largest possible scale of general physical abilities in relation to the given culture. On the basis of this, we can then "build" the acquisition of much more complex physical skills. This basic grounding then allows a person to use one's own strong side and to choose such a PA that satisfies ones and suits one's interests. Along with the age, a person changes one's personal interests and physical capacity, and the person can later use one's previous experience and find satisfaction in a different PA. When planning programmes for children and adolescents, we can recommend that the offer is as wide and comprehensive as possible and that the experience is in such a balance so that the person can achieve physical competence and use it in the future. This broad grounding for physical competence is than the basis of physical literacy (Whitehead, 2010b).

### *Physical literacy and environment*

A physically literate person should be able to use one's physical abilities and skills in the interaction with different environments and so that one develops oneself. The broader one's physical competence is, the better he/she is able to react to concrete physical requirements in a given environment. A physically literate person, who perceives one's environment with one's senses, is able to assess all relevant information (e.g. shape, weight, type of surface, speed, movement in others). Upon the assessment of this information, the person intuitively knows how he/she should move in relation to the circumstances of the given environment. The physically literate person then understands and adequately responds with a certain physical reaction to the challenges and opportunities arising in the given environment. This ability to perceive the environment and arising an adequate physical reaction is a result of previous experience. An approximate categorisation of environment is described in Table 3.

A person, who is able to "read" the environment, is able to react adequately with a certain imagination and intelligence. This intelligence is named kinaesthetic intelligence; this means the ability of an individual to act with self-confidence in different environment (Killingbeck, Bowler, Golding, & Sammon, 2007). For example, in a game environment, the person has to react to the position of the ball, opponent, and team mates; one has to anticipate possible game situations stemming from the game and own and opponents' strategy. The person has to have not only spacious vision but one should be able to quickly process the information and react according to the needs e.g. whether to pass the ball to a team mate or walk around a player (in football, rugby, handball or basketball, etc.). In order to react appropriately, the person has to have sufficient stock of possible game variations and then one is able to apply them with confidence in concrete environment. The adequacy of a selected reaction depends on the alert perception of the situation and on the flexibility with which the person is able to newly adapt a certain physical skill to the environment. These abilities develop only on the basis of experience and demonstrate the individual's perspicacity and imagination.

**Table 3:** *Possible categories of the environment with examples from everyday life and physical activities (adopted from Whitehead, 2010b)*

| Nature of the environment | Examples from everyday life | Examples from physical activity settings |
|---|---|---|
| An environment featuring gravitational force alone | Walking, running | Forms of dance, martial arts, climbing |
| An environment featuring gravitational force plus different surfaces, weather or media (such as water) | Walking on slippery ground, or in a high wind, wading through water | Skating, swimming, orienteering |
| An environment with fixed objects | Window cleaning, climbing a tree | Gymnastics, mountaineering, parkour, slalom skiing |
| An environment with heavy but moveable objects | Furniture moving | Weightlifting |
| An environment with portable objects | Carrying a tray or a suitcase, catching a falling plate | Shot put, throwing/catching in netball, softball |
| An environment with instruments that require dexterity | Playing a musical instrument, writing with a pen, driving a car | Darts, juggling |
| An environment including an extension of the arm | Conducting an orchestra, chopping wood | Using a ribbon in rhythmic gymnastics |
| An environment including using an implement as an extension of the arm in relation to a static object | Swatting a fly, cutting bread | Golf, snooker |
| An environment including using an implement in relation to a moving object | Netting a butterfly | Hockey, tennis, batting in baseball, clay pigeon shooting |
| An environment including others, with gravitational force only | Negotiating a busy thoroughfare | Group dance |
| An ever-changing environment including others, using an implement and/or portable object | Active transport in traffic | Basketball, hockey, lacrosse, fencing |
| A highly unpredictable environment often including others | Leaving crowded building in the event of a fire | Sailing, caving |

Self-confidence obtained on the basis of previous experience enables the individual to effectively function in many inconsistent and demanding situations. When managing demanding situations in a new environment, a new physical competence is created that adds to the already existing register of physical skills. If the perceptual observation widens and the register of physical skills broadens, the person is then able to react more effectively and act in newly arising situations.

"Reading" of the environment can be described in two perspectives. Firstly, the person is able to adopt one's own movement to the need of the situation. This reaction can occur both in everyday life and in PA. For example, in regular life, the person is able to react to icy surface on the sidewalk or he/she can carry a cumbersome object. In PA, it means for example an ability to "read" the game in a competition game or in running the river to react adequately to water streams or to the pitfall of the riverbed.

The second aspect actually precedes the first one. "Reading" of and reaction to the environment relate to the way a person moves in the environment without stopping and

thinking. We perform certain movements automatically, because they are a part of our register of skills and we make them without thinking in moments as certain situations occur in the environment. Only in exceptional situations it is necessary to think about the movement, especially when they are to occur in unknown and unexpected situations (strong wind in tennis or walking up the stairs with a broken leg), further in open skills or when the person performs PA in unknown environment. Once the person acquires such experience, it becomes a part of automatically carried out movements.

### *Self-concept, interaction, knowledge and physical literacy*

There are other three attributes of physical literacy. They are self-concept or perception of own's self, the development of smooth self-expression and effective interaction with other people and then just importantly acquisition of new knowledge and details about movement and health (Figure 2). According to the scheme, there is a reciprocal relation and these three attributes can have a positive effect on motivation, self-confidence and physical competence and on the smooth interaction with the environment. For example, the increased self-concept (the awareness of one's self) is reflected in internal motivation and the willingness to accept the challenges, while the smooth interaction with others encourages self-confidence and ability to cooperate in the environment where we perform PA.

Our embodiment is clearly an important aspect of our personality through which we are in the interaction with the surrounding world, and therefore this dimension plays an important role in forming own self-concept and the relation to our self. Basically, only through movement and our embodiment, the person can start to "process" the self-concept. If a person is physically literate, he/she will be prepared to manage physical challenges coming from the surroundings and that brings increase of self-confidence and self-awareness. Sense of self is not decreased with age, but it is more important in the ongoing development and it is primarily based on the feeling we have from our own body and the way our body makes links between us and the world. Therefore, exercise can have a positive influence on mental health and well-being and can contribute to the awareness of our own value (Grohan, 2008). Thus, exercise should be about excitement and happiness rather than about a competitive character. In order to strengthen one's self-concept, it is suitable that exercise is associated with positive experience and effective engagement and improvement that the person can appreciate.

High self-confidence is a part of psychological well-being and it is associated with emotional stability and thus with stronger base for development and learning. Low self-confidence can result in changes of mental state e.g. the occurrence of depressive moods and depression, instability and sadness. The support and increase of self-perception and self-confidence are either directly or indirectly the aim of many supportive therapeutical and educational programmes (Burgess, Grogan, & Burwitz, 2006; Colchico, Zybert, & Basch, 2000; Wilson et al., 2011).

In the contradiction to the concept of physical literacy, there can be the pressure coming from media on the ideal of female beauty (models and misses) and musculature male ideal. If a person perceives this ideal that he/she cannot reach despite a strong effort, one's self-concept can be quite threatened. The public "presentation" of this "unnatural" ideal may be a factor that can actually infer with one's participation in PA. Because of that,

there should be an emphasis put on the acceptance of different variability of shapes and measures of human body in the concept of physical literacy, and further there should be rather less engagement in the aesthetics of embodiment (in how our body is "pretty" in proportions) but more concentration on the functional aspect of the human dimension.

In the interaction with others, a self-confident person expresses verbally and the verbal expression is accompanied with non-verbal gestures. If a person is not secure with oneself (low level of self-confidence) then he/she can, in one's non-verbal expression, make mistakes he/she is not even aware of. Non-verbal expression can be in contradiction to verbal words. Not only that a person can express in a wrong way, but he/she can even wrongly understand other people's gestures, whom he/she communicates with. Therefore, physical literacy is an important concept in the development of one's self-confidence and it reflects also in the communication level of an individual.

In the development of the concept of physical literacy, the knowledge about movement on its own should be developed, i.e. to know the terminology of each postures and positions of the body, movements of limbs, terminology of sport events, but also the knowledge of the meaning of movements as a part of healthy lifestyle, physical fitness and benefits of movement for well-being.

## 2.5 Physical literacy in the course of life

Whitehead and Murdoch (2006) view a person in the course of life in six stages that have certain relations to the development of one's individual physical literacy. These stages are general and approximate and they depend on personal development and do not have necessarily clearly marked limits as it comes to creating and maintenance of physical literacy. Human life is thus divided into approximate basis for opportunities and experience and as a template for mapping the relation between physical literacy and PE.

These stages are (Čechovská & Dobrý, 2010):

- from birth to the age of 4,
- early childhood as a base and the period of school age at elementary school,
- adolescence in the period of schooling,
- adulthood,
- older age (seniors).

In the first period, they are mainly the parents who are responsible for the development of physical literacy in the child, and further family members and people who are in contact with the child most frequently. Since the youngest age, the child expresses through corporeity. The child's facial expression tells the mother about the child's state, which is the most important communication factor after birth to the time the child acquires mother tongue. And then, corporeity is also an essential communication means as it expresses at least symbolically what a certain person thinks. It is reflected also in his/her mimics and gestures, and corporeity thus accompanies spoken word. The environment that should be stimulatory in this period in order to enhance the development of physical literacy is

mainly home, the surrounding of the place one lives in, children's centres or kindergartens or the centres for leisure time activities for these children.

In the period of school age at elementary and secondary schools, the development of physical literacy should occur primarily as an inseparable part of school PA, especially PE lessons, in leisure time then in sport clubs and organisations, or it should be parents who are responsible for the development when the child does not perform an organised sport.

What the child acquires successfully in childhood, he/she can use effectively in adulthood and in older age. Therefore, it is important to acquire such physical skills that can be transferred into later life. If people are physically literate, they learn more easily and faster new skills and PA that present a challenge to them.

Physical literacy in later age can reduce the risk that a person's health state worsens or functional weakening occurs. Health problems in older people often interfere with their engagement in PA e.g. weakened muscles, problems with joints, injuries, long-term illness, etc. but these health problems are often a result of insufficient physically active lifestyle (Sallis & Owen, 1999). It then works as a "vicious circle". Another barrier is the "lack of time", however if we compare PA on weekdays and at weekends, even enough time at weekends does not lead to higher performance of PA (Pelclová, 2014). Moreover, it seems that some seniors have difficulties in understanding "health information" as PA recommendations (Brawley, Rejeski, & King, 2003). Further, we have to keep in mind that this group of people is very heterogeneous therefore the support of PA performance in this group has to be addressed more clearly. Because a different intervention is appropriate for e.g. a 58-year-old woman who is active in her whole life, 68-year-old senior with a sincere illness and who has not engaged in sport for 40 years, for an active 95-year-old senior woman who lives alone and is relatively independent, and for an 80-year-old man with bad health.

It is therefore necessary to constantly stimulate and support PA also in this age, but the support needs to have positive character. This means that negative information will not help such as claims like "If you do not exercise regularly, you then face risk of worsening your health state which can lead to shortening your lifespan, it reduces your ability to maintain your health at an optimal level and influences your well-being." Almond (2010) argues that meaningful PA can contribute to life energy and enable people to "feel" more vitality and dynamics. In the discussion with older people, he concluded three factors that are essential for quality life in seniors. He found that their life would be better if we could:

- talk to anyone regularly,
- leave home more frequently, have where to go, i.e. not to be lonely,
- or they could do something, have some appropriate fulfilment of time.

All these aspects can be given also by PA and the author named these factors as the enrichment of life. If we stress the positive aspects of PA also on this personal base, then the formulation of physically active programmes and interventions will be more effective. Physical literacy is a relevant concept that uses the role of PA as "some" tool accompanying one along his/her "life course".

Physical literacy has a great meaning also for the group of obese, with special needs, for various specific groups (religion, faith, race and culture), but these aspects do not fall into the scope of this work.

### 2.5.1 Physical literacy from the Canadian perspective

Lloyd et al. argue (2010, p. 179) that "physical literacy is a multidimensional and interactive construct that we should be concerned about and should measure". The authors define physical literacy as a construct that describes the essence and goal that quality PE and quality physical activity programme should achieve. It is the essence of the characteristics, attributes, behaviour, conscious, knowledge and understanding in relation to healthy active life, promotion of the possibilities of physical recreation and positive and healthy choice of activities in the course of life. We assume that physical literacy includes four mutually intervening areas (Figure 3): (a) bodily fitness (cardio-respiratory, skeleto-muscle, but also based on physical abilities), (b) basic physical skills (always modified in the dependency on the concrete needs, e.g. age, level of competition, gender), (c) physically active behaviour (objectively measured daily PA), and (d) psychosocial/cognitive factors (conscious, knowledge, and understanding). A really physically literate person should develop competence in these four areas and should be able to apply physical skills in a variety of environments, e.g. on the ground, in water, on ice or in air.

Physical fitness is one of the components of physical literacy and is just as important as basic physical skills, attitudes, knowledge and believes. Physically active behaviour is also important for the general physical development, health and well-being. Therefore, the authors believe that the tendency towards the reduction of physical fitness tests would be a mistake and that concrete testing e.g. in PE lessons (Rubín, Suchomel, & Kupr, 2014) should be always carried out in a broader context not in isolation. Literature shows that basic physical skills are linked to PA (Kantomaa et al., 2011), PA is linked to physical fitness (Physical Activity Guidelines Advisory Committee, 2008) and physical skills are linked to physical fitness (Barnett, van Beurden, Morgan, Brooks, & Beard, 2009). Knowledge and acquaintance are key parts of movement performance at a certain level, participation in PA and physical fitness. Physical education is not only about fitness, but it should

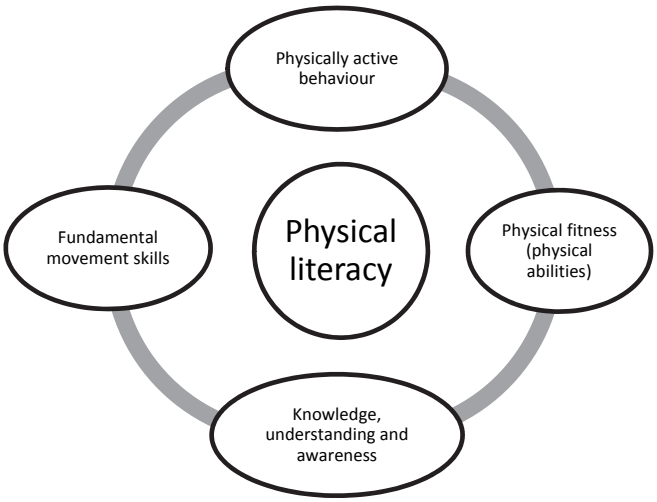



**Fig. 3:** *Scheme of multidimensional approach to physical literacy (adjusted from Lloyd et al., 2010)*

include all these basic parts of physical literacy (physical abilities and skills, PA, fitness and knowledge) as they talk about it in Canada.

In our perspective, we can say that we perceive physical fitness as a means of physical abilities and the triad of physical skills, knowledge and abilities are then associated with physically active behaviour that should be a result of these three components and an additional component of motivation. Further area that Canadian authors did not include into the scheme is motor learning that is an essential part of physical literacy.

Physical literacy aims at developing a child in a complex way in the early stage. It requires more than performing PA, also the fact that a child understands and has the knowledge why PA is important and what benefits it brings to a human, or what risks there are in case of the lack of PA (Haydn-Davies, 2005; Mandigo et al., 2009). In Canada, (Harber & Schleppe, 2010) they define physical literacy as the development of basic physical and sport skills that allow the child to move with security and in a control way in different types of PA, rhythmical (dance) and sport situations. Physical literacy also includes the ability to "read" what is happening around in the environment of PA, and adequately react to depending situations, which is in compliance with the concept by Margaret Whitehead. Important benefits of physical literacy are also seen in the fact that physically literate people moves not only effectively, but also creatively, competently, ethically, and with enthusiasm and with socially responsible manner. A person who is physically literate has also knowledge, abilities, and attitudes to lead own healthy lifestyle and help others to achieve this goal. Benefits of regular PA are enormous for an individual but also the society. Individuals benefit from the improvement of physical fitness, improvement of immunity, strengthening of bones, reduction of the risk of various chronic diseases and improvement of psychological health (Bailey, 2006). When majority of the population will be physically active, we can be witnesses of other social benefits such as e.g. the reduction of crime rate, reduction of the costs for health care, strengthening of academic results, and improvement of community interconnection.

Physical literacy is getting attention not only in Canada, but gradually across the world, but also in the United Nations (Project Play, 2015). One of the results of the effort and activity of people is the foundation of the International Physical Literacy Association – IPLA, http://www.physical-literacy.org.uk/. Health in present children is associated with a high risk due to complications caused by obesity and physical insufficiency due to present modern lifestyle. Therefore, vast and comprehensive assessment of physical literacy is necessary.

#### 2.5.1.1 Strategies for the enhancement of physical literacy

The question of the development of physical literacy is not only a question of the school system, yet a social pressure put also onto other organisations engaged in PA and offering other sport or touristic programmes is necessary for certain population groups (Figure 4).

The start with physical literacy should occur in families, in home setting and the closest surroundings, especially through games. Other area should be school with all the obligatory and optional activities (PE, school sport club or other school activities). It is necessary to involve also teachers whose teaching area is not directly physical education,

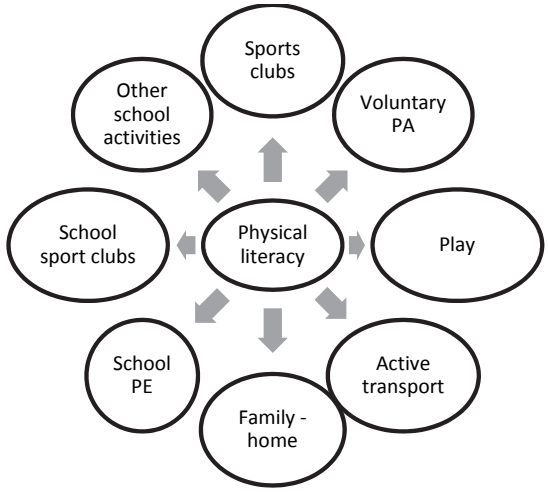



**Fig. 4:** *Physical literacy promotion in each sphere*

as that makes the effect more comprehensive. As Jansa and Kovář (2010) found, teachers of elementary schools can be a good role model for pupils "with their relation to physical activities, but also with other behaviour (non-smoking, little consumption of alcohol) or low obesity" (p. 66).

Further, leisure time PA or PA performed in sport clubs should contribute to physical literacy of an individual.

Physical literacy should be developed also with:

- the increase of opportunities for active play in children's life,
- the increase of knowledge and understanding on the side of teachers of other subject field that physical development is important and meaningful for pupils;
- active use of the recesses at school for PA;
- motivation that is crucial for the development of physical literacy and for the support of the participation in PA in lifelong term;
- the offer of wide scale of PA for young people so that the interest and potential of all is reflected and respected;
- "cancellation" of the obstacles for the participation in PA for certain groups;
- "cancellation" of the myths that PA is aimed only for the talented and is not for people with a handicap or for older population;
- the reduction of strong protective barriers for children in the way they could still move safely and freely.

## 2.5.2 The enhancement of physical literacy in the Czech Republic

The first quote about physical literacy occurred in 2010 in the journal "Tělesná výchova a sport mládeže" [Physical education and sport for youth] (Čechovská & Dobrý, 2010; Šafaříková, 2010) and since then other studies have appeared (Čechovská et al., 2011;

Nováková & Čechovská, 2012; Šimůnková et al., 2014; Šimůnková et al., 2010; Vašíčková, 2011; Vašíčková & Hřibňák, 2013a, 2013b). Discussions about this topic appear both in professional seminars as well as in other areas.

In May 2014, the Committee for education, science, culture and human rights and petitions with the professional support of the Czech Association of Sport for All organized a seminar named "Physical literacy" with the participation of Otto Jelinek, ambassador of Canada in the Czech Republic and a former Canadian minister for fitness and amateur sport. After all the speeches, the debate concluded and was represented with findings in three areas (adopted from the transcript of the Senate of the Czech Republic, 2014).

Area 1: Movement and healthy lifestyle
Key findings:
- Lifestyle is absolutely crucial for the individual's health and fitness. Lifestyle as determining parameter of personal health includes more aspects with adequate and regular PA and rational nutrition are at the forefront.
- The lack of PA in the Czech Republic is urgent public and political issue.
- The development of our civilization especially in the area of transport and communication technologies significantly decreases the need for movement in present population. This lack of movement is not sufficiently compensated.
- In the Czech Republic, physical fitness and physical literacy of the entire population are objectively worsening, dramatically in children and youth. One of the reasons is the long-term wrong orientation of values in citizens and consequently low motivation to carry out PA. High percentage of the population is obese.
- Hypokinesis in adulthood is a result of the lack of the offer of adequate, attractive and available physical activities in childhood. This is reflected in inadequate physical literacy in young and adult population and presents a wide range of health complications on one side and low level of skills on the other side.
- Regular, meaningfully targeted and qualified, directed sport and physical activity that motivate children and youth to movement, at school and outside of school creates favourable conditions and stimuli for positive relation to PA in middle and senior age.
- Regular PA and sport have to primarily enhance healthy lifestyle and social solidarity. It is one of the major integration tools in modern society.

Area 2: Physical literacy and education
- Physical literacy that we can unify with the term physical education is just as important as other types of literacy.
- There is constantly more apparent inadequate level of physical literacy and overall low physical readiness, also apparent in the possibilities in the labour market.
- At school, the number of children who are underdeveloped in motor skills and who cannot compete against children who are physically active and doing performance sport gradually increases.
- Although the group of people with a health handicap represents about one million Czech citizens, not enough attention is paid to this issue in the area of school physical education and leisure time activities of the population.

– Physical literacy forms the basis for healthy lifestyle of an individual, for one's harmonious development, for the widening of the spectrum of physical skills also for the whole engagement in the society.

Area 3: Physical literacy and state
– In the programmes of state support, there is a missing area that could support projects on the enhancement of physical literacy in present population.
– In the Czech Republic, there is a missing system of overall support of the development of physical literacy with the possible application already in the pre-school age education.
– There is disagreement between educational programmes and praxis in terrain.
– The system of school competitions is based on performance and the children who go to competitions usually train in various sport clubs.
– There are missing projects for the engagement of youth who do not carry out sport and are not talented.
– The Czech Republic does not adequately support creation of conditions for the performance of quality physical education and sport that causes lacking behind the developed states of EU.

Some partial conclusions:
1. Increase motivation and interest of citizens of all age groups in lifelong use of various forms of PA with the aim to increase physical literacy and physical fitness.
2. Obligatory and systematic allocation of means from publicly accessible programmes not only at the level of state budget, but also at the level of budgets in regions, towns, municipalities and physical education and sport organisations.
3. To provide state support of education and activities of volunteers in sport in such a way so that motivation of the interested ones to these publicly beneficial activities arises, yet at the same time to determine conditions for their education and qualification.
4. To even social availability of sport for the handicapped to the level of major population and thus to create more adequate conditions for the handicapped apart from other things with the provision of barrier-free sport infrastructure.
5. Clearly defined physical literacy should become the goal of education at school and extra-curricular PE and sport that would stem from a selected and generally accepted concept of PE and sport in the Czech Republic.
6. The content of education in obligatory PE should be differentiated for individual grades of education and should reflect life needs of present children and youth and their future fulfilment in society.
7. The area of education to healthy lifestyle and physical literacy should be incorporated into the system of education of the school directors.
8. To stabilize the salary system for teachers and at the same time to provide a methodology instruction for the school directors on how to confer individual personal remunerations and extra rewards for regular and extra activity contributing to physical literacy of pupils.

Major conclusion: State support should apply to all areas of physical culture, physical education and sport that primarily contribute to healthy lifestyle of the inhabitants. The support should be rooted in the legal system, systemic and stable so as to secure permanent development of conditions for PA and sport of the inhabitants in the Czech Republic.

The project "Physical activity and nutrition" was one of the projects that attempted to apply physical literacy to schools, in particular to the first stage (class 1-5) to 33 engaged pilot elementary schools, in the period 2013–2015 run by associate professor Mužík (Národní ústav pro vzdělávání, 2014). We agree with the quote that "physical education is to… give foundations for the basics of physical literacy in pupils, but the physical needs of a child have to be met by the total physical regime at school and outside of school" (p. 19). The materials published under this project also state six priorities in the area of movement that are the base of optimal physical regime, based on pupils' physical literacy (more in Czech language at http://pav.rvp.cz). The presented results show that there are positive changes due to the programmes in nutrition and pupils' movement and also in nutrition and movement in the family.

### 2.5.3 The relation between physical education and physical literacy

As Whitehead and Murdoch (2006) state that in relation to the definition of physical literacy there exist a linkage between physical literacy and physical education in two important aspects:

1. The development and maintenance of physical literacy is the basic goal of physical education.
2. Physical literacy is a personal attribute of an individual which is of lifelong importance, whereas physical education represents only certain experiences gained only in the course of obligatory school attendance (Čechovská & Dobrý, 2010, p. 3).

Physical education has a key and unique role in the development of physical literacy because PE is compulsory in the Czech Republic and applies to all, and to a certain extent to pupils with special needs. If physical literacy is to be developed and maintained, pupils have to participate in well-planned, structured and directed PE. In the critical and shaping period of school attendance, PE is the only "tool" where pupils can acquire experience essential for the establishment of physical literacy. If educated and aware teachers work on quality PE, then it can contribute to the increase of physical literacy and possibly also to the increase of the PA level. It is a challenge that is to be addressed in all schools to motivate all children and youth so that they acquire and maintain self-confidence and trust in physical abilities. However, this is not always the case as Červinka (2013) mentions in his article about the pupils' attitude to PE.

Teachers in PE have a unique possibility to create such opportunities for pupils so that areas in which they are good and they enjoy can be identified as well as the teachers can help pupils in the areas they do not feel strong. This applies not only to their physical competence, but also to their motivation, self-confidence, knowledge and understanding. This goal can be achieved through the development of physically literate person, who has physical and creative abilities, knowledge and the motivation to be physically active

in his/her life. Avoiding PA is one of a person's options that need to be prevented if we want pupils to become happy and healthy individuals. Therefore, the support of physical literacy in education is essential in order to enhance students' desire, interest, trust and competence to participate in PA in the course of their life. All experience and skills that they acquire in education help them to prepare for the path in adulthood.

On the basis of the scope of knowledge about physical literacy, there are these possible definitions:

**Physical literacy** is a concept that describes the lifelong quality level of a person; it is the ability and effort based on the motivation to apply physical skills, abilities and knowledge practically through physical fitness of an individual that results in physical behaviour contributing to healthy lifestyle and that is applied in everyday regime.

This definition is based on the complexity of the entire area and is aimed for discussion for a spectrum of professionals in this area and for the use in scientific groups. It connects all the attributes and emphasizes the everyday use of movement for healthy lifestyle of a person.

**Physical literacy** is (simply) the ability, confidence, and desire to be physically active in the whole life.

The second definition is simply formulated so that it is comprehensible and used by wide public i.e. also outside of professional areas.

**Physically literate person** is responsible for one's health and has physical abilities, skills and self-confidence to thrive on physical activity performed on lifelong basis in different environments. Such a person acquired different physical abilities through motor learning, knows the advantages of the engagement in various PA and is motivated to participate in PA regularly, is physically fit and appreciates PA and its benefits for healthy lifestyle.

The third definition defines the result of the application of physical literacy in the course of life i.e. a physically literate person.

# 3 RESEARCH AND METHODOLOGY ASSUMPTION OF THE CONCEPT

## 3.1 Motivation to physical activity in physical literacy

An important attribute of physical literacy is to identify major reasons and motives for the performance of primary PA, which is mainly physical or sport activity in leisure time in children, youth and adults.

In our research studies, we applied the validated questionnaire (Appendix 1) translated from English in compliance with an internationally recognized methodology process (Cull et al., 2002) „Motives for Physical Activities Measures – Revised" (MPAM-R) by Ryan, Frederick, Lepes, Rubio and Sheldon (1997) so that we could identify the structure and strength of the motives for PA. This instrument is based on the self-determination theory (Ntoumanis, 2001), where motives for movement associated with own satisfaction, surpassing a challenge and incentive are a sign of the top of self-determination. This change in behaviour is then more consistent and permanent. On the other hand, a person is linked with a low level of self-determination if he/she performs PA only in order to achieve a reward or escape a punishment (Hendl, 2009). The questionnaire contains 30 items which assess the strength of five groups of motives why people engage in PA, sport and exercise. The questioned ones need to consider their primary physical/sport activity and they answer each question in the questionnaire using 7 points of Likert's scale (1 = not true at all to 7 = very true statement). The MPAM-R has five groups of motives that contain five to seven questions (items). They are these groups:

(A) Interest/enjoyment (7 items) means that a person is physically active for mere enjoyment from a certain activity which is interesting, stimulating and nice.
(B) Competence (7 items) is a group of motives when a person is physically active because he/she desires to learn new physical skills, improve in a given activity or accepts new challenges associated with a certain activity.
(C) Appearance (6 items) refers to the fact that a person is physically active so that he/she increases one's physical attractiveness, has well shaped musculature, looks better or achieves or maintains concrete physical weight.
(D) Fitness (5 items) includes questions where there is reference to the effort of an individual to exercise and move to maintain a certain level of physical health and condition and so that he/she feels strong and full of energy.
(E) Social motive (5 items) means that a person participates in PA so that he/she wants to meet new people, or spend time with friends (Woods, Bolton, Graber, & Crull, 2007).

These five factors together explain 66% variation. For our research, we have calculated for the questionnaire the Cronbach alfa 0.80. For each group of motives, intergroup correlation coefficients were calculated Interest = 0.84; Competence = 0.83; Appearance = 0.61; Fitness = 0.81 and Social motive = 0.70. The results for each group of motives are stated

in average values and the highest average value shows which group of motives is at the first place in a certain observed group of respondents.

The MPAM-R is a revised version of a previous and shorter tool (Frederick & Ryan, 1993) that examined only three groups of motives (interest, competence and motives associated with one's own body) using 23 questions on the basis of the division of motives between internal and external. Although there is a clear association between PA and health, the biggest problem is not so much the motivation to start with PA but more the motivation to continue and maintain the chosen PA. Therefore, the authors (Ryan et al., 1997) focused on the question whether the initial motivation to exercise predicts also the following endurance and maintenance of the certain habit to exercise. They found out that it is the area of external motives that is more characteristic for the onset of PA or exercise (because I want to look good and have certain physical fitness). These initial motives however do not have to be sufficient to endure in the activity. The internal motives come here forefront, such as the enjoyment of PA, social interaction and increase of competence that are associated with higher adherence to PA.

It is important to mention in relation to motivation to start with exercise and to maintain it that the reasons to exercise differ depending on the age and therefore it is important to examine different age groups. Also motivation differs according to the type of PA, especially if it is an individual or a group PA (Frederick & Ryan, 1993). Apart from the five groups of motives examined with the MPAM-R questionnaire, there are other factors that influence the individual in one's endurance in a certain PA, e.g. atmosphere in a group, perception of achieved success or the occurrence of an injury. The initial motives can change, for example if somebody starts to exercise to improve or shape one's muscles, after some time the activity can become enjoyable and the person maintains it because of the enjoyable experience in the actual exercise.

## 3.2 Knowledge about health and physical activity

As we had not found in international and Czech literature any methods that in standardized way would test the cognitive sphere, i.e. pupils' and students' knowledge and in the areas related to PA, health and physical fitness, such a test had to be created. Therefore, we have created, validated (Vašíčková, Bláha, Lukavská, & Nykodým, 2010; Vašíčková, Neuls et al., 2009) and standardised a comprehensive test assessing knowledge about the areas of health and PA in our department (Vašíčková, Neuls, & Frömel, 2010).

We view it as necessary that pupils and students have sufficient knowledge about the benefits and risks of regular PA so that they can more easily adopt healthy lifestyle that includes PA, physical exercise and possibly also regular participation in organized sport as it is assumed by the "health belief model" (Hendl, 2009; Strecher & Rosenstock, 1997). The model is based on a person's behaviour in relation to his/her health on the basis of one's perception of four key areas: the sincerity of a possible person's illness, the person's predisposition to a certain illness (heredity, occurrence of the illness in the family), the benefit of performing a certain preventive action (here PA as a positive prevention) and

possible barriers (physical, mental, time and economic) for the performance of preventive action (PA performance).

