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Mobile apps that support physical activities and the potential of these applications in physical education at school

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ABSTRACT

The current trend in using digital technology to support physical activity (PA) is unstoppable at that time. The growing number of mobile device users maximises the possibility of the better utilisation of these devices for the support of physical activities. The objective of this paper is to create an insight into the use of mobile technologies in the physical education process and to establish the underlying considerations of their use. In the paper we generally discuss the utilisation of digital technologies in education and we focus in more detail on physical education as a subject and we examine the potential of mobile apps designed to support PA. A sub-objective is to define the possible risks associated with the use of these technologies. The paper also includes a survey research directed at a target group. The survey research focuses on the current status of how mobile technologies have spread over and how they are used in PE classes and the realisation of PA. Having studied literary resources we pursue the fundamental description of the technologies used in mobile apps, as well as the availability, functions and basic categorisation of these mobile apps. In the practical part of the paper we publish the initial results of our research plan, the introductory part of which we effected using survey research directed at a target group, that being primary and secondary school teachers and students from selected regions in the Czech Republic. The results of our work confirm the current tendency to use mobile technologies in connection with the realisation of physical activities. The high level of mobile devices used by the target group and the practical experience associated with the use of mobile apps to support PA indicate the potential for introducing mobile apps in lessons. Nonetheless, there are currently no appropriate recommendations, such as peer-reviewed application databases, that can be used in the physical education

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process. Mobile apps are a relatively new tool for interventions associated with health and physical activity and few academic works have been published in both Czech and foreign literature in regards to the impacts of mobile app use in this field. Where physical education classes are concerned, mobile apps represent low-cost and broadly used tools that need to be subjected to further expert investigation, mainly in relation to the enormous number of these mobile apps and the possible risks associated with their use. **Key words**: MOBILE APP, MOBILE TECHNOLOGY, PHYSICAL ACTIVITY, EDUCATION, PHYSICAL EDUCATION.

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INTRODUCTION

Over the past few decades, a new phenomenon independent of physical activities has emerged in connection with the fast development of information technology - the sedentary life style of both children and adults. Sedentary life style is most often characterised by the time spent watching TV, playing computer games and browsing the internet (Iannoti et al., 2009). In the past decade, the regular physical activities (PA) rate has shown a downward trend not only in the Czech Republic but also in other countries. Numerous studies then point to the downward trend of the regular PA of children and teenagers. Moreover, where the latter is concerned, a negative trend in their approach to physical education and physical activity in general has been established (Kudláček, Lokvencová Nováková, Rubín, Chmelík, & Frömel, 2013; Rubín, Suchomel, & Kupr, 2014; Frömel, Novosad, & Svozil, 1999).

Digital and also information and communication technology may also have a share in the current situation. These technologies have become an inseparable part of the everyday life of a large section of the population of the economically developed world. Their development has profoundly influenced the availability of information and thereby also the ways in how to look upon information, how to approach it and how to work with it (MŠMT, 2014). Today's youngsters are described as being the *net generation*, digital natives, Millennials and also the *online generation* (Prensky, 2001; Tapscott, 2009; Howe & Straus, 2000). Whilst older generations in the Czech Republic came face-to-face with most new information technologies when adults, and the mastering of these technologies was more a part of their undergoing retraining, the youngest generation often grew up with new information technologies which, thus, became a natural part of their environment. And so the young generation often starts school with a basic knowledge of information technologies acquired during leisure time (Saková, 2006).

The emerging penetration of portable devices, such as smartphones and tablets, which are currently owned by a high percentage of children and teenagers (Palička, Zvoníček et al., 2015; Filová, 2013) lends several areas for examining their intervention potential in the prevention of a sedentary life style and also their educational potential. The software programmes available in these devices can be constructively utilised to support the teaching process, student interest and improved learning efficiency in various subjects (Krause & Sanchez, 2014).

MATERIAL AND METHODS

Where the theoretical part of our paper is concerned, we used the key words to systematically search scientific databases, particularly Scopus, Web of science, SPORTDiscus, PubMed, SpringerLink and other similar databases, with the aim to find as much information about the topic. We present our findings in a structured form in the following chapters. We also drew on other website sources where we sought information about the practical experience users have with mobile technologies supporting PA.

Where the practical part of the paper is concerned, we carried out a survey research the aim of which was to ascertain the current status of how mobile technologies have penetrated PE classes and how they are used in these classes and the realisation of PA via mobile apps. A non-standardised questionnaire was disseminated electronically using the Google Forms tool; it was applied to a target group sample before full placement. In what concerns pupils and students (n = 1211), the figures show a cross section of primary school children attending Years 4 to 9 and secondary school students attending Years 10 to 13, including grammar schools attended by students aged 11 - 19 (Fig. 1), who were approached by university partner schools particularly in the Hradec Králové and Pardubice Regions. Where teachers are concerned (n = 331),

the survey was conducted amongst PE teachers in primary schools (both stage 1 and stage 2) and in all types of secondary schools, extended grammar schools included. PE teachers were approached in cooperation with the *Asociace školních sportovních klubů ČR,* the association of educational and sports clubs in the Czech Republic, in all of the regions of the Czech Republic.

