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Physical Inactivity - Do We Hit Rock Bottom? The Epidemiology and Impact of Physical Activity and Sedentary Behaviour in Adults

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Abstract
Introduction and purpose
Physical activity protects both physical and mental health [1]. However, widespread physical inactivity is the leading risk factor for global mortality. Despite the promotion of healthy lifestyle, there has been no improvement in global levels of physical activity since 2001 [2]. This review aims to present the prevalence of physical activity and inactivity across Poland, the European Union (EU) and the world. This cross-national compilation can be used to create campaigns to raise social awareness around physical activity as well as to help health-care providers encourage patients to limit sedentary time. It provides a reliable comparison and indicates vulnerable points regarding the physical activity levels in our societies that should be monitored in further researches. Additionally,

there is a summary of the most important health benefits associated with being more active and health risks arising from prolonged sitting time.
Brief description of the state of knowledge
World Health Organization (WHO) recommends adults to do at least 150 minutes of moderate-intensity, or 75 minutes of vigorous-intensity physical activity per week (or an equivalent combination of the two) [3]. Globally, more than 1 in 4 adults are insufficiently physically active [1].
Summary
If current trends in insufficient physical activity continue, the global target of a 15% relative reduction between 2018 and 2030 will not be met for adults. Investing in policies to promote active recreation and transport, creating affordable and safe spaces and conducting national and community-based campaigns play a key role in limitting sedentary behaviour and increasing physical activity [4].

Key words: physical activity, sedentary behaviour, health status, healthy lifestyle.

1. Introduction

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure whereas sedentary behaviour is any waking behaviour characterised by an energy use of 1,5 metabolic equivalent of tasks (METs) or lower, e.g. sitting, driving a car, reclining or watching television and most desk-based office work. According to the WHO's guidelines on physical activity and sedentary behaviour, adults should do at least 150 minutes of moderate-intensity or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week (or an equivalent combination). Additional health benefits are provided by muscle-strengthening exercises at moderate or greater intensity on at least 2 days a week. The recommendations for adults aged above 65 years are the same as for adults. However, they should incorporate a variety of multicomponent activities that emphasize functional balance and resistance training on 3 or more days a week. The recommended time of activity remains identical for people living with disability or chronic conditions, e.g. hypertension, type 2 diabetes and ancer survivors. Children and adolescents aged 5 to 17 years should do at least an average of 60 minutes per day of moderate- to-vigorous intensity, mostly aerobic, physical activity, across the week. All people ought to limit the amount of time spent being sedentary, particularly the amount of recreational screen time, replacing it with physical exertion of any intensity, including light-intensity (which uses between 1,5 and 3 METs, like very slow walking) [3]. Although the WHO's guidelines seem to be attainable, a sedentary lifestyle, personal motorized transportation, excessive recreational screen time and limited opportunities to be active at the workplace are significant obstacles to meet the recommended level of physical activity.

2. Aim

The aim of this review is to summarize and clarify heterogenous and continuously updated data of physical activity and sedentary lifestyle prevalence in Poland, Europe and in the world. It should be used as a support for further efforts to create more active societies, environments, people and systems. The selection of data aims to present different surveys and compare global, continental and national levels of physical activity and sedentary behaviours in adults. The results are presented in detail for better interpretation and comparison in subsequent researches over the next years, especially in post-COVID-19 era.

3. Methods

The study involved searching freely accessible databases such as PubMed, the National Library of Medicine, Clinical Trials and Google Scholar, using keywords such as 'physical activity', 'sedentary behaviour', 'prevalence', 'health status'. Furthermore, the latest high-quality statistics and data from the websites of WHO, Eurostat and Polish Central Statistical Office were searched to select and highlight the most important facts about the prevalence of physical activity and inactivity globally, in the European Union and in Poland. Articles were selected based on their title, abstract and publication date.