Our constructed comprehensive test contains 32 questions that are divided into four dimensions (conditional, energetic, nutritional and educational) with eight questions for each (Appendix 2). Each question has four possible answers A, B, C, D ("multiple choices"). Respondents choose always one answer that is according to them the most adequate. First they complete basic data – school, class (or a study programme), sex, name and last name (possibly an identification code), height, weight and the date of the measurement. The group of university students moreover completes information about the study of biology at secondary school (or a similar subject that would include the study of human biology) and whether the person graduated in this subject. The time to complete the test is 20–30 minutes. The test is distributed by a researcher and again collected upon its completion by students. This way the return of the test is 100% (Atkinson, 2012). At the beginning it is important to stress that respondents have to circle always one answer for each question and not to leave out any question so that the test can be included in the analysis. The test is assessed by the number of total points (maximum of 32 points) and in individual dimensions (maximum is 8 points in each dimension) that are transferred into percentage for better information. The standardization took place at secondary schools in 416 male and female students. The reliability of each dimension is identified in the interval of 0.59–0.73. Due to possible misuse of this test, it is not a part of the monography but it is available for research purposes at our department.

Because the area of health and PA is not addressed in an independent subject, the comprehensive test is an overall survey of knowledge in this area. The applied comprehensive test is aimed to determine the state of knowledge and acquaintance of the area of health and PA as a summary of information that the person has about this area in the given moment. The use makes it possible to assess the students' knowledge sphere that includes mainly the area of human biology, nutrition, and knowledge in the area of physical education and sport events. Further, we obtain information necessary for the analysis of adequately measured PA, or possibly for the comparison of the data obtained from the international questionnaire about PA. The test is particular and is aimed for the age of 15 and above, also for a broader population. It was created mainly for the research at the second stage at elementary schools, secondary schools and universities. It is a test assessing the state; it does not therefore evaluate the level of knowledge or whether the education goals were met at the given stage of schooling. Due to the protection of personal data at schools, we do not have access to the pupils' marks that would represent the level of their knowledge. The compiled and distributed test is a way how to obtain certain and comparable information from the pupils (Vašíčková, Chmelík, Frömel, & Neuls, 2009).

## 3.3 Intervention in physical education at school – monitoring and questionnaires

### 3.3.1 Pedometers

Interventions that are associated with the influence of the amount of PA or with PE at school can be divided between short-term and long-term.

In short-term interventions, we usually influence PA in PE lessons e.g. using monitoring devices or different approaches to teaching, etc. In long-term interventions we attempt to monitor PA using devices for a longer period of time more than one day and to estimate the immediate effects or effect with a time delay, and also using information and record booklets we attempt to provide necessary information about the role of PA, right nutrition, and recommendations for PA, etc.

For the interventions applied in this work, we used mainly the Digi-Walker SW-700 pedometers as the monitoring devices (Yamax Co., Yasama Corp., Tokyo, Japan), that are useful as a means for the modification of physical behaviour (De Vries, Bakker, Hopman-Rock, Hirasing, & Van Mechelen, 2006). Pedometers are described as devices that are valid and quite adequate due to low costs to monitor especially large groups of respondents (Cox, Schofield, Greasley, & Kolt, 2006). The used pedometers are well controllable, have display which is easily legible and informs the user about the immediate value.

Pedometers show changes in vertical oscillation of the measured body above the edge of pelvis bone. If the vertical oscillation is higher than the threshold of sensitivity of the device (0.35 g in pedometers of the line Yamax Digi-Walker), we calculate it as 1 "count" with which we work as with a step or a skip. Pedometers thus express the total number of "counts" as steps, skips and changes of body positions (Vincent & Pangrazi, 2002). Apart from "counts" that are often used instead of steps, pedometers can calculate the values also in the distance covers (expressed in kilometres) or in caloric expenditure (expressed in kilocalories). Pedometers do not measure PAs that are not locomotive e.g. cycling or in-line skating (Cuddihy, Pangrazi, & Tomson, 2005) and also they are not waterproof, which limits them in the activities performed in water environment (Loucaides, Chedzoy, & Bennett, 2003). Pedometers are less sensitive to changes of PA intensity and less exact for measurement of people that move slowly and insecurely (Crouter, Schneider, Karabulut, & Bassett, 2003), and also for highly obese probands because the pedometer can be improperly placed (Cuddihy et al., 2005).

Before measurement, the devices went through standard calibration (Vašíčková, Groffik, Frömel, Chmelík, & Wasowicz, 2013). Participants were informed about how to wear the device and use it. If it was a short term monitoring, the researcher resetted the device before the measurement and the participants recorded the number of "counts" into record sheets. In case of long-term monitoring, participants inserted the information on their weight and the length of their step into the device. At the end of the day they recorded the number of the "counts" into the record sheets and they could read how many kilometres they walked and how much energy they spent. Later they resetted the pedometer, and in the morning they started from a null again.

### 3.3.2 Questionnaires for the diagnostics of physical education lessons

Standardized questionnaires – Questionnaire (pupil's attitude towards the physical education lesson) (Frömel, El Ansari, & Vašíčková, 2009; Frömel, Novosad, & Svozil, 1999; Frömel, Vasendova, & Krapkova, 2000; Frömel, Vasendova, Stratton, & Pangrazi, 2002; Frömel et al., 2014) and Questionnaire (student teacher's attitude towards the physical education lesson) (university students who prepare for the profession of a teacher and who carry out obligatory internship at elementary and secondary schools) were applied in the intervention programmes and to describe the relation to physical education lessons (PELs) (Appendix 5).

The Questionnaire (pupil's attitude towards the physical education lesson) (Appendix 3) analyses the pupils' relations to the carried out physical education lesson (PEL) in the perspective of several important factors. It contains 24 dichotomous questions which pupils answer YES/NO. These questions are rated according to their content into six basic dimensions (cognitive, emotional, health, social, attitudinal, and creative) and one supplementary dimension (the pupil's role – questions no. 2, 4, 6. 12, 16, 18, 19. and 22) (Appendix 4). We assess the answers from the questionnaire with positive points. As positive we consider the answer YES to the questions apart from the questions no. 10, 11, 17, 18, and 23 which are formulated in a way that NO answer is considered as positive. For the whole group of respondents, we count the sum of positive points to questions and a percentage proportion of positive points in questions in relation to the maximal possible number of positive points (i.e. respondents in the group). Further, we calculate average assessment according to dimensions, in a way that we add up positive points from all respondents in each dimension and divide it with the number of respondents. Next, we calculate percentage representation of positive points in each dimension in relation to maximal possible number of points for each dimension. Maximal number of points for the basic dimensions is 4 and for the additional dimensions, it is 8 positive points.

The questionnaire is anonymous. Pupils complete the name of the school, class, gender, date and weight and height in the heading. Since 2009, they also answer questions on the level of sport physical fitness in comparison to other classmates and questions on the popularity of the subject. Since 2012, the information on the number of years spent at school and number of steps (estimated using the pedometer) have been collected for research purposes.

The evaluation of the questionnaire is done using tailored software "Dotaznik 2.0" (Chytil, 2002), into which we enter each questionnaire separately including the heading and the data are then exported into the MS Excel and further processed according to concrete requirements and needs.

Apart from the questionnaire for a pupil, we applied also the Questionnaire for student teachers to express their attitude toward a PEL (Appendix 5). The number of questions (rated in the same dimensions), their order and their content is almost the same; questionnaire differs in the formulation of some questions, when we ask the teacher on his/her impression of leading the entire group. The questionnaire is assessed using positive points. As positive, we consider YES answer to each question, and with questions number 9, 10, 11, 17 and 18 which are formulated in a way so that NO answer was considered as positive.

## 3.4 Physical activity and the level of education of adult inhabitants in the Czech Republic

The standardised International Physical Activity Questionnaire (IPAQ) was applied in studies that describe the amount and intensity of PA in different population groups, both the short and long version (Craig et al., 2003) (Appendix 6 and Appendix 7). The long version was applied also in the population of school youth aged 15–16 years, especially to verify the effect of the intervention as a pre-test and post-test. To both the versions, a standardised process was applied with the translation from English that is required for scientific purpose (Cull et al., 2002). The short and long version of the IPAQ are used as an assessment instrument in some intervention studies, however we have to consider the range of the application and the types of activities assessed by the questionanire. The use for the assessment of intervention studies carried out in smaller groups is not recommended.

The short version of the IPAQ questionnaire was created mainly for the purpose of the monitoring of PA level in adult population. The questionnaire was developed and tested for the application in the group of adults (15–69 years old) and without other adjustments, it is not recommended to apply for other age groups outside this range of population. The IPAQ "short" (short version) estimates the amount of PA that an individual carried out in the previous week. It asks about specific types of monitored activities as walking, moderate PA and vigorous PA, but also it asks about sitting on working days and at weekends. Individual items in the short version of the IPAQ are structured in a way so as to provide independent score for walking, moderate activities and vigorous activities, as well as total combined score describing the total level of PA. In order to calculate the total score, it is necessary to add the time of duration (in minutes) and frequency (days) of individual activities (walking, moderate PA and vigorous PA).

The IPAQ "long" (long version) estimates the amount of PA that an individual carried out the previous week more in detail, in four monitored areas: activities at work, at school, activities in transitions (transport), in household and in the garden, and leisure time PA. Further, it estimates the intensity of PA in four areas: vigorous PA (≥ 6 MET) (Bauman et al., 2009), moderate PA (3.5–6 MET) and walking (3.3 MET). The data that an individual enters are in the values from 10 minutes to 1 day. Further, the respondents record the number of days on which they carried out the PA. Individual items in the long version of the IPAQ are structured in a way so as to provide independent result for walking, moderate PA and vigorous PA in each monitored area: work (employment and school), transport, housework (household activities and care about the family) and leisure time PA. In order to calculate the total score, we have to add up the time of duration (in minutes) and the frequency (days) of individual activities (walking, moderate PA, vigorous PA) in all monitored areas. The results specific for individual monitored areas (sum of walking, moderate and vigorous physical activities in the certain areas) can be also calculated for individual activities (e.g. the sum of values for walking, transitions, in household and in leisure time).

In both IPAQ questionnaires we can obtain both categorical and continual indicators of PA. Continual indicators are however used more in scientific studies due to their use for better comparison; in case of the categorical variables, population is assessed according to

PA as low, moderate and vigorous category. Data meant as continual data are transferred into MET-minutes when each type of activity is linked with a value in METs according to its energy intensity (walking 3.3 METs; moderate PA 4.0 METs; vigorous PA 6.0 METs; riding a bicycle 6.0 METs; vigorous PA around the house 5.5 METs; moderate PA around the house 4.0 METs; moderate PA in house 3.0 METs) and the amount of PA is calculated. MET-minutes are calculated by multiplying MET score and the time spent for the activity (in minutes). The result in MET-minutes is relevant for a person with the weight of 60 kilograms. In the studies there are often used MET-minutes/week (more frequent and recommended) or MET-minutes/day.

Individual values are always checked according to the protocol „Guidelines for data processing and analysis of the International Physical Activity Questionnaire" (The IPAQ group, 2013) and standard methods of data files clearing have to be carried out. Using different procedures and rules could lead to a variety of data and to the reduction of their comparability. In the data clearing process, all the stated time has to be transferred into minutes, and the time spent with the activities should be stated in time per a day. If data on time and days are not stated, such questionnaires have to be left out of analysis. Limit values to exclude above values were stated for 360 minutes per day (total time spent with all activities) when the person can perform the activities (we calculate 8 hours of sleep). Questionnaires with higher values should be excluded. The number of days can be stated as 0–7 or 8 or 9 (replacing the value "I don't know" or the information is not stated), higher values are not allowed and thus mean the questionnaire has to be excluded. Minimal value for the duration of an activity is stated for 10 minutes, and in case there is stated less than 10 minutes, the data has to be recoded. Further, the protocol mentions a rule for decreasing/shortening of values, which is used to normalise the distribution of the level of activity that are in vast or national data files biased.

Apart from the identification of various types and kinds of PA, the questionnaires contain questions on demography (they are more detailed and there are more of them in the long version). The characteristics important for our analysis were: gender (male, female), age (26–34 years, 35–44 years, 45–54 years, 55–69 years), achieved education (less than 9 years at school = elementary education, 10–13 years at school = secondary education, more than 14 years at school = university education), BMI (less than 25 = normal, more than 25 = overweight), the factor of smoking (smoker, non-smoker). Place of living was another characteristic (place with more than 100 thousand of inhabitants=metropolis; place with 30–100 thousand of inhabitants = town; place with 1,000– 29,999 inhabitants = small town; less than 1,000 inhabitants = village).

Further, we identified whether a person lives alone, with a partner or in a family with children, whether owns a dog (has a dog, does not have a dog) and whether he/she participates in organised PA in leisure time. These data were key elements for the identification of the relation between education, sociodemographic characteristics, and level of PA in adult population. The amount of performed PA is a part of physical literacy and a sample and data can be obtained in adult population mainly using the questionnaire.

According to Craig et al. (2003), the IPAQ long is a reliable version and Spearman coefficient was estimated at 0.8. The IPAQ questionnaire long version is for our research purpose distributed independently or as a part of the ANEWS questionnaire (Abbreviated Neighbourhood Walkability Scale) (Mitáš & Frömel, 2013).

The most frequent problems associated with a questionnaire survey are in low return if the questionnaire is distributed via mail or e-mail or is not completed while the researcher is not present "face to face". The questionnaire includes questions that a person has to understand and understand what the researcher asks about. Often a change of words or another meaning of word expression can cause misunderstanding and wrong answer. When questionnaires are handed in, the other complications are missing answers to questions (Atkinson, 2012). If there are 50% of the data missing, the solution is to substitute missing data with the average value or to exclude the questionnaire from the analysis.

## 3.5 Statistical evaluation of the data

MS Access databases were used to process the data, into which the paper versions of completed questionnaires are entered manually. From the database or the INDARES.COM (Křen et al., 2007) application, the results are exported into MS Excel and if necessary adjusted further for following export into the statistical software STATISTICA CZ version 9.0 or SPSS in. 22.0 (IBM Corp., 2013). The basic statistical parameters were calculated in these programmes (frequency, mean [marked in tables as *M*], median, standard deviation [*SD*], percentage calculations) and for the estimation of differences parametric (ANOVA) and non-parametric tests were used: Mann-Whitney U test for two independent samples, Kruskal-Wallis test for more independent samples, Wilcoxon test for dependent measures, for which there are differences interpreted in tables such as z-score. Data from both questionnaires (pre and post) were evaluated in the intervention in individual domains of PA. Regarding gender, we then compared the found values before intervention (pre-test) and after intervention (post-test) using the pair t-test for repeated measurements.

The correlations dependencies were estimated using Pearson or Spearman correlation coefficient depending on the data character (Chráska, 2007). Logical significance was confirmed by the "effect size" coefficient according to the used statistics (coefficients $d$, $\omega^2$, $\eta^2$) (Cohen, 1988; Cortina & Nouri, 2000; Morse, 1999; Sigmundová & Sigmund, 2012). The level of significance was chosen in relation to research tools and the amount of obtained data ($p < 0.05$ and/or $p < 0.01$, possibly $p < 0.001$).

Logistic regression was used to estimate the ratio of possibilities that a certain phenomenon occurs in dependent variable that was coded as 0 (the phenomenon does not occur) and 1 (the phenomenon occurs) (e.g. positive evaluation of PEL, meeting of "health promotion" recommendations). The division of the variable into two groups was determined on the basis of median. To determine the parameters, independent variables were chosen afterwards and coded most frequently into two categories. We used the ENTER method for the analysis which describes the chances of all independent variables.

Linear regression was used to estimate what influences the number of steps made in a PEL (dependent variable) separately for boys and girls. The equation is then changed with independent variables such as the type of PEL in relation to the intensity of load (habitual vs. higher load) and type of PEL in relation to the game and non-game content and the actual content of PEL.

# 4 PHYSICAL LITERACY IN RESEARCH RESULTS

## 4.1 The awareness of physical literacy

In order to promote and enhance the development of physical literacy, it is essential to find out what awareness there is about this concept among pupils and their teachers. Physical literacy cannot be enhanced unless there are well informed professionals for physical education. If we want to enhance physical literacy well in pupils and students and their teachers, at first we have to find out what knowledge prospective PE teachers i.e. present students of the bachelor programme "Physical education and sport" have about healthy lifestyle and the role of PA. The results of this study are a part of one subchapter (subchapter 4.3.2, p. 59).

We had to organize a pilot study (Hřibňák, 2013) in teachers and pupils in selected elementary and secondary schools in Southern Moravian region for the purpose of practical implementation of the physical literacy concept. The research sample was formed by 99 respondents, 12 teachers (7 males and 5 females) and 87 pupils (49 boys and 38 girls). The age of respondents was not essential for the survey, the age spectrum included pupils of the second level of elementary school, but students of secondary school were also represented. Due to a limited number of respondents, the analysis in relation to gender and the level of school were not carried out (elementary school vs. secondary school).

This study included a compilation of a survey for pupils (Appendix 8) and for teachers (Appendix 9) which included general questions focused on the estimation of the state of knowledge about the concept of physical literacy. If a disagreement between the pupils' assumption and the generally recognized definition of physical literacy is found, we can focus on its elimination. Moreover, if we want to enhance the development of physical literacy in pupils, we have to identify what awareness about this concept may have those who are key persons in the enhancement of physical literacy, i.e. PE teachers (Whitehead, 2010b).

The evaluation of the survey was based on the content analysis of answers; a categorisation of data according to the most frequent occurrence of similar terms in answers and a following percentage evaluation and graphic depiction. As there is not homogeneity of the terms in Czech scientific groups, we did not attempt to unify the terms, but we state the quotations of individual answers in the text in italics. We do not mention the answers to all questions, but only the most relevant.

### 4.1.1 Physical literacy in the pupils' perspective

According to Balyi and Stafford (2005), general physical literacy consists of elementary physical competencies and sport skills that form the basis of every sport event. At the same time, we understand conscious control of the body, motivation, and confidence in own physical abilities under the term and at the same time one's readiness to physical

movement and sport skills (Šimůnková et al., 2010). We were interested in what the pupils imagine under the term physical literacy and what a physically educated person is like. As motivation is linked with physical literacy (Vašíčková, Hřebíčková et al., 2014), we were interested in what motivates pupils in PELs. Further, we asked whether pupils know how to increase PA outside of PE at school and whether they know also some modern technologies in relation to PA. Wishes and preferences of pupils in the relation to PA could appear in their answers – what activities the pupils would like to try in PE, which can be considered a feedback for PE teachers. At the end, we were interested in what contribution PA performance can have for each (whether pupils know about PA benefits).

The answers of most respondents to the first questions were associated with **"human movement"** (Figure 5). Among the answers that this term covered were for example "*how you move physically", "know how to move", "how is someone physically capable", "what a person manages physically with his/her body", "how you are capable in movement and sport", "I haven't heard about it, but I would say, it applies to things how we can manage various movement activities*".

The second most frequent term was **"practising sport"** (e.g. "*the knowledge of basic sports", "know how to sport", "skills in the area of sport", "that I have engaged in sport for a long time*"). **"Basic physical skills"** was the third most frequent term (e.g. "*basic things such as running", "running, jumping, throw", "the ability to perform physical exercise, e.g. climbing the rope, jumping over vaulting-buck", "the ability to perform classical physical activities necessary for life*").

The answers and the picture show that almost most answers were true and that the individual stated activities are ranked under the concept of physical literacy. Only PE teacher (in 2% of answers) is not ranked under the concept of physical literacy. A complex view is missing, but in case of pupils and students at elementary and secondary school we do not expect it a priori. What we are missing here out of the concept are the motivation

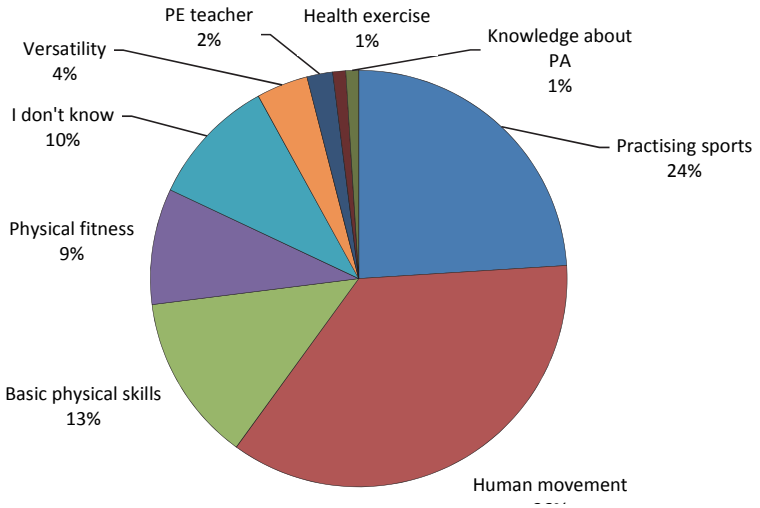



**Fig. 5:** *What do you imagine when you hear "physical literacy"?*

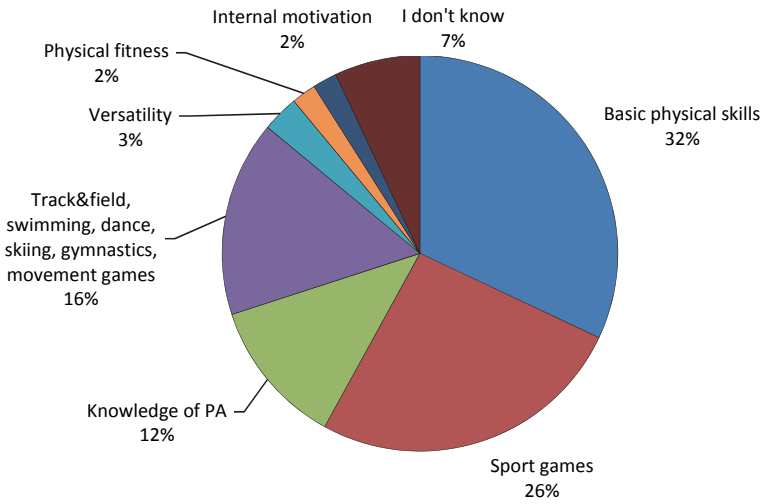



**Fig. 6:** *What do you think you should know/do to be physically literate?*

and knowledge that should not be missing in a physically literate person. We view it as an opportunity for the work of teachers not only in PE, but also in the broader area of PA in general.

The answers of most pupils to the second question (Figure 6) were most frequently associated with **"basic physical skills"** among which pupils stated e.g. running, walking, jumping, throwing, climbing, roll, squat, press-up, handstand, etc. The second most frequent term was **"sport games"** (e.g. *ball games – volleyball, football, floorball, basketball, further, "I should know how to sport", "know and can play ball games" or "know possibly all sports"*) and the third term was **"knowledge of physical activity"** (the most frequently stated *"rules of sport and movement games", "knowledge of movement"* for better specification). Concrete sports were summarized into one indicator.

These answers are closer to the definition of physical literacy, because pupils already state knowledge about sport and movement and they also state to a lesser extent, internal motivation and physical fitness.

The third question focused on the aspect of motivation, when we were in particular interested in what motivates pupils in PE lessons. There was a wider spectrum of answers that were difficult to unify therefore we state all of them (Figure 7).

The most frequently mentioned term was **"interest/enjoyment"** when pupils usually stated fun, mental well-being, relax or rest from learning. An interesting answer was *"I enjoy it; I don't need motivation"*. The second most frequently stated answer was **"competition (victory)"** (they stated "*winning over a classmate*"). The third was "**increase of physical fitness"** and the fourth category (**external appearance/look**) was mainly stated by girls when the girls' interest in figure shaping and weight maintenance is apparent. *("I want to achieve a better figure and that is why in PE lesson I do my best to help it.").*

The answer to the fourth question "How would you increase physical activity not only in physical education?" was most frequently "**better availability"** (49%), when pupils mentioned the need for a better offer of clubs for physical activity, better availability

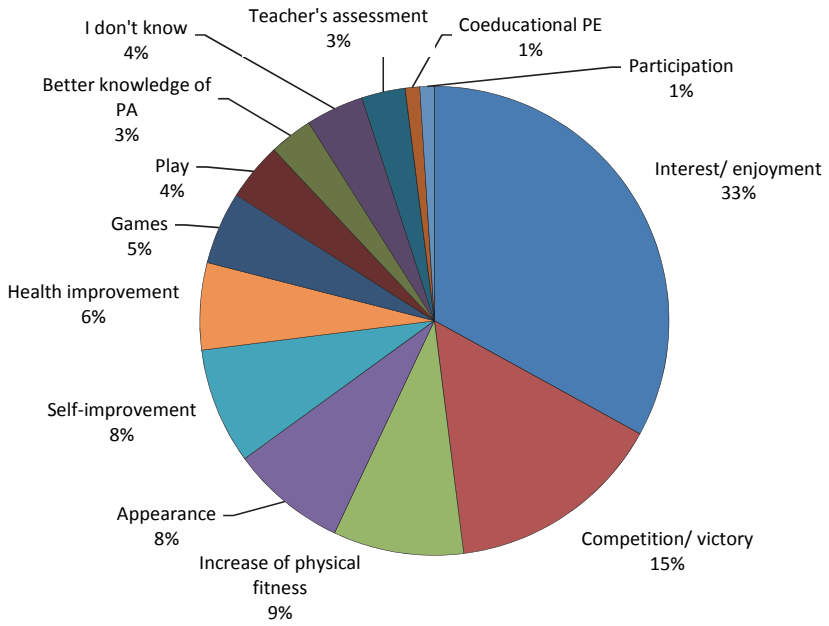



**Fig. 7:** *What motivates you in PE lessons?*

of sport equipment in corridors and gymnasiums at school, trips (cycling trips), hikes, recognition trips, the possibility to go outdoors in recess (PE outdoor), sport events (sport day) and discounts for students. The second most frequent answer was "**own initiative**" (22%) when there was stated "*I think there are enough possibilities, one just has to want*". Other responses were represented with less than 7%.

The fifth question concerning the knowledge of computer games and game consoles was answered only by 19% of pupils that they do not know anything from it. Among the positive answers, there were the games consoles Nintendo Wii (28%) and X-box 360 Kinect (17%).

The sixth question attempted to find out which physical activities the pupils would like to try in PELs (Figure 8). The answers can be interesting to teachers and for changes in the plan of topics or directly in the school educational programme.

The most frequent term mentioned in question 6 was **"sport games",** when pupils mentioned volleyball, basketball, netball played with ball kicked across, floorball, squash, hockey, and softball. The answers are likely based on the popularity of these sports that are the content of theme plans in PE. The second most frequently mentioned activities were "conditioning workout" (stated exclusively by girls, e.g. spinning, alpinning, Pilates and jumping) and **martial arts** (stated exclusively by boys, e.g. self-defence, or box). The category of **"others"** includes pétanque, swimming (because this PA appeared in less than 2% cases), coeducational PE or the answer "*I am satisfied*".

The last question elicited whether students know the benefits and positives of PA (Figure 9). The most frequent term was **"the increase of physical fitness"** (e.g. *better condition = higher self-confidence = good feeling*). The second most frequent term was

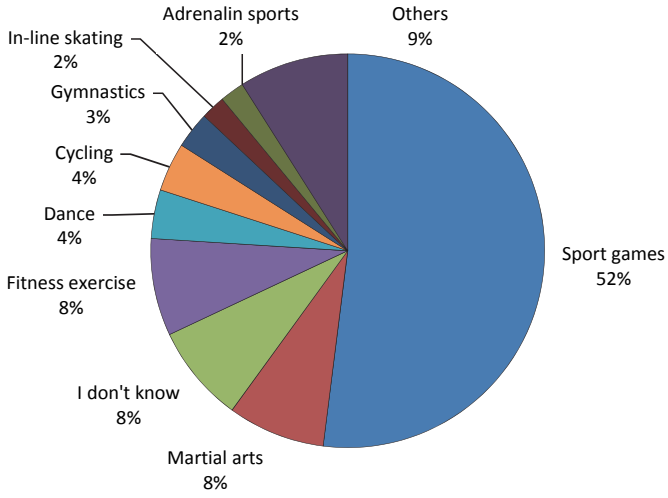



**Fig. 8:** *Which physical activities would you like to try in PEL?*

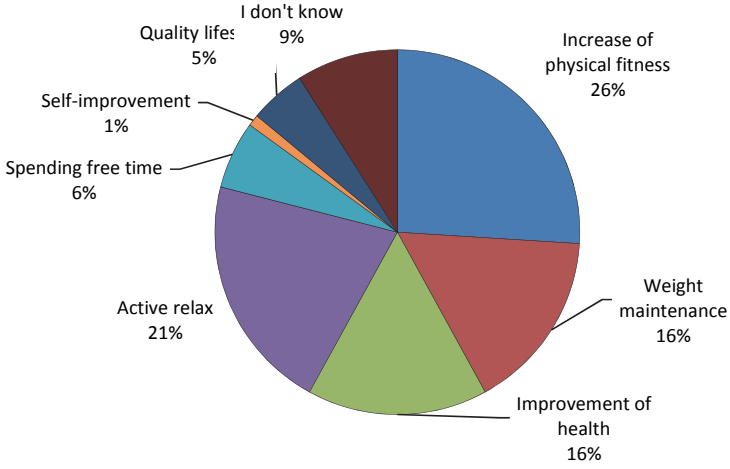



**Fig. 9:** *Do you know what benefits physical activity can bring to you?*

**"active relax"** when pupils stated *"let off steam", "better mood", "better mental state"* or *"relieve of stress"*. **"Improvement of health"** and **"weight maintenance"** are the third most frequent terms, while it is mostly girls who incline to these terms i.e. the influence of PA on health, appearance and weight maintenance. *"Better mood, more energy, body strengthening and enjoyment out of that I do something for myself"*. It is an alarming finding that 9% of pupils, especially at elementary school do not know what positives PA can have for them. Here, teachers should focus also on the general awareness and not only on the performed PA.

### 4.1.2 Physical literacy in the PE teachers' perspective

The first two questions were the same for teachers as in the questionnaire for pupils. The reason was the novelty of the concept in Czech conditions. The other questions concerned the application of this concept into the PE curricula, the increase of the awareness of physical literacy among parents, pupils and other teachers and the possibilities of the implementation of physical literacy into praxis and at a certain school. The last questions map the vision to enhance the physical literacy not only in teaching praxis, but also its implementation into policy strategic documents.

Under the term physical literacy, teachers most frequently imagine **"basic physical skills**", as second one, they mention **"physical abilities/fitness**", and they also remembered to mention **"theoretical knowledge"** and **"internal motivation"** (Figure 10). The statements show that PE teachers understand a sum of basic physical skills and abilities under the term that are applicable in activities of everyday life (Vašíčková & Hřibňák, 2013a).