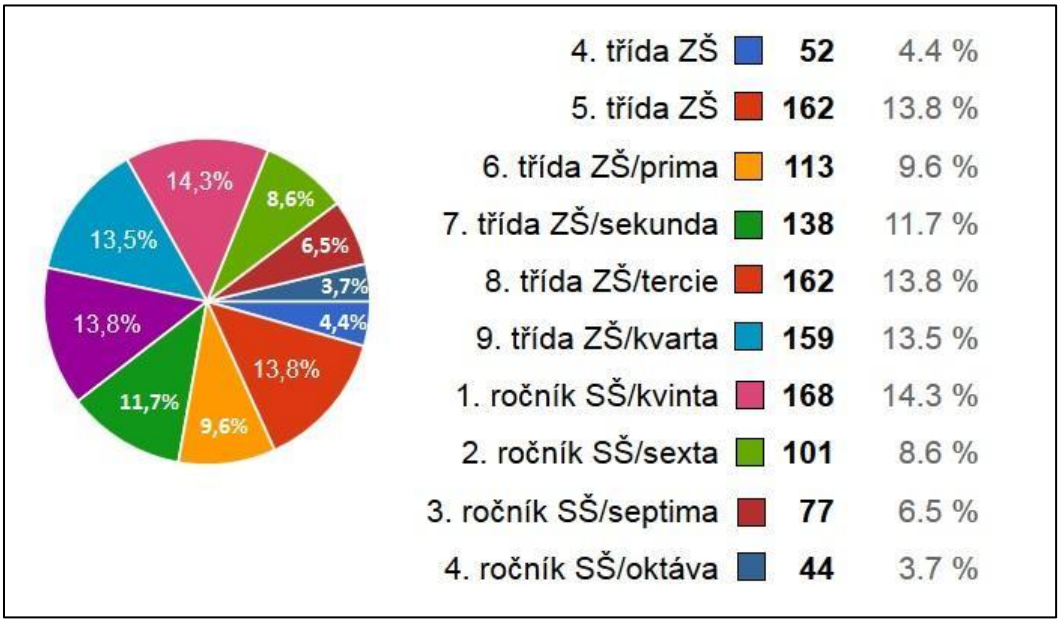

Figure 1. Breakdown of respondents – pupils.

Legend:
Primary school Year 4 – 4,4 %
Primary school Year 5 – 13,8 %
Primary school (extended grammar school) Year 6 – 9,6 %
Primary school (extended grammar school) Year 7 – 11,7 %
Primary school (extended grammar school) Year 8 – 13,8 %
Primary school (extended grammar school) Year 9 – 13,5 %
Secondary school (grammar school) Year 10 – 14,3 %
Secondary school (grammar school) Year 11 – 8,6 %
Secondary school (grammar school) Year 12 – 6,5 %
Secondary school (grammar school) Year 13 – 3,7 %

RESULTS

Digital technologies in education

Digital technologies (DT) have become a regular part of the facilities of schools which are aware of the potential of DT, particularly in the field of the support of educational strategies and the application of innovative teaching methods. The implementation of these technologies in our education system permeates many areas of education and many schools have been equipped with the necessary technology, such as interactive whiteboards, projectors, computers, tablets, multimedia teaching aids, and others within the Information Literacy Promotion National Strategy (MŠMT, 2014).

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Currently, we have become witnesses to the constantly increasing use of DT by children and teenagers in their leisure time in the form of social networks or software for digital content production (Norwegian Media Authority 2010; Ofcom 2013). It is, however, common knowledge that the period of time and the method of learning and communication using these means in a home environment differs significantly from that of a school environment (Buckingham, 2003). The search for the reasons of those differences and the possibilities of the positive networking of both processes in favour of pedagogy constitutes the subject of present research (Bjorgen & Nygren, 2010). The momentum with which these digital technologies are being developed, however, has a tendency to jump the current methods of the research of this phenomenon (Gardner & Davies, 2013; Lewis, 2014).

Physical education and the possibilities of using technologies

According to the Framework Educational Programme, physical education (PE) belongs to the educational field Humans and Health (Člověk a zdraví) together with the subject titled Health Education (*Výchova ke zdraví*). The terms and conditions applicable to the use of DT are more limited in Physical Education owing to the focus of the subject, relocation, fieldwork, insufficient time, and the like. Nonetheless, teachers now have several ways how to incorporate these means in the teaching process. But in many cases these are expensive solutions that require further training, and the like. From an economic point of view, it would be suitable to search for solutions that are innovative, effective and easily accessible by a wide range of users and which will not burden school budgets too much (Krause & Sanchez, 2014).

Technologies have emerged in the past decade that have the potential to combat the sedentary life style phenomenon, particularly thanks to their relevance in the realisation of physical activities. This particularly concerns portable/mobile devices such as smartphones, tablets, wearables – smart wristbands, watches, etc., the potential of which lies primarily in the possibilities of using sensor technologies which through software solutions enable users to monitor and evaluate their PA in line with generally accepted recommendations. In this context we are inclined to think that it is vital for PE teachers to have the possibility to follow current trends as students themselves already use these technologies in their day-to-day activities. An opportunity lends itself to PE teachers how to show pupils and students these tools during class and they are provided with the possibility to instruct them how to use them in support of their physical activities (Cummiskey, 2011).

Mobiles apps – availability and platforms

*Curr*ent mobile apps can be defined as simple computer programmes which can be installed onto mobile devices with an advanced operating system (OS); those being a smartphone and tablet in our case. An operating system functions as an intermediary between hardware (the technical equipment of a device) and a specific programme (application) used by the user.

There is currently a vast amount of mobile apps on the market that are placed on web interfaces depending on the individual types of OS (Fig. 2). Users can download them from App stores via the internet. The App store functions as a database where applications can be located according to category, user assessment, and the like. Our work focused on the three platforms that our survey showed to be widely prevailing, those being the operating systems Android, iOS, and Windows Phone. Applications of differing quality and orientation may exist for each of these platforms but it is currently common for a substantial amount of applications to be available for more OS. Lately, web applications and applications using web technologies (HTML, CSS, JS) have emerged because contrary to the operating systems installed on these devices web browsers are almost the same everywhere and an application programmed in this way is often transferrable to all of the platforms at a minimum cost (Hua, 2010). Lehocký and Churý (2014) regard applications

designed only for OS as being native and web solutions as being responsive websites; many cases see a combination of both approaches. There are certain differences between these applications that go beyond the scope of this paper.