4.1. European physical activity surveillance

The third European Health Interview Survey, conducted in 2019, surveyed people aged above 15 years from all 27 European Union Member States as well as from Iceland, Norway, Serbia and Turkey to provide reliable data

on health status, health care use and health determinants for the Public Health policies across Europe. It included a questionnaire for assessment of work-related, transportation and leisure time physical activity [5].
According to Eurostat (2019), 82,6% of interviewees from the European Union countries spent at least 10 minutes continuously walking to get to and from somewhere on at least one day within a typical week, in 2019. This share ranged from 68,1% in Portugal to 95,7% in Finland and it was 87,8% of respondents in Poland. Furthermore, 23,6% of the reference population cycled to or from somewhere for a minimum of 10 minutes continuously at least once a week. This commuting activity was most common in the Netherlands, performed by 61,3% of respondents. In Polish population, the share was 28,4%. With regard to leisure time physical actvity (it includes sports, fitness and recreational activities), 44,3% of the EU and 25,8% of Polish interviewees declared doing aerobic sports lasting at least 10 minutes without ceasing at least once a week. The highest share was reached by residents of Norway, reported by 84,2% of the reference population. Carrying out muscle-strengthening activities such as resistance training or strength exercises (using free weights or bodyweight moves) at least one day a week were performed by over a quarter of people in the EU (26,3% exactly) and merely one out of eight Polish respondents (12,1% to be specific). Significantly more strength-trainings were conducted among the population of Finland - 59,5% [6].
Moreover, the European Health Interview Survey from 2019 focused on the share of adults (aged above 18 years) who performed health-enhancing aerobic physical activities of moderate-intensity for at least 150 minutes per week in combination with muscle-strengthening on at least 2 days in a typical week. 13,6% of adults in the EU met the WHO's recommendations in 2019 by performing above physical activities. The highest share was recorded in Iceland - 41,3% whereas in the EU it belonged to Sweden - 32,4%. Poland took 22nd place (out of 27 EU countries), reporting 6,4% share of reference population. An analysis by sex indicated a gender gap with a higher share for men that was observed in nearly all EU Member States. In the EU and Poland, it was 4,8 percentage points and 5 percentage points in men's favour, respectively. In addition, the share of people performing the recommended amount of time on exercise decreased with increasing age. In the EU, over a quarter (26.9 %) of people aged 18-24 years and over one fifth (20,5%) of people aged 25-34 years met the recommendations in a typical week in 2019. This share decreased progressively through the age groups 35-44, 45-54, 55-64 and 65 years and over and it was sequentially 14,3%, 12,6%, 10,1% and 7,4%. The same trend was observed in these age groups of Polish reference population - 14,4% (18-24 years), 10,9% (25-34 years), 8,8% (35-44 years), 4% (45-54 years), 2,4% (55-64 years) and only 1,1% among Polish people aged 65 years and over. This pattern of a decreasing share of people spending the recommended amount of time on health-enhancing physical activity for progressively older age groups was observed across almost all EU Member States. Among the youngest age group (aged 18-24 years), the share of persons reporting that they performed at least the recommended activity levels exceeded two fifths in Sweden (43,4%), Finland (44,1%) and Germany (45,8%). Higher shares were observed for this age group in Norway (46,1%) and Iceland (63%). Impressively, in Sweden 25,2% of people aged 65 years and over performed recommended aerobic and muslce-strengthening activities in a typical week [7].
The next point included in the survey was aerobic physical activity performed in a typical week in 2019. It included total duration of sports, fitness or recreational activities that cause at least small increase in breathing or heart rate, e.g. ball games, running, brisk walking, bicycling, aerobics [5]. Almost half (47,3%) of the EU population aged 18 years and over did not undertake any such activities at all (0 minutes). For comparison, in Poland it was 56,1% of population. Turning to people who performed aerobic physical activities for at least 150 minutes or more a week, their share in the EU was 32,7% and in Poland it was 20,3%. By the contrast, from all participating countries the highest share was achieved by Norwegians - 67,6% of population performed aerobic activities for at least 2 and a half hours in a typical week. Generally in the EU, 42,4 % of people with a high level of education (tertiary education) spent at least 150 minutes per week on aerobic physical activities in 2019, as compared with 32,8% of those with a medium level (upper secondary or post-secondary non-tertiary education) and around 20,5% for those with a low level of educational attainment (at most lower secondary education). This pattern was observed throughout the European Union, including Poland where 28,2% of people with tertiary education, 16,9% of those with medium education and 12,8% of those with low education were sufficiently active [8]. In 2019, 39,5% of the EU population in the fifth (highest) income quintile (the 20% of the population with the highest income) reported spending the recommended amount of time exercising per week, compared with 31,2% in the third income quintile and 26,3% in the first (lowest) income quintile (the 20% of the population with the lowest income). Nearly all of the EU Member States reported a similar pattern. In Poland, interestingly, the shares of people in the highest income quintile and in the third income quintile were approximately equal 19,9% and 19,8%, respectively. 14,3% of Polish people with the lowest income performed recommended physical activity. The narrowest differences were in Romania, where low shares were observed for all income levels, and in Poland - the quintile gap was only 5,6 percentage points (compared with 13,2 percentage points gap in the EU) [9].
Other study, the Eurobarometer questionnaire (2022) comprised six items that asked about physical activity via the number of days of vigorous activity, moderate activity (excluding walking), and walking for at least 10 minutes in the last 7 days and the respective daily duration in order to assess the levels of physical activity according to the

