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Physical activity as a factor of health-related behaviour in Czech adults

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Abstract

Physical activity is an important salutoprotective component of health-related behaviour, which delays cardiovascular ageing and prolongs life. The aim of this research is to map the extent of physical activity carried out by adults in the Czech Republic, assess the influence of determinants of physical activity and examine the relationship between physical activity and subjective health complaints. The research sample consisted of 1,263 Czech adult respondents aged 22–93. The volume of physical activity decreases with age. Based on regression analysis, we identified the strongest predictors of physical activity such as age, gender and the personality dimensions of ascendancy and vigour (according to Gordon Personal Profile - Inventory (GPP-I)). Men are more physically active than women, yet 51% of all respondents did not meet the minimum recommended amount of sports physical activity. It was confirmed that the higher extent of physical activity reduces the number of health complaints.

Keywords: Physical activity (overall, sports, non-sports), health-promoting behavior, health complaints, age.

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1. Introduction

Today, lifestyle is seen as the strongest predictor of health; the World Health Organization (WHO) (2010, according to Kriz, 2011) ascribes that lifestyle has a full 50% of the total influence on health. Thus, in our perspective, behaviour is the largest factor on the continuum between health and sickness. In industrialised countries, a significant portion of mortality due to the most common causes of death is associated with specific behavioural patterns, and these patterns can be changed (Conner & Norman, 2005). Steptoe and Wardle (2004) name the following forms of health-promoting and health-threatening behaviour, as currently having a major impact on health, in the Euro–American culture: smoking, nutrition (intake of fats, carbohydrates, consumption of fruit and vegetables), physical activity, alcohol consumption, cancer screening, risky sexual behaviour and risky driving.

This study specifically focuses on physical activity by mapping its prevalence among Czech adults, examining the influence of demographic and personal determinants and observing the relationship between physical activity and subjective health complaints.

Physical activity is defined in accordance with Caspersen's (1989) approach, as any movement that is exercised thanks to skeletal muscles and that leads to burning calories. Sports physical activity can be defined as structured activity with its own rules and, above all, as an activity that can be quantified (Hendl & Dobry, 2011). Non-sports physical activity includes various activities ranging from housework, to work in the garden, walks, or walking the dog, to climbing the stairs to work.

Physical activity is an important salutoprotective component of health-promoting behaviour. Smigielski et al. (2016) confirmed a lower risk of death among physically active men compared to those leading a sedentary lifestyle. Physical activity at work was proven to have a protective effect for the age category of 50–59, while a similar effect was achieved primarily by leisure time physical activity among men over 60 years of age.

The research of Shortreed, Peeters and Forbes (2013) focuses directly on cardiovascular diseases. According to their findings, long-term physical activity delays death from cardiovascular diseases or any other causes. For men, it also reduces the incidence of cardiovascular diseases. Similarly, Garcia-Ortiz et al. (2014) discovered an inversely proportional relationship between regular physical activity and cardiovascular ageing. Patel et al. (2013) are even more precise in this respect. A higher degree of physical activity is correlated with a lower risk of heart failure, but all degrees of physical activity, i.e. even a small amount, is correlated with a lower risk of acute myocardial infarction, stroke and cardiovascular mortality. Physically active people had a lower overall prevalence of cardiovascular disease risk factors. However, Rahman, Bellavia, Wolk and Orsini (2015) point out that this protective effect is brought about primarily by recent physical activity. Physical activity carried out earlier in life, regardless of intensity, does not carry over its protective effect into the present.

A seven-year study by Heikkila, Venermo, Kautiainen, Aarnio and Korhonen (2016) also discovered that physical activity correlates positively with increase in the ankle–brachial index. Test of ankle–brachial index is a non-invasive diagnostic method of detecting diseases of the peripheral arteries. The lower the value of the index the more the peripheral arteries are afflicted. Physical activity may therefore function as prevention or as treatment of peripheral artery disease. This finding is supported by a study, which found that physically active individuals had a lower incidence of peripheral artery disease and lower mortality of any origin. The physically active had higher ankle–brachial index values compared to the physically inactive, even in cases where they already suffered from peripheral artery disease (Chang et al., 2015).

Further evidence for the field of cardiovascular disease research is provided by Crichton and Alkerwi (2015). Their study presents evidence of the influence of physical activity on cholesterol levels and triglyceride levels, both of which are associated with cardiovascular diseases. Less time spent sitting and more intense physical activity were linked to higher levels of HDL cholesterol (so-called 'good cholesterol') and lower levels of overall and LDL cholesterol ('bad cholesterol') and triglycerides.