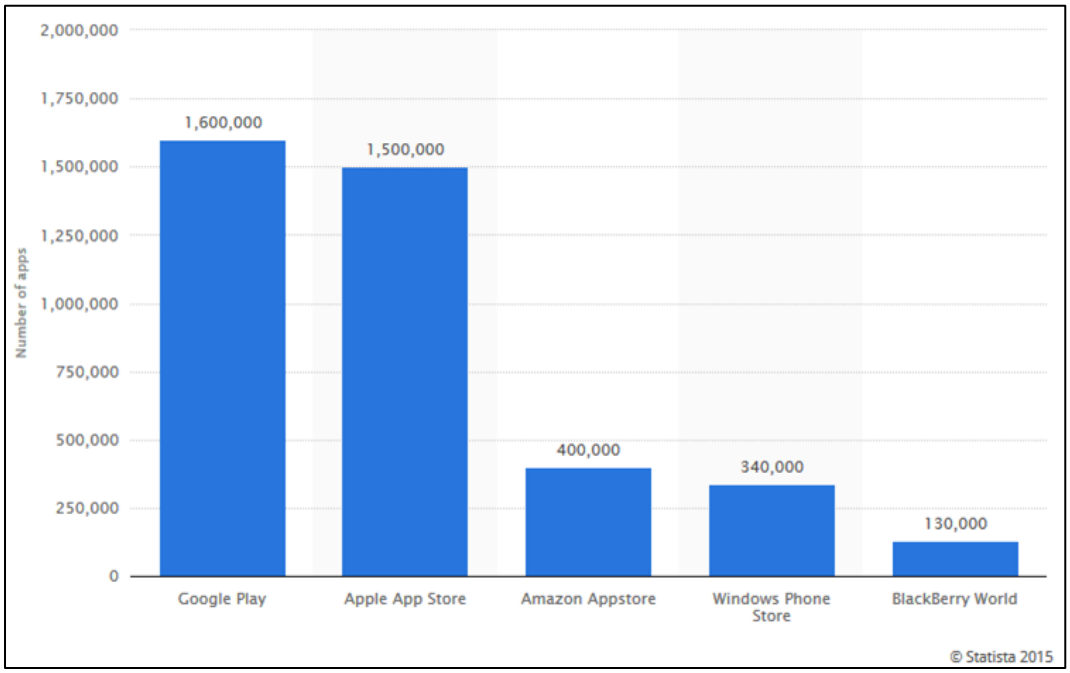

Figure 2. The number of applications available at leading App stores (Statistica, 2015).

Applications can be had either free of charge or subject to a fee. Also common is a combination of when an application with limited functions is provided free-of-charge and can be made available in its entirety subject to a fee. In what concerns applications for PA this means that the free versions provide only a limited amount of information about the activities carried out. When the full version has been purchased, more functions can be used, such as more advanced statistics about the user's results, connection with other devices, etc. Most of these applications usually facilitate the monitoring of long-term result prognosis but this is not the case with some applications which require the user to login to an account via the internet or to connect the application to a social network. Thus, where some applications are concerned, the user cannot record anything without a data connection in his device (Eliáš, 2013). These mobile apps can be downloaded from iTunes (iOS), Obchod Play (Android) and Windows Phone store directly from a smart device.

Mobile apps for physical activities and a healthy lifestyle

Where utilisation in PE is concerned, we are primarily interested in mobile apps for implementing physical activities (PA apps), usually referred to as Physical Activity Mobile Applications. These applications allow for the monitoring of the course of activities of various physical activities or sports through the sensor technologies integrated in mobile devices. For example, they measure path movement, distance, speed and the number of steps taken and with the use of simple algorithms they can also provide the user with a calorie counter relating to the activity selected (Nutriweb, 2013). Then there are applications for fitness bodybuilding, creating exercise programmes, geocaching, physical activities for groups or exergames. Some of these programmes are referred to as personal trainers because they are so sophisticated.

This type of application has seen a massive increase over recent years and their numbers have doubled over the past two years. Google announced that this category is the fastest growing category of all. Nowadays,

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users can choose from more than 100 000 applications from this category at Apple and Obchod Play portals (HealthTap, 2015). Applications are available at web stores in the Health and Fitness category; all of the three most used OS refer to the same category. There is no sharp distinction between health and fitness and, thus, this category also includes, for example, applications that focus on comprehensive health intervention. These applications are referred to as Healthcare apps, cumulatively then mHealth or also eHealth. In a wider context, these are then, as a general rule, so-called telemedicine systems which are ordinarily aimed at connecting multiple applications and other devices together with online medical support. Some producers implement these applications as a part of the operating system of a phone, including Samsung, Nokia, LG, Apple and others. Such sophisticated implemented software for monitoring health indicators include Samsung S-health, Apple Health kit and Google Fit, for example (Shaughnessy, 2014).

Hardware technologies used by current PA apps

In the past decade, mobile devices such as smartphones and tablets have been on the increase (Kocman, 2014). Their intervention potential lies primarily in hardware fitted with measuring sensors. Together with suitable software (mobile apps), these sensors enable, besides other things, the monitoring of the physical activities of people.

GPS – A Global Positioning System receiver embedded in a phone which uses the application to determine the user's location. Measuring using GPS results in geographic coordinates being recorded in the applications; these geographic coordinates can be displayed on a map. Coordinates are recorded in a three dimensional space and also include information about the sea level. In specific cases, like running, for example, a GPS receiver can display, through an application, the total profile of the path and information about the sum of altitudinal metres covered while climbing and descending. Several applications make it possible to set how often GPS data about the location should be downloaded. More precise measurements are achieved when reading is effected, for example, once per second. This is especially true when the user does not run in a straight line (sharp bends). More frequent readings, however, result in increased phone battery consumption (Bouška, 2013).

Accelerometer – Another widespread sensor integrated in smart devices is the accelerometer, which is a sensor that measures inertial motion in various axes. The accelerometer function can be used to replace the classic pedometer. Studies reveal a positive correlation between measurements provided by smartphone sensors and classic accelerometers (Saha, Dirik, Topkara, Memon, Gutierrez & Rao, 2010; Fedrová, 2013).