WHO's recommendations. It also asked about the frequency of exercising or playing sports, and of other physical activity such as cycling or gardening [10]. Using the Eurobarometer questionnaire can result in more favourable physical activity prevalence data compared to using other instruments [11]. This survey was commissioned by the European Commission, Directorate-General for Education, Youth, Sport and Culture and carried out by the Kantar network in the 27 Member States of the European Union between 19 April and 16 May 2022. 26,578 EU citizens from different social and demographic categories were interviewed face-to-face at their home and online. In Poland, the survey was conducted face-to-face. Main finding of Eurobarometer in 2022 was that 45% of respondents never exercise or play sport. This share gained 6 percentage points since 2009, up from 39% to 45%, but it lost 1 percentage point since 2017. Worryingly, over half of respondents in 8 countries say that they never exercise or play sport, with the highest levels in Portugal (73%), Greece (68%) and in third place - Poland (65%). Overall in the EU, men exercise, play sport or engage in other physical activity more than women. The share of men who exercise or do sport never or seldom (1 to 3 times a month or less) in the EU was 57% and in Poland it was 70% whereas in women who do so in the EU it was 65% and in Poland 84%. The most people inactive at this frequency among EU population were female aged above 55 years (75%) and male aged above 55 years (73%). In Polish population, 93% of women and equally 93% of men over 55 years old never or seldom exercise or play sports. According to socio-professional category of the survey, 93% of retired people in Poland never or seldom exercise in a sport context, in comparison with 74% in the EU. In addition, 38% of EU citizens exercise or do sport at least once a week (in Poland it was 22%) and 6% do so five times a week or more (in Poland merely 2%). Futhermore, 31% of interviewees from EU countries and 42% from Poland claimed that they never engage in other physical activity such as cycling from one place to another, dancing, gardening (i.e. physical activity for recreational or non-sport-related reasons). Merely, 14% in the EU and 6% in Poland do such physical activities regularly (5 times a week or more). Less engaged in other physical activity were women, in particular aged 55 years or older both in the EU (57%) and in Poland (73%) and also with the highest share of retirees in Poland (72%). Slightly more than one in five Europeans (21%) reported that they never do any vigorous physical activity like lifting heavy things, digging, aerobics or fast cycling. The share of respondents from Poland was smaller - 16% of them don't do such activities. 10% of European population and 8% of Polish population never do any moderate physical activity as carrying light loads at normal pace or double tenis excluding walking. Alarmingly, one in ten respondents in the EU and 14% from Poland say that they never walk for at least 10 minutes at a time. A majority of respondents (43%) answered that they sit for between 2 hours 31 minutes and 5 hours 30 minutes (including time spent at a desk, studying, watching television, visiting friends) on a usual day. However, close to four in ten respondents (39%) sit for a longer time. Nearly three in ten (28%) sit for between 5,5 hours and 8,5 hours and slightly more than one in ten (11%) say that they sit for more than 8 hours and 31 minutes on a typical day. For comparison, in Poland, 9% of population sit 8 hours and 31 minutes or more whereas close to a quarter of respondents (24%) sit for between 5,5 hours and 8,5 hours. The majority of the Polish population sits for between 2 hours 31 minutes and 5 hours 30 minutes (41%). The socio-demographic data show that Europeans who see themselves as upper or upper middle class are the most likely to sit for more than 8,5 hours on a usual day (18% in both categories, compared with 10-11% in the three other categories - the middle, lower middle and working class). Over one in ten respondents among other white collars (17%), managers (16%), students (13%) and unemployed people (14%) spend more than 8 and a half hours sitting down a day, a much higher proportion than among manual workers (5%). Respondents who live in a large town are more likely than those who live in a rural village to sit for between 5 hours 31 minutes and 8 hours 30 minutes on a usual day (32% compared with 25%), but they are less likely to sit for between 2 hours 31 minutes and 5 hours 30 minutes (40% compared with 45%) and for 2 and a half hours or less (14% compared with 18%). Similarly, rural village residents and large town residents sit more than 8,5 hours (11% compared with 12%). Respondents aged 15 to 24 years are the most likely to sit for between 5 hours 31 minutes and 8 hours 30 minutes on a usual day (37%), compared with 28% among those aged 55 years and over. Those who continued education up to the age of 20 or beyond are the most likely to sit for more than 8,5 hours (14%, compared with 8% among those who left school between 16 to 19 years). There is also a socio-economic gradient in the EU. 24% of people who consider themselves working class exercise at least once a week and 51% of people who consider themselves upper class do so. Futhermore, respondents who see themselves as working class (23%) are far more likely than those who consider themselves as upper class (8%) to never engage in any moderate physical activity.