Physical activity does not affect only cardiovascular health. Bula (2016) views physical activity as a possible key factor in improving cognitive and executive functions, both for people without a cognitive deficit and those with signs of dementia. His claims are supported by the research of Fulcher et al. (2014), which provides proof of a link between physical activity and overall cognition, attention, executive function and task processing speed. Lower physical activity was associated with poorer performance in the tests, but had no effect on memory tests. Likewise, Ahlskog, Geda, Graff-Radford and Petersen (2011) make a connection between, in particular, aerobic physical activity and lower incidence of cognitive disorders and dementia.

By contrast, lack of physical activity increases the risk of cardiovascular disease, high blood pressure, diabetes, cancer, osteoarthritis and osteoporosis and depression (Warburton, Nicol & Bredin, 2006).

All of the above findings are summarised in a meta-analytical study by Reiner, Niermann, Jekauc and Woll (2013), covering 15 longitudinal studies of a total number of 2,88,724 participants in age range 18–85. They found a negative relationship between physical activity and obesity, weight gain, cardiovascular diseases, diabetes mellitus type 2 and dementia. However, they encourage further research of the relationship between physical activity and dementia.

Physical activity has a positive effect not only on physical and mental health, but also on the feeling of perceived life satisfaction (Maher, Pincus, Ram & Conroy, 2015). Respondents experienced greater life satisfaction, primarily on days when they were more physically active than usual.

A summary of the benefits of physical activity is offered by Marcus and Forsyth (2010):

- Reduction of the risk of heart disease, high blood pressure and diabetes
- Reduction of the risk of colon cancer
- Reduction of the risk of breast cancer
- Healthy and strong bones
- Lower risk of influenza or cold
- Better weight control
- More energy
- Better sleep
- Lower level of anxiety and depression
- Higher self-confidence

In 2010, the WHO released a recommendation of the minimum physical activity for the entire population from five years of age upwards, regardless of gender or race, operating with three age categories (5–17, 18–64, 65 and above). It notes for all age categories that the recommendations apply primarily to healthy people, and people who do not suffer from a musculoskeletal disease. For others, it recommends consulting a physician; however, people should always be as physically active as their skills and mobility allow (‘Global Recommendations’, 2010).

An adult person should spend at least 150 min a week doing moderately intense physical activity, or 75 min a week doing highly intense physical activity (or can combine the intensity of activities correspondingly). Aerobic activities should always last at least 10 min, and a person should find the time to exercise the major muscle groups at least two days a week.

Haskell et al. (2007) set the lower limit at 30 min of moderately intense physical activity five times a week or 20 min of highly intense physical activity three times a week. Moderately intense activity need not be performed all at once, however, the minimum duration of physical activity should not be lower than 10 min. Time should be devoted to strengthening the muscles and developing stamina at least twice a week.

Whether we follow the recommendation of the WHO or Haskell, it holds for all age groups that it is better in practice to belong to the group with low physical activity than to the group with no physical

activity. This claim is supported by research of Merino et al. (2015), where participants achieved health improvements even though their physical activity was below the recommended minimum.

Dosedlova, Klimusova and Buresova (2016) mapped individual elements of health-related behaviour, including physical activity, on a group of 1,268 Czech adult respondents and examined the influence of age and gender on the extent of health-related behaviour. The extent of physical activity linearly decreased for both men and women. These outputs are in conformity with the conclusions of research by Sarafino (1990), who states that older people engage more in caring for their health, with the exception of physical activity, which declines. This decrease in physical activity is supported by evidence provided by the European Health Interview Survey from 2014, which confirms a decreasing trend of physical activity, including walking, over the course of life among both men and women in the Czech Republic. Physical activity is thus a component of health-promoting behaviour, which would be a suitable target for preventative programmes due to its undeniable positive influence on physical and mental health.

2. Purpose of the Research

The aim of the present research was to map the extent of physical activity carried out by adults in the Czech Republic, assess the influence of determinants of physical activity (gender, age, selected personality characteristics) and examine the relationship between physical activity and subjective health complaints.

The research questions were: Do the respondents meet the minimum recommended amount of physical activity? Does physical activity change with age in the four age groups (20–34, 35–44, 45–59, 60 and older)? Are men more physically active than women? Which personality dimensions are associated with physical activity? What are the predictors of physical activity? Is physical activity associated with the number of subjective health complaints?

