

ACTIVE SPORT PARTICIPATION AND WALKING BEFORE AND DURING COVID-19 PANDEMIC IN A LARGE COHORT OF POLISH ADULTS: RESULTS OF THE NATIONAL TEST FOR POLES' HEALTH

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Abstract

Objectives: The COVID-19 pandemic has led to significant changes in daily life, including changes in physical activity levels. This study aims to examine the impact of the pandemic on sport participation and walking among Polish adults. **Material and Methods:** The data was collected using the *National Test for Poles' Health*, a large-scale online survey. The survey was conducted before and 1 year after the pandemic onset in Poland (March 2020 and March 2021), with >300 000 participants in each year. **Results:** The results revealed that the percentage of respondents engaging in at least 2 h/week of sport increased by 2.3% (from 24.6% to 26.9%) ($p < 0.0001$) and percentage of respondents not engaging in any sport decreased by 2.5% (from 48.0% to 45.5%) ($p < 0.0001$). These trends were observed across different age, sex, dwelling-place, education level, and employment groups. Percentage of respondents declaring they spend >2 h/day on walking also increased, from 5.6% to 6.6% ($p < 0.0001$). Furthermore, a positive association was found between sport participation and walking time ($p < 0.0001$). **Conclusions:** The findings suggest a slight improvement in physical activity levels among Polish adults during the pandemic, which may be attributed to factors such as increased time available due to remote work and the prioritization of health during the crisis. Further research is needed to explore the long-term consequences of the pandemic on physical activity and public health. *Int J Occup Med Environ Health.* 2024;37(4)

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INTRODUCTION

The COVID-19 pandemic has brought about drastic changes in the daily lives, including changes in physical activity levels. With the implementation of social distancing measures and lockdowns, individuals have been forced to stay indoors and reduce their physical interactions with others. As a result, many have reported a decrease in their physical activity levels, leading to concerns about the impact of this pandemic on public health. After 3 years since the first news of the COVID-19 pandemic broke, the scientific community has learned a great amount of information on the risk factors and protective behaviors when it comes to infectious diseases. Underlying conditions such as hypertension, diabetes and obesity have been identified as possible causes of higher risk of acute symptoms and death from COVID-19 [1,2]. Older age and socioeconomic status are another important factors influencing the severity and progression of the disease [3,4]. Several methods of treatment have already been identified, as well as vaccines [5].

A number of studies have investigated the changes in physical activity levels during the COVID-19 pandemic. A study conducted in Italy found that during the lockdown period, there was a significant reduction in physical activity levels among adults, with a decrease in the number of steps taken per day and an increase in sedentary behavior [6]. Similarly, a study conducted in China reported a decrease in the level of physical activity among adults during the pandemic, with a significant increase in sedentary behavior and a decrease in moderate-to-vigorous physical activity [7]. A study done on a Spanish population also showed a reduction in physical activity due to pandemic-related restrictions, such as confinement [8].

The reduction in physical activity levels during the pandemic has raised concerns about its impact on public health. Physical activity has been shown to have a number of health benefits, including reducing the risk of

chronic diseases such as heart disease, diabetes, and cancer [9]. In addition, physical activity has been shown to have a positive impact on mental health, reducing the risk of depression and anxiety [10]. Regular physical activity is also one of the most important factors affecting the aging process in people [11,12]. The decrease in physical activity levels during the pandemic may therefore have long-term consequences for public health. It is also even more concerning considering the fact that the level of physical activity among Polish people remains too low, leading to higher risk of developing diseases and disability [13].

During the COVID-19 pandemic online questionnaires have become the safest option of sourcing data from large groups of people. An example of such online-based study is the *National Test for Poles' Health (Narodowy Test Zdrowia Polaków – NTZP)*. Conducted in 3 waves so far (2020, 2021 and 2022) by Medonet (a popular Polish health-oriented Internet platform) on a large group of Polish Internet-users, it has shown to be a valuable source of information on the health of Polish adults before and during the COVID-19 pandemic. The NTZP includes questions about various health behaviors, such as diet, exercise, time spent walking, sleep duration, frequency of medical consultations, use of alcohol, cigarettes, drugs and others. The questionnaire is designed to be understandable and simple to fill-out by everyone. Respondents are presented with a health index score after subjecting the filled-out questionnaire. They are also given recommendations on ways to improve their health and lifestyle.

The aim of this article is to present some of the findings of one of the biggest studies on the health status of Polish adults. This article focuses on time spent on engaging in physical activity in the form of sport participation and walking and how it changed in the time of the COVID-19 pandemic. The aim was also to analyze how sport participation was correlated with age, sex, education level, place of residence and employment of the respondents.