The Special Eurobarometer survey (2022) involved also motivators and barriers to sport participation. More than half of Europeans (54%) engage in sport or physical activity to improve their health (the most cited reason). In Poland, 48% of participants indicated this reason and 47% of them do sports to improve physical performance. Around four in ten Europeans perform physical activity to improve fitness (43%) or to relax (39%). Regarding barriers, lack of time is by far the main reason currently preventing Europeans from practising sport more regularly - 41% of respondents in the EU and 46% of respondents in Poland. As a second reason, a quarter of Europeans chose that they lack motivation or not interested (23% of Polish population). 17% of Polish respondents have disability or illness that prevents them from practising sport more regularly and 11% answered that it is too

expensive. Finally, when it comes to settings where citizens engage in sport or other physical activity, nearly half of respondents do so outdoors (47% in the EU and 46% in Poland). 37% of Europeans and 42% of Polish exercise at home. Almost a quarter of the EU respondents (24%) said that they are physically active on the way between home and school, work or shops (28% in Poland). Nearly three in ten Europeans are members of a club where they participate in sport or recreational physical activity (a health or fitness centre, a sport club, a socio-cultural club that includes sport in its activities, e.g. employees' club, youth club, school or university-related club). Only in two EU Member States, a majority of respondents say that they are members of a club - Sweden (51%) and the Netherlands (50%). In Polish population such membership declared 29% and the most common answer was socio-cultural club that includes sport in its activities - 11% (it was the most mentioned type of club exclusively in Poland) [10].