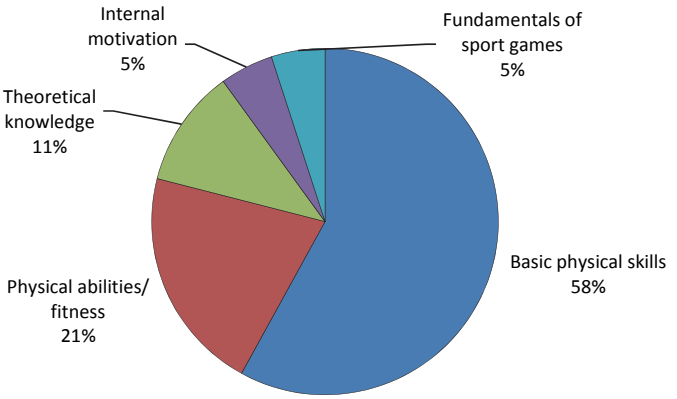



**Fig. 10:** *What do you image when you hear „physical literacy" term?*

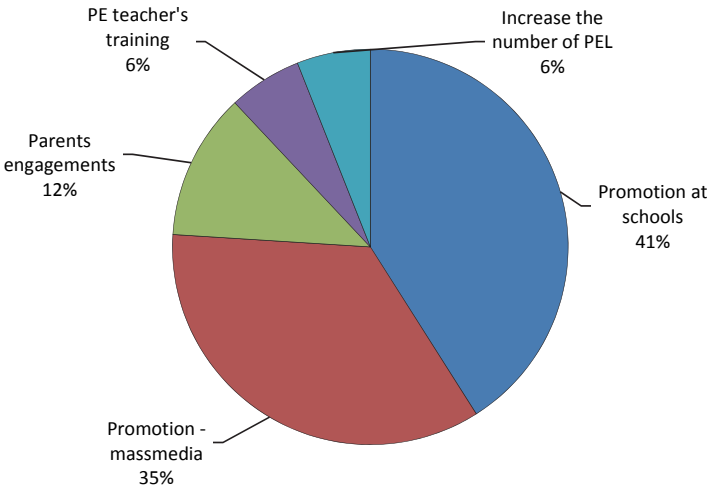



**Fig. 11:** *How would you increase awareness of physical literacy (among parents, pupils, and teachers)?*

In the answers to the second question "What do you imagine a physically literate (educated) person to be like?", there were most frequently **"basic physical skills"** (50%) as walking, running, climbing, swimming, riding a bicycle, skiing. The second most frequent answer was **"basic theoretical knowledge"** (27%) that was not specified more in detail in the answers, however we can read the emphasis on the reasons why they perform PA. The third most frequent answer was **"physical abilities/fitness"** (18%) and then **"internal motivation"** (5%).

Majority of addressed PE teachers (92%) thought that the physical literacy concept could be applied into the curricula of the subject of physical education provided that the concept is well supported (question no. 3) which means that this aspect appears in particular educational framework programmes.

The answers to the fourth question were aimed for the teachers to express their opinions on the increase of awareness of physical literacy (Figure 11).

Under the term "**promotion at schools"** was meant "*widening of the offer of clubs for physical activities", "sport events and days", "tournaments", "theoretical lectures"*. In case of **promotion** using **mass media**, teachers stated *"internet pages", "TV programmes", "discussions with professionals". "The most influential is the role of mass media; without their support, the lector seems to the pupils as an 'alien'." "I miss a TV programme that would be aimed for this topic and that would promote physical literacy in the same way as for example health nutrition is spoken about."*

The fifth question dealt with whether teachers knew what way they would implement physical literacy into praxis (Figure 12). The distribution here was more even, most frequently they would include a **theory part** in physical education lesson that would discuss motivation to movement and its role for a human.

As **better accessility**, we understand here better availability of sport facilities with appropriate prices and better support of leisure time activities and sport on the side of the state (founding, state medical campaign to enhance PA, organisation of sport and physical events). Moreover, there is the request on the specialisation of PE teachers already at the

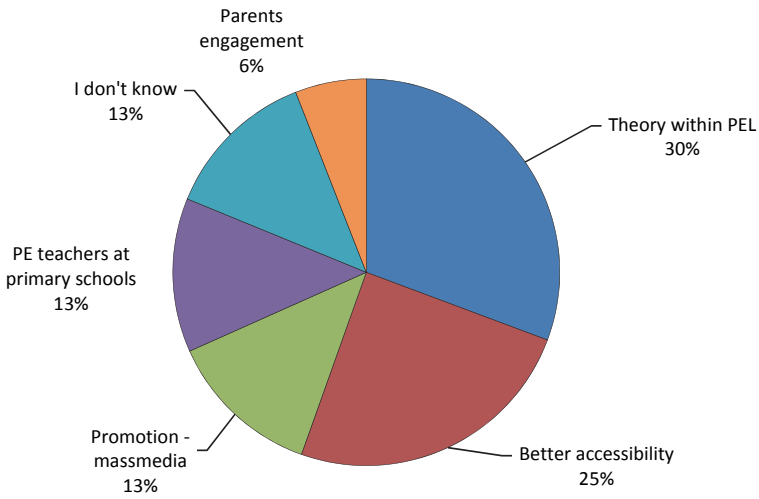



**Fig. 12:** *How would you implement physical literacy into praxis?*

first stage of elementary school, either as a part of their qualification or with the possibility of cooperation with teachers from the second stage of the school.

Teachers would be able to develop physical literacy if there was a wider offer of physical activity clubs (focus on more modern trends), physical activities (sport days, schools and courses) and if other teachers included pauses with physical activities into lessons. These arguments are stated by 44% addressed teachers. Further, PE teachers state that two PELs are not enough for the development of physical literacy. Majority of PE teachers (58%) would welcome further education concerning the overall concept of physical literacy.

It is apparent that without enough promotion and education of PE teachers also in their pre-gradual preparation (Vašíčková & Hřibňák, 2013a), it is not possible to enhance and promote physical literacy. As a primary condition, we consider the concept is adopted at the top levels and is politically accepted and supported. Further, it can be incorporated into educational framework programmes and afterwards included in detail in school educational programmes.

## 4.2 Motivation to primary physical activity in the concept of physical literacy

Motivation is a key factor in physical literacy and thus in the PA performance. Since often there is a considerable decline in adolescents and mainly girls in physical activities, it is essential to explore factors that can influence the probability that adolescents stay physically active.

PE, an obligatory subject at elementary and secondary schools, is the source of positive or negative attitude to PA, which pupils take on further into their life and that influences their behaviour and lifestyle in adulthood. Some studies show that there are factors that discourage girls from PA for example competitive team sports when girls do not feel competent enough or the performance of PA in front of the class, the impossibility to choose the activity or the lack of time to practise a skill (Pfaeffli & Gibbons, 2010).

In order to identify the limits that there are for youth that impede their participation in PA, we can apply e.g. the "leisure constraint" theory (Hinch, Jackson, Hudson, & Walker, 2005; Samdahl & Jekubovich, 1997) which discusses leisure time and activities that we perform in it, but it especially studies and attempts to comprehend the barriers that impede the performance of activities in leisure time. These activities are different but PA belongs among them. The leisure constraints theory is used to explain changing trends in the preference of activities performed in leisure time and in the course of years and in order to understand the changes and experiences in the way leisure time is spent by different population groups. This theory studies especially three kinds of constraints in leisure time activities: intrapersonal (that include e.g. anxiety, perception of own abilities, convenience of a certain activity, and the shaping desire of an individual to participate in or prefer a certain activity in the leisure time); interpersonal (they are social relations that impede the activity performance, for example not to have anyone else to carry out this activity with) and structural (e.g. lack of time or finances, unavailability or inconvenience of the facility) (Crane & Temple, 2015). In order to participate in PA, it is important that these

constraints are at a limited level. The leisure constraints theory presents, however, only one possible approach to the study of leisure time activities, because next to barriers, we have to explore also motives, satisfaction, benefits that a certain activity brings (Jackson, Crawford, & Godbey, 1993). Moreover, a choice of leisure time activity is influenced by other factors, e.g. values, advantages/results, opportunities, and the life situation of each individual (Henderson, 1997).

In this chapter, we would like to explain possible motives that influence the participation of youth in sport and PA. Motivation is a key part of physical literacy and there are several theories that are to explain the motivation to perform any type of activity. Two out of these theories were described in the chapter about physical literacy and motivation (for detail see page 21) and they were the content of the article in which we discussed the motives to perform PA (Vašíčková, Hřebíčková et al., 2014).

At first we attempted to analyse the motives to carry out PA and then to state and describe the differences in motivation in relation to gender, age and BMI in adolescents. The results are important in order to understand the changes in behaviour in adolescents and they are important for teachers and their construction of PE programme in relation to physical literacy.

1411 participants aged 15–20 years who attended secondary schools in the Czech Republic were involved in the study (970 girls and 441 boys) . The adolescents completed the MPAM-R (subchapter 3.1) questionnaire that is a part of the INDARES.COM internet system. The completion of the questionnaire takes 5–7 minutes (the questionnaire is not anonymous, however, names are deleted upon the clearance of the file). The final analysed sample comprised 1316 questionnaires (93.26%) when only one dominant aspect was found in the analysis for the participation in PA. Out of the possible motives they are: interest/experience, competence/challenge, appearance, fitness and social factor. Questionnaires where two and more motives appeared as primary were excluded from the analysis (6.73%).

Finally, 916 questionnaires completed by girls were comprised (69.60%; age: 16.72 ± 1.37 years; weight: 59.41±9.14 kg; height: 167.34 ± 6.43 cm; BMI: 21.19 ± 2.83) and 400 questionnaires completed by boys were comprised (30.45%; age: 16.66 ± 1.46 years; weight: 71.03 ± 12.07 kg; height: 179.39 ± 7.90 cm; BMI: 22.06 ± 3.43). The division into age groups responded to ontogenetic development and the number of probands in certain age categories: 15–16 years (51.2% girls and 43.75% boys) and 17–20 years (48.8% girls and 66.25% boys). There were three groups created according to BMI – normal (76.9% girls and 71.3% boys), a group with underweight (10.8% girls and 9.5% boys) and a group with overweight (12.3% girls and 19.3% boys). Body mass index was identified in the age category 14–19 years according to percentiles stated by WHO (World Health Organisation, 2007a, 2007b), for older than 19 years, it was stated standardly (less than 18 was not found in the sample; up to 25 = normal; 25–30 = overweight; over 30 = obesity – 17 pupils showed BMI higher than 30 and they were included in the category of overweight).

### 4.2.1 Differences in the motives for physical activity according to gender, age and BMI

Regardless of gender, the most frequently stated motive for PA was fitness. The second most frequently stated motive in both genders was interest/experience. The third most frequent motive was appearance in girls and competence in boys (Figure 13).

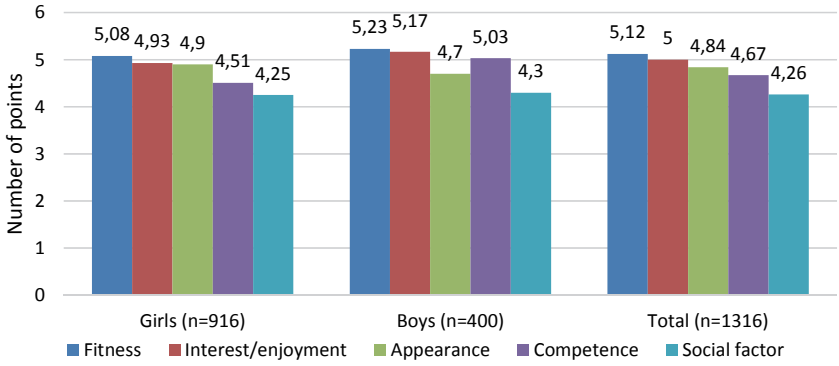



**Fig. 13:** *Average number of points in particular motives for PA (MPAM-R) according gender and total*

The differences between genders that were statistically significant and confirmed with a small "effect size" coefficient were in the motives of fitness ($p < 0.05$), interest/experience ($p < 0.01$), appearance ($p < 0.05$) and competence ($p < 0.001$). The most frequently mentioned motive both in girls and boys was the statement *"because I enjoy physical activity"* 67.2% girls and 73.5% boys assess this statement on the Likert's seven-point scale with the value 6 or 7.

Once we considered also age next to gender, we found that both for younger and older girls, the most important motive was physical fitness. In younger girls, the second motive was interest, while in older girls it was appearance (Figure 14). There was a statistically

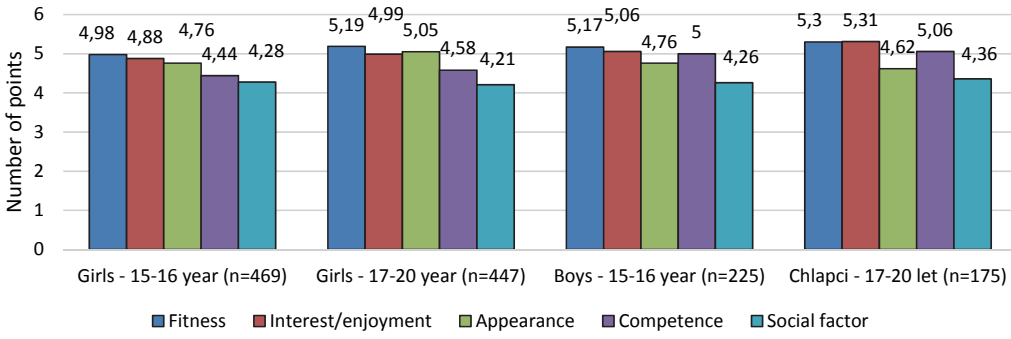



**Fig. 14:** *Average number of points in particular motive for PA (MPAM-R) according to gender and age*

significant difference and small effect size coefficient between the motives of appearance and physical fitness in relation to age in girls. In boys, the order of motives was found in reverse order in relation to age, when younger boys prefer physical fitness and older prefer interest/experience. On the following three places, the order of motives is the same. There were not statistical significant differences found in any motives. The most frequently mentioned motive both in younger and older girls and in younger boys is *"because I enjoy the activity"* (66.7–69.3%) and in older boys *"because they like to perform this PA"* (77.1%).

The most interesting results were found in the analysis of questionnaire answers in relation to gender and BMI (Figure 15). Girls with normal weight state as their primary motive fitness, whereas girls with overweight state appearance and fitness in the second place. In case of girls with underweight, they state interest as the primary motive and fitness in the second place. There were statistically significant differences found only in appearance (small effect size coefficient). In boys with normal weight, fitness and interest are the primary motive and in boys with overweight it is fitness and followed by interest/experience (Figure 16). In boys with underweight, the primary motive is interest and the second fitness. Statistically significant differences were identified in all motives except the social one ($p < 0.05$). The most frequent motive for PA in girls with overweight is: *"because I want to maintain my weight or lose weight to look better"* (71.7%). Boys with overweight state most frequently: *"because I like to perform this activity"* (67.6%).

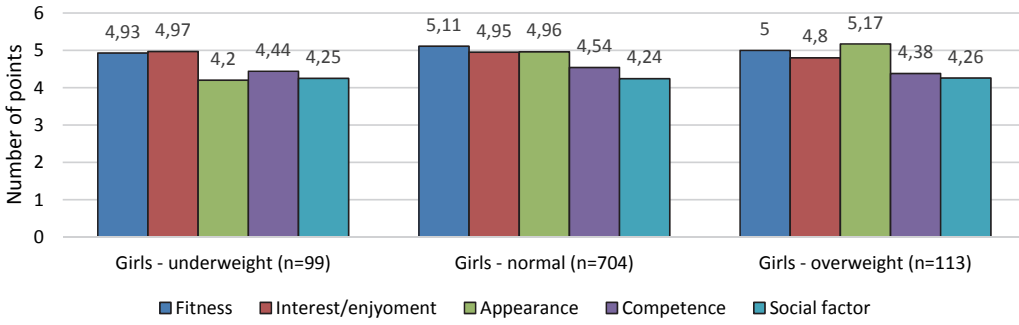



**Fig. 15:** *Average number of points in particular motives for PA among girls according to BMI*

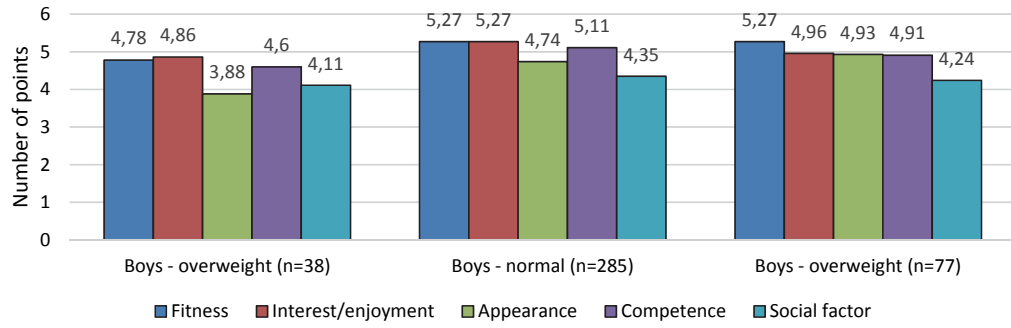



**Fig. 16:** *Average number of points in particular motives for PA among boys according to BMI*

In order to make bigger generalisation of the results, there is disproportion between the respondents in the group of girls and also boys in relation to the division according to BMI.

As it was mentioned in the beginning of the chapter and some authors state (Biddle & Wang, 2003), the motivation to PA in adolescent girls is complex and broad issue that we have to consider in the interpretation of results. The most important motive is fitness in both genders, and interest/experience in the second place. Physical fitness belongs to external motivational factors and it is thus apparent that the value of the participation in physical activity in the sample is different than the actual performance of PA. External motivational factors are not perceived as negative but the authors (Ryan et al., 1997) found that for adults, fitness and appearance negatively correlate with time spent with exercise per week. On the other hand, motives such as interest/experience and competence were positively correlated with time spent with exercise per week and are moreover associated with the satisfaction from PA. The development of motivation not only for PA at school, cannot work without a positive attitude to school as the institution, where children and youth spend an essential part of life and where the teachers' support plays a crucial role (Vašíčková et al., submitted). This positive attitude however declines with age, when boys and girls in the age of 11 show the best results (72% vs. 82.3%) and on the other hand, 15 year-old adolescents showed the least percentage of fondness to school (63.3% vs. 69.6%).

The MPAM-R scale was used in Czech conditions in research for a diploma thesis (Lagnerová, 2010). The author found similar results, although the sample comprised two classes. In girls, fitness (37.5%) is dominant among motives before appearance (27.1%) and, in boys, motive of fitness (40.9%) before interest (22.7%). The author was also interested in the hypothesis that secondary school students, who show the most frequent motive to PA, would also show higher amount of PA per week. PA was monitored using Actigraph device (Sigmund & Sigmundová, 2011). The hypothesis was not however confirmed as the highest amount of PA was identified in students who recorded "interest" as the most frequent motive. This group showed the highest amount of PA in all monitored categories (vigorous PA, moderate PA, and walking). It is therefore apparent that the internal motivation factor, which the interest in PA really is, is for sure positively apparent in the amount of carried out PA. The dominance of the internal factors is important for the maintenance of physical activities (Rintaugu & Ngetich, 2012). The same result was found in the study in Illinois (Woods et al., 2007), where children aged 7–12 stated as the most frequent motive for the participation in PA interest and experience. 82% of pupils stated that *"they participate in a favourite sport because it is fun and because they like to perform it"*.

Frederick and Ryan (1993) mention gender differences when men show more competitiveness and women higher motivation associated with physical appearance. Research shows that internal versus external motivation factors in sport are influenced by gender, participants' age and the type of PA but also cultural influences (Iannotti et al., 2013; Yan & McCullagh, 2004).

## 4.3 Knowledge about health and physical activity as a key attribute to physical literacy

For physical literacy, it is the knowledge of some factors that is crucial and that can help in the decision process. In order to decide whether to participate in PA or not, it is necessary broader awareness about the given area. The area of PA is however not dealt much with at schools and there are only some parts of disconnected information discussed in some subjects. At the first and second stage of elementary school, it is the educational areas of Man and Health and Man and Society, and at secondary schools it is Biology, Health Education and Physical Education. In PE students receive most knowledge about the rules of sport and games, about safety in PA and fitness or stretching of muscles (answers of pupils at the second stage of elementary school), whereas the least knowledge pupils have in history of sport and games (Mužík & Vlček, 2010).

### 4.3.1 The knowledge of students at secondary schools about health and PA

In the period 2008 to 2010, the comprehensive test was distributed at several secondary schools as a part of a broader survey in the Czech Republic (Vašíčková, Chmelík et al., 2009). For the purpose of this work, the results were unified and analysed comprehensively. The analysis comprised 666 comprehensive tests from pupils in 13 secondary school (11 grammar school and 2 vocational schools) in different cities in the Czech Republic. The summary of the number of tests, type of school and gender is shown in Table 4.

In the total result of the comprehensive test, a statistically significant difference was found between boys and girls confirmed by a small effect size coefficient (Table 5). Girls showed better knowledge about the area of health and PA than boys. The only difference not found was in the dimension of fitness that appeared to be more dominant in boys who recorded higher percentage of correct answers. The highest difference was found in the dimension of nutrition with the results in girls showing deeper interest in the area of healthy lifestyle which is closely associated with the present modern trends of the promotion of the ideal of slenderness (Černá, 2011).

Only in pupils at five grammar schools, the results were above the 50% benchmark (Figure 17). We assume that a higher intellectual and knowledge level of the pupils at grammar schools is reflected here. In both professional schools the students' results were lower which we can associate with less intellectual and knowledge level in these students. Moreover, biology is not taught at the vocational schools, and the students thus can gain the information mainly on the basis of their experience, life or other knowledge obtained at elementary schools. On the basis of the total evaluation of knowledge about the area of health and PA we can conclude that students at secondary schools (both grammar and vocational) show under average knowledge and facts about this area. It is apparent that evidence-based knowledge about the importance and benefits and risks of PA need to be included into education as a part of education to physical literacy so that we increase the awareness of individuals about the benefits of healthy lifestyle and thus we can reach

**Table 4:** *The summary of the sample of analysed comprehensive tests in students at secondary schools*

| Characteristics | Number of tests (*n* = 666) | Percentage (%) |
|---|---|---|
| City | | |
| Bohumín | 33 | 5.0 |
| Frýdek-Místek | 56 | 8.4 |
| Hlinsko | 54 | 8.1 |
| Holešov | 85 | 12.8 |
| Jaroměř | 39 | 5.9 |
| Karviná | 82 | 12.3 |
| Letohrad | 33 | 5.0 |
| Soběslav | 48 | 7.2 |
| Vysoké Mýto | 53 | 8.0 |
| Zábřeh | 40 | 6.0 |
| Zlín | 60 | 9.0 |
| Znojmo | 27 | 4.1 |
| Žamberk | 56 | 8.4 |
| Type of secondary school | | |
| Grammar school | 525 | 78.8 |
| Vocational school | 141 | 21.2 |
| Gender | | |
| Boys | 254 | 38.1 |
| Girls | 412 | 61.9 |

**Table 5:** *Differences in the individual dimensions and in total in comprehensive test in relation to gender in students of secondary schools (in points and in percentage)*

| Dimension | Boys (*n* = 254) | | Girls (*n* = 412) | | *Z* | Cohen's *d* |
|---|---|---|---|---|---|---|
| | M (SD) | % | M (SD) | % | | |
| Fitness | 3.40 (1.58) | 42.50 | 3.35 (1.40) | 41.88 | 0.27 | 0.02 |
| Energy | 3.44 (1.35) | 43.00 | 3.75 (1.39) | 46.88 | 2.71** | 0.21† |
| Nutrition | 3.20 (1.28) | 40.00 | 3.61 (1.22) | 45.13 | 4.43** | 0.34† |
| Educational | 5.21 (1.44) | 65.13 | 5.44 (1.45) | 68.00 | 2.10* | 0.16 |
| Total | 15.26 (3.54) | 47.67 | 16.17 (3.16) | 50.52 | 2.99** | 0.23† |

*Notes: Z* = z-score Mann-Whitney U test; *d* = effect size coefficient; † small effect; *$p < 0.05$; **$p < 0.01$

positive changes in their behaviour (Dunn, Thomas, Green, & Mick, 2006). In former research (Contento, Manning, & Shannon, 1992), the authors mention that in order to increase knowledge, it is necessary 10–15 hours of intervention and to achieve a positive behavioural change towards healthy lifestyle, 50 hours of intervention are necessary.

It is therefore desirable to include knowledge about health, PA and its benefits or risks and about possible PA to be suitable for people with special needs into education in order to enhance physical literacy. Upon the information is provided, an interest in this area

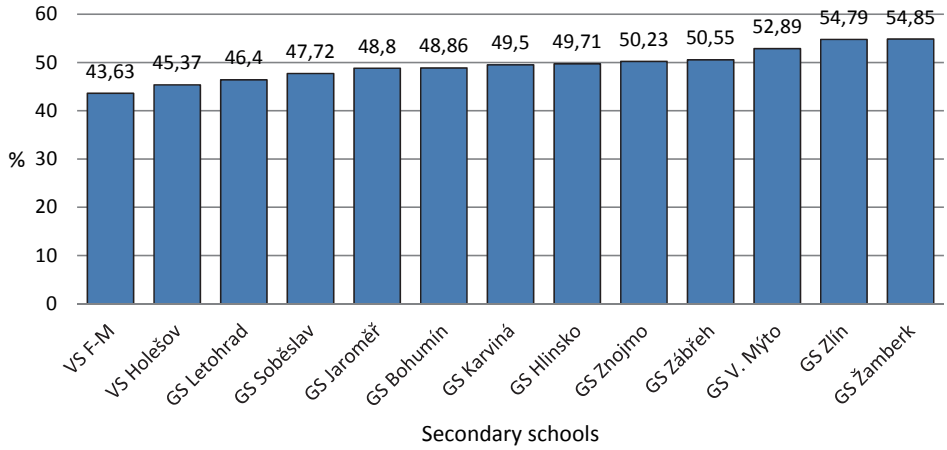



**Fig. 17:** *Total results in comprehensive test between various secondary schools (% of success) (VS – vocational school, GS – grammar school)*

needs to be evoked in students which cannot be done unless the teacher himself/herself is motivated and knows the required information and is able to provide it to students naturally.

### 4.3.2 The knowledge of university students about health and PA

The group of university students who prepare for the professional role of teachers is quite crucial in shaping the future generation and for the promotion of healthy lifestyle as a part of physical literacy. If these students are not sufficiently professionally qualified which means if they do not have adequate knowledge, it is necessary to provide such knowledge to them during their studies or to motivate them at least to obtain such knowledge. Due to the demographical curve, which influences the selection of students admitted to study at the university, we are limited also by the level of knowledge of those who apply to study the programme Physical education and sport. Since the number of universities and colleges has grown and there are more possibilities that attract students (e.g. international internships or study abroad), top students do not usually apply to sport programmes. We aimed to find out the knowledge about health and PA in students of bachelor study programmes and via their test completion to induce deeper interest in this area in them. The comprehensive test about health and PA was distributed at seven universities in years 2009–2014 with the help of cooperating colleagues who handed in the test in the seminars. The distribution in the individual years did not take place at all schools therefore we show the number of analysed tests in individual years, the number of obtained test at individual school and according to gender (Table 6).

**Table 6:** *Summary of analysed comprehensive tests in university students*

| | Number of tests ($n$ = 1,402) | Percentage (%) |
|---|---|---|
| Year of survey | | |
| 2009 | 291 | 20.8 |
| 2010 | 255 | 18.2 |
| 2011 | 157 | 11.2 |
| 2012 | 323 | 23.0 |
| 2013 | 137 | 9.8 |
| 2014 | 239 | 17.0 |
| Faculty/University | | |
| Faculty of Physical Culture, Palacky University, Olomouc | 847 | 60.4 |
| Pedagogical faculty, West Bohemia University, Pilsen | 180 | 12.8 |
| Faculty of Sport Studies, Masaryk University, Brno | 119 | 8.5 |
| Pedagogical faculty, University of J. E. Purkyně, Ústí nad Labem | 110 | 7.8 |
| Pedagogical faculty, University Hradec Králové | 62 | 4.1 |
| Pedagogical faculty, South Bohemia University, České Budějovice | 58 | 4.1 |
| Pedagogical faculty, Ostrava University | 26 | 1.9 |
| Gender | | |
| Men | 759 | 54.1 |
| Women | 643 | 45.9 |

Due to the disproportion in the number of questionnaires in connection to the year of collection and the university, we present the results comprehensively (Table 7). In the total results of the comprehensive test, a statistically significant difference between men and women was not found. In two dimensions, there were statistically significant differences found, but they were not confirmed with the effect size coefficient.

**Table 7:** *Differences in individual dimensions and in total in the comprehensive test in relation to gender in university students (in points and in percentage)*

| Dimension | Men ($n$ = 759) | | Women ($n$ = 643) | | $Z$ | Cohen's coefficient $d$ |
|---|---|---|---|---|---|---|
| | M (SD) | % | M (SD) | % | | |
| Fitness | 4.84 (1.42) | 60.50 | 4.67 (1.55) | 58.38 | 2.14* | 0.11 |
| Energy | 4.02 (1.38) | 50.25 | 4.12 (1.44) | 51.50 | 1.23 | 0.07 |
| Nutrition | 4.20 (1.41) | 52.50 | 4.24 (1.32) | 53.00 | 0.45 | 0.02 |
| Educational | 5.93 (1.26) | 74.13 | 6.18 (1.18) | 77.25 | 3.56** | 0.19 |
| Total | 18.99 (3.49) | 59.33 | 19.21 (3.61) | 60.03 | 0.80 | 0.04 |

*Notes: Z* = z-score Mann-Whitney U test; *d* = effect size coefficient; *$p < 0.05$; **$p < 0.01$

In the dimension of fitness, men showed better knowledge than women, in contrary women showed better results in the dimension of education. The differences were however minor considering the effect size coefficient and they were only statistically significant, therefore we did not choose gender as a factor for other analysis. The same results were already obtained in a pilot study as far as the answers in individual dimensions are concerned (Vašíčková, Bláha et al., 2010); a difference was found in total results when in the pilot study men were more successful than women (60.6% vs. 59.38%). The difference was minor (1.25%).

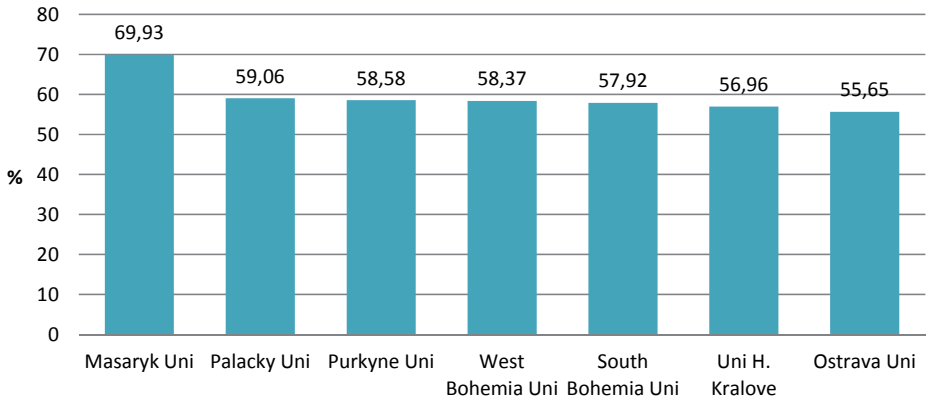



**Fig. 18:** *Total results in comprehensive test between universities (% of success)*

When comparing individual universities (Figure 18) we have found the highest average number of points to be in the students of Masaryk university in Brno (69.93%), which is in compliance with a previous study (Vašíčková, Svozil, Nykodým, Lukavská, & Bláha, 2012). The lowest average number of points was identified in the students of Pedagogical faculty at Ostrava University (55.65%). These students did not participate in the pilot study in 2009 as well as students at the Pedagogical faculty at the South Bohemia University and students at the Pedagogical faculty at the University of Hradec Králové. These faculties were involved in testing later and upon the consent of the cooperating colleagues to participate. The limit is uneven number of comprehensive tests obtained and analysed at individual universities and missing participation of the Faculty of Physical Education and Sport, Charles University in Prague.

Since it is a comprehensive test, we cannot discuss individual questions and answers here. We can only show where there are the biggest drawbacks on the side of university students and where the knowledge is stable. The most difficult for the students were questions that concerned energy consumption where they more likely made tips in the answers, further the question on the most powerful energy source of movement and the issue of mutual interaction of health-condition-weight. The highest number of positive answers was found in the questions on the frequency of food, need of PA for different population groups, PA effect on the creation of chemical substances, values of optimal BMI and issues in relation to weight reduction. It is also a question whether students' knowledge is also reflected in their own lifestyle as this has not been explored yet. There are not many research studies that analyse knowledge on PA and health factors therefore

it is difficult to discuss it. However, there is an agreement that knowledge as an inseparable part of physical literacy of a human is important for future performance of physically active lifestyle and for the dissemination of knowledge and instructing of prospective students. Physical literacy is promoted easiest through the generation of prospective teachers therefore it is important to estimate their knowledge. Generally, the awareness about recommendations for PA, suitable PA for different groups of inhabitants about the role of nutrition, the contribution of condition and energy demands of PA should be still enhanced (Vašíčková, 2013).