3. Methods

3.1. Participants

The total number of respondents was 1,263, of which 410 were men (32.5%) and 853 were women (67.5%). The age range was from 22 to 93 years of age (m = 40.5, sd = 15.4, md = 38). The nationality of the respondents was primarily Czech (82.9%), followed by Slovak (15.5%), with other nationalities constituting the remaining 1.5%. The most common highest level of education completed was secondary school (42%), followed closely by university education (41.7%). The majority of respondents were employed (65.8%), while one-third was students (33%).

3.2. Tools

The respondents filled out an extensive test battery, either electronically or manually. From this test battery, the study utilises demographic information, Scale of Health-related Behaviour, Inventory of Health Complaints and GPP-I. The obtained data were analysed using the statistical program SPSS Statistics, version 24. We utilised, in particular, the functions of descriptive statistics, correlation analyses, scatter analyses, factor analyses, regression analyses and applicable non-parametric variants of statistical procedures.

The Scale of Health-related Behaviour consisted of 42 items, which were further differentiated into individual areas. Based on factor analysis, we can operate with these seven questionnaire areas: healthy diet, mental hygiene, substance abuse, preventative behaviour, regular regimen, physical activity and exposure to the sun and harmful substances (Dosedlova, Klimusova & Slovackova, 2013). The scale contained three parts, of which the first was presented in the form of statements that either do or do not apply to the respondent (on a five-level Likert-type scale: from ‘fully applies’ to ‘does not

apply at all'). The second part asked about the frequency of a specific type of behaviour (five-level scale from 'never' to 'very often'). The third part consisted primarily of open questions asking about amount (e.g., beer drunk per week). In our research, we primarily use the section of the scale that focuses on physical activity.

The Inventory of Health Complaints (Osecka, Rehulka & Macek, 1988) consists of 21 described health problems. The respondents answered how often they suffered from the specific problem in the last year (four-level scale from 'never' to 'often'). The higher the values achieved by the respondents in the inventory, the worse their subjectively perceived state of health. The internal consistency of the inventory items was examined using Cronbach's alpha, which has a value of 0.89.

Gordon Personal Profile - Inventory (GPP-I) (Gordon, 1953, modified by Svoboda, 1999). The personality questionnaire measures eight personality traits, which affect everyday activity: ascendancy, responsibility, emotional stability, sociability, carefulness, original thinking, personal relations and vigour. In a standard format, the questionnaire is administered in an ipsative manner. On the basis of a pilot study (Klimusova et al., 2013), we chose simpler administration by a normative method with five-level Likert scale expressing the degree of agreement with a given statement. We determined the internal consistency of the items in the individual dimensions; Cronbach's alpha was between 0.84 and 0.92.

4. Results

4.1. Extent of physical activity during adulthood

We can confirm that the extent of physical activity declines with age in both men and women, and does so in terms of overall physical activity ($r = -0.232$; $p < 0.01$; $N = 986$) as well as sports activity ($\rho = -0.196$; $p = 0.01$; $N = 1{,}201$) and non-sports activity ($r = -0.214$; $p < 0.01$; $N = 1{,}258$).

With regard to meeting the minimum recommended amount of physical activity (150 min of moderately intense physical activity a week), we found that 51% of all respondents do not meet this minimum in their sports physical activity. In addition, a full 21% of respondents stated that they dedicate no time to sports activity. The median of the number of hours devoted to sports activity per week was two hours.

4.2. Determinants of physical activity

In line with several earlier studies, our study also showed that men were more physically active, both in overall physical activity ($t = 3.9$; df = 553.9; $p < 0.01$; $N = 986$), and in both constituent levels of physical activity (sports activity: $U = 1{,}30{,}355$; sd = 5.569; $p < 0.01$; $N = 1{,}201$; non-sports activity: $t = 2.5$; df = 1,256; $p < 0.05$; $N = 1{,}258$). The relationship between overall physical activity and gender (coded 1 = male, 2 = female) is statistically significant, but is negligible in terms of the closeness of the correlation ($r = -0.130$; $p < 0.01$; $N = 986$), as is the relationship between sports activity and gender (sports activity: $\rho = -0.144$; $p < 0.01$; $N = 1{,}201$). The relationship between non-sports activity and gender is statistically significant due to the large number of respondents, but is again completely negligible (non-sports activity: $r = -0.070$; $p < 0.05$; $N = 1{,}258$).