Gyroscope – This sensor is used in devices to monitor the rate of rotation in one or more axes (McGrath & Ni Scanaill, 2014). Thus, gyroscopes can precisely measure complicated movements in free space. Thus, together with an accelerometer the device recognises its exact location.

Further thereto, the cameras of some phones can be used to measure, for example, the user's heart rate. In this way a user can record his heart rate over a certain period of time in relation to a certain sport and he can monitor optimised sports zones. The heart rate is measured on the basis of the colour spectrum of the skin through which blood passes owing to heart activity (Zavřel, 2011; Bouška, 2013).

Wearables – The term wearables refers to all devices and instruments that can be worn on the body and which provide various required information (Park, Chung & Jayaraman, 2014). Keeping PA in mind, this type of sensor provides the individual with PA feedback. In essence, wearables are devices that combine the above described technology and which may but do not have to have a display showing current data because they can, most often, be connected to a smartphone, tablet or computer in which the data are then evaluated

and thus provide the user with feedback. This category includes various types of wristbands, smart watches and sensors which provide information, for example, about the heart rate, step counting, energy expenditure or exact data about a path covered, speed of movement and altitudinal profile included.

Techniques producing behavioural changes in PA apps

The term *Behavioural Change Techniques* (BCT) is referred to in foreign literature in connection with mobile apps. BCT is an observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behaviour. In other words, BCT are free-standing components leading to behavioural changes (Michie et al., 2011). BCT may include, for example, the provision of social support, instructions on behavioural changes, self-assessment, feedback during the course of the changes, and the like.

A comprehensive taxonomy of these techniques was carried out only recently by Michie et al. (2013). On the basis of an extensive analysis, he identified 35 out of a possible 93 BCT amongst the PA apps tested in the field of mobiles apps for PA Yang, Maher and Conroy (2015). Relations between BCT in applications and the real realisation of behavioural changes continue to be the subject of many research challenges and future studies should focus more on ascertaining which BCT, and their combinations, could become even more effective with the use of mobile apps. (Middelveerd, 2014; Direito, 2015). Another topic of our on-going research will be the inclusion of selected BCT in the evaluation of mobile apps that can be used in physical education classes in relation to the curricular documents of the Czech Republic and the search for further techniques not as yet identified in PA mobile apps – refer to Yang et al. (2013).

Risks associated with the use of mobile apps

Acceleration connected with the excess use of digital technologies also carries many risks, particularly in connection with the concepts of digital dementia, social isolation, learning disabilities and attention deficit disorders. Also described are the negative consequences of using a computer and the internet and the therewith associated issues such as digital piracy, cyberbullying, stalking and the also so often cited lack of physical activity and the consumption of high-calorie foods (Spitzer, 2014; Jechová, 2010; Rojek, 2010; Vondráčková, 2009; Block, 2008, Beard & Wolf, 2001). Children spending more and more of their leisure time alone in their rooms with their *digital friends* instead of playing outside and communicating face-to-face with their peers or parents have experts worry that this generation of children will show significant differences in intellectual, physiological and psychological development compared to preceding generations (McNeal, 1999; Weir, Etelson, & Brand, 2006).

Research conducted in developed countries has established that there are wide gaps between users from various social classes given that children from families with lower incomes do not make use of mobile technologies and teaching applications to such an extent as do children from richer families and this leads to inequalities in access to education. This phenomenon has lent itself to the term *App Gap* (Mouza & Barret-Greenly, 2015; Hasseldahl, 2008).

Some mobile apps already compete with fully-fledged computer games. Even though many computer games were originally designed for adults, they have become a part of the lifestyle of children (Snyder, 2000). Age recommendations and limits on grounds of inappropriate content in computer games are often ignored by both the children themselves and their parents (Tufte & Rasmussen, 2010). However, it should be noted that there are also indications that mention the positive effects of these impacts, such as the positive effect of computer games on cooperative social skills, problem-solving skills or therapeutic importance (Egenfeldt-Nielsen, Smith, & Tosca, 2013; Annema, Vestraete, Abeele, Desmet, & Geerts 2012).

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Apart from the positive effects associated with the use of PA apps, there are also downsides in that given the current large amount of these applications there is no guarantee that all of them credibly evaluate data, that they do not mislead the user or else motivate the user to strive for extreme performance that may lead to injury or unreasonable weight-loss, for example, (Ho, 2013). Beyond this aspect, there is also a real risk as to the abuse of personal data, as suggested in a report by the US Federal Trade Commission. In one of its studies it identified 12 Health and Fitness mobile apps that disclose personal data to up to 76 third parties. The data may bear personal information on the basis of which it may be ascertained, for example, where and when the user moves about or what are the metric indicators of the user's body, which could result in the abuse of such data (Farr, 2014). Some of the free-of-charge PA apps which we downloaded and tested were referred to as *without assessment,* which may potentially also be applications with an inappropriate content where children are concerned (Google Play, 2014). It is for the above reasons that users, particularly teachers, should be on the lookout and they should use only recommended and verified applications.

Typology, classification and examples of PA apps

Owing to the enormous amount of PA apps and the overlap of their functions and orientation, it is not easy to separately characterise individual categories. In this chapter we present a category system as proposed and generalised by us; we concentrate on providing a description of the purpose and an overview of the basic functions of the individual types of PA apps which in their nature correspond to potential use in PE at schools.