### 4.3.3 The relation between the level of knowledge about health and physical activity and the amount of performed PA in adolescents

No one has been so far interested in the aspect of the relation between cognitive area and performed PA. In a pilot study at four schools, we explored the level of knowledge about health and PA and really performed PA in students of the first class at secondary schools (Vašíčková, Chmelík et al., 2009). The results have shown that there is an association between the knowledge about health and PA and really performed PA in boys and girls and using correlations there was a statistically significant negative relation found. Even internationally there are not studies on the relation between the amount of performed PA and the level of knowledge very numerous. In kinanthropology a knowledge test that examines PA named FitSmart Test by Zhu, Safrit and Cohen (1999) is known. It is based on the assumption that students who show better knowledge and facts about the PA area will more likely include PA into their lifestyle because they will know the benefits of regular performance of PA. This assumption is common to all interventions that aim to increase the amount of performed PA through the enhancement of awareness of participants. In a meta-analysis (Kahn et al., 2002), the authors reached a conclusion that the effectiveness of interventions using more information provided to the participants in lessons at school had not been sufficiently confirmed due to inconsistent conclusions in analysed studies. Although an increase of awareness occurred in many cases, this change was not reflected in the level of analysed PA. Another study (Ferguson, Yesalis, Pomrehn, & Kirkpatrick, 1989) confirmed that the assumed benefits of exercise and their knowledge along with other factors significantly contribute to the performance of exercise and to the present physically active behaviour. Due to inconsistent findings and on the basis of our pilot study, we decided to verify and analyse this area in the larger sample of adolescents.

The aim of this chapter was to identify whether there is a connection or an association between the level of knowledge about health and PA according to the present curricula and the really performed amount of PA in students in the first class at secondary schools.

The statistical analysis included data from 139 boys and 266 girls of the first class at eight grammar schools and two vocational secondary schools. The selection of schools and class for the aim of the research was intentional; university students working on their theses arranged the cooperation with the schools with their management for the purpose of their research. In the beginning of the survey, the students of the first classes at secondary schools completed the Comprehensive test about health and PA and the IPAQ long questionnaire (Appendix 7) which was a part of the ANEWS (Abbreviated Neighborhood

Environment Walkability Scale) (Mitáš & Frömel, 2013). In a more detailed analysis of the associations between knowledge and PA, we focused also on PA of different intensity and types as it is defined in the handbook for data processing of the IPAQ questionnaire (The IPAQ group, 2013). The data sample was analysed in relation to gender, and we examined the differences in the knowledge sphere and the amount of PA in relation to gender.

The review of achieved points in individual dimensions of the comprehensive test and total result are presented in Table 8. The total average number of points in girls is above 50% whereas in boys the half of correct answers was not reached (maximum of 32 points, 50%=16 points). We found this difference as statistically significant and it was confirmed with a small "effect size" coefficient. Also, there were significant differences found also in the dimensions of nutrition and education, when girls reached on average higher score than boys.

**Table 8:** *Differences in point results of a comprehensive test*

| Dimensions | Gender | *M* | *SD* | *Z* | Cohen's *d* |
|---|---|---|---|---|---|
| Total | Boys[a] | 15.30 | 3.53 | 2.31* | 0.23[†] |
| | Girls[b] | 16.19 | 3.44 | | |
| Fitness | Boys[a] | 3.43 | 1.58 | 0.44 | 0.04 |
| | Girls[b] | 3.38 | 1.42 | | |
| Energy | Boys[a] | 3.53 | 1.29 | 1.19 | 0.12 |
| | Girls[b] | 3.72 | 1.45 | | |
| Nutrition | Boys[a] | 3.24 | 1.28 | 2.83** | 0.28[†] |
| | Girls[b] | 3.62 | 1.31 | | |
| Educational | Boys[a] | 5.10 | 1.48 | 2.42* | 0.24[†] |
| | Girls[b] | 5.46 | 1.48 | | |

*Notes: Z* = z-score Mann-Whitney U test; *d* = effect size coefficient; [a]n = 139; [b]n = 266; [†]small effect; *$p < 0.05$; **$p < 0.01$

The correlation coefficients between the comprehensive test and performed PA found in the IPAQ questionnaire and in both genders are shown in Table 9. In total, there was a negative relation in all types of PA and comprehensive test results found (negative values) both in boys and girls although the correlation coefficients are very low. A significant negative relation was found in moderate PA and in total PA in boys and in walking in girls. A statistically significant difference was found in all examined types except of walking concerning the examination of differences between the amount of PA in individual types between boys and girls.

Physical activity in girls and boys is shown in Figure 19. Statistically significant differences were found in the categories of vigorous PA, moderate PA and in total PA at the level of significance $p < 0.01$. In other examined categories, differences were not found.

The result of correlation analysis show that better knowledge about the area of health and PA in pupils is not associated with a higher amount of performed PA. In fact, regardless of the knowledge, pupils prefer other after school activities than physical ones (e.g.

**Table 9:** *The relation between the result of the comprehensive test and performed PA in relation to gender*

| Type of PA | Boys ($n$ = 139) | | Differences | Girls ($n$ = 266) | |
|---|---|---|---|---|---|
| | *M (SD)* | $r_p$ | *Z (d)* | *M (SD)* | $r_p$ |
| Vigorous PA [MET-min/week] | 3,002 (2,379) | –0.15 | 5.48** (0.54$^{\dagger\dagger}$) | 1,790 (1,978) | –0.02 |
| Moderate PA [MET-min/week] | 1,819 (1,444) | –0.26** | 2.31* (0.22$^{\dagger}$) | 1,515 (1,400) | –0.03 |
| Walking [MET-min/week] | 2,364 (2,618) | –0.08 | 0.84 (0.08) | 2,513 (2,542) | –0.13* |
| Total PA [MET-min/week] | 7,167 (4,683) | –0.20* | 3.02** (0.30$^{\dagger}$) | 5,803 (4,248) | –0.10 |

*Notes:* $r_p$ = Pearson's correlation coefficient; *Z* = z-score Mann-Whitney U test; MET – metabolic equivalent; *d* = effect size coefficient; Cohen's *d*; $^{\dagger}$ small effect; $^{\dagger\dagger}$ moderate effect; *$p < 0.05$; **$p < 0.01$

specific interest clubs, music, drawing, computers, etc.). However, these assumptions would require a survey to be intentionally done for this purpose. It is also possible that a higher amount of PA is associated with other knowledge than that the applied test examines.

We view a limit in the application of subjective research methods (questionnaire and test) where misinterpretation can occur. Another limit is the fact that the research focuses only on students in the first class of secondary schools who are still adapting to new environment and therefore the results of the comprehensive test can be biased (Vašíčková, Neuls et al., 2009).

In total, we can answer the question in a way that there was not a positive relation found between knowledge about health and PA and the amount of performed PA in

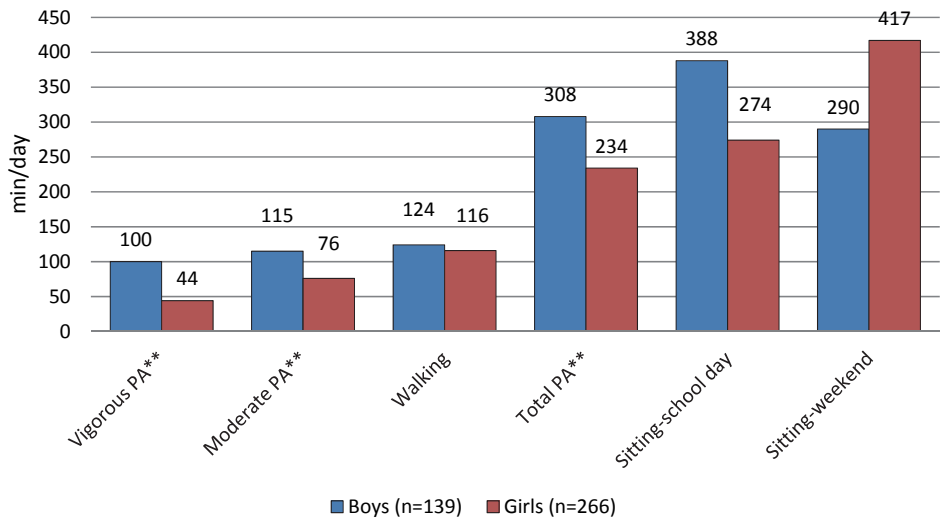



**Fig. 19:** *Differences in average values in time per day spent with PA and sitting in secondary school students; **p < 0.01.*

students in the first class at secondary schools. The intervention to increase PA in this age category needs to be aimed in some different ways for example in the offer of attractive programmes, or using a complex intervention when along with the acquisition of knowledge there is also the influence of healthy lifestyle or the emphasis put on experience in PE (Wang & Liu, 2007).

## 4.4 The students' attitude to physical education at school as an entry variable of physical literacy

Since we assume that physical literacy would be developed the easiest in PE, the essential entry value is some level of positive students' attitude to the subject at school.

### 4.4.1 Secular trends in the evaluation of PEL in different educational systems

Monitoring of state and trends in PE is an irreplaceable part of diagnostics of motor development in children but also an essential basis for the physical literacy in pupils. The role of school is crucial for the enhancement of healthy lifestyle (Lau, 2007). The assessment of the state and trends in PE at school should be based on the continuous long-term diagnostics as it is obligated by the European Commission to individual states to monitor PA (EU Working Group, 2008). PE at school needs clear evidence-based education in order to exist, and for the support of its role the curricula and for its position in the prevalence of and adherence to physically active and healthy lifestyle in children and youth. At present, in the worldwide critique of the level of PE at school (Bowes & Bruce, 2011; Bronikowski, 2007; Bronikowski & Bronikowska, 2008; Hardman & Marshall, 2001; Peneva & Bonacin, 2011; Pringle, 2010; Rossi, Tinning, McCuaig, Sirna, & Hunter, 2009) and low level of PA in children and youth (Bronikowski & Bronikowska, 2011; Cabak & Woynarowska, 2004; Drygas et al., 2005; Pate et al., 2006; Tigerstrom, Larre, & Sauder, 2011; Zhang, Solmon, Kosma, Carson, & Gu, 2011), it is important to use examples of good practice in PE in different socioeconomic and educational conditions for the students' benefits (Cale, 2000).

There are still existing differences in the curricula in the EU and in the professional preparation (one major or double major), in the number of PE lessons per week, in coeducational – differentiated or combined – organisation of PE lessons, in the legislation and in other areas (Hardman, 2007, 2008a, 2008b; Hardman & Marshall, 2001; Hartman-Tews, 2006; Pühse & Gerber, 2005). The PE teachers' obligation in the post communist countries is to contribute to the European education thinking with the analysis of the impact of these changes into a different educational and social environment. A typical example is the application of educational changes from the coeducational environment (most schools in Western Europe teach PE coeducationally) into differentiated PE environment (most schools in post communist countries teach PE separately for boys and girls) and the search for appropriate curricular and school policy strategies.

One of the most important indicators of quality of PE at schools is the quality of PE lessons (PELs) represented by the students' attitude/relation to these lessons. The attitude/relation in students is an important construct that requires attention on the side of teachers, university teachers and researchers (Subramaniam & Silverman, 2007). It has been found that children who have positive attitude to PA will be more likely to participate in PA also outside of school (Portman, 2003; Subramaniam & Silverman, 2007) than those who have rather a negative attitude to PA. Moreover, it is more likely that they will be physically active in the life course (Sekot, 2009; Trudeau, Laurencelle, Tremblay, Rajic, & Shephard, 1999). PE at school should be evaluated mainly on the basis of what conditions it creates for PA and physical education of pupils with different needs. With the present increase of sedentary behaviour and decreasing PA (Currie et al., 2012; Pate et al., 2006; Sas-Nowosielski, 2006; Sjöström, Oja, Hagströmer, Smith & Bauman, 2006; Świderska-Kopacz, Marcinkowski, & Jankowska, 2008), increase of overweight and obesity in children and youth (Bac, Woźniacka, Matusik, Golec, & Golec, 2012; Bryl, Hoffmann, Miczke, & Pupek-Musialik, 2006; Bunc, 2008; Lobstein, Baur, & Uauy, 2004; Vignerová, Humeníkova, Brabec, Riedlová, & Bláha, 2007; World Health Organisation, 2007c), it is a priority to assess the quality of PE at school according to participation, attitude to PE, quality physical literacy and also according to the level of PA and physical condition of physically and in sport less capable students. The key is meeting their need to succeed in PE in a way as it is explained in one minitheory in the self-determination theory (Ryan & Deci, 2000; Zhang et al., 2011).

The aim was to identify the state and the trends in the total assessment of PEL by boys and girls in different educational systems and we were interested in the "pupil's role" and in individual dimensions. The other factors that can influence the assessment of PEL and were analysed using the questionnaires were gender, period of survey, school class, type and content of PEL.

We chose different educational environments that are Poland and the Czech Republic. In Poland, PE teachers are prepared in a one-major five-year professional preparation and further education is a standard part of the career development system. The number of weekly PEL in the curricula has been three lessons at secondary schools since 2009 and two lessons in lower levels. Since 2010 there are two obligatory PE lessons at secondary school and one optional, at elementary schools there are two obligatory lessons and two optional lessons. Polish schools create their own programmes for PE on the basis of national documents, similarly to the system in the Czech Republic (CZE). In the Czech Republic teachers are mostly prepared in a double-major study programme (there is a choice of two majors that are even for example physical education-mathematics), and further education of teachers is optional and in contrary to Poland, the career development system is not created yet. The number of weekly PEL (2) is stated in the framework educational programme and at some schools the management adds more PE out of the number of available lessons (Výzkumný ústav pedagogický, 2007b).

The research was carried out in the framework of teachers' training placement in the PE students of two universities at elementary and secondary schools in natural school conditions. The schools were selected annually in 2000–2011 according to the place of living of the student teachers and in total 25,988 Czech and 21,205 Polish students participated in the study. In the Czech Republic there were schools from the entire country,

but majority of them were from Moravia and East Bohemia. At school it was either PEL in girls or in boys as it is given by curricular documents in legislation (Výzkumný ústav pedagogický, 2007a). In Poland, they were mainly schools in the Silesian-Katowice region in the South of Poland. Due to analytical reasons, we compared girls and boys in both countries separately and in relation to individual time intervals of the data collection. The characteristics of individual groups according to state and gender are stated below (Table 10). Monitored period of 12-year period was in compliance with a four-year school programmes divided into three four-year periods.

**Table 10:** *Descriptive characteristics of an analysed sample of Czech and Polish data in relation to gender*

| State | Gender | *n* | Age (year) *M (SD)* | Weight (kg) *M (SD)* | Height (cm) *M (SD)* | BMI *M (SD)* |
|---|---|---|---|---|---|---|
| CZE | Boys | 9,924 | 15.3 (1.3) | 60.7 (9.6) | 172.5 (7.0) | 20.3 (2.1) |
| | Girls | 16,064 | 15.1 (1.7) | 53.6 (6.9) | 164.8 (5.1) | 19.7 (1.7) |
| Poland | Boys | 10,395 | 15.6 (1.8) | 62.9 (13.8) | 171.5 (10.6) | 21.1 (2.8) |
| | Girls | 10,810 | 15.4 (1.6) | 53.9 (8.2) | 164.2 (6.6) | 19.9 (2.2) |

*Notes:* BMI – body mass index

In order to assess PEL we used the Questionnaire (pupil's attitude toward the PEL) (Appendix 3). The questionnaire was applied at the end of each PEL in the relaxation part of the lesson. Students did not know in advance that they would complete a questionnaire at the end of the lesson. The student teachers knew that the lesson would be evaluated by the students. All the student teachers took part in an instruction session on the teaching placement and the role of the evaluation of PE lesson by students, the way the questionnaires are to be applied and about the use of the obtained data for the improvement of one's own teaching.

**The analysis of the data obtained with the questionnaire**

Special software was used to process the answers to individual questions, individual dimensions and the total evaluation (Chytil, 2002). Questionnaires with incomplete questions or with YES answer to all questions were excluded from the evaluation. The number of excluded questionnaires was 2–3% in individual years. On the basis of previous partial studies and their impact to school praxis, the minimal logical significance (Frömel et al., 2009; Frömel et al., 2000; Frömel et al., 2002; Górna et al., 2002) is considered 5% difference in positive answers to individual questions and individual dimensions (10% is relevant to medium level and 15% to high level of logical significance). Minimal logical significance presents difference at the level of one pupil, the medium one at the level of two pupils and the high level of three pupils.

### 4.4.1.1 The assessment of PEL in individual dimensions and in total

Czech girls assessed PEL in all dimensions and in total ($Z = 19.92$; $p = 0.00$; $d = 0.25$) better than Czech boys (Table 11). Polish pupils and girls assessed individual dimensions and in total PEL similarly, there were differences only in the emotional and social dimensions and that in favour of girls. Girls in the Czech Republic and Poland (POL) assessed PEL the same way only in the health and attitudinal dimensions where there were not significant differences found. On the other hand, boys in both states differed in the assessment significantly in all dimensions and in total. "Effect size" coefficients in all dimensions suggest interpretations of significant differences are made rather with caution due to high level of respondents and because they show no or only a small effect.

**Table 11:** *The assessment of PEL in individual dimensions and in total in relation to gender and state*

| Dimensions | Czech Republic *M (SD)* | | *Z* (CZE) | Poland *M (SD)* | | *Z* (POL) | *Z* girls | *Z* boys |
|---|---|---|---|---|---|---|---|---|
| | Girls (*n* = 16,064) | Boys (*n* = 9,924) | | Girls (*n* = 10,810) | Boys (*n* = 10,395) | | | |
| Educational | 2.52 (1.05) | 2.42 (1.11) | 5.97* | 2.75 (1.03) | 2.77 (1.04) | 1.87 | 18.11* | 22.46* |
| Emotional | 3.21 (0.90) | 3.03 (1.05) | 11.06* | 3.32 (0.87) | 3.28 (0.86) | 5.15* | 11.73* | 15.31* |
| Health | 2.64 (1.13) | 2.45 (1.19) | 12.56* | 2.68 (1.11) | 2.72 (1.08) | 2.47 | 2.22 | 15.96* |
| Social | 2.34 (0.94) | 2.08 (1.03) | 19.06* | 2.52 (0.95) | 2.47 (0.96) | 4.34* | 15.85* | 26.08* |
| Attitudinal | 3.02 (1.18) | 2.76 (1.24) | 18.31* | 3.02 (1.18) | 3.01 (1.14) | 1.65 | 0.10 | 15.16* |
| Creative | 2.69 (1.10) | 2.51 (1.15) | 12.20* | 2.78 (1.08) | 2.79 (1.11) | 1.19 | 6.70* | 17.87* |
| Pupil's role | 4.80 (1.64) | 4.56 (1.78) | 9.79* | 5.16 (1.66) | 5.17 (1.68) | 0.61 | 17.37* | 23.87* |
| Total | 16.42 (4.20) | 15.27(4.56) | 19.92* | 17.07 (4.10) | 17.04 (4.02) | 0.90 | 12.65* | 28.35* |

*Notes: Z* = z-score Mann-Whitney U test; *$p < 0.001$

### 4.4.1.2 Trends in the assessment of PEL in the four year periods

In the course of three four-year-time periods since 2000 to 2011, there is a decline in the total positive assessment of PEL in all groups except of Polish girls where there is a big deviation in the period of 2004–2007, but in total a great increase (Figure 20). The lowest assessment and the biggest decrease in total assessment are found in Czech boys and mainly in Czech girls.

In the dimension "the pupil's role" in the course of years of monitoring, the pupil's role in PEL was decreasing in Czech boys and girls (Figure 21). Clearly the lowest evaluation of the possibility to assert oneself in PEL (pupil's role) was found in Czech boys. At Polish schools, there was rather a trend that preserved the same level approximately in boys, whereas in girls there was an increase in the dimension "pupil's role" in the course of years with a deviation in 2004–2007.

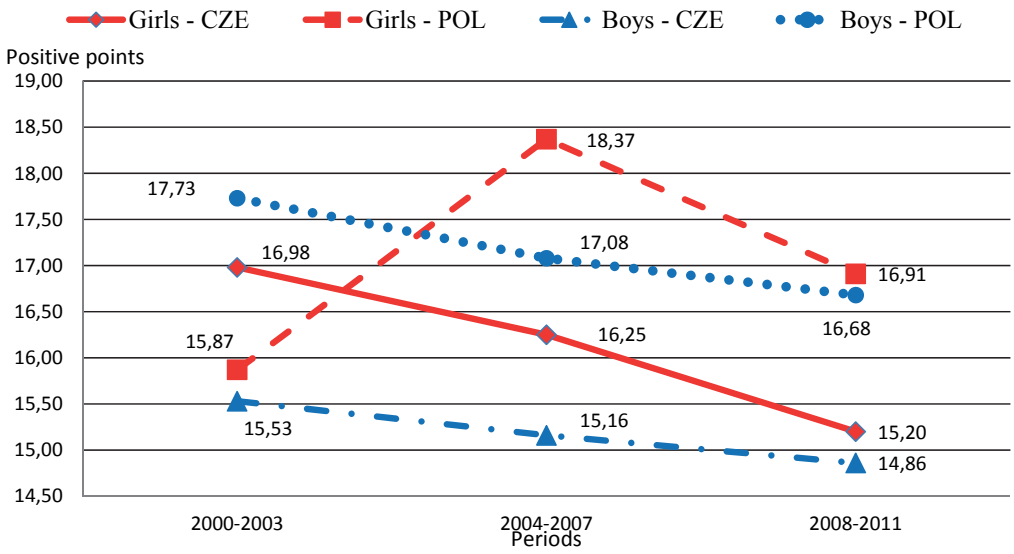



**Fig. 20:** *Trends in total assessment of PEL by Polish and Czech pupils according to gender*

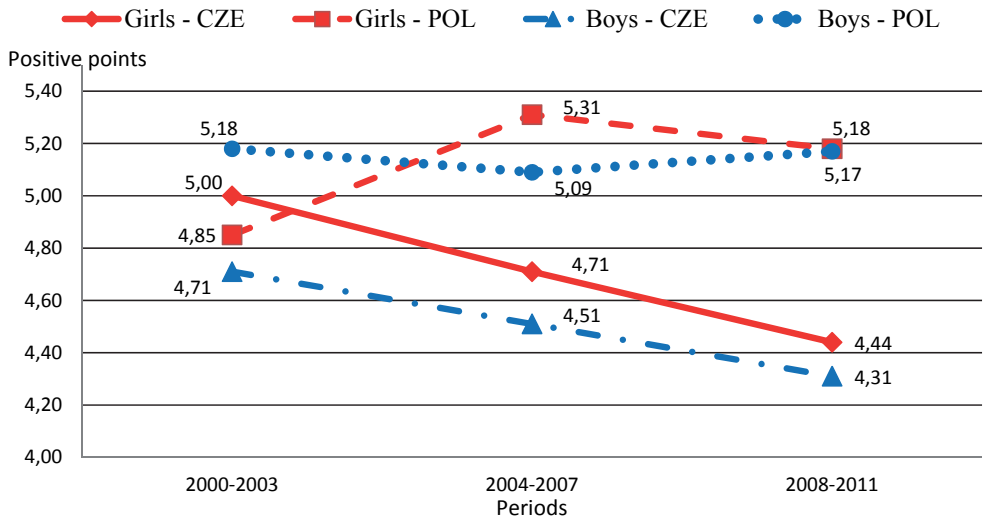



**Fig. 21:** *Trends in assessment of PEL by Polish and Czech pupils in supplementary dimension "pupil's role"*

### 4.4.1.3 The comparison of Polish and Czech pupils in individual dimensions of the assessment of PEL

The assessment of PEL in Polish and Czech boys expressed in percentage shows significant differences in individual dimensions in favour of Polish boys (Figure 22). In all dimensions there is statistically significant difference ($p < 0.01$), with total evaluation that is apparently in favour of Polish boys (17.04 vs. 15.27; $Z = 28.35$; $p < 0.01$; $d = 0.40$) (Table 11).

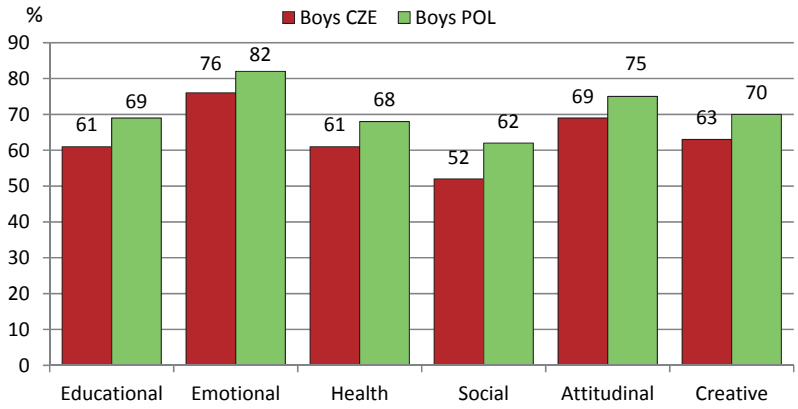



**Fig. 22:** *Assessment of PEL by Polish and Czech boys in all dimensions*

Polish girls assessed PEL better than Czech ones. It was the opposite only in the attitudinal dimension and Czech girls show evaluation that was in one percent higher than in Polish girls (Figure 22). In all dimensions except of the health and attitudinal dimensions there were significant differences found. In total the evaluation of PEL by girls was statistically significant in favour of Polish girls, but logical significance was not found (16.42 vs. 17.07; $Z = 12.65$; $p < 0.01$; $d = 0.15$).

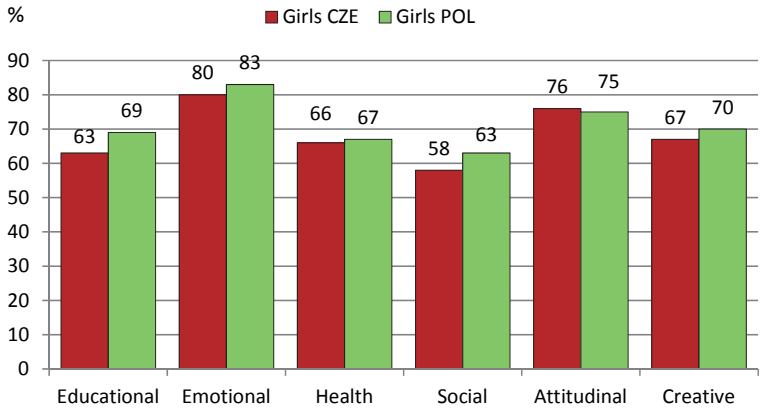



**Fig. 23:** *Assessment of PEL by Polish and Czech girls in all dimensions*

This data matrix was also studied and analysed in relation to self-perceived physical fitness of individuals (Frömel et al., 2014). The most important finding was that pupils who perceived their physical fitness in the top half expressed more positively about the carried out lessons both in the Czech Republic and in Poland. In the course of the three four-year time periods there was a decline in the evaluation of PEL in Czech girls with lower physical fitness and also in Czech boys with lower physical fitness. The Polish educational system involves more obligatory lessons of PE per week than in the Czech Republic and it offers further education to teachers that can focus on how to address the groups of students that are not asserted in PE lessons. The undergraduate study should

focus more on the motivation of pupils who self-evaluate themselves in the lower part of the group concerning their physical fitness.

In relation to the size and the spectrum of the survey, we also focused on factors that influence the positive evaluation of PEL measured with the questionnaire. An analysis was made for each state separately. We applied binary logistic regression with total evaluation used as a dependent variable in the analysis. Total results were divided into two categories with a median found in the data matrix as the dividing parameter. Questionnaires with total score 0–16 points were ranked in the category with the value 0 and questionnaires with the total score in the range 17–24 were ranked in the category with the value 1. Among the independent variables that could influence total evaluation of PEL and that were recorded in the questionnaires in the survey we chose:

- the period of the survey (0 related to the period of 2002–2003; 1 = 2004–2006; 2 = 2007–2009; 3 = 2010–2011);
- the gender of pupils (0 = boys; 1 = girls);
- school (0 responded to the class 6.–9. regardless whether it is elementary school or the lower grade of grammar schools; 1 = 1.–4. class at school providing secondary education);
- type of teaching lesson (0 responded to a progressive PEL that were not habitual [i.e. for example the application of higher load, progressive, creative and more individualized approach]; 1 = habitual PEL);
- content (0 responded to game content; 1 = non game content e.g. athletics, gymnastics, aerobics etc.).

**Table 12:** *Binary logistic analysis for factors that influence positive evaluation of PEL in the Czech Republic and in Poland*

| Variables | Czech Republic | | | Poland | | |
|---|---|---|---|---|---|---|
| | % | OR | 95 % CI | % | OR | 95 % CI |
| Gender | | | | | | |
| Boys | 45.0 | Ref. | | 61.3 | Ref. | |
| Girls | 55.0 | 1.46*** | [1.39–1.53] | 61.2 | 0.99 | [0.93–1.05] |
| Survey periods | | | | | | |
| 2010–2011 | 43.1 | Ref. | | 58.1 | Ref. | |
| 2007–2009 | 45.2 | 1.12*** | [1.01–1.24] | 62.5 | 1.37*** | [1.26–1.48] |
| 2004–2006 | 49.7 | 1.23*** | [1.11–1.37] | 69.8 | 1.84*** | [1.60–2.12] |
| 2002–2003 | 56.4 | 1.51*** | [1.36–1.67] | 64.3 | 1.69*** | [1.50–1.91] |
| School classes | | | | | | |
| 1.–4. class (SS) | 45.8 | Ref. | | 59.1 | Ref. | |
| 6.–9. class (ES) | 52.6 | 1.11** | [1.04–1.18] | 64.3 | 1.06 | [0.97–1.16] |
| Type of PEL | | | | | | |
| Progressive | 43.7 | Ref. | | 62.4 | Ref. | |
| Habitual | 52.8 | 1.18*** | [1.10–1.27] | 59.9 | 0.68*** | [0.63–0.73] |
| PEL content | | | | | | |
| Games | 47.2 | Ref. | | 57.9 | Ref. | |
| Non-games | 54.7 | 1.24*** | [1.18–1.31] | 63.5 | 1.23*** | [1.16–1.31] |

*Notes:* % = percentage of pupils who positively evaluate PEL according to the Questionnaire (total assessment in points within the range 17–24 points); ES = elementary school; SS = secondary school; OR = odds ratio; CI = confidence interval; Ref. = reference group; **p < 0.01; ***p < 0.001

The logistics regression shows that there are more chances to positively assess PEL in the Czech Republic found in girls (OR = 1.46), in pupils in lower classes (6.–9. class regardless of whether at elementary or secondary schools OR = 1.11), in habitual PEL and in non-game content of lessons (Table 12). On the basis of repeated surveys in several periods we can find a decline of chances to obtain positive evaluations. In the early period there was a higher chance to obtain positive evaluation (e.g. in 2002–2003). This can indicate an increasing pupils' criticality and their demands or the possibilities of how to induce their interest in PE lessons.

On the other hand, in Poland, gender does not play a significant role and the chances to obtain positive evaluations of PEL is the same in both boys and girls. Similarly, the year of schooling in which the pupils take part in PE is not significant either. The highest chance to obtain positive evaluations in Poland was found in the years 2004–2006 (almost twice higher). In comparison to the Czech Republic, in Poland, they more positively assess PEL with progressive content when the teacher adopts a selected innovation. In concordance with Czech pupils there is also in Poland greater possibility to obtain more positive evaluations of PEL with non-game content. This implies that pupils prefer non-competitive sports in which they could be the "winner" by themself.

The results that influence positive pupils' attitude to PEL are in compliance with the study by Luke and Sinclair (1991) that in Canadian adolescents identified five major determinants influencing the pupils' attitude to PEL: curriculum that means the content of PE, teacher's behaviour, atmosphere in the group, self-perception and equipment of PE. The study did not identify the difference between genders but in both cases the content of PE is essential. The content can on one hand motivate both girls and boys and on the other hand it can discourage them from PE which can be reflected in the negative evaluation.