In terms of personality characteristics in Gordon's approach, a correlation was found between overall physical activity and the dimensions of responsibility, original thinking and vigour. All personality characteristics with the exception of carefulness correlated with sports physical activity. Non-sports physical activity correlated with dimensions of responsibility, original thinking and vigour. Due to the large number of respondents, we list only those correlations that are significant at the 1% significance level; however, the closeness of the associations is negligible or very low (see Table 1).

Table 1. Relationship between physical activity and personality dimensions according to GPP-I

Personality dimensions	Overall physical activity			Sports physical activity			Non-sports physical activity		
	r	***p<***	***N***	***ρ***	***p<***	***N***	***r***	***p<***	***N***
Ascendancy		*X*		–0.186	0.01	1,198		*X*	
Responsibility	–0.099	0.01	981	–0.119	0.01	1,188	–0.100	0.01	1,243
Stability		*X*		–0.188	0.01	1,188		*X*	
Sociability		*X*		–0.145	0.01	1,189		*X*	
Cautiousness		*X*			*X*			*X*	
Original thinking	–0.132	0.01	983	–0.198	0.01	1,192	–0.106	0.01	1,248
Personal relations		*X*		–0.094	0.01	1,189		*X*	
Vigour	–0.207	0.01	983	–0.249	0.01	1,192	–0.109	0.01	1,248

To determine the personality predictors of physical activity, we used a regression model using the eight personality dimensions according to GPP-I as predictor variables. This model explained 6.4% of the scatter in the extent of overall physical activity (β = 0.701; sd = 0.305; F = 8.4; $p < 0.01$). Three personality dimensions have proven to be relevant predictors of overall physical activity: ascendancy (β = 0.183; $p < 0.01$), original thinking ($\beta = -0.104$; $p < 0.01$) and vigour ($\beta = -0.249$; $p < 0.01$).

In the second wave, we expanded our regression model by adding demographic variables (gender and age). This model explained 13% of the scatter in the extent of overall physical activity (β = 1.351; sd = 0.316; F = 14.5; $p < 0.01$), where personality dimensions explained 6.4% of the scatter, gender another 2.4% and age the remaining 4.2%. All these changes were statistically significant. Significant predictors of overall physical activity were thus ascendancy (β = 0.182; $p < 0.01$), vigour ($\beta = -0.265$; $p < 0.01$), gender (β = 0.150; $p < 0.01$) and age ($\beta = -0.215$; $p < 0.01$). The statistically significant predictors of physical activity are shown in Table 2. However, both regression models are prone to possible overvaluation due to violation of the requirement for absence of multi-collinearity within the personality dimensions.

Table 2. Statistically significant predictors of physical activity

Predictors	Standardised β	Significance level
Ascendancy	0.182	<0.01
Responsibility	–0.062	0.121
Stability	–0.027	0.507
Sociability	0.032	0.426
Cautiousness	0.030	0.468
Original thinking	–0.038	0.326
Personal relations	–0.040	0.294
Vigour	–0.265	<0.01
Gender	0.150	<0.01
Age	–0.215	<0.01

4.3. Relationship between physical activity and health complaints

Due to the findings of studies describing the relationship between physical activity and (objective or subjective) health, our study also examined whether higher degree of physical activity (sports or non-sports) is associated with lower health complaints. This was confirmed to hold true for both overall ($\rho = -0.108$; $p < 0.01$; N = 983), as well as sports ($\rho = -0.236$; $p < 0.01$; N = 1,197) and non-sports ($\rho = -0.078$; $p < 0.01$; N = 1,254) physical activity.

Based on factor analysis of the items of the Scale of Health Complaints, we arrived at a total of five factors that did not correlate with one another and explained 54.5% of the scatter. All of the factors with the exception of the first had a normal distribution. The first factor comprised of symptoms of states of anxiety (e.g. palpitations, shaking hands), the second comprised of items related to fatigue (e.g. overall weakness), the third factor consisted of complaints related to restlessness and insomnia (e.g. lack of concentration, nightmares), the fourth factor comprised of gastrointestinal problems (e.g. nausea) and the fifth factor was related to pain, primarily of the skeletal system and associated muscle groups (e.g. back pain, headaches). Overall, physical activity correlated negatively with factors two and five. Sports physical activity correlated negatively with factors one, two, three and five. Non-sports physical activity correlated negatively with factors one and five. Due to the large number of respondents, we list only those correlations that are significant at the 1% significance level; however, the closeness of all the significant relationships is negligible (Table 3).