4.2. National physical activity surveillance

The Ministry of Sport and Tourism of the Republic of Poland conducted a quantitive research in 2023 based on the standardized International Physical Activity Questionnaire (IPAQ) and administered by telephone interview [12]. The International Physical Activity Questionnaire was developed as an instrument for cross-national monitoring of physical activity and inactivity and produced repeatable data [13]. The questions involved transport-related and recreational physical activity in the previous 7 days. For the purpose of analysis, physical activity lasting at least 10 minutes without interruption was considered. Futhermore, regular physical activity was described as at least 5 days per week for moderate-intensity and at least 3 to 4 days per week for vigorous-intenisty acitivity. The main finding was that the share of Polish respondents aged 15 to 69 years who met the World Health Organization recommendations for physical activity (i.e. at least 150 minutes of moderate-intensity, or 75 min of vigorous-intensity physical activity per week, or any equivalent combination of the two) during leisure time (excluding walking) was 28%. If we consider regular cycling for transportation, the percentage of Polish individuals in the same age group who meet WHO standards increases to 34%. Significantly, Polish men are more likely than Polish women to perform physical activity during leisure time (excluding walking) - 32% vs. 24%, as well as activity including regular cycling for transportation - 38% vs. 30%. For the purpose of transportation, regularly 21% of interviewees aged above 15 years walk and 6% of them ride bicycles. Physical activity can be undertaken regularly or from time to time. Regular leisure walks are declared by 29% of the respondents. The percentage of people aged 15 to 69 who meet the WHO criteria, considering two types of physical activity - leisure time activity and activity related to commuting (walking and cycling) is 75%. However, if we consider any physical activity during leisure time and only regular activity related to commuting, the percentage of those meeting WHO standards drops to 62%. For every physical activity, the share of Polish interviewees who meet the WHO criteria for regular physical activity is lower than the share of those who perform it occasionally. The share of people who engage in physical activity during leisure time regularly is 48%. However, if we exclude recreational walking, this proportion drops to 10%. Nearly half of the respondents meet the WHO standards for walking as a form of physical activity. In all considered categories, Polish women were less active than Polish men [12].

4.3. Global physical activity surveillance

The Global Observatory for Physical Activity (GoPA) is a council of the International Society for Physical Activity and Health (ISPAH) which collects and analyzes global data on the topic of physical activity and health. In the Second Physical Activity Almanac GoPA (2021), the set of 164 Country Cards with the data on physical activity surveillance and research from 2019-2020 is presented. It is based on self-reported physical activity assessed using the Global Physical Activity Questionnaire (GPAQ), the International Physical Activity Questionnaire (IPAQ) or similar questionnaires covering activity at work or in the household, in transport, and during leisure time. Across all countries in the GoPA analysis, in the European and Central Asia Region and in Poland, the median of deaths related to physical inactivity was 8% and 8,3%, respectively [14]. The physical activity prevalence in this study was calculated by subtracting the prevalence of physical inactivity estimated in the analysis across 168 countries, including 1,9 million participants, published in the Lancet (2018) from 100% [2]. In Poland, it was 66% for both sexes, 67% for men and 63% for woman [14]. The total daily duration of sitting of Polish people accumulated across all domains, including occupation, leisure, domestic and travel and measured by IPAQ in 2017 was 282 min (4,7 hours) per day. It is classified globally as the medium tertile of daily sitting time [15].
The global analysis of 358 population-based surveys across 168 countries, including 1,9 million participants, of age-standarized prevalence of insufficient physical activity, which included physical activity at work, at home, for transport, and during leisure time (i.e. not doing at least 150 min of moderate-intensity, or 75 min of vigorous-intensity physical activity per week, or any equivalent combination of the two) shows that 27,5% adults are not sufficiently physically active and there is no significant change between 2001 and 2016. The difference between sexes was 8,3 percentage points (men were more active than women). Moreover, the study estimated worlwide trends in insufficient physical activity. Thus, if current tendency continues, the 2025 global physical activity target