Trackers – An application for the personal tracking of a wide range of sports. It is based on measuring activities using a GPS sensor. It is designed for running, walking, cycling, skates, skiing and other sports. Some applications also support other *phone sensors* (especially the accelerometer) and *external sensors* (primarily in regards to heart rate tracking). Measuring using GPS is the same for various sports and a wide variety of these sports can be set. Applications quite often also support sports that cannot simply be measured using GPS, such as aerobic, box, swimming; manual records can be created in regards to these sports. Most of these applications work with the same set of values, such as time*,* distance*,* speed or pace, whereby these can be switched or combined. Average values relating to the entire time of activity and current data can also be displayed. Some applications make it possible to look back (even during the course of an activity) at a certain section even after, for example, 1 km. Moreover, the number of calories burned is added to these measured values (according to information about the person, the type of sport and performance). In what regards running, some applications use the at first glance somewhat unusual unit min/km instead of the common km/h to report speed. The English term *pace* denotes the number of minutes (time) per 1 km (or 1 mile); for example: pace 5 min/km corresponds to a speed of 12 km/h. In order to make modifications and the browsing of recorded graphs more comfortable, applications use a web interface and the option to publish the results on a social network, where the user can proudly display them for his friends to see, gain support or find a friend to train with him. Some sports applications even have their own network of friends. Users can compare their results with friends and even challenge them to compete or wager them (Bouška, 2013).

Where this category is concerned, Czech PA mobiles apps include *Indares,* an application developed by Palacký University, Olomouc, that enables connection to a responsive web interface. This interface provides the user with further functions, such as the testing of physical fitness and the monitoring and comparison of group results.

Personal trainers – Universal applications that support a wide range of sports are sometimes referred to as *personal trainers*. For example doing exercises at home or at a fitness centre is a certain specific activity and there exist various applications even for this type of activity. These applications offer advice how to exercise

and accurately record the training session done. We provide the following examples: *JeFit, Nike Training Club, Adidas miCoach, Workout Trainer, WeightTraining, GAIN Fitness, Stronger, Fitness Tracker 90 CE, Push Ups pro.*

Exergames – Originally, exergames referred to computer games that contain an activities component. Thus, the objectives of the game are achieved through the movement of one's own body. Movements are usually recorded by a sensor located on the body or away from it; in this case it is a GPS chip, accelerometer or gyroscope in a smartphone. This category may also partially include applications for universal tracking which contain gaming principles on the basis of comparing results and their publication on social networks. These applications include: *Dokobots, Coderunner, Zombie, Run!, Fitocracy, Ingress.*

Teaching applications – These include applications aimed at teaching certain movement skills or understanding the functioning of a certain phenomenon of movement. Teaching applications usually do not make use of sensory technologies and they are principally based on the use of videos and audio (training video, graphics, etc.). We provide the following examples: *Breakdance Tutorial, Floorball Tactic Board, Coach´s Eye.*

Sports social networks – This category includes most responsive websites the output of which are mobile apps. These websites lend themselves to users arranging joint activities, organising sports events, finding sports grounds, and the like. Typical representatives, for example, are: *Sportongo, Sport Central, Mevyo.*

To give an inspiring example, we present a classification according to the HealthTap Annual Report (2015) which gives the top 100 applications recommended by American independent doctors for Android and iOS platforms from the Health and Fitness category. In view of such an extensive classification we have selected only those categories that we consider to be relationally connected to the educational field Humans and Health (*Člověk a zdraví*) according to the Framework Educational Programme of the Czech Republic. We provide examples of two applications per each OS that were given the most points (Table 1).

Table 1. Classification and examples of the most recommended PA apps according to the HealthTap Annual Report for the year 2014

AB workout apps	**A:** Daily AB workout, ABS trainer, **iOS:**Daily AB workout, AB trainer X
Aerobics apps	**A:** Runtastic PRO, Smart pedometer **iOS:** Cardiovascular circuit training, Walkathlon+Fitness games
Anatomy apps	**A:**Visual anatomy, Muscle Trigger Point Anatomy **iOS**: Visual anatomy,Netter´s anatomy atlas.
Endurance training apps	**A**: Couch to 5K, Bridge to 10K **iOS:** Map my ride, Runtastic ride-route tracker
Fitness and exercise apps	**A:** Instant Heart Rate, Fit bit **iOS**:Fit bit, Fitness buddy
Healthy eating apps	**A**: Fooducate, EZ sodium tracker **iOS:** Fooducate, Food Labels With Nutritional Facts
Healthy living apps	**A:** Pocket First Aid+CPR, iBP blood presure **iOS:** Hydrate yourself, Virtual Dentist
Mental health apps	**A:** At Ease, Free hypnosis **iOS:** T2 Mood Tracker, Caring bridge
Mind and body apps	**A:** Relax and Rest Meditations, Relax

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	iOS: Meditation oasis, Breathing zone
Running apps	**A:** Runkeeper, Runtastic
	iOS: Runkeeper, Runtastic pedometer
Sleep and dreams apps	**A:** White Noise, River Sounds Nature to Sleep
	iOS: White Noise, Sleep cycle
Sports apps *(sportovní)*	**A:** Runtastic Mountain Bike, Boxing Timer Pro
	iOS: Sports Tracker, Swim log
Strenght training apps	**A:** Total 90, Push Ups Trainer Pro
	iOS: Bodyweight training, JEFIT
Weight loss apps	**A:** Wieght Watcher Mobile, Lose It!
	iOS: Weight Watcher Mobile, Lose It!

Selected results of the survey research

The currently presented results include a group of pupils (n = 1211) and a group of teachers (n = 331) from primary and secondary schools from selected regions in the Czech Republic. Given on-going research and the capacity of this paper, we present only selected indicative results to establish a basic understanding of the issue at hand. The number of respondents may slightly differ in regards to the individual graphs for reasons of alternating numbers at intermediate points during the processing of the graphs.

Pupils

Question for pupils: "What type of mobile phone do you own?" (Fig. 3) for greater clarity it contained the caption: "A SMARTPHONE functions as a small computer. (It has Wi-Fi, a larger touch screen, it can download and install applications, it uses GPS, etc.). A CLASSIC PHONE ordinarily does not have Wi-Fi, demanding applications cannot be downloaded into it and it usually has a smaller display and buttons." The question "How much time do you spend on your mobile phone?" was placed as-is without any further comments (Fig. 4). We were also interested about the penetration of so-called smart wristbands (Fig. 5) and what type of application pupils use most often (Fig. 6). Specification of the names of the applications from the given categories usually prevailed in the answers to this question under the entry "Others". The last presented result of the pupil survey concerns a question of interest in using PA apps in physical education (Fig. 7).