Table 3. Relationship between physical activity and health complaints

Factor	Overall physical activity (*r*)	Sports physical activity (*ρ*)	Non-sports physical activity (*r*)
Anxiety	×	–0.092	–0.064*
Fatigue	–0.117	–0.197	×
Restlessness	×	–0.062	×
Gastrointestinal d.	×	×	×
Pain	–0.131	–0.148	–0.114

* Here, we use the non-parametric Spearman's rank correlation – *ρ*

5. Conclusions

The first research objective was to map the amount of physical activity carried out by adults and assess the possible differences in its extent between four age cohorts (22–34, 35–44, 45–59, 60 and above) in the Czech Republic. We were also interested in whether the respondents meet the minimum recommended amount of sports physical activity. The results indicate that physical activity decreases with age among both men and women. The most physically active in all types of physical activity were people aged 22–34, while the least physically active was the category aged 60 and above. These results correspond with the findings of a number of other studies such as Dosedlova et al. (2016), Gerovasil, Agaku, Vardavas and Fillipidis (2015), Mielgo-Ayusoy et al. (2016), Schrack et al. (2014), Westerterp (2015). The recommended amount of sports activity in the Czech Republic is not reached by 51% of respondents and 21% do not spend even an hour per week performing sports activities. Cavill, Kahlmeier & Racioppi (2006) state that, on average, only about one-third of the population of the European Union carries out sufficient physical activity. By contrast, Marques, Sarment, Martins and Saboga Nunes (2015) or Gerovasili et al. (2015) state that up to three-quarters are sufficiently physically active. It depends, of course, on the definition of physical activity and on the measurement method (methods based on self-reporting are always less reliable).

In terms of the demographic characteristics, we confirmed that gender and age are significant determinants of physical activity. Men are more physically active than women, especially in the area of sports activity. Similar conclusions were reached in the research of Mace et al. (2016), Asci, Lindwall, Altıntas and Edepli Gursel (2015) or Atikovic et al. (2014).

As for personality-related determinants, all dimensions of the GPP except for sociability were found to be determinants of overall physical activity, while all dimensions of the GPP were figured as determinants of sports physical activity. For non-sports physical activity, only responsibility, original thinking and vigour were found to be determinants. According to the research by Klimusova et al. (2013), the dimensions we identified as predictors of the extent of overall physical activity can be compared with the Big Five approach, where they would match the scales of extraversion, conscientiousness and openness. In this indirect way through the Big Five model, our results support

the results of both older (Vickers Jr. & Booth-Kewley, 1994) and more recent studies (Stephan, Sutin & Terracciano, 2014; Wilson & Dishman, 2015).

We followed up on our results with a regression model, where we included the variables of age, gender and personality dimensions. We explained 13% of the scatter in overall physical activity and found age, gender and the personality dimensions of ascendancy and vigour to be significant predictors.

The final research objective was focused on physical activity in relation to the degree of subjective health complaints. It was confirmed that the extent of physical activity (overall, sports and non-sports) and the degree of subjective health complaints correlate negatively, yet the closeness of the relationship is only minor. Interpretation is problematic due to the nature of the correlation. We cannot determine causality and deduce that a higher extent of physical activity leads to a lower degree of health complaints. A subjectively worse perceived state of health associated with a higher degree of health complaints may, of course, naturally limit physical activity.

The contribution of the study lies not only in updating the data related to the extent of physical activity among adults in the Czech Republic, but also in verifying psychological correlates and predictors of physical activity. The results may significantly increase the targeting efficiency of upcoming intervention programmes. It is apparent that physical activity should become a priority of intervention programmes focused on health-related behaviour for middle age and above.

The main limits of the research are associated with convenient sampling of the research sample and its composition. Participation in the research was voluntary and filling out the entire questionnaire battery was relatively time-consuming (50–60 minutes). The sample is not fully representative of the population in terms of gender, age, education and personality characteristics. Our sample has a higher representation of people with higher education, people who are conscientious, willing to help and are interested in a healthy lifestyle. In addition, methods based on self-reporting may reduce the reliability of the output. We would recommend that follow-up or extension research utilises a deeper and more objective methodology of examining the extent of physical activity.

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