(a 10% relative reduction in insufficient physical activity) will not be met [2]. What is more, the first Global Status Report on Physical Activity from 2022 shows that progress towards the Global Action Plan on target of a 15% relative reduction in physical inactivity by 2030 also is slow and unequal [1]. Prevalence in 2016 was more than twice as high in high-income countries (36,8%) as in low-income countries (16,2%) and insufficient activity has increased in high income countries over time (31,6% in 2001). The data were obtained from WHO and other international surveys. The overall prevalence of insufficient physical activity in Poland was 32,5%. For comparison, in the Central and Eastern Europe (including Poland) it was 23,4%. In addition, it was 31,5% in Polish men and 33,4% in Polish women, compared to 22% in men and 24,7% in women of the Central and Eastern Europe. However, a country with the maximum insufficient physical activity prevalence in this region was Serbia (39,5%) and with the minimum prevalence Moldova (11,5%). It should be mentioned that Polish data was collected in 2005, 2011 and 2013 and based on Eurobarometer surveys [2].

5. Discussion

Worldwide 9% of deaths are due to physical inactivity [16]. About 7-8% of all cases of cardiovascular diseases, depression and dementia, and about 5% of type 2 diabetes cases, could be prevented if people were more active. Physical activity is beneficial for people of all ages and abilities [1].

Physical activity contributes to preventing and managing noncommunicable diseases such as cardiovascular diseases, cancers and diabetes [3]. Primarly, health benefits associated with regular physical activity are lower risk of all-cause mortality, cardiovascular disease mortality, hypertension [17]. There is strong evidence for an association between highest versus lowest physical activity levels and reduced risks of bladder, breast, colon, endometrial, esophageal adenocarcinoma, renal, and gastric cancers. Relative risk reductions ranged from approximately 10 to 20%. In addition, there is also moderate evidence that individuals in the highest category of physical activity had lower risk for lung cancer compared with those in the lowest category (25% relative reduction) [18]. It is well known that physical activity plays a role in the prevention of type 2 diabetes. Comparing the most active to the least active race-ethnic groups, the magnitude of protection among non-Hispanic White was 29% (relative risk 0,71), for Asians it was 24% (relative risk 0,76), Hispanics 25% (relative risk 0,75) and American Indians 27% (relative risk 0,73). The summary effect for non-Hispanic Blacks was non-significant [19]. In people with type 2 diabetes physical activity reduced progression of disease indicators: hemoglobin A1c, blood pressure, body mass index and adverse blood lipid profile [17]. An increase from being inactive to achieving recommended physical activity levels was associated with lower risk of cardiovascular diseases (including myocardial infarction, stroke, heart failure) mortality by 23%, cardiovascular diseases incidence by 17%, and type 2 diabetes incidence by 26%, after adjustment for body weight [20]. According to the meta-analysis measuring the association between steps per day and all-cause and cardiovascular mortality, a 1000-step increment was associated with a 15% decreased risk of all-cause mortality while a 500-step increment was associated with a 7% decrease in cardiovascular diseases mortality. Compared with the reference quartile with median steps per day (3867), the Quartile 1 (median steps: 5537), Quartile 2 (median steps 7370), and Quartile 3 (median steps 11529) were associated with lower risk for all-cause mortality - 48%, 55% and 67%, respectively. Similarly, compared with the lowest quartile of steps per day (median steps 2337), the Quartile 1 (median steps: 3982), Quartile 2 (median steps 6661), and Quartile 3 (median steps 10413) were associated with a reduced risk of cardiovascular mortality by 16%, 49%, and 77%, respectively [21]. The Washington State University study found that the more active twins in discordant monozygotic-twin pairs (one twin having at least 150 minutes of moderate to vigorous physical activity per week and their co-twin having less than 150 minutes) had epigenetic alterations that correlated with reduced metabolic parameters, i.e. body mass index and waist circumference. Combined observations demonstrate that behavioral factors, such as physical activity, appear to promote systemic epigenetic alterations that impact metabolic risk factors [22]. Physical activity is highly beneficial for improving symptoms of depression, anxiety and distress across a wide range of adult populations, including the general population, people with diagnosed mental health disorders and people with chronic disease. Thus, it should be included in the management of depression, anxiety and psychological distress [23]. Strong evidence demonstrates that moderate-to-vigorous physical activity improves the quality of sleep in adults. It does so by reducing the length of time it takes to go to sleep and reducing the time one is awake after going to sleep and before rising in the morning. It also can increase the time in deep sleep, reduce daytime sleepiness and frequency of use of sleep-aid medications [24]. Some benefits happen immediately. A single bout of moderate-to-vigorous physical activity will reduce blood pressure, improve insulin sensitivity, improve sleep, reduce anxiety symptoms, and improve cognition on the day that it is performed. Most of these improvements become even larger with the regular performance of moderate-to-vigorous physical activity [17]. Exercise-related physical activity is associated with increased brain volumes, indicating potential neuroprotective effects. A higher number of days of moderate to vigorous physical activity predicted larger normalized brain volumes in multiple regions, including total gray matter volume, total white matter volume, hippocampus, frontal cortex, parieta lobes, and occipital lobe [25]. Physical inactivity remains modifiable risk factor for dementia (as well as excessive alcohol consumption, head injury, air pollution, less eductaion,