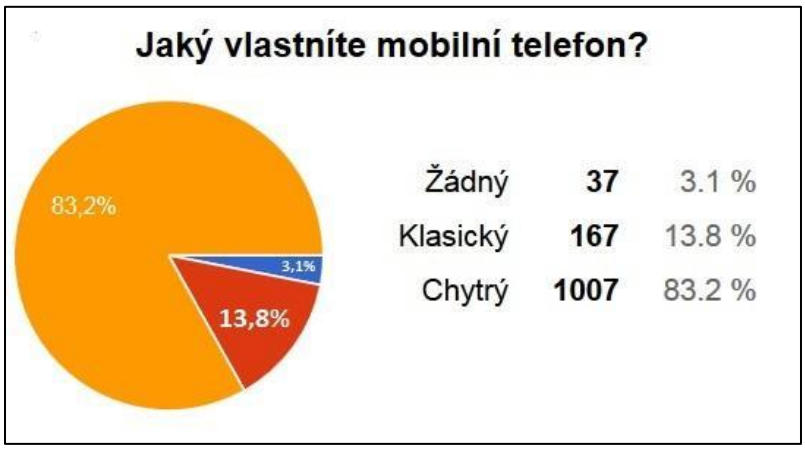

Figure 3. Phone ownership – pupils.

Legend:
What type of phone do you own?

None – 3,1 %
Classic phone – 13,8 %
Smartphone – 83,2 %

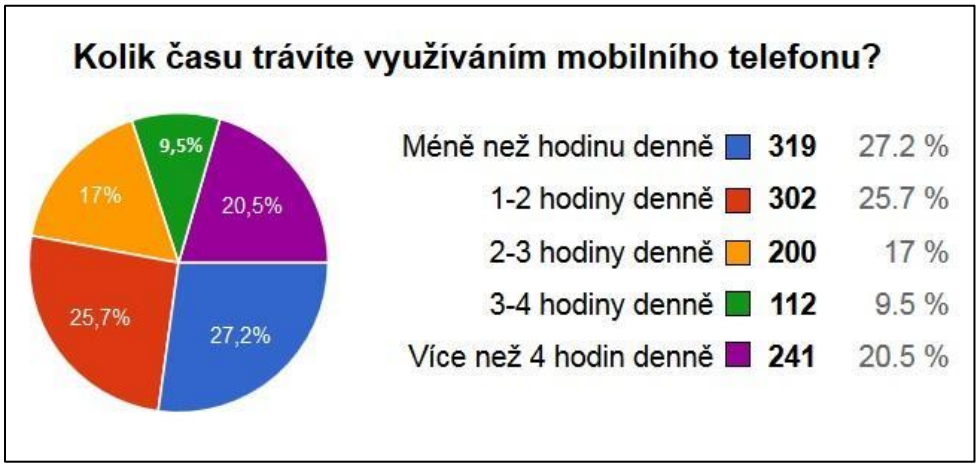

Figure 4. Time spent – pupils.

Legend:
How much time do you spend using your phone?
Less than an hour a day – 27,2 %
1 – 2 hours per day – 25,7 %
2 – 3 hours per day – 17 %
3 - 4 hours per day – 9,5 %
More than 4 hours per day – 20,5 %

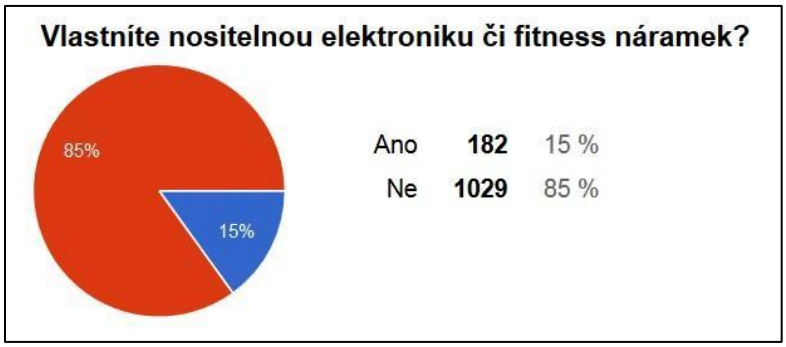

Figure 5. Wearables – pupils.

Legend:
Do you own any wearables or a fitness wristband?
Yes – 15 %
No – 85 %

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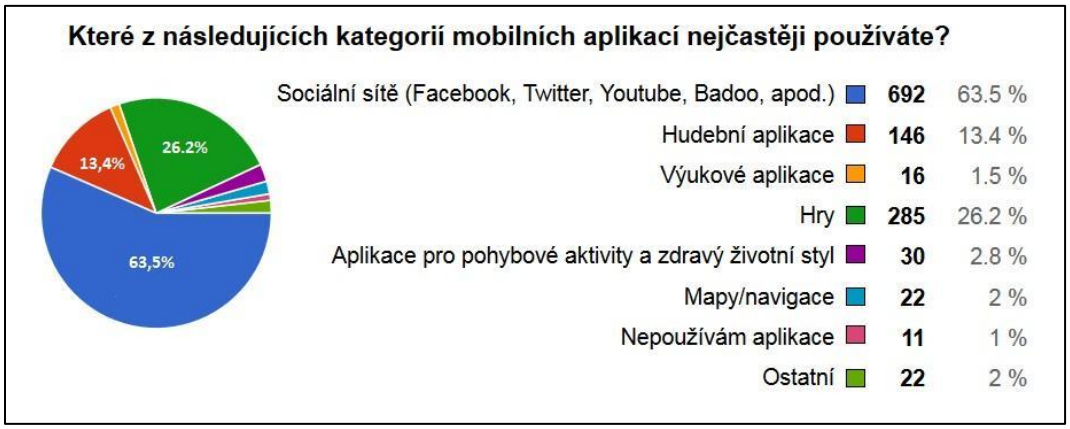

Figure 6. Most frequently used apps – pupils.