### 4.4.2 The relation between pupils' self-perceived physical fitness, PA level and their attitude to PE lessons: use of pedometers

The significance of PA and its role in active lifestyle needs to be still emphasized. It is necessary to establish the right habits and attitude to sport and movement already in early age that is then positively apparent in adulthood (Barnekow-Bergkvist, Hedberg, Janlert, & Jansson, 1996; Gordon-Larsen, Nelson, & Popkin, 2004; Sacker & Cable, 2006; Trudeau et al., 1999). As the most suitable means for children of both sporting and non-sporting parents we can view PE at school that presents an obligatory amount of physical activity in a weekly regime in children and youth (Alderman, Benham-Deal, Beighle, Erwin, & Olson, 2012; EU Working Group, 2008). It has been confirmed that in adolescents the participation in the obligatory school physical activity programme motivates them to more activity (Alderman et al., 2012). PA monitoring and self-perception of one's own possibilities and limits is based on the self-determination theory (Ryan et al., 1997; Ward, Wilkinson, Graser, & Prusak, 2008), when external motives can and should become internal motives that are more stable. In PE, performance, mark or good feeling can be the feedback. The objective indicator (the data from a pedometer) however provides another and a new dimension in physical activity. Not only that it provides the probands with clear information but it can also contribute to modification of PEL and make it more attractive.

The use of pedometers to support PA in PE has been well documented among scientists (Beighle, Morgan, & Pangrazi, 2004; Morgan, Pangrazi, & Beighle, 2003). Higher PA in PE estimated using pedometers is also conditioned with the possibility to choose the content (Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009) and is influenced by individual pupils' physical fitness (Le Masurier & Corbin, 2006).

General "global strategy" of World Health Organization (WHO) calls upon the member states to support PA which includes healthy diet and PA that should be in balance (World Health Organisation, 2004). This strategy is applied in the easiest way in the educational process at school and especially as a key topic in the educational area Man and Health (Výzkumný ústav pedagogický, 2007a, 2007b). At the European level the working group stresses the interdisciplinary approach in the PA enhancement and in relation to education; schools should be supported in providing everyday PA either in the school programmes or in the cooperation with partners of local organisations (EU Working Group, 2008). For PE to be adjusted and beneficial to all pupils, it is necessary to use the newest knowledge found in research and transferred into teachers' praxis in order to maximise the opportunities for learning and success in all areas of PA.

The aim of this chapter is to provide overall results from a two-year faculty project. The main aim of the project was to carry out repeated short-term monitoring of PA at school PE using pedometer and thus to obtain further information from the Diagnostics of PEL questionnaire (Appendix 3). Further aim was to verify the educational possibilities using pedometers in school setting and specify how the content of PE is reflected in the attitudes to PEL in boys and girls.

**Participants**

The selection of elementary and secondary schools was made first on the basis of students' personal contacts and on previous good experience and cooperation with the schools. The factor of the intentional selection of schools was also the possibility to establish an agreement with the school management and their willingness to participate in the project. In the project, we used non-invasive, standardised, health and hygiene sound, risk free devices. The participants in the survey immediately learnt the results upon monitoring was completed, namely the number of steps made, and the amount of energy output. The participation in the research was voluntary and without financial incentives for the pupils. The data were processed and published anonymously; distributed questionnaires are also composed as anonymous.

The project was carried out in two versions; as a wider version i.e. as an experiment with the supervision by students at the schools they selected (Figure 25). And this one was supported with the narrow version which students in the graduate programme did within their teaching placements (Figure 24).

We used the Digi-Walker SW-700 pedometers in the research (see subchapter 3.3.1 Pedometers, p. 40) for objective measurement of number of steps as indicators at the level of PA and subjective method – Diagnostics of PEL questionnaire (Appendix 3). The data from the pedometer were calculated into a time unit (min) for the purpose of comparison.

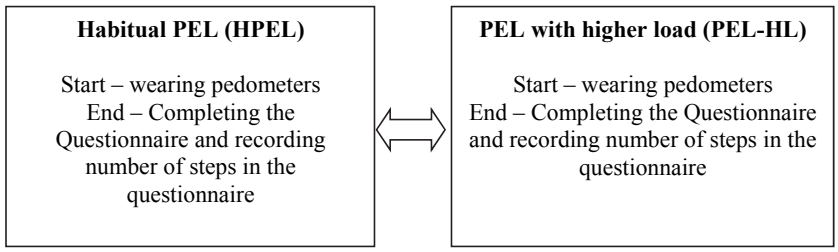



**Fig. 24:** *A scheme of the research carried out within students' placement of the students of Palacký University Olomouc (narrow version)*

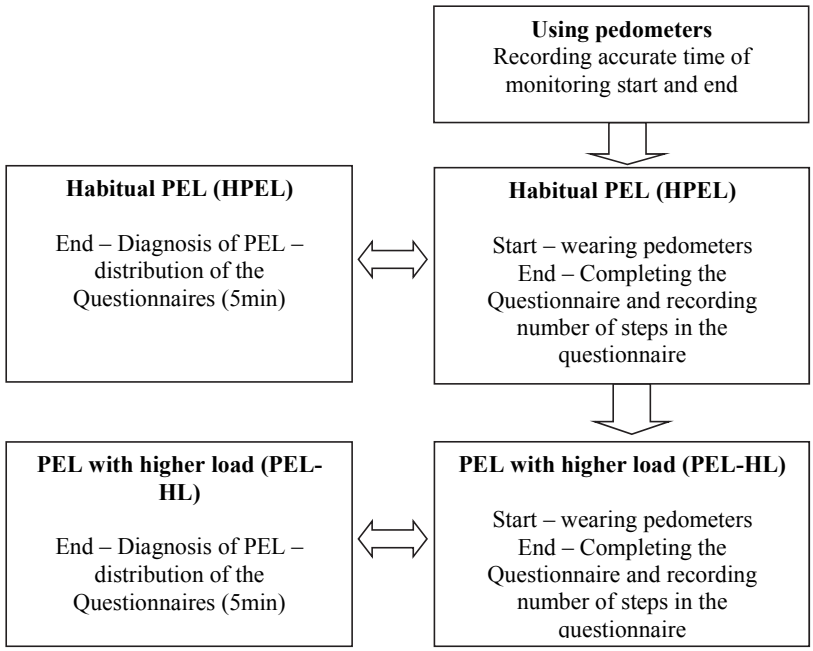



**Fig. 25:** *A scheme of research carried out in one class in PE*

### 4.4.2.1 The assessment of the level of PA in PEL

We monitored PA using pedometers in lessons. In order to assess the level of PA we analysed habitual PEL so that the amount of PA is not influenced by load level. In boys, the highest level of PA was found in PEL with football, the second highest PA was in PEL with basketball and the lowest level of PA was in PEL with gymnastics (Figure 26). Generally, PEL with games content show higher level of PA and they are also the most frequently applied ones.

In girls, the highest level of PA was found in football PEL, but there is a low number of the assessed data (Figure 27). Therefore, we prefer the fact that the highest level of PA was found in basketball lessons and in lessons where the content was marked as other games. Among these, there are for example floorball, frisbee, and dodge ball. In the opposite there were lessons with gymnastics which is due to a specific content that was

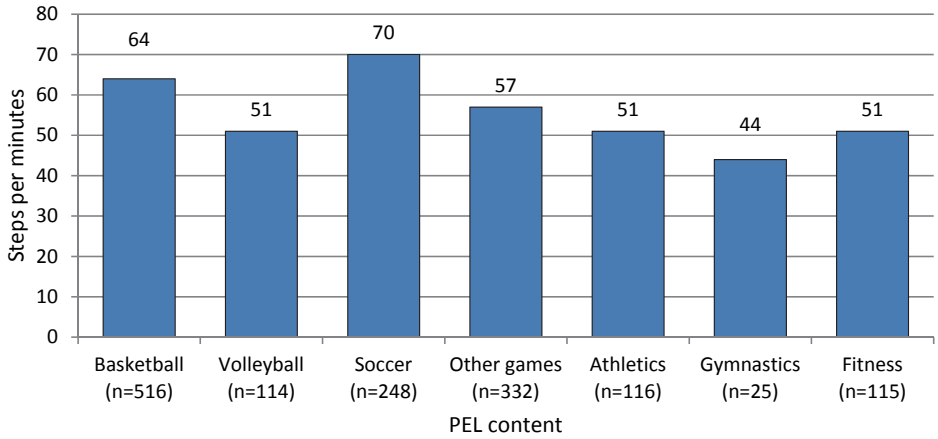



**Fig. 26:** *The average number of steps per minute in boys in PEL with different content (the data taken from the pedometers are in the brackets)*

not linked with much locomotion movement. On the other hand, the results in volleyball in girls were surprising which, however, rise questions how PEL was structured and how much time they spent with training or drill of volleyball. Our findings in the larger sample of respondents both in girls and boys are in compliance with a previous pilot study (Vašíčková, Neuls, & Šimůnek, 2014).

The highest level of PA was found in football PEL in boys and in girls in basketball or fitness PEL. In girls, the level of PA measured with pedometers was very even regardless of the content of PEL.

We decided to apply the linear regression analysis for each gender separately to find out how the content of PE influenced the amount of PA in adolescents and we included all the data from pedometers as dependent variable. As an independent variable we determined the type of PEL in relation to load (habitual vs. higher load), the content of PEL (game and non-game) and a concrete specific content of the PEL.

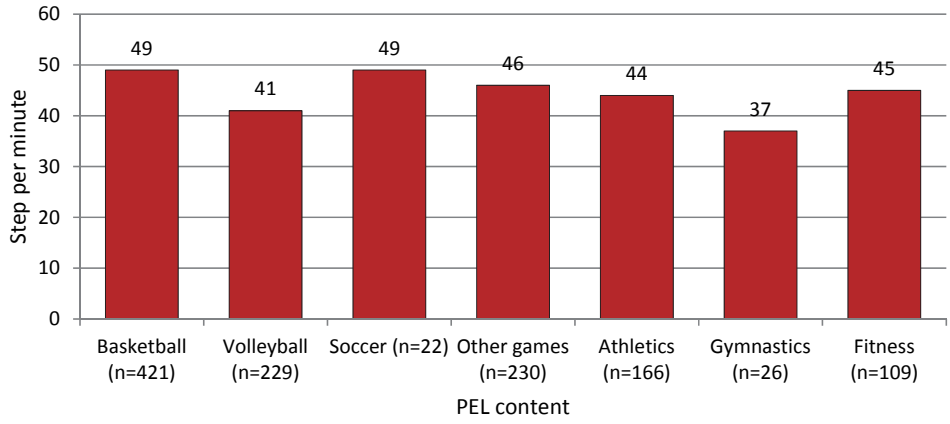



**Fig. 27:** *Average number of steps per minute in girls in PEL with different content (in brackets number of data taken from the pedometer)*

In boys, we have found that the type of load (marked as $x_1$ in the equation) and game or non-game PEL (marked as $x_2$ in the equation) significantly influence the level of PA expressed as the number of steps (Y) ($p < 0.01$). The concrete specific content (marked as $x_3$ in the equation) was not important ($p = 0.18$) then. (61.63 is a constant.)

$$Y \text{ (estimated; boys)} = 61.63 + 3.14x_1 - 2.68x_2 - 0.54x_3$$

In girls, we have found that the type of load (marked as $x_1$ in the equation) and a concrete specific content (marked as $x_3$ in the equation) were significant predictors of the PA level expressed by the number of steps (Y) in physical education ($p < 0.01$). The game or non-game content was not significant for the level of PA in girls ($p = 0.09$). (42.65 is a constant.)

$$Y \text{ (estimated; girls)} = 42.65 + 4.25x_1 - 0.60x_2 - 1.15x_3$$

In girls, the content of PE and the level of load influence the amount of PA in PEL. In boys, the amount of PA was influenced by the type of load (higher load) and game content in the PEL. What games were in the content was not important.

#### 4.4.2.2 The evaluation of the level of PA in PEL with regard to self-perceived physical fitness

We have examined the subjective evaluation of the pupils' level of physical fitness using a questionnaire in physical education lessons. The pupils rated themselves to either the low half of the class or the high half of the class in relation to self-perceived of physical fitness. This criterion served in the assessment of the level of PA in PEL according to the data measured by pedometers. We have evaluated the data with regard to gender.

In boys, the difference in the amount of PA was statistically significant (Figure 28) in favour to pupils who assessed their physical fitness in the high half of the class ($n = 1{,}900$; 64.78%) ($Z = 4.75$; $p < 0.01$; $d = 0.18$) as opposed to pupils in the low half of the class (n = 1,033), however this difference was not confirmed with an "effect size" coefficient.

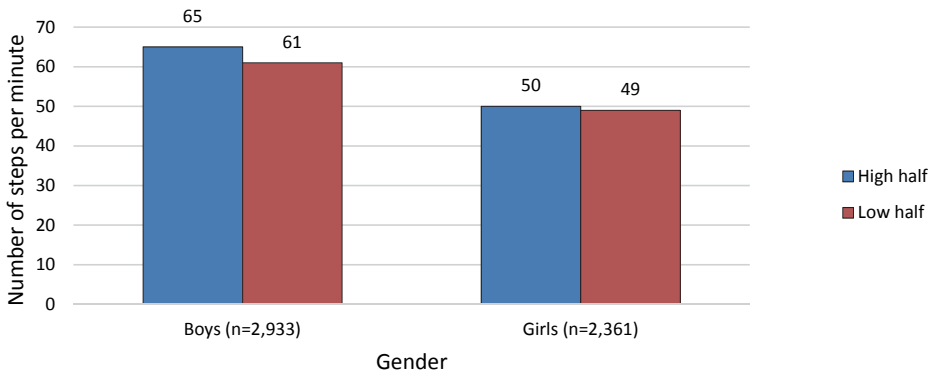



**Fig. 28:** *The differences in the level of PA in PEL in regard to self-perceived physical fitness*

The difference in girls was not statistically significant ($Z = 1.90$; $p = 0.06$; $d = 0.08$). The level of PA estimated using pedometers was in girls who assessed their level of physical fitness as "higher" ($n = 1{,}451$; 61.46%) almost the same as in girls with "lower" level of physical fitness ($n = 910$).

In boys, it has been found that higher self-perceived physical fitness is reflected positively in the amount of performed PA. In girls, this conclusion was not applied; the self-perceived physical fitness was not reflected in the amount of PA. We can therefore conclude that the differences in the amount of PA in adolescents with low and high level of physical fitness were found only in boys.

### 4.4.2.3 The evaluation of the level of PA in PEL in regard to PE popularity

We examined the popularity of the subject of physical education among boys and girls using a questionnaire in the physical education lessons. The pupils were to answer the question: "Is physical education the most favourite subject for you?" with YES or NO. This criterion served to assess the level of PA in PE according to the data measured by the pedometers with regard to the fondness of PE. We evaluated the data with regard to gender.

In boys, there was a very small difference ($Z = 2.15$) in the amount of PA between those who preferred PE ($n = 1{,}782$; 60.76%), and those for whom PE was not a favourite subject (Figure 29) and it is statistically significant at the level of 0.05, which was not confirmed by the "effect size" coefficient ($d = 0.08$). In girls, the difference was statistically significant ($Z = 4.22$; $p < 0.01$; $d = 0.17$) between girls who rated PE as their most favourite subject ($n = 1{,}014$; 42.95%), and those who did not rate it as their most favourite subject. The percentage representation was higher in girls who do not have PE as their most favourite subject. A similar study (Vašíčková, Neuls, & Svozil, 2015) argues that in both genders, the popularity of PE plays a significant role, at both elementary and secondary schools in relation to PEL and the amount of PA. In boys, the amount of PA (given by the average number of steps per minute) was higher than in girls; PA increases with age in boys and in contrary it declines in girls. The popularity of PE as a subject in both genders declined with age, in girls more abruptly, and it was the lowest in girls in the ninth class at elementary

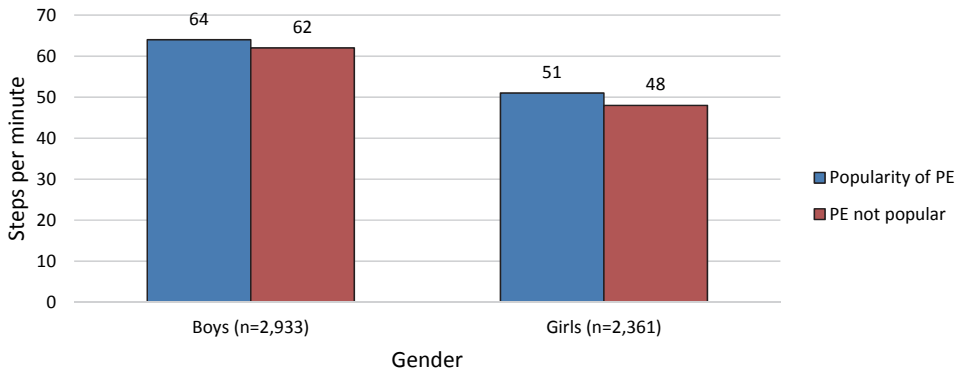



**Fig. 29:** *The differences in the level of PA in pupils in PEL in relation to popularity of PE*

schools and in the fourth class at secondary school. Similar results were found in a study by Antala et al. (2012), when PE popularity in Slovak girls was lower than in boys and it was more apparent at secondary schools. PE popularity proves itself in both genders. We can argue that in both girls and boys who like PE the amount of PA is higher (in girls the difference is statistically significant).

### 4.4.2.4 The evaluation of PEL in regard to self-perceived physical fitness

We examined the pupils' attitude to a finished PEL using a questionnaire in the PEL and as a criterion to compare the relations we used at first the rating of oneself into the "low" or the "high" half of the class according to the evaluation of one's own level of physical fitness. We evaluated the data with regard to gender.

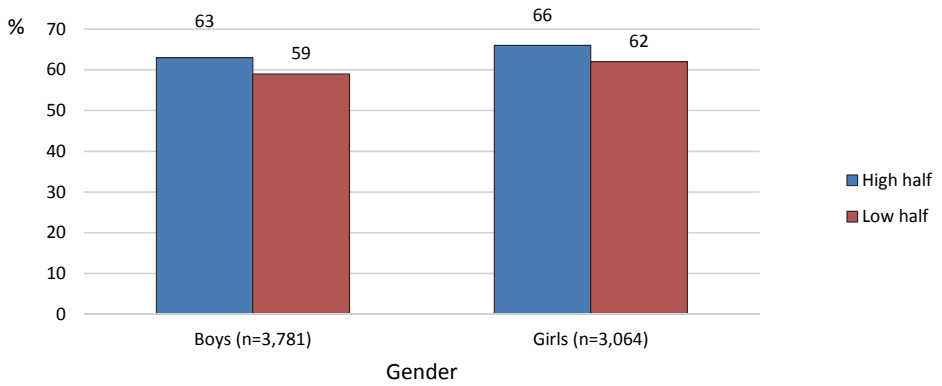
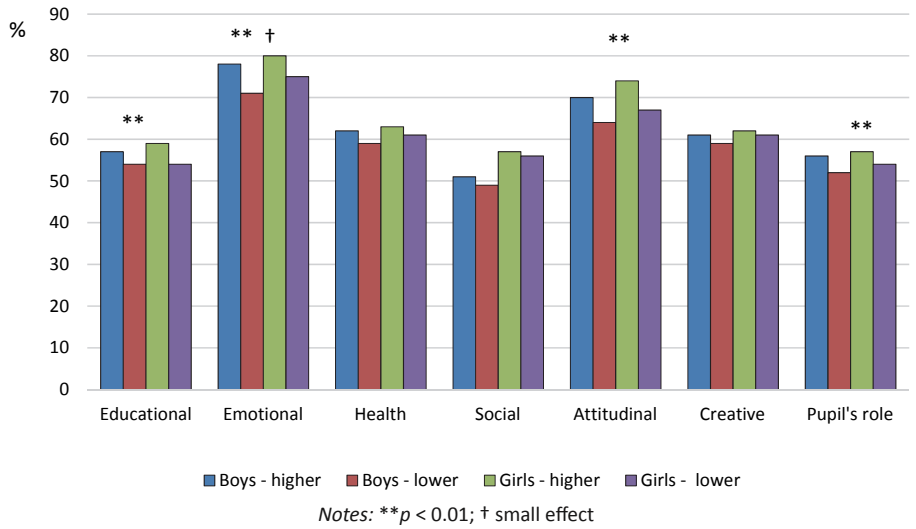



**Fig. 30:** *Differences in the total evaluation of the pupils' attitude to PEL according to the average number of points expressed in percentage and in relation to self-perceived physical fitness*




*Notes:* $^{**}p < 0.01$; † small effect

**Fig. 31:** *Differences in the individual dimensions of the questionnaire to PEL according to average number of points expressed in percentage and in relation to self-perceived physical fitness*

In boys and girls, a statistically significant difference was found in the total evaluation that expresses the pupils' attitude to PEL with regard to the self-perceived physical fitness in both genders in favour to pupils from the "high" half of the class (Figure 30). In boys, a small "effect size" coefficient was found ($Z = 6.25$; $d = 0.20$), whereas in girls the "effect size" coefficient was at the limit ($Z = 5.36$; $d = 0.19$).

There was a statistically significant difference found in the cognitive, emotional, attitudinal dimensions and the additional dimensions of "pupil's role" both in boys and girls; in the emotional dimension the difference was also confirmed by a small "effect size" coefficient ($d = 0.27$ in boys; $d = 0.25$ in girls) (Figure 31). All the differences were found in favour of girls and boys with higher level of physical fitness. In summary, we can say that higher self-perceived of physical fitness significantly and positively reflects in the evaluation of PEL.

### 4.4.2.5 The evaluation of PEL in regard to PE popularity

We examined the pupils' attitude to the finished PEL using a questionnaire in the physical education lesson and as a criterion to compare the attitudes we used the pupils' statement about the popularity of PE with answers divided between "*PE is the most favourite subject*" and "*PE is not the most favourite subject*". Assessment with regard to gender was made again (Figure 32).

In boys and girls, a statistically significant difference was found in the total evaluation that expresses the pupils' attitude to PE in regard to PE popularity, and in both genders in favour of pupils who stated PE as their most favourite subject. In both genders, a statistically significant difference ($p < 0.01$) was found in the total evaluation in relation to PEL confirmed with a small "effect size" coefficient ($d = 0.38$ in boys; $d = 0.44$ in girls).

In boys and girls, a statistically significant difference ($p < 0.01$) was found in all dimensions except of the creative one in boys ($p < 0.05$). Apart from the social and creative dimensions in both genders the differences were confirmed with a small "effect size" coefficient. In girls, a medium effect was found in girls in the attitudinal dimension ($d = 0.54$) (Figure 33). All the differences were found in favour to both and girls who state PE as their most favourite subject. We found the same results also in a partial study both in

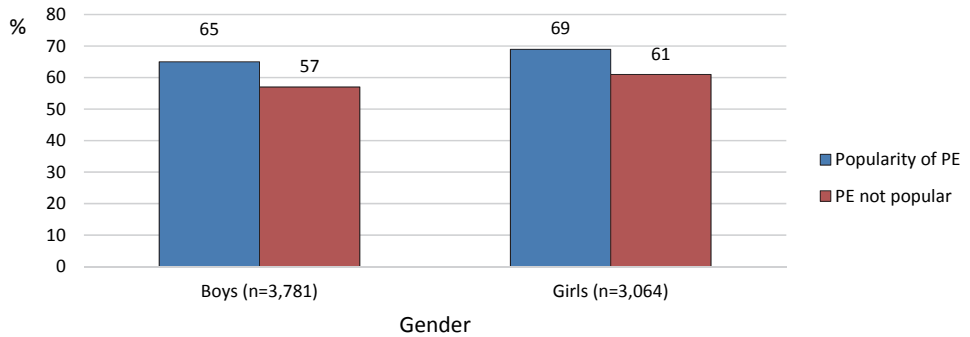



**Fig. 32:** *Differences in the total evaluation of the pupils' attitude to PEL according to the average number of points expressed in percentage and in relation to PE popularity*

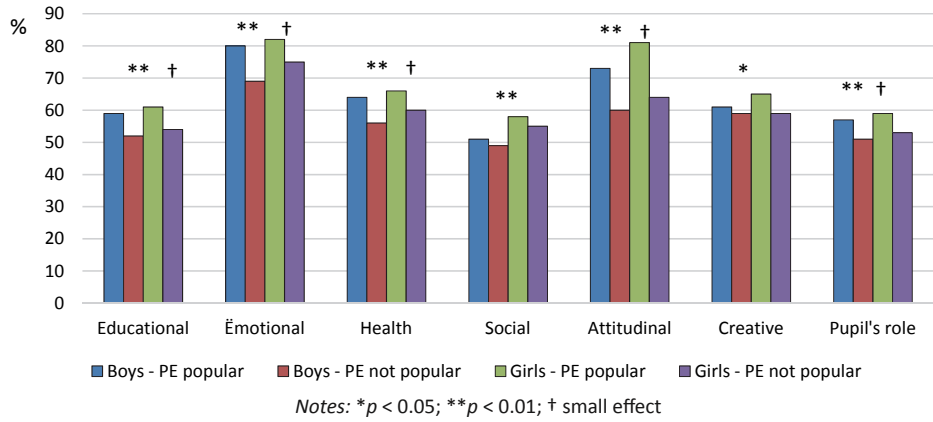



**Fig. 33:** *Differences in the individual dimensions of the questionnaire to PEL according to average number of points expressed in percentage and in relation to PE popularity*

elementary and secondary schools (Vašíčková et al., 2015). Overall we can conclude that the popularity of PE subject significantly and positively influences the evaluation of the just performed PE lessons despite its content that does not belong among the favourite ones.

### 4.4.2.6 The evaluation of PEL in regard to the content of lessons

We estimated the pupils' relation to just performed PEL using a questionnaire in the lessons and as a criterion we used the content of lessons that the student teachers recorded into the record sheets. We evaluated the data in relation to gender. At first we were interested in the total relation that is described in Figure 34.

The total attitude to the performed PE is different in boys and girls with the regard to the content of PE and these differences are statistically significant (boys: $F = 2.99$; $p < 0.01$; $\omega^2 = 0.006$; girls: $F = 3.59$; $p < 0.01$; $\omega^2 = 0.01$), yet the "effect size" coefficient showed a small effect only in girls. The most positive attitude in boys was found in gymnastics PEL and

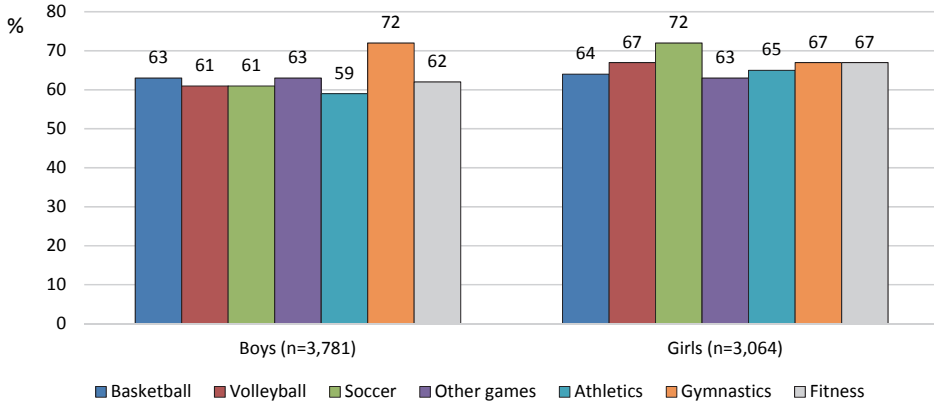



**Fig. 34:** *Differences in the total pupils' attitude to PEL according to average number of points expressed in percentage and in relation to the content of PE*

in girls in football PEL, however, sufficient analysed data were not here available, and this is a limitation in order to make generalised statement. If we did not consider these two extremes, then boys positively accepted PEL with basketball and other games, and girls accepted positively lessons with volleyball, gymnastics and fitness lessons. Figure 34 shows that girls assessed PEL more positively in total than boys regardless of its content.

When we consider the answers in individual dimensions, then in boys there was a statistically significant difference in the creative dimension ($F = 4.68$; $p < 0.01$; $\omega^2 = 0.01$) and in the individual dimension of "pupil's role" ($F = 3.57$; $p < 0.01$; $\omega^2 = 0.008$), where a small "effect size" coefficient has been also found (Table 13).

**Table 13:** *Average point evaluation in individual dimensions in boys in relation to the PEL content*

| Dimensions | Content | | | | | | |
|---|---|---|---|---|---|---|---|
| | Basketball (*n* = 651) | Volleyball (*n* = 164) | Soccer (*n* = 304) | Other games (*n* = 408) | Athletics (*n* = 161) | Gymnastics (*n* = 35) | Fitness (*n* = 142) |
| Educational | 2.52 | 2.37 | 2.11 | 2.22 | 2.19 | 2.69 | 2.43 |
| Emotional | 3.11 | 2.98 | 2.99 | 3.11 | 2.94 | 3.51 | 3.14 |
| Health | 2.49 | 2.32 | 2.42 | 2.39 | 2.40 | 2.89 | 2.46 |
| Social | 2.06 | 2.05 | 2.01 | 2.04 | 1.99 | 2.43 | 2.03 |
| Attitudinal | 2.78 | 2.65 | 2.61 | 2.84 | 2.52 | 2.74 | 2.73 |
| Creative* | 2.46 | 2.38 | 2.50 | 2.53 | 2.21 | 3.00 | 2.18 |
| Pupil's role* | 4.46 | 4.27 | 4.35 | 4.45 | 4.01 | 5.26 | 4.28 |

*Notes:* *$p < 0.01$

In girls who assessed the performed PEL there were statistically significant differences found in four dimensions: educational ($F = 4.28$; $p < 0.01$; $\omega^2 = 0.01$), emotional ($F = 5.15$; $p < 0.01$; $\omega^2 = 0.02$), health ($F = 4.27$; $p < 0.01$; $\omega^2 = 0.01$) and social ($F = 5.82$; $p < 0.01$; $\omega^2 = 0.02$). In these four dimensions, the difference was also confirmed with a small effect ("effect size" coefficient) (Table 14).

**Table 14:** *Average point evaluation in individual dimensions in girls in relation to the PEL content*

| Dimensions | Content | | | | | | |
|---|---|---|---|---|---|---|---|
| | Basketball (*n* = 564) | Volleyball (*n* = 273) | Soccer (*n* = 22) | Other games (*n* = 306) | Athletics (*n* = 212) | Gymnastics (*n* = 31) | Fitness (*n* = 146) |
| Educational* | 2.22 | 2.41 | 2.45 | 2.19 | 2.57 | 2.26 | 2.30 |
| Emotional* | 3.04 | 3.27 | 3.64 | 3.12 | 3.25 | 3.45 | 3.03 |
| Health* | 2.39 | 2.73 | 2.68 | 2.40 | 2.47 | 2.74 | 2.69 |
| Social* | 2.34 | 2.36 | 2.32 | 2.06 | 2.24 | 2.10 | 2.58 |
| Attitudinal | 2.91 | 2.86 | 3.14 | 2.78 | 2.81 | 2.97 | 2.99 |
| Creative | 2.46 | 2.57 | 3.05 | 2.54 | 2.36 | 2.68 | 2.57 |
| Pupil's role | 4.55 | 4.67 | 4.91 | 4.34 | 4.42 | 4.94 | 4.64 |

*Notes:* *$p < 0.01$

### 4.4.2.7 The influence of the application of pedometers on the pupils' attitude to a PEL with different load

In order to answer the question "Does the application of pedometers influence the pupils' attitude to PEL with different load?" we analysed the data from the experimental survey at schools where for each class there were questionnaires applied in four sessions; (two habitual [HPEL] and two PEL with higher load [PEL-HL]) and pedometers were applied in two of the sessions (always one in the habitual and one in the PEL with higher load) (Figure 25). In total, the student teachers obtained 425 questionnaires from boys (232 from HPEL and 193 from PEL-HL), 640 questionnaires from girls (372 from HPEL and 268 from PEL-HL) and further 216 data sets from pedometers from boys (118 in HPEL and 98 in PEL-HL) and 439 data sets from pedometers from girls (176 in HPEL and 140 in PEL-HL).