hypertension, hearing impairment, smoking, obesity, depression, diabetes, and infrequent social contact). Modifying these 12 risk factors might prevent or delay up to 40% of dementias [26]. For people with various chronic medical conditions, physical activity reduced risk of all-cause and disease-specific mortality, improved function, and improved quality of life [24]. According to WHO's guidelines, as part of weekly physical activity, older adults should do varied multicomponent physical activity that emphasizes functional balance and strength training at moderate or greater intensity, on 3 or more days a week, to enhance functional capacity and to prevent falls. An example of a multicomponent physical activity programme can include walking (aerobic activity), lifting weights (muscle strengthening), and incorporates balance training [3]. The exercise types most efective on bone mineral density for the neck of femur, which should be considered in clinical practice, appear to be the progressive resistance strength training for the lower limbs. Te most efective intervention for bone mineral density at the spine has been suggested to be the multicomponent training exercise programme [27].

Sedentary behaviour is any waking behaviour characterized by an energy expenditure of 1,5 METs or lower while sitting, reclining, or lying whereas sedentary screen time is time spent watching screen-based entertainment (television, computer, mobile devices). All people should limit the amount of time spent being sedentary, particularly recreational screen time, replacing it with physical activity of any intensity, including light intensity as slow walking or other incidental activities that do not result in a substantial increase in heart rate or breathing rate [3]. The Canadian 24-hour Movement Guidelines for the first time identified specific treshold values for daily sedentary behaviour, i.e. 8 hours per day or less and recreational screen time, i.e. no more than 3 hours a day. More over, it is recommended to break up long periods of sitting as often as possible [28]. Sedentary behavior has wide-ranging adverse impacts on the human body. It increases risk of all-cause mortality, cardiovascular diseases mortality and incidence of type 2 diabetes [29]. A meta-analysis including 70,576 participants aged 18-87 years reported that increasing device-measured total sedentary time was associated with higher fasting glucose, fasting insulin, triglycerides, waist circumference and lower HDL-C [30]. Hypothesized mechanisms by which prolonged sitting may influence risk for hypertension and cardiovascular complications include reduction in metabolic demands and systemic blood flow, and stimulating the sympathetic nervous system which decrease insulin sensitivity and vascular function while promoting oxidative stress and low-grade inflammatory cascade [31]. High sedentary behaviour levels increase the risk for developing ovarian, endometrial, colon, breast, prostate, and rectal cancers. In addition, it was associated with an 18% increased risk of all-cancer mortality [32]. Nota bene, sedentary time is the reason for weight gain and obesity is a risk factor for several cancers [33] [34]. In a meta-analysis of prospective studies, a significantly positive association between sedentary behaviors (especially mentally passive behaviors such as watching television) and the risk of depression was observed. may increase the risk for depression by hindering direct communication and reduction in social interactions, or by reducing time to engage in physical activities that help to prevent and treat depression [35]. It is crucial to limit the amount of time spent being sedentary, especially during leisure time, because we live in societies where increasing numbers of people have to sit for long hours for work. High levels of moderate intensity physical activity (60-75 minutes a day) seem to eliminate the increased risk of death associated with high sitting time (even more than 8 hours a day). However, watching television for 3 hours or more per day was associated with increased mortality regardless of physical activity, except in the most active participants (doing more than 35,5 MET-hours per week), where mortality was increased in people who watched television for 5 hours a day or more [36]. New evidence, using device-based assessments, demonstrates that physical activity of any duration, without a minimum threshold, is associated with improved health outcomes, including all-cause mortality. That's way health care professionals, to promote small increases in routine daily physical activity, can advise patients activities that do not take 10 minutes such as parking farther away from a destination and walking or taking the stairs rather than the elevator [37].