Legend:
Which of the following mobile application categories do you use most often?
Social networks (Facebook, Twitter, Youtube, Badoo, etc.) – 63,5 %
Music apps – 13,4 %
Teaching apps – 1,5 %
Games – 26,2 %
Applications for psychical activities and a healthy lifestyle – 2,8 %
Maps / navigation – 2 %
I do not use any applications – 1 %
Other – 2 %

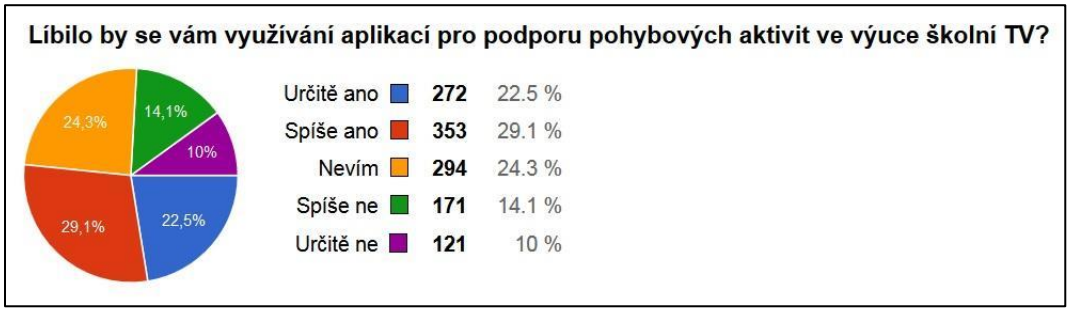

Figure 7. Use of PA apps in PE - pupils.

Legend:
Would you like to use applications supporting physical activities in PE classes?
Definitely yes – 22,5 %
Generally yes – 29,1 %
I do not know – 24,3 %
Generally no – 14,1 %
Definitely not – 10 %

Physical education teachers

Where teachers are concerned, the survey was conducted amongst PE teachers in primary schools (both stage 1 and stage 2) and in all types of secondary schools, extended grammar schools included. PE teachers were approached in cooperation with the Association of Educational and Sports Clubs in the Czech Republic

(*Asociace školních sportovních klubů ČR*), which sent out questionnaires to all of its regional offices in the Czech Republic. We were interested in the teachers' attitude to the issue at hand, particularly their opinion on interconnecting digital technologies with PA in general (Fig. 8) and then also their idea about the use of mobile apps in PE (Fig. 9) by pupils and the teachers themselves (Fig. 10). In conclusion we indicate the structure of the answers to the question examining which category of mobile apps teachers like best (Fig. 11).

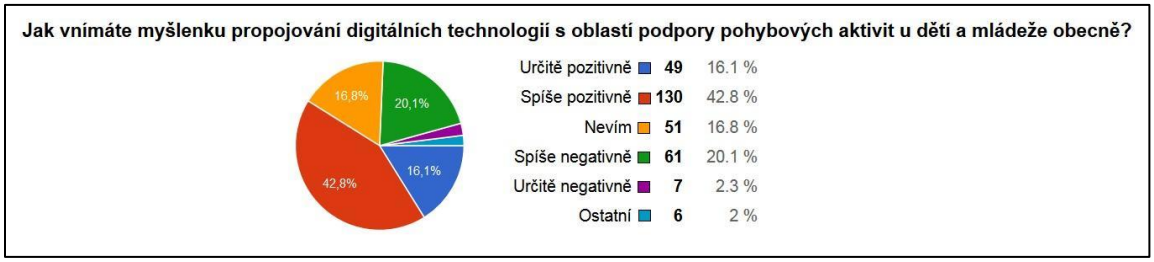

Figure 8. Teacher opinion on interconnecting DT with PA where children and teenagers are concerned.

Legend:
How do you generally view the idea of interconnecting digital technologies and physical activities where children and teenagers are concerned?
Definitely positively – 16,1 %
Positively in general – 42,8 %
I do not know – 16,8 %
Negatively in general – 20,1 %
Definitively negatively – 2,3 %
Other – 2 %

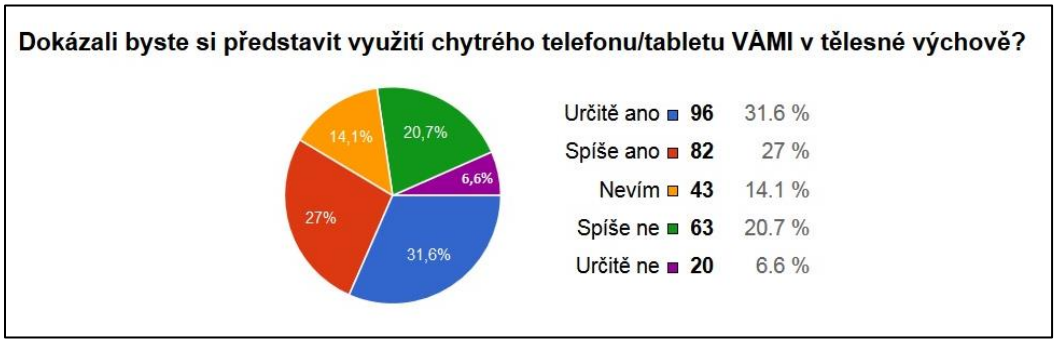

Figure 9. Teacher perception of using mobile technologies in PE.