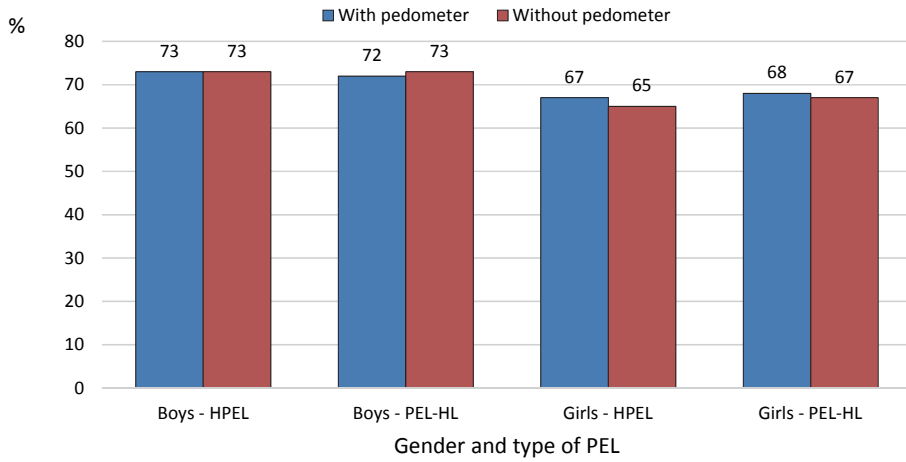



**Fig. 35:** *Differences in the total evaluation of pupils' attitude to PEL according to the average number of points expressed in percentage in regard to the type of PEL (the size of load) and in relation to the application of pedometers*

In boys and in girls, there were no significant differences found between the evaluation of lessons in relation to the load and in relation to the application of a monitoring device (Figure 35). Using pedometers to monitor PA in adolescents in PE was not reflected in the evaluation of PE. No significant differences were found in any of the analysed dimensions.

In summary, the findings show that the highest amount of PA is reached in lessons with football, basketball and games (other) regardless of gender. The level of PA is dependent on the size of load and in boys also on whether it is a lesson with a game content, whereas in girls it is the concrete content of the lesson that plays a role. A higher level of PA and a more positive attitude to PEL are reached by those pupils who state PE to be their most favourite subject or those who assess their physical fitness to be in the high half of the class. Boys show a more positive attitude to PEL with gymnastics, basketball and games content (other games than football, volleyball and basketball). Girls show a more positive

attitude to lessons with football, volleyball, gymnastics and fitness content. The pedometers applied in the monitored PELs did not have influence on the pupils' attitude to the lessons. Although there is not an association confirmed, still it is apparent what a teacher can use in PE and what he/she can use to support physical literacy in PEL.

### 4.4.3 The pupils' and student teachers' attitude to a performed PEL

"Attitude permeates everything we do" (Silverman & Subramaniam, 1999, p. 97). A review study that included the concept of attitudes, the question of research techniques that are used to "measure" attitudes, research of pupils' attitudes and relations to PE and following other logical conclusions was compiled by Silverman and Subramaniam (1999). The importance of pupils' attitudes is important in forming their positive attitude to the content of PE and thus especially to PA (Robinson, 2009). It also helps to clarify the complex character of the educational process in PE and the identification of attitudes can be stimulating and enriching for teachers. Teachers are the crucial determinant to create either a positive or a negative pupils' attitude to PE. Especially the teachers' attitude to one's own profession plays a key role in forming the pupils' attitude to the subject (Pethkar, Naik, & Sonawane, 2012). If pupils have a positive attitude to PE, it can positively influence the actual environment for learning and thus the whole group of pupils and for the teachers themselves (Tannehill, Romar, O'Sullivan, England, & Rosenberg, 1994; Tannehill & Zakrajsek, 1993). It is also important to know the public's opinion on the implementation of PE at elementary and secondary schools because often they are public authorities (elected representatives) who apply the information into policy making or management areas in the form of strategic decisions or legislation documents (Mužík & Vlček, 2010).

The question of the pupils' attitudes to PE is discussed by kinanthropologists with regard to different approaches, goals, or research problems (Antala, 2012; Bartík, 2009; Bartík & Mesiarik, 2009; Ludviková, 2010; Mužík & Vlček, 2010; Pavelková & Škaloudová, 2006). Direct and immediate opinion on the actual performed PEL was assessed with regard to the type of PEL and the size of load (Chmelík, Frömel, & Svozil, 2007; Chmelík, Frömel, Svozil, & Maleňáková, 2007; Mitáš & Frömel, 2005; Sigmund, Frömel, Sigmundová, & Skalik, 2009; Sigmund, Sigmundová, Frömel, & Vašíčková, 2010), PE popularity (Vašíčková et al., 2015) or self-perceived physical fitness (Frömel et al., 2014; Neuls, Vašíčková, & Svozil, 2014; Neuls, Vašíčková, & Vysloužilová, 2014). The teacher's opinion who managed the particular PEL was also recorded in the survey but no analysis of it has been done so far.

The aim of the analysis was to find out whether pupils and student teachers assess the actual performed PEL similarly or whether their opinion differs in some ways. In the teaching practices during 2012–2014, the questionnaires completed by pupils and student teachers were compiled and in total 500 pairs of data were created. Class was selected here as the unit for statistical analysis (Chmelík, Frömel, & Svozil, 2008). The answers from the questionnaires were aggregated, the obtained data for the entire group were calculated in the averages and these averages were compared to the questionnaires completed by student teachers.

**Table 15:** *Differences in the assessment of PEL in individual dimensions and in total according to questionnaires completed by pupils and student teachers*

| Dimensions | Pupils[a] | | Student teachers[a] | | *Z* | *p* | Cohen's *d* |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | | |
| Educational | 2.27 | 0.55 | 3.53 | 0.64 | 18.50 | 0.001 | 1.65$^{+++}$ |
| Emotional | 3.09 | 0.48 | 3.81 | 0.51 | 17.20 | 0.001 | 1.54$^{+++}$ |
| Health | 2.48 | 0.55 | 2.93 | 0.87 | 9.43 | 0.001 | 0.84$^{+++}$ |
| Social | 2.41 | 0.46 | 2.81 | 0.73 | 15.21 | 0.001 | 1.36$^{+++}$ |
| Attitudinal | 2.78 | 0.60 | 3.54 | 0.71 | 15.24 | 0.001 | 1.36$^{+++}$ |
| Creative | 2.46 | 0.54 | 2.89 | 1.04 | 8.61 | 0.001 | 0.77$^{++}$ |
| „Pupil's role" | 4.46 | 0.80 | 6.07 | 1.24 | 18.48 | 0.001 | 1.58$^{+++}$ |
| Total | 15.24 | 4.46 | 19.51 | 2.49 | 17.71 | 0.001 | 1.65$^{+++}$ |

*Notes: Z* = z-score Wilcoxon non-parametric test; *p* = statistical significant level; *d* – "effect size" coefficient; [a]*n* = 500; $^{+++}$ high effect; $^{++}$ medium effect

The results of the analysis show (Table 15) that pupils' and student teachers' opinions differed extensively in all surveyed dimensions, where a high effect between the assessments was found. A medium effect was found in the creative dimension. Apparently student teachers assessed more positively the performed PEL; however, in answers they considered the whole class (Appendix 5).

The description of positive answers to individual questions in percentage is in overall shown in Figure 36. The wording of questions in the questionnaire is stated in Appendix 5. Only in four questions, pupils evaluated the actual PEL more positively than the student teacher. In question 3, the relaxation and regenerative effect of the lesson was evaluated; it is apparent that for the student teacher the lesson did not have such a regenerative effect as for the pupils because the student teacher has to lead the lesson, organize it and keep discipline. Prospective teachers perceived the regeneration effect of the lessons in 46% and pupils in 56% cases ($Z = 4.81$; $p < 0.001$; $d = 0.43$).

In question no. 10 the instances of indiscipline were evaluated. In more than 60% of lessons, instances of indiscipline appeared but they are not specified more in detail. Physical education is in general more tolerant to instances of indiscipline due to its genuine character (Kulinna, Cothran, & Regualos, 2006). A more critical opinion was found in pupils, but the identified difference between answers of student teachers and pupils was not statistically significant ($Z = 1.58$; $p = 0.12$; $d = 0.14$). We assume that the limit of the perception of indiscipline is the same in pupils and in student teachers, which is a fact that can significantly help in the class management in PE (Cothran & Kulinna, 2007; Supaporn, 2000).

In question no. 18, 82% pupils stated the feeling that they were constantly "directed" by the teacher (by the student teacher here) as opposed to 72% of student teachers who had to manage and still control the pupils in the course of the lesson. These answers should not be understood negatively as the management and organization work is a teachers' competence not only in PE. Without a responsible management there might be chaos in lessons (Gay, 2006).

In question no. 22, pupils expressed to the correction of mistakes in a classmate's exercise or by a classmate and the student teacher expressed to the engagement of pupils in the mutual correction of mistakes. The difference in answers was not significant ($Z = 1.89$; $p = 0.06$; $d = 0.17$), which denotes the same opinion on the given question. The aspect of feedback from classmates has not been sufficiently carried out in praxis as the number of positive answers was less than 30%. This question is not well investigated in research either; there is more evidence concerning feedback from the teacher (Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012; Nicaise, Cogérino, Bois, & Amorose, 2006). The question asked in the questionnaire rather induces the transfer of responsibility to the pupil and thus it increases one's role in the process of education in PE.

There were differences in answers and small "effect size" coefficients in two answers found in the analysis. In question no. 11, almost 60% of pupils and 70% of student teachers admit that an individual exercise outside of school could be better than the lesson or that it could provide better exercise in free time than the one in the lesson. A question rises, what is the cause of negative answers in student teachers, whether it is the obligation to

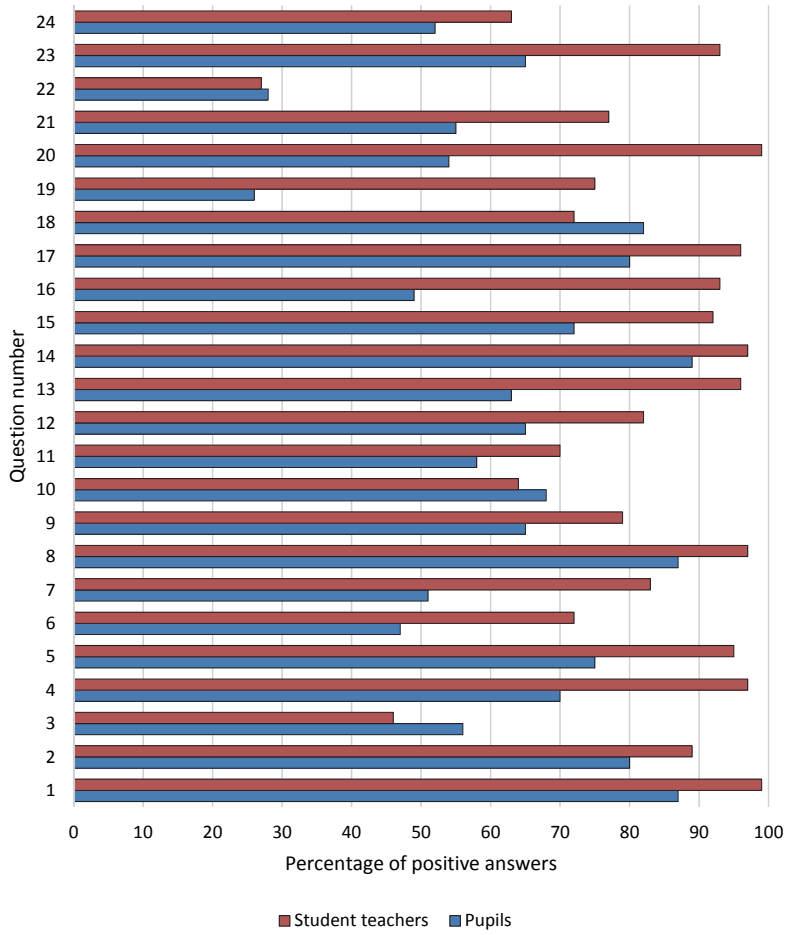



**Fig. 36:** *Differences in the evaluation of PEL in individual questions using questionnaire between pupils and student teachers (expressed in percentage)*

work within the framework of the curriculum (School educational programme) and thus include also "unpopular" PA in the lessons or for example insufficient material conditions or the pupils' indiscipline which means overcoming difficulties in the class management and organisation. There needs to be more content analysis done in order to address these aspects. In case of pupils, it is comprehensible that some content in PEL can evoke also negative feedback in them. They have more opportunities to choose an activity or PA closer to their interests in their free time.

Question no. 24 explored a moment of surprise or whether there was something new in the lesson. It is possible that the distribution of questionnaire itself or the presence of a "new" unexperienced teacher (the student teacher) could invoke a positive answer. However, it was not explored in any of the groups what the moment of surprise was or what "new" there was in the PE lesson.

There were two questions in the analysis that show medium "effect size" coefficient in the differences. Question no. 2 asked pupils whether they felt satisfaction from the PA in the course of the lesson, and the student teacher was asked whether he/she was satisfied with pupils' PA. Both the questions ask a subjective opinion of each group and therefore it is apparent that coincident statements cannot be reached. Similarly, in question no. 12, when we ask pupils and the student teacher whether pupils could at least once in the lesson freely decide what they would do and in what manner.

In other questions, a statistically significant difference at the level of significance $p < 0.001$ was found with a large "effect size" coefficient $d \in \langle 0.81; 1.65 \rangle$ which means that the answers of pupils and student teachers differed greatly.

We tried to describe pupils' and student teachers' opinions on the performed PE lessons. We had assumed that there would be differences in most questions and dimensions, which has been confirmed. The approach of the "prospective" teacher is extremely important due to the relationships between the attitude and the activity. The attitude or the relationship the teacher adopts influences one's view of education, pupils' behaviour and further also pupils' results in the education (Pethkar et al., 2012). A similar analysis of the pupils' and teachers' relationship to PEL accomplishment has not been carried out yet, however such an analysis appears to be beneficial, stimulating and quite important as a feedback to student teachers in the development of physical literacy in PE.

## 4.5 The enhancement of physical literacy in adolescents using an intervention to increase PA

Children spent approximately 40–45% of their time when they are awoke at school (Fox, Cooper, & McKenna, 2004), therefore it is apparent that the school environment is crucial in the PA enhancement. In order to increase the level of PA, it is most effective to increase the number of PE lessons at school (van Beurden et al., 2003), which is not however possible on a broad level. Although there are schools that try to include a third PE lesson, mainly in the first stage of elementary school, for example in a pilot verification of the programme Physical activity and nutrition (Mužík, Vrbas, & Trávníček, 2014).

If we want to influence the level of PA, we can use the targeted intervention in PE or in a combination focusing on PA and other factors that influence healthy lifestyle (e.g. diet, motivation, awareness, etc.). Among such projects, there were for example the CATCH project at elementary schools (Luepker et al., 1996) or SPARK (Sallis et al., 1997; Sallis et al., 1993; Sallis et al., 1999; Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2007) or M-SPAN (McKenzie et al., 2004) project at secondary schools that aimed to increase the amount of PA in PE and also outside of school. Welk and Corbin (1995) found that pupils are more active on days with PE than on other school days or in the time after school. Further, D. Dale, Corbin and K. S. Dale (2000), described the same situation and they moreover studied if pupils somehow compensate the insufficient physical activity on the days when they do not have PE. It has been found that they do not, and that on days without PE they are insufficiently physically active. In the Czech Republic, Sigmund et al. (2013) found in 9–11 years old children that active exercise in PEL contributes to the higher level of daily PA of moderate to vigorous intensity and it contributes to meeting the health recommendation especially in girls with obesity and overweight. A meta-analytic study by Fairclough and Stratton (2006) examined, apart from other things, the interventions that increase PA in PE in children at elementary schools. The authors found that interventions are beneficial and lead to the increase of time spent with moderate PA in PE in about 13%, however, once the intervention finishes there is the reduction of quality and quantity in PE.

Most intervention studies examine the short term effect that is especially the increase of the level of PA, and mainly in PE. However, it is quite necessary to examine whether the effects of interventions are of a permanent character and whether there is a more significant change of physical activity behaviour. In Poland, they examined whether the effect of a 15 month-long intervention aimed at self-direction and development of individual responsibility for the planning of concrete individual goals in leisure time activity lasted after three years (Bronikowski & Bronikowska, 2009). The primary aim of the intervention was not to increase the level of PA, but to show the pupils and teach them how to engage in planning their own leisure time PA and take over the responsibility for their health. In the intervention group, pupils still after 2.5 years since the experiment ended showed higher frequency of PA in leisure time (Bronikowski & Bronikowska, 2011). Intervention studies in PE at school at the second stage of elementary schools and secondary schools focus on different factors that can increase the level of PA. Some studies examine factors concerning the pupil, e.g. the motivational climate enhancing PA and exercise in PE (Braithwaite, Spray, & Warburton, 2011; Digelidis, Papaioannou, Laparidis, & Christodoulidis, 2003), the influence of intervention to enhance PA in different socio-economic groups of adolescents (De Bourdeaudhuij et al., 2011), or factors associated with the applied theory, e.g. the application of different theory models in creating the intervention (Hendl, 2009; Lee, Kuo, Fanaw, Perng, & Juang, 2012) or in understanding physical activity behaviour (Motl, 2007). Other intervention studies deal with the change of behaviour in the educator or the change of the educational style (McKenzie et al., 2004; van Beurden et al., 2003) in relation to the enhancement of PA in PE at school or there are combined studies e.g. aimed for example at the enhancement of PA not only at school but also in the family or the community (Lubans, Morgan, Callister, & Collins, 2009; van Sluijs, McMinn, & Griffin, 2007).

There are also many review studies in the international databases that deal with the interventions on the enhancement of PA at school according to in advance selected criteria (De Meester, van Lenthe, Spittaels, Lien, & De Bourdeaudhuij, 2009; Dobbins, De Corby, Robeson, Husson, & Tirilis, 2009; Dobbins et al., 2013; Salmon, Booth, Phongsavan, Murphy, & Timperio, 2007; van Sluijs et al., 2007). The results of these review studies were comprised in a study by Kriemler, Meyer, E. Martin, van Sluijs, Andersen and B. W. Martin (2011). The most important findings are:

- Intervention (for PA at school and the enhancement of healthy lifestyle leading to the increase of the PA level or physical fitness in children and adolescents) has a positive impact on the duration of PA at school and on physical fitness but it is often only a short term effect.
- Intervention improves the amount of PA mainly at school; the transfer into leisure time is not verified.
- Studies that assess PA objectively are more effective than those than assess PA only using questionnaires.
- Interventions in adolescents are more effective than in children.
- An evidence based long term effect is missing.
- Interventions are more successful if they are of a long term character and if specialists engage in them.
- Interventions are multifacets or aimed only at PA, and they are more effective if they focus on the adoption of healthy behaviour from different aspects.
- Interventions that are more effective for children are those that focus on PE, physical activities in recesses, or interventions that engage the family.

The authors also come up with results from the latest intervention studies published in 2007–2010 that discuss the important effect of the intervention on the amount of PA in at least one domain (at school, outside of school, or in PA in total; found in 100% studies), important influence on physical fitness (found in 55% studies) and also important influence of the intervention on physical skills (successfulness found in 67% of studies).

It is therefore apparent that we set our research goal in relation to the ambiguous findings in previous studies. The aim was to:

1. find out if a month-long intervention using pedometers can influence the level of PA in adolescent girls and boys;
2. find out whether a month-long intervention can influence the amount for PA in girls and boys who showed a lower level of PA in the initial survey.

Due to the character of the verification of this intervention and in order to use the results in diploma theses of the engaged students, it was not our goal to verify the long term effect.

**Participants**

Pupils engaged in the research were randomly selected in first classes at schools that the student of the master study programme at the Faculty of Physical Culture, Palacký University Olomouc addressed and arranged the realisation of the interventions with the school management and PE teachers. Pupils and their parents signed consent with the

participation in the intervention and provided information on their weight and height. Pupils did not face any sanctions if they wanted to finish the intervention earlier before its end. All the obtained data were processed anonymously. The research sample included obtained data from pupils from eight grammar schools (towns: Bohumín, Jaroměř, Karviná, Soběslav, Vysoké Mýto, Zábřeh, Zlín, Žamberk) (the number of pupils engaged in the intervention $n = 168$) and from two secondary schools (Frýdek-Místek and Holešov) (the number of pupils engaged in the intervention $n = 66$). The analysed data sample comprised 234 pairs of data (pretest and posttest) (total: $n = 468$; boys: $n = 82$; girls: $n = 152$). Table 16 provides a summary of individual characteristics of the sample.

**Table 16:** *Characteristics of the data sample according to gender, total PA and sitting before and after intervention.*

| Characteristics | Boys ($n = 82$) | | Girls ($n = 152$) | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Age (years) | 15.54 | 0.69 | 15.60 | 0.66 |
| Weight (kg) | 67.91 | 10.43 | 57.79 | 8.07 |
| Height (cm) | 179.77 | 7.65 | 167.44 | 6.06 |
| BMI | 20.87 | 2.14 | 20.66 | 2.47 |
| Measurement | Before intervention | After intervention | Before intervention | After intervention |
| Physical activity (MET-min/day) | 10,125 | 8,635 | 10,637 | 11,702 |
| Sitting (min/day) | 370 | 334 | 392 | 368 |

*Notes:* MET = metabolic equivalent

**The intervention model and applied instruments**

In the research, Digi-Walker SW-700 pedometers, motivational booklets, IPAQ – long questionnaire were used and the pupils were offered to use the internet INDARES.COM programme.

In the introductory session, we acquainted the pupils with the content of the intervention (Figure 37), explained the work with the pedometers (resetting) and its correct wearing. The pupils completed the IPAQ – long version questionnaire (Appendix 7) at the beginning which is a part of the ANEWS questionnaire that collects information on the surroundings in relation to PA. The data from the IPAQ questionnaire were used as the source of the initial values of the level of PA and sitting. Pupils were instructed to daily monitor their PA using pedometers which were calibrated standardly before the measurement. Pupils learnt when to wear the pedometer and when to take it off. Every pupil recorded the value of number of steps each evening, distance walked and the number of calories into the motivational booklet (log), and resetted the pedometer. The booklets are suitable for children older than 15–16 years (Armstrong & Welsman, 2006). The motivational booklet included information on the PA record, health recommendations for weekly PA in adolescents, explanation of some terms, information on some energy values of selected food and energy expenditure in some activities. Monitoring took place

for a month. A week after monitoring finished pupils received the IPAQ – long, which estimated the level of PA after the targeted intervention.

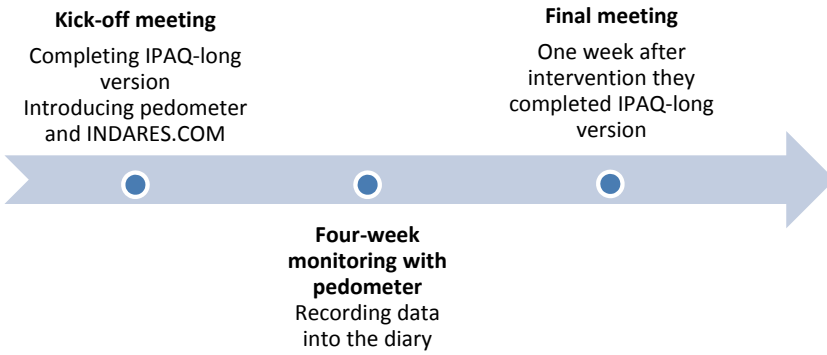



**Fig. 37:** *Time model of the intervention*

### 4.5.1 The effects of a month-long intervention to increase PA in adolescents

In girls, the intervention had a positive impact on the time spent walking and with vigorous PA; after a month intervention higher values were found. Also, time spent sitting decreased on a school day. The differences were not however statistically significant (Figure 38). On the other hand, there was a decrease in the time spent with moderate PA in girls. In boys, we have also found an increase in the time spent walking and decrease

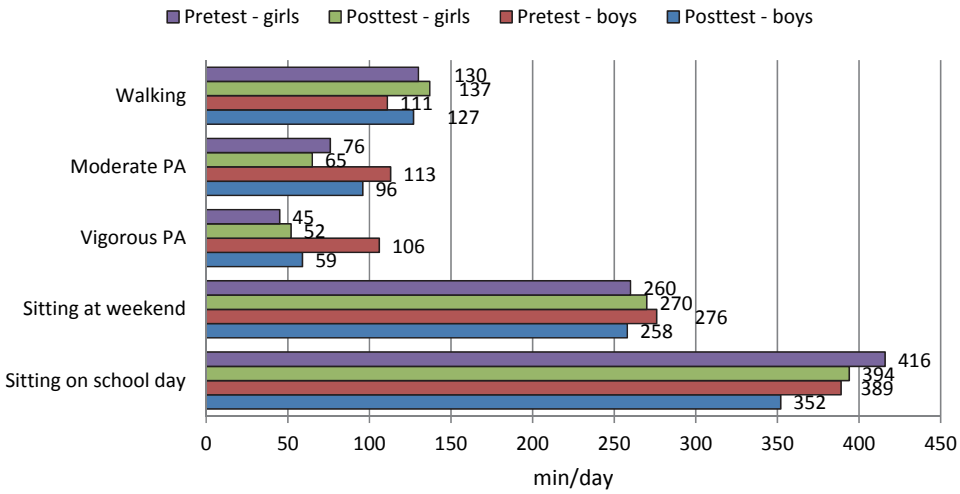



**Fig. 38:** *Average values in min/day PA and sitting according to gender and time of monitoring*

in time spent sitting both on school days and at weekend. Less time spent with moderate PA and vigorous PA was found in boys in the week after the intervention finished.

Statistically significant values confirmed with the "effect size" coefficient were found in boys and in moderate and vigorous PA, but there was a decline in subjectively reported values in both characteristics (Table 17). In girls, we recorded in all characteristics an increase of values in the posttest, a statistically significant difference was found only in walking. Similar results were found in a study in Polish adolescents, when there was an increase of the total value of PA in girls (MET-min/week) expressed in a median in the intervention group up 10.3%, on the other hand in boys there was a decline in the total value of PA in the expressed in median of 10.2% (Vašíčková et al., 2013).

**Table 17:** *Average values of PA (MET-min/week) according to gender and time of monitoring*

| Gender and characteristics | Repetition | *M* | 95% CI | *t* | Cohen's *d* |
|---|---|---|---|---|---|
| Boys | | | | | |
| Walking (MET-min/week | pretest<br>posttest | 3008<br>3151 | 2066–3949<br>2006–4296 | 0.30 | 0.07 |
| Moderate PA (MET-min/week) | pretest<br>posttest | 2586<br>2230 | 1904–3268<br>1473–2988 | 1.74 | 0.39† |
| Vigorous PA (MET-min/week) | pretest<br>posttest | 4562<br>3254 | 3101–6022<br>2190–4318 | 2.36* | 0.53†† |
| Girls | | | | | |
| Walking (MET-min/week) | pretest<br>posttest | 4572<br>5412 | 3396–5749<br>3829–6995 | 1.87 | 0.31† |
| Moderate PA (MET-min/week) | pretest<br>posttest | 3454<br>3587 | 2099–4810<br>1590–5584 | 0.28 | 0.05 |
| Vigorous PA (MET-min/week) | pretest<br>posttest | 2648<br>2712 | 1917–3379<br>1940–3484 | 0.27 | 0.04 |

*Notes:* CI = confidence interval; *t* = pair t-test statistics; *d* = "effect size" coefficient; †small effect; ††medium effect

The findings show that in the area of PA, boys reacted to the month-long intervention with pedometers rather negatively because a decline in the PA level was found in the subjective data from the IPAQ questionnaire that was distributed after the intervention. There was a positive effect of the intervention on the decline of the sitting time. In girls, the month intervention has proved rather positively in PA, because there was a small increase of the values after the intervention. The average time spent sitting in girls has declined only on school days but the differences were not significant.

In conclusion, we can say that the intervention had the effect only on the time spent sitting, both in boys and girls. The amount of PA was not influenced with the intervention significantly.

### 4.5.2 The effect of a month-long intervention in pupils with low level of PA

We identified the median for the analysed sample of data of the total number of MET-min/week according to physical activity before the measurement, separately for girls (5,359 MET-min/week, which equals 89 MET-hours/week) and for boys (7,049 MET-min/week, which equals 117 MET-hours/week). This limit value divided the sample into two groups of the same size – with low and high level of PA. The group of girls with low level of PA showed 2,622 MET-min/week (43.7 MET-hours/week) on average before the intervention, and the group of boys with low level of PA showed on average 3,969 MET-min/week (66 MET-hours/week). We assumed that groups with high level of PA performed regularly some PA in their leisure time, and they were not the subject of our survey.

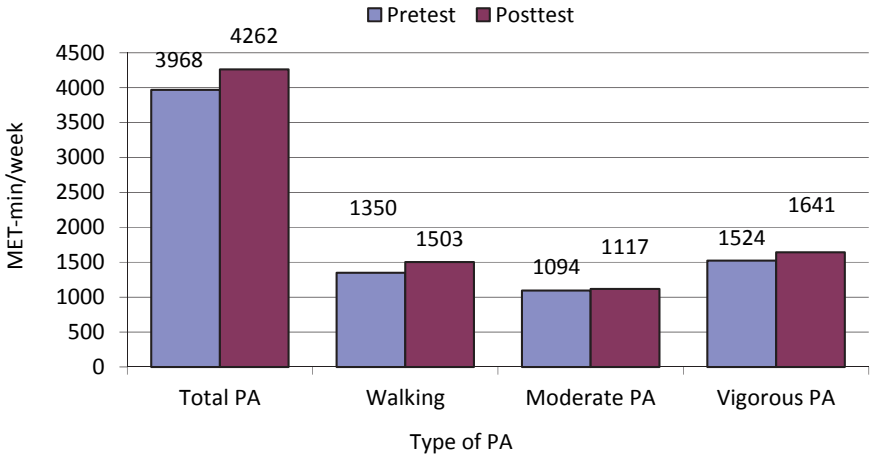



**Fig 39:** *Average values in individual types of PA before and after the intervention in boys with low level of PA (n = 41)*

In boys with low level of PA, there was an increase in the value of total PA by 294 MET-min/week (Figure 39), after the intervention which equals the increase by approximately 1.2 hours of PA per week (Frömel et al., 2006). This difference was not significant but it shows a small effect (Table 18) and it is in compliance with a similar study (Vašíčková, Svozil, & Chmelík, 2012), which however did not examine the difference in relation to gender. In any of the observed types of PA a difference of at least one hour has not been identified.

After the intervention there was a significant increase of the values in all types of PA (Figure 40) in girls confirmed with the "effect size" coefficient (Table 18). In summary, there was a difference of 1,653 MET-min/week in the total level of PA, which represents almost 7 hours of more PA (6.89 h). The biggest difference, more than 4 hours was found in walking. If we compare the results we found with the results of a study by Rütten and Abu-Omar (2004), then the initial values of PA in groups with low PA are above the average they had found. In a group of 15–24 year olds, these two authors show average values of MET-hours/week 48.7 in males (2,922 MET-min/week) and 36.0 MET-hours/

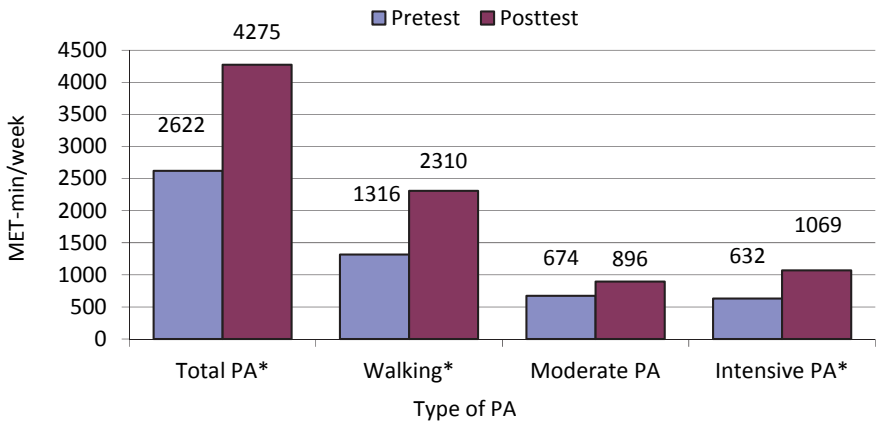



**Fig. 40:** *Average number of values in individual types of PA before and after intervention in girls with low PA (n = 76)*
*Notes: *p < 0.05*

week in females (equals 2,160 MET-min/week). The initial values we found were by 36% higher in boys and 21% higher in girls than those stated by the above mentioned authors.