The physical activity prevalence depends on which criteria, domains of life (work, transportation, leisure time) and questionnaires are used. Occupational physical activity is still the largest contributor of adults' weekly physical activity [38]. An analysis by sex indicates that in most countries women are less active than men. Futhermore, age is an important factor in terms of engaging in physical activity. The share of people meeting the recommendations decreases with age. The percentage of Europeans meeting the recommended level of health-enhancing physical activity was higher for higher levels of educational attainment. Income is another key factor. The share of adults performing aerobic physical exercise for 150 minutes or more throughout the week was higher for higher income levels in the EU [10]. However, physical inactivity prevalence is higher in high-income countries all over the world than in low-income countrie [2]. In addition, physical exertions was performed occasionally rather than regularly in Polish society [12]. The extent of physical activity depends on a range of diverse factors such as the availability of leisure time, access to activity spaces, cultural factors, as well as the socioeconomic profile of specific societal groups. All above mentioned facts and factors should be considered with the aim of suitable health policies and infrastrucutre.

According to the international study conducted in 76 countries, 92% of countries have national policy documents, legislation, strategies, or action plans that outline the government's intention to increase physical activity. However, only 62% of countries have formal written policies aimed at tackling sedentary behaviour. The policies

were generally more developed in high-income countries and countries of European and Western-Pacific regions [39].
To establish accurate prevalence data and to monitor changes and trends in physical activity, valid, reliable and regular measures are required [40]. Traditionally, physical activity is assessed by means of self-reported questionnaires. It can be measured objectively or subjectively. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

6. Summary (conclusions)

Regular physical activity is a known protective factor for the prevention and management of noncommunicable diseases. Unfortunately, level of insufficient activity remains largely unchanged. Alarmingly, if this trend continues, the global target of a 15% relative reduction between 2018 and 2030 will not be met for adults [2]. New tools adjusted to the latest global and national guidelines should be applied in further studies for reliable physical activity and inactivity surveillance. Standardised questionnaires used in the cross-national researches could improve monitoring of physical activity for more oriented campaigns and policies, particularly for fighting against inequalities between women and men, young and old, etc. There is a great need to update physical activity prevalence, considering the COVID-19 pandemic and prospective socioeconomic and health challenges such as the global obesity epidemic and the growing burden of cancer.

Author's contributions
Conceptualization, AR and NP; methodology, AR, NP and SK; software, SK, MD, BR, MK and WD; check, AR and NP; formal analysis; MD, MK, WD; investigation, SK, MD and BR; resources, AR and BR; data curation, MK and WD; writing – rough preparation, AR, SK, MD, NP, BR, MK and WD; writing – review and editing, AR, SK, MD, NP, BR, MK and WD; visualization, AR and NP; supervision, AR, SK and MD; project administration, BR and WD;
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Conflict of Interest Statement
Authors declare no conflict of interest.

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