Legend:
Could you imagine yourself using a smartphone/tablet in PE?
Definitely yes – 31,6 %
Generally yes – 27 %
I do not know – 14,1 %
Generally no – 20,7 %
Definitely not – 6,6 %

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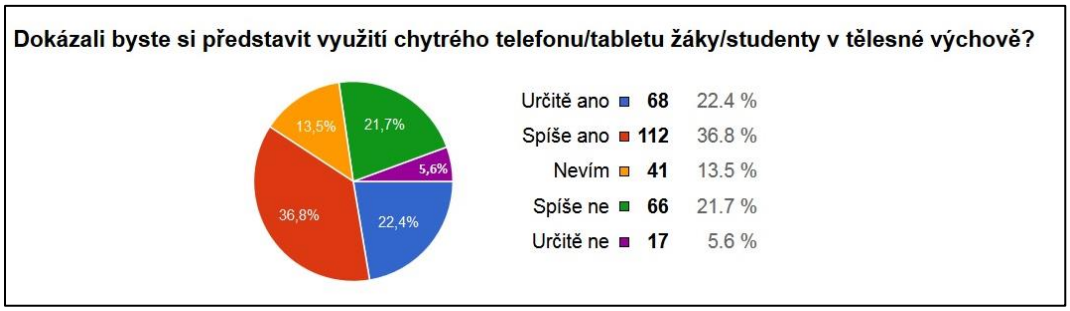

Figure 10. Teacher perception of pupils using mobile technologies in PE.

Legend:
Could you imagine pupils/students using a smartphone/tablet in PE?
Definitely yes – 22,4 %
Generally yes – 36,8 %
I do not know – 13,5 %
Generally no – 21,7 %
Definitely not – 5,6 %

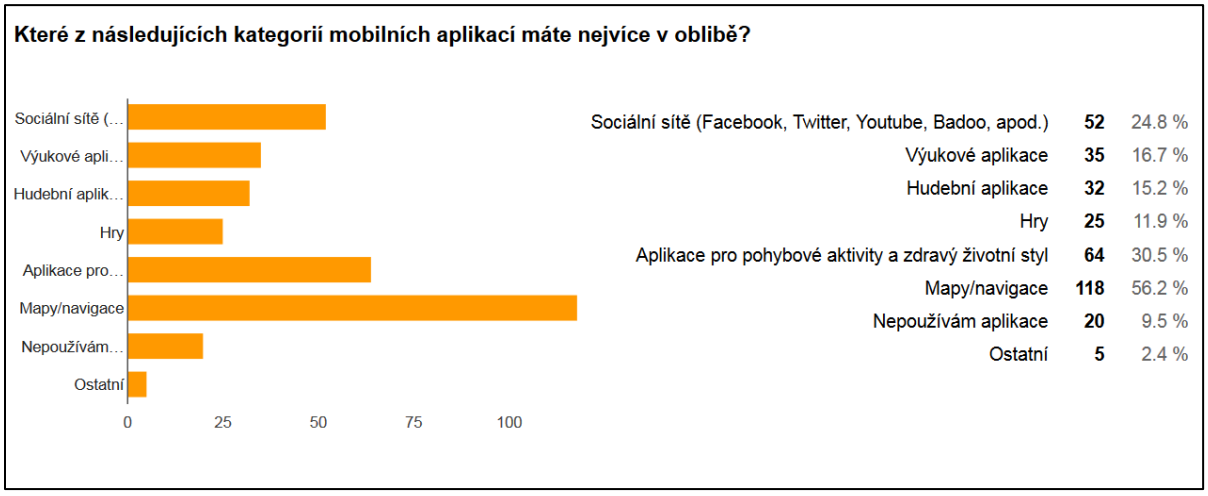

Figure 11. The popularity of mobile apps with PE teachers.

Legend:
Which of the following mobile application categories do you like most?
Social networks (Facebook, Twitter, Youtube, Badoo, etc.) – 24,8 %
Teaching apps – 16,7 %
Music apps – 15,2 %
Games – 11,9 %
Applications for psychical activities and a healthy lifestyle – 30,5 %
Maps / navigation – 56,2 %
I do not use any applications 9,5 %
Other – 2,4 %

DISCUSSION

It follows from the research conducted that mobiles apps, particularly smartphones, are used by the majority of pupils interviewed and that they spend much of their time using these mobile apps. The sample used showed high smartphone penetration, particularly in the secondary school Year 10, specifically up to 95 %. Given the current results, penetration in Year 5 was about 75 %. Considerable is also the frequency of ownership of fitness wristbands which makes up 15 %. PA apps are a popular choice for pupils; they came fourth, right after social networks, games and music applications.

What concerns teachers, research showed that the majority of them are in favour of using mobile technologies in PA and that some of them have already integrated them into PE classes. This is, moreover, demonstrated by the popularity of PA apps, which took second place, right behind applications like maps and navigation. It can be seen based on our research results that the scope of the use of mobile technologies and PA apps in physical education at schools offers some potential in the sense of how very much widespread they are and the preparedness of the target group to use them. In our view, this potential should be subject to further research in follow-up studies and research.

CONCLUSIONS

Mobile apps are a relatively new tool for interventions associated with health and physical activity and few academic works have been published about the impacts of the use of mobile apps (Middelveerd et al., 2014). From a research point of view, this issue seems advisable also by reason of the ever-increasing number of smartphone users (Kocman, 2014). Despite the popularity of PA mobile apps, their efficiency in enhancing the PA rate has still not been clearly demonstrated. This fact is also given on the grounds of the dynamic development of digital technologies which leapfrog the older tempo of conventional research methods.

Neither Czech nor foreign academic literature has as yet provided us with a taxonomy of PA apps that would take into account age group suitability or a connection to the education system or specification, to name just a few. Usually, we only come across recommendations on the basis of school teacher user experience. There is currently no professionally created and assessed database of PA apps for the purpose of teaching practice or which would take into account the above-stated aspects. It is on these grounds that the objective of our follow-up task is to determine the building blocks for the development of this type of database that may find their place within a portfolio of practical tools for PE teachers. For these purposes we conducted a survey research that helped us determine the extent to which mobile technologies are prevalent in the target group, its stand on that issue and the extent of literacy in regards to the use of these means in promoting PA.

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