In order to enhance and increase PA in pupils that show low level of PA, it is appropriate to use a combination of various motivational "tools" or "means". A pedometer can be one of them unless they had been acquainted with it earlier. Among similar "tools" can be other monitoring devices that however are not as easily accessible. For an everyday use, we can recommend applications available for smartphones to download for free. Among the technology platforms, the INDARES.COM system can be applied in education that can due to its various modules provide also valuable information to teachers. The results of the questionnaire on PA preference can be then used for effective planning activity (Kudláček & Frömel, 2012).

**Table 18:** *Statistical differences in types of PA before and after the intervention in boys and girls with low level of PA*

| Types of PA | Boys (*n* = 41) | | | Girls (*n* = 76) | | |
|---|---|---|---|---|---|---|
| | *t* | *P* | *d* | *t* | *p* | *d* |
| Total PA | 0.73 | 0.47 | 0.23$^{\dagger}$ | 2.56 | 0.01* | 0.59$^{\dagger\dagger}$ |
| Walking | 0.59 | 0.56 | 0.19 | 2.18 | 0.03* | 0.50$^{\dagger\dagger}$ |
| Moderate PA | 0.14 | 0.89 | 0.04 | 1.20 | 0.24 | 0.28$^{\dagger}$ |
| Vigorous PA | 0.47 | 0.64 | 0.15 | 2.21 | 0.03* | 0.51$^{\dagger\dagger}$ |

*Notes: t* = statistical pair t-test; *d* = effect size coefficient; $^{\dagger}$small effect; $^{\dagger\dagger}$medium effect; **p* < 0.05

Pupils below average (here in relation to the level of PA) are a "vulnerable" group not only in PE. They are more prone to sedentary lifestyle, they do not have enough information on the negative effects of the lack of PA, and they show more inclination to obesity. In PE they do have difficulties in performing physical abilities and they do not have enough possibilities to practice them (Silverman, 1993). Fun games and activities which require

team cooperation present an option how these pupils below the average can effectively engage in PE (Bernstein, Phillips, & Silverman, 2011).

In conclusion, we can argue that girls showed higher values of PA level after the four--week intervention, especially in walking. In boys, the level of PA after a month-long intervention with pedometers and booklets rather decreased and the decrease was also in time spent sitting. The intervention has not shown a required effect for the group of boys with low PA and there was not an increase in the individual types of PA. The total PA increased by 1.2 hours per week. For the group of girls with low PA, the intervention had a significant effect; there was an increase in values of vigorous PA, moderate PA, walking and total PA. We can argue that girls can be motivated to a higher performance of PA by using a simple monitoring device.

## 4.6 Physical activity and the level of education in healthy and physically active lifestyle in adult population – implemented physical literacy

The amount of PA in adult population decreases with age (Ruchlin & Lachs, 1999). Among other factors that influence the decline of PA, there are socioeconomic status, financial conditions, health, psychosocial and behavioural variables (Droomers, Schrijvers, & Mackenbach, 2001) and also achieved education.

On one side there are studies that confirm the positive association between education and amount of performed PA (Pate et al., 1995; Sallis & Owen, 1999; Trost, Owen, Bauman, Sallis, & Brown, 2002), and on the other hand we can find also studies that state a negative association between education and total amount of PA (Bergman, Grjibovski, Hagströmer, Bauman, & Sjöström, 2008). A Swedish study argues that those who have university education show more PA in their leisure time and as they have a less demanding or precisely a "sedentary" occupation, their PA is in total lower. Yet, educated people have more information on the benefits of PA and therefore they incline to the performance of PA more.

Czech society has undergone political transformation which has brought also changes in the behaviour of adult population in relation to the changes of values. Trends that used to be apparent in Western Europe have appeared also in the Czech Republic at present. For many people the preferred value is to have a job and spend in the job more time as that brings economic benefits. This brings a lack of free time that one can spend for oneself or with the family, and especially women feel it is difficult to find a balance between work and family (Horáková, 2004). Once an individual has free time, society provides many more opportunities how to spend it (Šamanová & Červenka, 2011). Modern technologies and their boom and also developmental trends show there are differences in ways of spending free time (Šafr & Patočková, 2010). "The proportion of people in the Czech population who at least sometimes include physical and sport activities in their free time increased from 20% in 1984 more than twice in 1991 (42%). In the following years, the proportion increased only a little to 45% in 2007" (Špaček, 2009, p. 69).

In order to develop physical literacy also in adult age, it is necessary for people to be informed and consciously include PA into their own lifestyle. If they are educated, we assume that it will be reflected also in the total amount of performed PA. It has been found that university students are sufficiently physically active and as far as 85% meet the health recommendations for PA (Vašíčková, Frömel, & Nykodým, 2008). Yet, students do not have their own families and work obligations, therefore it is easier for them to plan active spending of free time.

In our study, we analysed data of the inhabitants in the Czech Republic obtained in the IPAQ-short (Appendix 6) ($n$ = 6,989) with regard to education and other sociodemographic determinants in relation to performed PA (Vašíčková, Roberson, & Frömel, 2012). The analysed sample of questionnaires was compiled in spring 2008 using a random sampling in the selection of locations and represents all regions in the Czech Republic. 400 addresses were randomly selected from the database of the Ministry of the Interior. Trained coordinators visited the locations, explained to the addressed people the rationale of the research survey and provided instructions to complete the questionnaire. In total 10,571 questionnaires were obtained, but for the analysis we selected only the sample of adult individuals aged 26–69 years old. We were primarily interested to identify from the data whether education reflects in the total declared PA in relation to gender, and secondarily what factors play a role in meeting recommendations for PA in men and women. Tertiary, we examined what factors determine meeting recommendations for PA in men and women in relation to education achieved. Thus, we focused on the identification of factors that can determine PA so that we are able to effectively influence and enhance implemented physical literacy.

There were criteria established according to the protocol to meet the recommendations for PA: 3×20 minutes vigorous PA per week 5×30 minutes moderate PA per week and 5×30 minutes walking per week. We have created three categories: "health minimum" that comprises those who meet only one criterion (regardless which one), "health promotion" that comprises those who meet two or three criteria, and the third category ("none") which comprises those who do not meet any criterion for PA and do not fall into any of the previous categories. In order to assess the level of education, the answers to the question "how many years did you spend at school" were used. Answers were then ranged into categories: less than 9 years representing the category of elementary education, 10–13 years representing secondary education and more than 14 years representing the category of individuals with university or higher education.

The total sample comprised 3,540 women (age: 43.4±10.6 years; weight 66.6±10.8 kg; height: 166.5±6.2 cm; BMI: 24.0±3.9) and 3,449 men (age: 43.5±10.6 years; weight: 85.2±11.6 kg; height: 179.9±7.3 cm; BMI: 26.4±3.2). Other information on the analysed sample is presented in Table 19.

Among women, 22.8% did not meet any recommendation, and 33.4% ranged in the category "health promotion" (Table 20). No recommendation was more frequently met by women with university education; on the other hand, the category of "health promotion" comprised the highest number of women with elementary education. In men, 24.4% did not meet any recommendation (mainly men with university education) and 37.8% ranged in the category of "health promotion" (mainly those with secondary education). Statistically significant differences were found in both genders in the category "health

**Table 19:** *Characteristics of the sample (data from the IPAQ short version)*

| Variable | Women ($n$ = 3,540) | | Men ($n$ = 3,449) | |
|---|---|---|---|---|
| | *n* | % | *n* | % |
| Age | | | | |
| 26–34 year | 933 | 26.36 | 918 | 26.62 |
| 35–44 year | 1144 | 32.32 | 1053 | 30.53 |
| 45–54 year | 968 | 27.34 | 970 | 28.12 |
| 55–69 year | 495 | 13.98 | 508 | 14.73 |
| BMI | | | | |
| BMI < 25 | 2346 | 66.27 | 1201 | 34.82 |
| BMI ≥ 25 | 1194 | 33.72 | 2248 | 65.18 |
| Smoker | 843 | 23.81 | 1027 | 29.78 |
| Education | | | | |
| Elementary | 324 | 9.15 | 224 | 6.49 |
| Secondary | 2329 | 65.79 | 2176 | 63.09 |
| University | 887 | 25.06 | 1049 | 30.41 |
| Location | | | | |
| City (>100 000 inhabitants) | 744 | 21.01 | 733 | 21.25 |
| Town (30–100 000 inhabitants) | 816 | 23.05 | 821 | 23.80 |
| Small town (1 000–29 999 inhabitants) | 1396 | 39.44 | 1331 | 38.59 |
| Village (< 1 000 inhabitants) | 584 | 16.50 | 564 | 16.35 |
| Home | | | | |
| House | 1687 | 47.66 | 1676 | 48.59 |
| Flat | 1853 | 52.34 | 1773 | 51.41 |
| Living status | | | | |
| Alone | 240 | 6.78 | 309 | 8.96 |
| With a partner | 1420 | 40.11 | 1400 | 40.59 |
| Family with children | 1880 | 53.11 | 1740 | 50.45 |
| Owing a dog | 1478 | 41.75 | 1410 | 40.88 |
| Participation in organised PA | 1227 | 34.66 | 1191 | 34.53 |
| Meeting recommendation | | | | |
| 1 recommendation for PA | 1550 | 43.79 | 1304 | 37.81 |
| 2 recommendations for PA | 1000 | 28.25 | 961 | 27.86 |
| 3 recommendations for PA | 183 | 5.17 | 343 | 9.95 |

promotion" in relation to achieved education (women: $Z = 2.32$; $p < 0.05$; $d = 0.08$; men: $Z = 7.11$; $p < 0.001$; $d = 0.24$), that were moreover confirmed with a small "effect size" coefficient.

Using the binary logistic regression, we determined factors that influence meeting the category "health promotion" in our sample. Generally, the possibility to meet two or three recommendations for PA is found in men, people with BMI < 25, people with elementary and secondary education, people living in a small town or a village, people who live with a partner or have a dog, and those who participate in an organised PA (Table 21). In all these categories, a statistically significant difference was found out at the level of significance $p < 0.01$. Perhaps the most controversial finding is the fact that people with elementary education have more possibilities to meet the recommendations

**Table 20:** *Meeting recommendations for PA according to gender and education*

| Education | Women (*n* = 3,540) | | | | | | Men (*n* = 3,449) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | None | | Healthy minimum | | Health promotion | | None | | Healthy minimum | | Health promotion | |
| | *n* | %* | *n* | %* | *n* | %* | *n* | %* | *n* | %* | *n* | %* |
| Elementary | 70 | 21.6 | 137 | 42.3 | 117 | 36.1 | 50 | 22.3 | 90 | 40.2 | 84 | 37.5 |
| Secondary | 532 | 22.9 | 1000 | 42.9 | 797 | 34.2 | 461 | 21.2 | 785 | 36.1 | 930 | 42.7 |
| University | 205 | 23.1 | 413 | 46.6 | 269 | 30.3 | 330 | 31.5 | 429 | 40.9 | 290 | 27.6 |
| Total | 807 | 22.8 | 1550 | 43.8 | 1183 | 33.4 | 841 | 24.4 | 1304 | 37.8 | 1304 | 37.8 |

*Notes:* health minimum = meet one recommendation for PA; health promotion = meet two or three recommendations for PA; %* = percentage in relation to gender and education

than people with university education. The first possible explanation suggests that the number of people in individual categories is not proportionally the same (the number of people with elementary education is the lowest) and the second that people with university education have a more time demanding employment and they lack the time carry out PA. We present our results below that are in compliance with a Swedish research study (Bergman et al., 2008).

With regard to gender, men are more likely to meet the recommendation for PA for the "health promotion" if their BMI is normal (< 25), as opposed to men with overweight, they do not have university education, live in a village and participate in organised PA. Women are more likely to meet the recommendation for PA for the "health promotion" if they do not have university education, do not live in a city (i.e. a location with more than 100,000 inhabitants), do not live alone, have a dog and participate in organised PA.

Another analysis using binary logistic regression focused on the individual groups created according to gender and education (Table 22). Women with elementary education are more likely to meet the recommendation for PA for the "health promotion", if they live in a family with children and own a dog. Women with secondary education are more likely to meet the recommendation for PA for the "health promotion" if they live with a partner or in a family with children, live in a town and participate in an organised PA. In men with secondary education the main factor that influences meeting the recommendation for PA for the "health promotion" is normal level of BMI. Men and women with university education have more chances to meet the category of "health promotion" if they participate in organised PA.

According to Sallis and Owen (1999) education belongs among determinants that show positive associations with total level of PA. In Czech conditions, a similar study in adult population (aged 18–79) was carried out by Špaček (2009), who found that a university educated person shows 4.5× higher chance to sport than a person who achieved elementary education at the most (in the same conditions). In his study, those who inclined to sport were mainly men, people who live in towns, people of younger age and those whose father had university education. In a regression model, the factors he studied explained only 40% of variation. It is arguable that the research study included also university students who could "influence" the results in their favour.

**Table 21:** *Odds ratio to meet PA recommendations for "health promotion" in relation to socio-demographical factors (with regard to gender)*

| Factors | Health promotion – TOTAL | | | | Health promotion – MEN | | | | Health promotion – WOMEN | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | % | OR | 95% CI | *n* | % | OR | 95% CI | *n* | % | OR | 95% CI |
| Gender | | | | | | | | | | | | |
| Females | 1183 | 33.4 | ref. | | | | | | | | | |
| Males | 1304 | 37.8 | 1.33*** | 1.20–1.48 | | | | | | | | |
| BMI | | | | | | | | | | | | |
| ≥25 | 1207 | 35.1 | ref. | | 308 | 35.9 | ref. | | 399 | 33.4 | ref. | |
| <25 | 1280 | 36.1 | 1.15** | 1.03–1.28 | 496 | 41.3 | 1.33*** | 1.14–1.54 | 784 | 33.4 | 0.97 | 0.84–1.14 |
| Education | | | | | | | | | | | | |
| Elementary | 201 | 36.7 | 1.67*** | 1.36–2.06 | 84 | 37.5 | 1.72** | 1.26–2.35 | 117 | 36.1 | 1.55** | 1.17–2.05 |
| Secondary | 1727 | 38.3 | 1.60*** | 1.42–1.80 | 930 | 42.7 | 2.00** | 1.70–2.36 | 797 | 34.2 | 1.27** | 1.05–1.48 |
| University | 559 | 28.9 | ref. | | 290 | 27.6 | ref. | | 269 | 30.3 | ref. | |
| N. of residents | | | | | | | | | | | | |
| >100,000 | 454 | 30.7 | ref. | | 253 | 34.5 | ref. | | 201 | 27.0 | ref. | |
| 30,000-100,000 | 561 | 34.3 | 1.13 | 0.97–1.31 | 290 | 35.3 | 0.98 | 0.79–1.21 | 271 | 33.2 | 1.33** | 1.07–1.65 |
| 1,000-29,999 | 1020 | 37.4 | 1.27*** | 1.10–1.46 | 506 | 38.0 | 1.07 | 0.88–1.30 | 514 | 36.8 | 1.51** | 1.24–1.84 |
| <1,000 | 452 | 39.4 | 1.35*** | 1.14–1.60 | 255 | 45.2 | 1.37** | 1.08–1.73 | 197 | 33.7 | 1.28** | 1.00–1.64 |
| Living status | | | | | | | | | | | | |
| Alone | 157 | 28.6 | ref. | | 110 | 35.6 | ref. | | 47 | 19.6 | ref. | |
| With a partner | 973 | 34.5 | 1.30* | 1.06–1.61 | 502 | 35.9 | 1.02 | 0.79–1.33 | 471 | 33.2 | 2.00*** | 1.42–2.80 |
| Family with children | 1357 | 37.5 | 1.49*** | 1.21–1.83 | 692 | 39.8 | 1.21 | 0.94–1.58 | 665 | 35.4 | 2.17*** | 1.55–3.05 |
| Dog | | | | | | | | | | | | |
| Don't have | 1390 | 33.9 | ref. | | 735 | 36.0 | ref. | | 655 | 31.8 | ref. | |
| Have | 1097 | 38.0 | 1.15** | 1.04–1.27 | 596 | 40.4 | 1.14 | 0.99–1.32 | 528 | 35.7 | 1.16* | 1.00–1.35 |
| Participation in organised PA | | | | | | | | | | | | |
| No | 1552 | 34.0 | ref. | | 828 | 36.7 | ref. | | 724 | 31.3 | ref. | |
| Yes | 935 | 38.7 | 1.30*** | 1.17–1.44 | 476 | 40.0 | 1.20* | 1.04–1.40 | 459 | 37.4 | 1.38*** | 1.18–1.60 |

*Notes:* BMI = body mass index; OR = odds ratio; 95% CI = confidence interval; *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

**Table 22.** *Odds ratio to meet PA recommendation in "health promotion" category regarding socio-demographical factors (in relation to gender and education)*

| Factors | | Woman EE (*n* = 324) | | | Men EE (*n* = 224) | | | Women SE (*n* = 2,329) | | | Men SE (*n* = 2,176) | | | Women UE (*n* = 887) | | | Men UE (*n* = 1,049) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % | OR | CI | % | OR | CI | % | OR | CI | % | OR | CI | % | OR | CI | % | OR | CI |
| Age | 26–34 year | 49.0 | ref. | | 31.4 | ref. | | 30.7 | ref. | | 45.0 | ref. | | 29.7 | ref. | | 28.1 | ref. | |
| | 35–44 year | 31.0 | 0.41* | 0.18–0.94 | 39.0 | 1.13 | 0.45–2.80 | 36.3 | 1.23 | 0.98–1.54 | 43.4 | 0.93 | 0.74–1.18 | 33.3 | 1.01 | 0.68–1.50 | 28.4 | 0.99 | 0.66–1.50 |
| | 45–54 year | 41.3 | 0.70 | 0.32–1.55 | 42.6 | 1.37 | 0.60–3.13 | 35.5 | 1.29* | 1.00–1.66 | 44.0 | 1.00 | 0.78–1.28 | 29.6 | 0.91 | 0.61–1.34 | 27.4 | 1.10 | 0.74–1.65 |
| | 55–69 year | 30.7 | 0.53 | 0.24–1.17 | 35.9 | 0.92 | 0.39–2.19 | 33.5 | 1.33 | 0.95–1.85 | 34.9 | 0.72* | 0.54–0.97 | 24.3 | 0.77 | 0.41–1.45 | 25.6 | 1.20 | 0.72–2.02 |
| BMI | < 25 | 41.0 | ref. | | 35.0 | ref. | | 34.4 | ref. | | 48.4 | ref. | | 29.5 | ref. | | 30.4 | ref. | |
| | ≥ 25 | 32.4 | 0.75 | 0.44–1.27 | 38.4 | 1.24 | 0.64–2.42 | 33.8 | 0.95 | 0.78–1.15 | 40.0 | 0.71*** | 0.59–0.86 | 32.8 | 1.31 | 0.92–1.85 | 25.8 | .81 | 0.61–1.09 |
| Smoking | NO | 37.9 | ref. | | 42.9 | ref. | | 35.0 | ref. | | 43.6 | ref. | | 30.3 | ref. | | 28.0 | ref. | |
| | YES | 32.0 | 0.71 | 0.40–1.25 | 31.4 | 0.56 | 0.30–1.03 | 31.7 | 0.91 | 0.74–1.12 | 41.1 | 0.93 | 0.77–1.11 | 30.4 | 1.08 | 0.71–1.65 | 26.4 | 1.00 | 0.71–1.40 |
| N. of residents (thousands) | > 100 | 28.3 | ref. | | 33.3 | ref. | | 26.9 | ref. | | 41.9 | ref. | | 26.8 | ref. | | 24.7 | ref. | |
| | 30–100 | 36.6 | 1.55 | 0.71–3.38 | 41.3 | 1.18 | 0.50–2.82 | 34.8 | 1.44** | 1.10–1.90 | 37.1 | 0.81 | 0.62–1.06 | 27.7 | 1.01 | 0.65–1.55 | 30.9 | 1.29 | 0.88–1.88 |
| | 1–29 | 39.3 | 1.67 | 0.81–3.47 | 34.9 | 0.98 | 0.45–2.14 | 36.9 | 1.51** | 1.17–1.94 | 42.9 | 1.01 | 0.79–1.30 | 35.9 | 1.36 | 0.93–1.99 | 27.8 | 1.11 | 0.77–1.59 |
| | < 1 | 37.0 | 1.62 | 0.70–3.74 | 43.2 | 1.32 | 0.50–3.45 | 35.5 | 1.37 | 0.99–1.88 | 50.2 | 1.30 | 0.96–1.75 | 24.3 | 0.75 | 0.42–1.33 | 26.9 | 1.06 | 0.62–1.81 |
| Living status | Alone | 24.0 | ref. | | 18.5 | ref. | | 18.2 | ref. | | 39.3 | ref. | | 18.9 | ref. | | 33.0 | ref. | |
| | With partner | 33.3 | 1.50 | 0.69–3.24 | 38.5 | 2.17 | 0.71–6.65 | 34.3 | 2.09** | 1.32–3.32 | 41.2 | 1.11 | 0.79–1.56 | 29.8 | 1.73 | 0.82–3.68 | 24.0 | 0.61 | 0.36–1.02 |
| | Family with children | 44.9 | 2.32** | 1.02–5.23 | 42.0 | 2.57 | 0.84–7.83 | 35.9 | 2.27*** | 1.42–3.60 | 44.5 | 1.23 | 0.88–1.72 | 31.8 | 1.87 | 0.89–3.96 | 29.6 | 0.81 | 0.48–1.37 |
| Home | House | 36.0 | ref. | | 40.7 | ref. | | 36.7 | ref. | | 45.5 | ref. | | 33.4 | ref. | | 28.8 | ref. | |
| | Flat | 36.3 | 1.49 | 0.85–2.62 | 37.5 | 0.96 | 0.49–1.86 | 32.0 | 0.93 | 0.76–1.13 | 40.1 | 0.91 | 0.75–1.11 | 27.6 | 0.75 | 0.54–1.03 | 26.6 | 0.90 | 0.67–1.23 |
| Owing dog | NO | 31.1 | ref. | | 35.2 | ref. | | 32.5 | ref. | | 41.5 | ref. | | 30.3 | ref. | | 26.6 | ref. | |
| | YES | 42.4 | 1.73* | 1.05–2.84 | 40.2 | 1.12 | 0.62–2.04 | 36.6 | 1.16 | 0.97–1.39 | 44.8 | 1.10 | 0.92–1.32 | 30.4 | 0.88 | 0.64–1.20 | 29.5 | 1.19 | 0.88–1.61 |
| Participation in organised PA | NO | 36.3 | ref. | | 38.0 | ref. | | 32.1 | ref. | | 42.0 | ref. | | 25.7 | ref. | | 23.5 | ref. | |
| | YES | 35.3 | 0.86 | 0.43–1.72 | 35.0 | 0.82 | 0.39–1.73 | 38.6 | 1.39*** | 1.15–1.68 | 44.2 | 1.05 | 0.86–1.27 | 35.5 | 1.57** | 1.17–2.11 | 33.5 | 1.65*** | 1.24–2.19 |

*Notes:* EE = elementary education; SE = secondary education; UE = university education; BMI = body mass index; OR = odds ratio; 95% CI = confidence interval; ref. = reference group. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.

The author also examined the reasons to participate in sport that actively sporting respondents see as those with the highest significance. Up to 68% of participants recorded as "very important" the role of physical and mental health, 42% recorded meeting other people as "very important" reason to sport and 38% participants stated the effort to look good.

A positive association between the achieved education and the amount of PA was found also in other studies (Bernstein, Costanza, & Morabia, 2001; Burton & Turrell, 2000; Droomers et al., 2001; Fogelman, Bloch, & Kahan, 2004; Kahan, Fogelman, & Bloch, 2005; Sjöström et al., 2006). Shaw and Spokane (2008) found in older population (aged 54–72) that people with higher education are more likely to engage in PA than those with lower education unless health problems or any functional limitations occur. Bertrais et al. (2004) found a positive association between the level of education and meeting health recommendations for PA, but only in women. In a Croatian research study (Jurakić, Pedišić, & Andrijašević, 2009) a negative association between education and total amount of PA was found, but a positive association between education and leisure time PA. Our aim was not to analyse the amount of PA in individual areas (PA at work, in household, in leisure time and in transportation), but we assume that the low total amount of PA in people with university education is likely associated with their sedentary behaviour which responds to the increase in time spent sitting (Sjöström et al., 2006). The determinants of PA and exercise in older people (age 55+) were examined systematically in research in several studies (Koeneman, Verheijden, Chinapaw, & Hopman-Rock, 2011), where three research surveys did not find any association (Burton, Shapiro, & German, 1999; Garcia & King, 1991; McAuley et al., 2007) and four studies found rather negative association (Finkelstein, Brown, Brown, & Buchner, 2008; King et al., 1997; Li, Fisher, & Brownson, 2005; Pelcová, 2014), which corresponds with our study.

In conclusion, we can argue that in the Czech Republic people with elementary and secondary education are more physically active. The level of PA on average ranged between 67.6 and 73.9 MET-hours/week (average low value for the oldest age category). The category "not meeting any recommendation" for PA and meet the recommendation for PA for "health minimum" comprises mainly secondary educated men and women with elementary education. The important factors that influence meeting two or three recommendations for PA are BMI < 25, elementary and secondary education, location in a small town or a village, life with a partner or a family, ownership of a dog and in all analysed samples it is the participation in organised PA.

# 5 CONCLUSIONS

We have contributed to a more detailed insight into the area of physical literacy in Czech environment with partial studies based on the description of the concept of physical literacy and its individual components. In the introduction, we dealt with the level of the awareness of this concept among pupils and PE teachers. The general awareness of this concept is missing in children and teachers. The areas that are most often associated with physical literacy are *human movement, mastering of sports* and *basic physical skills* that should be managed by a person that can be called a "*physically literate*" person. Teachers' answers in the survey are closer to the concept we present with answers about physical literacy according to them means *basic physical skills, abilities and fitness,* some mention also the *theoretical knowledge* and *internal motivation.* Participating teachers have agreed that unless there is promotion, training and support from the top levels (e.g. the Ministry of Education, Youth and Sport), physical literacy cannot be adequately implemented.

On the basis of the determined partial goals and the research questions stemming from them, we have reached these conclusions.

The motivation to primary PA in the concept of physical literacy.

- In adolescent girls and boys, the most frequent motive to carry out PA is physical fitness. In the second place it is appearance in girls and experience in the third place. In boys, there are interest and experience in the second place and appearance in the third place.
- Upon the comparison of girls with normal weight and girls with overweight it was found that girls with normal weight state appearance and girls with overweight state physical fitness to be dominant. In boys with normal weight, the dominant motive is physical fitness, and in boys with overweight it is interest and experience.
- The differences between genders in the motives of fitness, interest/experience and competence were statistically significant and confirmed with a small effect of the "effect size" coefficient. Yet, these differences do not influence the order of the motives; it is only the expression of more tendency or decisiveness in boys.

The knowledge about health and PA as a key attribute of physical literacy:

- The knowledge about health and PA are under the average in students at secondary schools, students of grammar schools show better results than students of vocational schools. Girls at secondary schools including grammar schools show better results than boys.
- The level of knowledge about health and PA in university students reaches values above the average. Students of the FSPS MU in Brno show the best results. The most difficult questions to answer for the students were questions asking about energy expenditure.
- A positive association between the level of knowledge about health and PA and the really performed PA has not been found. Although the knowledge about health and PA is essential for physical activity, in adolescents in first class at secondary schools it

does not have the effect on the actual performance of PA. A survey in adult population could be interesting as the adults can work more freely and use their own free time.

The pupils' attitude to PE lessons as the entry variable of physical literacy.

- There is an association between the self-perceived physical fitness and the level of PA in boys at the second stage of elementary schools and secondary schools. Boys who assessed their physical fitness in the "high" half of the class show a higher amount of PA in PEL. In girls at elementary and secondary school, the association between self-perceived physical fitness and the level of PA has not been verified.
- It has been confirmed that there is an association between self-perceived physical fitness and the pupils at elementary and secondary schools' attitude to performed PEL. Pupils who assessed their physical fitness in the "high" half of the class show a more positive attitude to PEL, regardless of their gender. Physical literacy in praxis should aim mainly at individuals who assess their physical fitness in the "low" half of the class.
- A short term use of pedometers did not have an effect on pupils' attitude to PEL. The use of pedometers did not influence positively the girls' and boys' attitude to PEL; both genders evaluated PEL approximately in the same positive way. It is necessary to work more with pedometer in PEL and use the possibilities it provides to enhance PA and to influence the relation to PEL.
- Pupils and student teachers evaluated the same PEL differently. In four questions, there were more positive answers by pupils. These questions asked about the regenerative effect of the lesson, manifestations of indiscipline, and the implementation of the student teacher's direction style and the mutual correction of mistakes. In two thirds of questions, there was a very significant difference between the answers by pupils and student teachers, when student teachers tended to assess their PE lessons more positively.

Intervention at school to enhance physical literacy.

- The amount of PA was not influenced by the intervention with pedometers significantly, however, time spent sitting decreased in both genders. In boys with the initial low level of PA, the intervention did not bring the required effect. On the other hand, in girls with initial low level of PA, there was a significant influence on the level of PA using pedometers, when the time spent with vigorous PA, moderate PA, walking and thus total PA increased. Therefore, we can say that girls reacted positively to the month-long intervention with pedometers.

Physical activity and the level of education in healthy active lifestyle in adult population – carried out physical literacy.

- Women with elementary education and men with secondary education are among physically active people. It was not verified that people with higher education perform more PA. University educated people ranged mainly in the category "they do not meet any recommendation for PA" or in the category "meet the health minimum" (i.e. meet only one recommendation).

# 6 SUMMARY

The main objective of this paper is to present knowledge about the concept of physical literacy. Through education as a basic building block of developing and maintaining an active lifestyle one can also develop physical literacy (PL). Findings on physical activity (PA), motivation to PA, pupils' relationship to physical education (PE) and intervention to increase PA level are rather a "finger raised" to highlight the need to make fundamental change in school curricula, particularly in the area of PE but also in strategic and policy action documents covering the entire Czech population.

We start with description of the concept of PL in the Czech environment, which is based on the monistic approach. Especially we focus on its possible applications within PE. Literacy, as such, should not only be seen as the ability to read, write and understand a text, but its scope is much broader, particularly as regards the so-called "functional" literacy. In the society there are several similar terms emerging and establishing themselves with regard to literacy as for instance financial literacy, computer literacy, and others. In the paper we attempt to present the concept of physical literacy, which is a type of the functional literacy that has been overlooked or neglected. It is not the fault of physical literacy itself, but rather due to the novelty of the concept and insufficient discussion within the Czech kinanthropology and professional society. Gradually, however, awareness of the concept rises. This is possible also thanks to the action plan – Health 2020, which we have assisted to prepare.

Motivation for PA, the level of knowledge about health and PA, mastering basic movement skills along with the development of motor abilities through motor learning process and PA actually implemented within the lifestyle of an individual seem to be the most important components for the development of physical literacy. Motivation, based on the internal needs of the individual, is necessary not only for the initiation of PA, but also for adherence to activity for a long time. The level of knowledge about health and PA is important for understanding the importance of PA and its benefits for healthy lifestyle. Lack of PA and especially prevalent sedentary lifestyle then may lead to the occurrence of non-communicable of lower or higher severity. Mastering basic movement skills together with development of physical abilities leads to a potential development of specific physical activities in a particular sports discipline. For some individuals it is necessary to manage self-care activities, at least for their own independence and freedom of being. PA actually implemented is an expression of all movements that a person can do every day. It comprises a movement within work or school, during transport (preferring walking or riding a bike to passive transport), at home or its surroundings and movement performed in spare time.

The sub-objective of the paper is to inform about specific research findings on the various components of PL performed in adolescents and adults. For the survey we used the Digi-Walker SW-700 pedometer (Yamax Co., Yasama Corp., Tokyo, Japan) – an objective monitoring device that records changes of individual's body positions, skips and steps in two axes. This device is inexpensive and easy to use. We also employed the standardized questionnaires. To determine the motivational sphere of primary PA we used

the MPAM-R standardized questionnaire, which examines motives in five different areas using various statements. The questionnaires were also used to diagnose a PE lesson (by pupil and preservice teacher, Appendix 3 and Appendix 5). International Physical Activity Questionnaire – IPAQ (short and long versions, Appendix 6 and Appendix 7) helped us to assess the intervention effect. The comprehensive test on health and PA was used to describe the knowledge of adolescents and young adults (Vašíčková, Neuls et al., 2010).

Awareness of PL among pupils and teachers is not yet at an appropriate level. They often link this concept to human physical activity, sports and mastering basic motor skills, which a "physically literate" or "physically educated" person should manage. Teachers' responses obtained in the survey were more approaching to our discussed concept, when the concept of PL includes basic motor skills, physical abilities and fitness, some of them also mentioned the theoretical knowledge and internal motivation as a part of the concept. All the addressed teachers agreed that it is necessary to disseminate information on PL through all sort of "information channels" and from and to all possible directions.

Surprisingly, we found out that the most common motive for primary PA in adolescent girls and boys was physical fitness, which is associated rather with an external motivation. Different primary motives were observed in boys and girls with different BMI and differed also by age. Girls with normal weight engaged in PA primarily for appearance while physical fitness dominated in overweight girls. Physical fitness was the primary motive for exercising in boys with normal weight while overweight boys preferred to take part in PA due to the interest and experience.

Knowledge of health and the PA in secondary school students were below average, this means that students did not even reach 50% success rate. Girls scored better than boys and also grammar schools students showed better knowledge compared to students from secondary vocational schools. At universities, students of the Physical Education and Sport programme achieved above-average results (60%). Knowledge test results showed no difference between girls and boys among university students. The positive relationship between knowledge and actually undertaken PA in the 1st grade pupils of secondary schools was not observed. We conclude that "smarter" students prefer to do different activities than the physically-oriented ones.

We found out a positive association between self-perceived physical fitness of students and PA actually done in PE lessons and also attitude to PE lessons. Pupils who assessed themselves in the "high" half of the class in terms of their self-perceived physical fitness achieved more PA monitored by pedometer and had more positive attitude to PE lesson regardless of gender. Pupils who stated that PE is their favourite school subject, also showed a higher number of steps and more positive attitude towards PE lesson than pupils whose favourite subject was not a PE, which was also independent of gender.

The students and pre-service teachers rated the same PE lessons differently. For one third of the questions the differences were not statistically significant, while for the four questions more positive answers among pupils were found. These questions concerned the regenerative effect of the lesson, discipline problems, applying a command teaching style by the teacher and peer feedback. For two thirds of the questions we found very significant differences between the responses of students and pre-service teachers, who tended to evaluate their own PE lesson in a more positive manner. Short-term use of pedometers as part of the teaching practices of master pre-service students did not affect

the attitude of the pupils towards PE lesson. Medium-term (month-long) interventions with pedometers for 1st grade secondary school students positively influenced only time spent sitting, which was reduced, but there was no significant influence (increase) on time spent on PA.

The relationship between education and PA in the adult population was not observed. Women with elementary education and men with secondary education were more physically active. We did not find out the people with higher education to perform a larger amount of PA. People with university degree were included in our investigation and mostly classified in the category of "not meeting any recommendations for PA" (expressed as an option: 3×20 minutes of vigorous PA, 5×30 minutes of moderate PA, or 5×30 minutes of walking) or into the category of "meet PA minimum" (i.e. e. they meet only one recommendation for PA).

Physical literacy is therefore as important as other literacy. Nobody is born as an athlete and without physical education too many people turn away from the sports or PA. It is obvious that the development of PL will take considerable amount of time and effort. This monograph outlines the issues and attempts to highlight some of the difficulties that are neglected in society and especially in the educational system. It should provoke discussion among professionals and teaching staff to make this concept viable and feasible.

# 8 TERMINOLOGY

**Physical activity** (PA) is any kind of physical movement carried out by the skeletal muscles which requires energy expenditure (World Health Organisation, 2004). It is a complex of human behaviour that includes all physical activities of a human. PA is also a basic means to improve physical and mental health of an individual (World Health Organisation, 2006).

> Physical activity is a kind of human movement that is characterized by distinctive internal determinants (physiological, psychic, neuromuscular coordination, requirements on muscle fitness, intensity, etc.) and external shape and form that the locomotive system performs with a higher caloric consumption i.e. with energy expenditure that is higher than the state of the resting metabolism in a person (Dobrý, Čechovská, Kračmar, Psotta, & Süss, 2009, p. 10).

**Exercise** is a subcategory of PA, it is planned, structured, repeated and intentional with the aim to improve or maintain one or more components of physical fitness. Physical activity is a very broad term, that includes exercise (for the improvement of fitness and health) or sport (that includes the aspect of competition), but also other activities that require physical movement and are performed as a part of game, work, active transportation (walking or riding a bicycle), housework or work in the garden and recreational activities (World Health Organisation, 2006).

Physical activity is a complex behaviour that we can divide into various subcategories according to different aspects. The only requirement of the categorisation is that categories should be mutually exclusive. We can therefore divide PA into voluntary or obligatory; spontaneous or planned PA; PA performed at school (work) days or at weekend; PA during sleep, at work or in leisure time; low, moderate and vigorous PA, etc.

Physical activity differs according to the intensity that a person performs it with. **Moderate physical activity** increases human metabolism above the resting level 3–6 times (3–6 metabolic equivalent – MET), increases the individual's heart rate, he/she feels warmed up, and breathes worse. For a majority of untrained individuals, fast walking or as slow running can be an example of moderate physical activity. **Vigorous physical activity** increases human metabolism above the resting level more than 6 times (> 6 MET), a person perspires when performing it and cannot "breathe in". Running or riding a bicycle fast can be examples of vigorous PA.

Among other parameters of PA, except of intensity, there are the type (which PA we perform), duration (the time we engage in the activity) and frequency (how often they perform PA), all together marked as FITT characteristics (in Czech FIDD) (Frömel et al., 1999).

**Physical inactivity** "denotes an individual's behaviour that is associated with a very low volume of ordinary daily physical activities and the absence of structured PA with skills" (Dobrý et al., 2009, p. 11). Physical inactivity (the lack of PA) is identified as a forth risk factor of mortality (it is a cause of 6% of deaths). Moreover, it is estimated that physical inactivity is the major cause disease occurrence of such illnesses as breast cancers

and large intestine cancer (approximately in 21–25% of cases), diabetes (it is stated in 27% of cases) and ischemic coronal disease (estimated in 30% of cases) (World Health Organisation, 2004).

**MET** (= metabolic equivalent) expresses the consumption of oxygen to secure resting energy consumption (i.e. 3.5 ml of oxygen per 1 kg of physical weight per 1 minute). 1 MET is resting energy expenditure, and 3 METs mean three times higher energy expenditure than in resting state.

**Physical activities** are intentionally practised movements, consciously carried out with the aim to solve some movement task. They include sport events, PA, but also a group of similar activities or sports (e.g. adrenalin sports, dance activities, martial arts, etc.).

**Physical fitness** is the ability to carry out physical activity of moderate to vigorous intensity for a longer time period without getting tired and the ability to maintain this fitness in the course of life. Sometimes we can meet the term cardiovascular fitness and metabolic fitness. Caspersen, Powell and Christenson (1985) divide physical fitness into health-related fitness (cardiorespiratory endurance, muscle endurance, muscle strength, body composition and flexibility) and skill-related fitness (balance, coordination, speed, strength, agility, and reaction speed).

We perceive the term **sport** within the definition by Hodaň (2006): "sport is a specific, strictly organized activity of movement or other type of physical, technical or intellectual character with a dominant performance motivation on basis of which experience, realised in reaching absolute or relatively maximal performance in clearly defined and controlled conditions" (p. 171). Sport establishes together with physical education and recreational physical activities individual subsystems of physical culture. In international publications sport often substitutes physical activity. However, in the International Charter of Physical Education and Sport (UNESCO, 2015), there is already a difference between sport and physical activities.

**Physical education** is understood as a subject at school that can directly influence health and lifestyle of youth and later of the adult population

> **Physical education** draws mainly on a motivating atmosphere, the pupil's interest and his/her individual capabilities (potential) in striving for a lasting positive attitude to exercise and the optimal development of fitness, mental and social competencies. To this end, it makes use of specific emotional experiences, social situations and bioenergetic load in an individually prepared spectrum of exercise activities (ranging from fitness and wellness to sports performance activities). In terms of a lifelong perspective, Physical education is aimed at providing the pupil with a better orientation in issues concerning the effect of exercise on health. It guides them towards mastering and regularly utilising specific exercise activities (conditioning and compensation programmes) in accord with his/her exercise interests and health needs. The question of safety and injury prevention in exercise is, of course, not to be omitted. At this level, great attention is also paid to the development of talent for movement and to the correction of movement handicaps (weaknesses) (Výzkumný ústav pedagogický, 2007a, p. 57).

**Physical education lesson (PEL)** is a basic organisational form that is understood as relatively stable and organized system of major actors in the educational process and the

relations between them, determined by the content and the aim of curriculum, space, time, mental and physical level of pupils, teacher's experience and qualifications and other teaching prerequisites (Rychtecký & Fialová, 2000).

**Framework educational programme** is a curricular document of school reform policy that defines the creation of school educational programmes. A school educational programme is a document that each school creates according to its own conditions and which is based on the particular framework educational programme. It is obligatory and the school management is responsible for it.

**Curriculum** is a complex term that is difficult due to the language translations, differences in the educational systems, and in pedagogical teachings in individual countries. In the narrow sense, it is the programme of teaching, and in broader sense, it is all teaching that appears at school and other institutions both planned and unplanned learning. Průcha (2009) describes and discusses the term in detail.

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# LIST OF APPENDIXES

# Appendix 1: Motives for Physical Activities Measure – Revised (MPAM-R)

| School: | | Grade: | |
|---|---|---|---|
| Name: | | | |
| Date: | | | |

| Gender: | M F |
|---|---|
| Weight: | |
| Height: | |

**The level of your fitness as compared to your classmates is in your opinion:**

☐ Below average – Above average ☐

**Is Physical education the most favourite subject for you?**

☐ Yes – No ☐

The following is a list of reasons why people engage in physical activities, sports and exercise. Keeping in mind your primary physical activity/sport, respond to each question (using the scale given), on the basis of how true that response is for you.

**1) Because I want to be physically fit.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**2) Because it's fun.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**3) Because I like engaging in activities which physically challenge me.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**4) Because I want to obtain new skills.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**5) Because I want to look or maintain weight so I look better.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**6) Because I want to be with my friends.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**7) Because I like to do this activity.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**8) Because I want to improve existing skills.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**9) Because I like the challenge.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**10) Because I want to define my muscles so I look better.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**11) Because it makes me happy.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**12) Because I want to keep up my current skill level.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**13) Because I want to have more energy.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**14) Because I like activities which are physically challenging.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**15) Because I like to be with others who are interested in this activity.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**16) Because I want to improve my cardiovascular fitness.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**17) Because I want to improve my appearance.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**18) Because I think it's interesting.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**19) Because I want to maintain my physical strength to live a healthy life.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**20) Because I want to be attractive to others.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**21) Because I want to meet new people.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**22) Because I enjoy this activity.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**23) Because I want to maintain my physical health and well-being.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**24) Because I want to improve my body shape.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**25) Because I want to get better at my activity.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**26) Because I find this activity stimulating.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**27) Because I will feel physically unattractive if I don't.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**28) Because my friends want me to.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**29) Because I like the excitement of participation.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

**30) Because I enjoy spending time with others doing this activity.**

Not at all true for me ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 Very true for me

# Appendix 2: The comprehensive test about health and physical activity – handbook

## 1. Introduction

The knowledge test is aimed at identifying knowledge about health and physical activity. The main aim is to assess students' knowledge level that comprises areas of human biology, nutrition and knowledge from the fields of physical education and sport and thus obtain information necessary to analyze the actual measured physical activity or the data obtained using the international questionnaire on physical activity. The test is nominal and aimed for the age group of 15 years old and older, and therefore also for a wider population. It was created especially for the purpose of research at the upper level of elementary schools (9th grade), secondary schools and universities.

## 2. The structure of the test

The knowledge test comprises 32 questions that are divided into four dimensions with eight questions in each. There are four possibilities A, B, C, and D of answers to each question. The respondents are to circle the most correct answer according to them and always choose only one.

| Part | Dimension: | Questions no: |
|---|---|---|
| I. | Conditioning | 1, 5, 9, 13, 17, 21, 25, 29 |
| II. | Energy | 2, 6, 10, 14, 18, 22, 26, 30 |
| III | Nutrition | 3, 7, 11, 15, 19, 23, 27, 31 |
| IV. | Education | 4, 8, 12, 16, 20, 24, 28, 32 |

## 3. The application in praxis

The questionnaire is assigned to pupils and students before the onset of the research survey. The respondents complete basic information – school, grade, gender, first name and last name, and the date of measurement. In the case of university, they also state a study programme, and whether they studied biology and whether they graduated from biology at secondary school. Afterwards, they go through the questions and circle the correct answers. It takes about 20-30 minutes to complete the questionnaire.

## 4. The test standardization

In the test verification for the purpose of standardization, 416 pupils from different grades at secondary schools participated. The test was applied as a pre-test in March 2008 and after a month-long break, the post-test was applied in April 2008.

The stability coefficient by the method of repetition was estimated as $r_{tt}$=0.527 (significant at the level $p < 0.01$), and for the dimensions, it ranges $r_{tt}$=0.234-0.445 ($p < 0.01$). The intraclass correlation as the Cronbach's alpha coefficient is 0.627.The reliability is estimated using the method of half division between the even and odd questions and is $r_{sb}$=0.514 ($p < 0.01$) and after the division between the "A" version (questions 1-16) and "B" version (questions 17-32) is $r_{sb}$=0.494 ($p < 0.01$). The knowledge test has a Czech and Polish version.

## 5. The assessment of the test

The assessment of the test is done using computer and specially tailored software VedTEST in the MS Access application. Basic data on the respondent are entered into the top heading and then the particular answer to a question. (Always one answer to one question, no question can be omitted, and it is not possible to select two or more answers. Such a test then needs to be excluded.) The data from the database can be exported into MS Excel sheets according to given criteria. The data are then transported into the present version of the IBM SPSS (SPSS Inc., Chicago, IL) statistical software. The result of each test is the total point sum (maximum 32 points) and sums for individual dimensions in each respondent. For a group of people we can then estimate the average total sum, average sums for individual dimensions and item analysis of each question. Further, the comparison regarding various factors can be carried out.

# Appendix 3: Questionnaire (pupil's attitude towards the PEL)

| | |
|---|---|
| School: | |
| Class: | |
| Number of school year finished: | |
| Date: | |

| | |
|---|---|
| Gender: | M F |
| Weight: | |
| Height: | |
| Number of steps: | |

**Assess the level of your physical fitness compared to your classmates:**

☐ Better half of the class – Worse half of the class ☐

**Is Physical education your favorite subject?**

☐ Yes – No ☐

Mark X!

| No. | Question | Yes | No |
|---|---|---|---|
| 1 | Could you identity the aim of the lesson and what the teacher was attempting to do? | | |
| 2 | Was the physical activity satisfying? | | |
| 3 | Were you relaxed after the lesson? | | |
| 4 | Was the teacher friendly during the lesson? | | |
| 5 | Would you like to have the same or a similar lesson next time? | | |
| 6 | Did you have the chance to solve a problem on your own? | | |
| 7 | Did you learn anything new? | | |
| 8 | Were there positive learning atmosphere during the lesson? | | |
| 9 | Were you too exhausted after the lesson? | | |
| 10 | Did classmates misbehave during the class? | | |
| 11 | Would an extracurricular activity be better than participating in this lesson? | | |
| 12 | Did you have a chance to make a decision in the lesson to do something on your own and in your own way? | | |
| 13 | Did you learn any new skills or improve old ones? | | |
| 14 | Was the lesson fun? | | |
| 15 | Do you think that the lesson improved your physical fitness (strength, endurance)? | | |
| 16 | Did you ask any questions during the lesson? | | |
| 17 | Would you have preferred attending another class? | | |
| 18 | Did you feel that the teacher always gained control of you? | | |
| 19 | Did you give any demonstration in the lesson? | | |
| 20 | Did the teacher and/or a classmate give positive feedback to you? | | |
| 21 | Did you think about your posture during the lesson? Did you stretch your muscles? | | |
| 22 | Did you correct one another if there was a mistake? | | |
| 23 | If you had been allowed to leave the lesson and go home, would you have done so? | | |
| 24 | Were there any surprises or new things in the class? | | |

**Mention positives (+) and negatives (-) of just realized PE lesson:**

| **Positives** |
| --- |
| + |
| + |
| + |
| + |

| **Negatives** |
| --- |
| - |
| - |
| - |
| - |

# Appendix 4: Handbook of the Questionnaire on the attitude toward physical education lesson (pupils and teachers)

## 1. Introduction

The questionnaire aims at identifying pupils' opinions on the just performed or finished Physical education lesson. The questionnaire is aimed for teachers and its other modifications have similar structure and differ only by adjusted questions. The main aim of the questionnaire application is to obtain information about the Physical education lesson that is difficult to obtain by observation, measurement, etc. It is characterized as a questionnaire which is anonymous, and "universal" for the age of 10 to 18 years old. This means it is aimed mainly for pupils at elementary and secondary schools.

## 2. Questionnaire structure

The questionnaire comprises 24 questions that are divided into six dimensions and one additional dimension. On the back page of the questionnaire, pupils can record their opinions and feelings about what they believe the positives and negatives of the just finished lesson were.

| no. | Dimension: | Question number: |
|---|---|---|
| I. | Educational (cognitive) | 1, 7, 13, 19 |
| II. | Emotional | 2, 8, 14, 20 |
| III. | Health | 3, 9, 15, 21 |
| IV. | Social (interaction) | 4, 10, 16, 22 |
| V. | Attitudinal | 5, 11, 17, 23 |
| VI. | Creative | 6, 12, 18, 24 |
| VII. | Pupil's role (supplementary dimension) | 2, 4, 6, 12,16, 18, 19, 22 |

## 3. Application in praxis

The questionnaire is applied to students and teachers at the end of the lesson. The lesson is finished with relaxation exercise (when pupils stand on marks, or various lines, etc.). After two or three relaxation exercises, the pupils are handed in questionnaires and pencils (if the lesson takes place outdoor, also writing pads). Pupils complete the questionnaire by themselves with the possibility to ask questions about the question content. Pupils in lower classes sometimes take the advantage of this possibility. It takes about 4-6 minutes to complete the questionnaire. The teacher (student teacher, teacher) completes the questionnaire also immediately after the lesson has finished.

## 4. Teacher's (student teacher's) additional record

The teacher has to state some important characteristics about the lesson along with the information stated in the questionnaire:

- Who taught – a teacher or a student teacher?
- Which environment the lesson took place in – gymnasium, work out room, outdoor ground, swimming pool, etc.?
- Which lesson it was in the daily schedule of lessons?
- A more detail description of the lesson in terms of the content (game – basketball, gymnastics, track and field, swimming, conditioning, etc.), in terms of prevalent focus (training, repetition, creative, individualized, etc.), in terms of load (habitual load, higher load) or other types (coeducational, health-oriented, etc.).

## 5. Questionnaire standardization

***Questionnaire for pupils***

The questionnaire verification comprised 440 pupils from 27 classes at different schools. By random halving of classes, when each half of the class responded to one half of the questionnaire, significant differences were found using the t-test in five classes. In the other classes, the differences were not significant. A statistically significant coefficient of inner consistency 0.63 was found in 157 pupils by halving the questionnaire. The coefficient of stability estimated in 103 pupils equals $r_{tt}$=0.82 and at the level of dimensions $r_{tt}$=0.92. Little lower, but still statistically significant is the coefficient of validity $r_{xy}$=0.42, estimated in relation to the results of the assessment scale (n=51). A part of the standardization was the verification of the questionnaire in methodologically identical experiments, but in different teaching conditions.

The questionnaire includes English, German, Polish, Slovakian, Slovenian and Swedish version.

***Questionnaire for teachers***

53 teachers from different types of schools participated in the questionnaire verification. By random halving of groups, when each half of the group responded to one half of the questionnaire, significant differences in the assessment were not found using the t-test. The values of the stability coefficient estimated in each group of teachers ranged $r_{tt}$= 0.86–0.94. The coefficient of validity estimated in relation to the evaluators' results (n=53) was $r_{xy}$=0.77 in total evaluation and at the level of $r_{xy}$= 0.53–0.82 in case of dimensions.

## 6. Questionnaire assessment

The assessment of the questionnaire is done in computer in a specifically tailored programme Dotazník2002 version 2.0. Upon the entry of the information about the given group of pupils, the assessment takes only a few seconds. For other analysis, the data are exported into the MS Excel as a chart that is more appropriate for statistical processing (a possible transition into a statistical software).

# Appendix 5: Questionnaire (student teacher's attitude towards the PEL)

| Start of monitoring: | | End of monitoring: | |
|---|---|---|---|

| | | | |
|---|---|---|---|
| School: | | Student teacher's gender: | |
| Class: | | Number of years of praxis: | |
| Date: | | Height: | |
| Pupils' gender: | B G Mixed | Weight: | |
| Type of PEL: | | Age: | |

Mark X!

| No. | Question | Yes | No |
|---|---|---|---|
| 1 | Did you inform students about the objective of the lesson? | | |
| 2 | Were you satisfied with student's physical activity? | | |
| 3 | Could you sense the class was relaxed after the lesson? | | |
| 4 | Were you friendly to your students throughout the lesson? | | |
| 5 | Would you like to teach the same or a similar lesson next time? | | |
| 6 | Did you create an atmosphere so that students had a chance to solve a problem independently? | | |
| 7 | Did your students learn anything new? | | |
| 8 | Did you have a positive teaching atmosphere during the lesson? | | |
| 9 | Were you too exhausted after the lesson? | | |
| 10 | Did students misbehave during the class? | | |
| 11 | Would you use some of these activities from today's class in the extracurricular activities? | | |
| 12 | Did you students have a chance to make a decision in the lesson to do something on their own and in their own way? | | |
| 13 | Did your students learn any new physical skills or improve old ones? | | |
| 14 | Was the lesson fun? | | |
| 15 | Do you think that the lesson improved students' physical fitness (strength, endurance)? | | |
| 16 | Did your students ask any questions during the lesson? | | |
| 17 | Would you have preferred teaching another lesson? | | |
| 18 | Did you feel that you must often gain control of your students? | | |
| 19 | Did somebody give any demonstration in the lesson? | | |
| 20 | Did you give positive feedback any of your students? | | |
| 21 | Did your students have correct posture and stretch their muscles? | | |
| 22 | Did students correct one another if there was a mistake? | | |
| 23 | Were you satisfied with the course of the lesson? | | |
| 24 | Were there any surprises or new things in the class? | | |

## Supplementary characteristics of PEL

**Environment:** gym fitness gym outdoor playground swimming pool other.....

**Ranking of PEL within daily timetable (what lesson in order of subjects):**

0 1 2 3 4 5 6 7 8

**Specification of PEL type according to the content:**

Games → basketball floorball soccer handball volleyball dodgeball
other: .....
Gymnastics Athletics Swimming Fitness Dance Aerobics
mixed (mark what content) other: .....

**Specification of PEL according to prevailing objective:**

rehearsal repetition (drill) regeneration other: .....
habitual (usual) progressive (individualized, creative,...) with higher load
other:.....

**Specification of PEL according to intensity of physical load:**

Low intensity moderate intensity vigorous intensity

**Further specification:**

Coeducational Healthy oriented Integrated other: .....

**Mention positives (+) and negatives (-) of just realized PE lesson:**

| **Positives** |
|---|
| + |
| + |
| + |

| **Negatives** |
|---|
| - |
| - |
| - |

# Appendix 6: International Physical Activity Questionnaire – short version (IPAQ-short)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?
   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?
   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?
   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?
   _____ **days per week**

   ☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

---

**Demographic questions**

1. Gender: _____ Man
   _____ Woman
2. How many years have you got at your last birthday?
   _____ Year
   _____ I don't know/I am not sure
   _____ I refuse to answer
3. How many years of education have you completed? (min. 1, max. 20)
   _____ Number of years
   _____ I don't know/I am not sure
   _____ I refuse to answer
4. Do you have a paid job at the present time?
   _____ Yes
   _____ No → skip to question 6
   _____ I don't know/I am not sure → skip to question 6
   _____ I refuse to answer → skip to question 6
5. How many hours weekly do you work at your job?
   _____ Number of hours per week
   _____ I don't know/I am not sure
   _____ I refuse to answer
6. How would you classify the place where you live?
   _____ A large city (100,000 inhabitants or more)
   _____ A medium-sized town (30,000-100,000 inhabitants)
   _____ A small town (1,000-29,999 inhabitants)
   _____ A small community or village (less than 1,000 inhabitants)
   _____ I don't know/I am not sure
   _____ I refuse to answer

---

**Additional information (fill or mark appropriate answer)**

Height (cm): _____ Weight (kg): _____
Residence: region _____ city/town _____ Nationality _____
Housing: house _____ block of flats _____
Smoker: YES _____ NO _____
Household: I live alone _____; in family _____; in family with children under 18 _____.
Do you have a dog: YES _____ NO _____
Do you have access to any of the following?
Bike: YES ___ NO ___ Car: YES ___ NO ___ Holiday/weekend home: YES ___ NO ___
Organized participation in physical activity (Regular participation in PA throughout the year – organized by a person or institution): NO ___ Once a week ___ Twice a week ___ More times per week ___
Type of your physical activity: Do you participate in most regularly _____?
Would you like to participate in _____?
I do not participate in any activity _____.

## This is the end of the questionnaire, thank you for participating.

# Appendix 7: International Physical Activity Questionnaire – long version (IPAQ-long)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

***PART 1: JOB-RELATED PHYSICAL ACTIVITY***

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?
   - ☐ Yes
   - ☐ No → ***Skip to PART 2: TRANSPORTATION***

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.
   _____ **days per week**
   - ☐ No vigorous job-related physical activity → ***Skip to question 4***

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?
   _____ **hours per day**
   _____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.
   _____ **days per week**
   - ☐ No moderate job-related physical activity → ***Skip to question 6***

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?
   _____ **hours per day**
   _____ **minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.
   _____ **days per week**
   - ☐ No job-related walking → ***Skip to PART 2: TRANSPORTATION***

7. How much time did you usually spend on one of those days **walking** as part of your work?
   _____ **hours per day**

_____ **minutes per day**

***PART 2: TRANSPORTATION PHYSICAL ACTIVITY***

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?
   _____ **days per week**

   ☐ No traveling in a motor vehicle → ***Skip to question 10***

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?
   _____ **hours per day**
   _____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?
    _____ **days per week**

    ☐ No bicycling from place to place → ***Skip to question 12***

11. How much time did you usually spend on one of those days to **bicycle** from place to place?
    _____ **hours per day**
    _____ **minutes per day**

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?
    _____ **days per week**

    ☐ No walking from place to place → ***Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, CARING FOR FAMILY***

13. How much time did you usually spend on one of those days **walking** from place to place?
    _____ **hours per day**
    _____ **minutes per day**

***PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY***

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?
    _____ **days per week**

    ☐ No vigorous activity in garden or yard → ***Skip to question 16***

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?
    _____ **hours per day**
    _____ **minutes per day**

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?
_____ **days per week**

☐ No moderate activity in garden or yard → ***Skip to question 18***

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?
_____ **hours per day**
_____ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?
_____ **days per week**

☐ No moderate activity inside home → ***Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY***

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?
_____ **hours per day**
_____ **minutes per day**

***PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY***

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?
_____ **days per week**

☐ No walking in leisure time → ***Skip to question 22***

21. How much time did you usually spend on one of those days **walking** in your leisure time?
_____ **hours per day**
_____ **minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?
_____ **days per week**

☐ No vigorous activity in leisure time → ***Skip to question 24***

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?
_____ **days per week**

☐ No moderate activity in leisure time → ***Skip to PART 5: TIME SPENT SITTING***

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

***PART 5: TIME SPENT SITTING***

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?
_____ **hours per day**
_____ **minutes per day**

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?
_____ **hours per day**
_____ **minutes per day**

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**Demographic questions**

1. Gender: _____ Man
_____ Woman
2. How many years have you got at your last birthday?
_____ Year
_____ I don't know/I am not sure
_____ I refuse to answer
3. How many years of education have you completed? (min. 1, max. 20)
_____ Number of years
_____ I don't know/I am not sure
_____ I refuse to answer
4. Do you have a paid job at the present time?
_____ Yes
_____ No → skip to question 6
_____ I don't know/I am not sure → skip to question 6
_____ I refuse to answer → skip to question 6
5. How many hours weekly do you work at your job?
_____ Number of hours per week
_____ I don't know/I am not sure
_____ I refuse to answer
6. How would you classify the place where you live?
_____ A large city (100,000 inhabitants or more)
_____ A medium-sized town (30,000-100,000 inhabitants)
_____ A small town (1,000-29,999 inhabitants)
_____ A small community or village (less than 1,000 inhabitants)
_____ I don't know/I am not sure
_____ I refuse to answer

---

**Additional information**

Height (cm): _____ Weight (kg): _____
Residence: region _____ city/town _____ Nationality _____
Housing: house _____ block of flats _____
Smoker: YES _____ NO _____
Household: I live alone _____ In family _____ In family with children under 18 _____
Do you have a dog: YES _____ NO _____
Do you have access to any of the following?
Bike: YES ___ NO ___ Car: YES ___ NO ___ Holiday/weekend home: YES ___ NO ___
Organized participation in physical activity (Regular participation in PA throughout the year – organized by a person or institution): NO ___ Once a week ___ Twice a week ___ More times per week ___
Type of your physical activity: Do you participate in most regularly _____?
Would you like to participate in _____?
I do not participate in any activity _____

**This is the end of the questionnaire, thank you for participating.**

## Appendix 8: Survey for pupils about "Physical literacy concept"

Hello,
As a part of my research for final thesis I would like to obtain information about your knowledge on the concept (term) Physical literacy.

Please, complete the survey that is anonymous. Answering all the question will take approximately 10 minutes

1. What do you imagine when you hear "physical literacy"?
2. What do you think you should know/do to be physically literate? (what physical activities, games, sports, knowledge etc. you should master)
3. What motivates you in PE lessons?
4. How would you increase physical activity not only in physical education? (during recesses, out of school, with parents etc.)
5. Do you know any computer games and game consoles that force you to move?
6. Which physical activities (sport games, movement games, non-traditional sports etc.) would you like to try in physical education lessons? What would you recommend to PE teacher?
7. Do you know what benefits physical activity can bring to you?

Thank you very much for your answers! Your participation in the survey helped me to obtain important information for my thesis. If you are interested in the results I will be ready to send them to you.

## Appendix 9: Survey for PE teachers about "Physical literacy concept"

Good morning,
As a part of my research for final thesis I would like to obtain information about your knowledge on the concept (term) Physical literacy.

Please, complete the survey that is anonymous. Answering all the question will take approximately 10 minutes

1. What do you imagine when you hear "physical literacy" term?
2. What do you imagine a physically literate (educated) person to be like?
3. Do you think that physical literacy concept can be applied within the PE curricula in the Czech Republic? (explain)
4. How would you increase awareness of physical literacy (among parents, pupils, and teachers)?
5. How would you implement physical literacy into praxis? It is suitable in your opinion?
6. How do you go to develop physical literacy in the conditions of your school?
7. Are two PE lessons enough for physical literacy development (your idea)?
8. Would you be willing, after a closer acquaintance with the concept of physical literacy, work with it within your lessons?
9. Do you think that you have adequate knowledge about physical literacy concept?
10. Do you think that physical literacy concept should be included within leisure-time activities (hobbies, sports etc.)?
11. Do you think that physical literacy concept would become the objective for school PE?

Thank you very much for your answers! Your participation in the survey helped me to obtain important information for my thesis. If you are interested in the results I will be ready to send them to you.

**doc. Mgr. Jana Vašíčková, Ph.D.**

## Physical literacy in the Czech Republic

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