MATERIAL AND METHODS

The NTZP questionnaire was completed by >300 000 adults during the first 2 waves of the survey. The first wave was conducted right before the initial pandemic restrictions were put in place in Poland (March 2020 – NTZP 1) and the second wave took place 1 year after (March 2021 – NTZP 2). As of the end of March 2021, when the second wave was conducted, Poland had recorded 187 526 weekly confirmed cases and 3055 deaths from COVID-19, according to the WHO database. For the purpose of this article, responses from the first and second wave were analyzed. The 2 groups of respondents were highly similar in sex, age, dwelling place, education and employment. A noticeable difference can be seen in the number of people >65 years old participating in NTZP 2, however the mean age of NTZP 1 is 47.8 years and 50.9 years for NTZP 2. Characteristics of the respondents are presented in Table 1.

Respondents were divided into groups based on their age, sex, dwelling-place, education level and employment. Respondents were divided into 3 groups depending on the amount of physical activity they engaged in: high level of physical activity (≥ 2 h/week), medium (1–1.5 h/week), low (< 4 h/month) and those who did not engage in physical activity. The definition of physical activity in this study encompassed active participation in any type of sport, while a separate question was posed specifically about physical activity in the form of walks. When asked about the time spent on walks in a day, respondents could choose between the following answers: < 30 min, 30–60 min, 1–2 h, > 2 h. An additional answer was present for people who did not engage in walks or did not leave their house due to medical reasons. The methods were also described in another published article by the authors of this study [12].

In order to analyze the collected data, in the case of characteristics of the respondents, the numbers and percentages of people belonging to the appropriate categories of

the analyzed variables were given. The relationships between the features were assessed using the χ^2 test of independence, giving the value of statistical significance (p). Relationships for which $p < 0.05$ were considered significant. Statistica v. 13 was used in the analyses.

All methods were carried out in accordance with relevant guidelines and regulations for online questionnaires. Informed consent was obtained from all subjects. For the purpose of analyzing data gathered during NTZP, Bioethics Committee at the Medical University of Lodz, Poland, issued a statement confirming the data analysis did not have the characteristics of a medical experiment or a clinical research performed on a patient.

RESULTS

Sport participation

In the first wave 24.6% of respondents declared they engaged in physical activity in the form of sport for ≥ 2 h/week, while in the second wave it was 26.9% ($p < 0.0001$). The percentage of people not engaging in any sport decreased between the waves, from 48% in the first wave to 45.5% in the second wave ($p < 0.0001$). Results are presented in Figure 1 a.

A similar tendency can be observed in both women and men, as seen in Figures 1 b and c. The percentage of respondents engaging in sport for ≥ 2 h/week or 1–1.5 h/week increased between waves, while the percentage of those who did not engage in any sport or did so for < 4 h/month decreased in both sexes ($p < 0.001$).

This tendency can also be observed when respondents are divided into age groups (Figure 2). In most age groups the percentage of people most frequently engaging in sport increased, while the percentage of people engaging in sport rarely or never decreased. In the age group of 45–54 years old, there can be observed an increase from 25.2% to 29.1% of respondents declaring engaging in sport for ≥ 2 h/week ($p < 0.0001$). The percentage of people who did not engage in any sport decreased the most in the age

Table 1. Characteristics of the respondents of *National Test for Poles' Health (Narodowy Test Zdrowia Polaków – NTZP)* in 2020 (NTZP 1) and in 2021 (NTZP 2) conducted in Poland before the onset of the COVID-19 pandemic and 1 year later

| Variable | Participants (N = 676 102) | | | | | |
|---------------------------|-------------------------------|------|-------------------------|------|---------|------|
| | NTZP 1 (N = 376 102) | | NTZP 2 (N = 300 000) | | total | |
| | n | % | n | % | n | % |
| Sex | | | | | | |
| female | 219 127 | 58.3 | 172 683 | 57.6 | 391 810 | 58.0 |
| male | 156 975 | 41.7 | 127 317 | 42.4 | 284 292 | 42.0 |
| Age | | | | | | |
| 18–24 years | 19 949 | 5.3 | 11 285 | 3.8 | 31 234 | 4.6 |
| 25–34 years | 57 049 | 15.2 | 34 606 | 11.5 | 91 655 | 13.6 |
| 35–44 years | 84 878 | 22.6 | 59 019 | 19.7 | 143 897 | 21.3 |
| 45–54 years | 78 726 | 20.9 | 64 364 | 21.4 | 143 090 | 21.1 |
| 55–64 years | 80 521 | 21.4 | 65 994 | 22.0 | 146 515 | 21.7 |
| ≥65 years | 54 979 | 14.2 | 64 732 | 21.6 | 119 711 | 17.7 |
| Dwelling place | | | | | | |
| countryside | 80 035 | 21.3 | 62 864 | 20.9 | 142 899 | 21.2 |
| city | | | | | | |
| ≤19 000 people | 42 353 | 11.3 | 33 640 | 11.2 | 75 993 | 11.2 |
| 20 000–49 000 people | 53 440 | 14.2 | 42 894 | 14.3 | 96 334 | 14.2 |
| 50 000–99 000 people | 41 810 | 11.1 | 33 538 | 11.2 | 75 348 | 11.1 |
| 100 000–199 000 people | 38 992 | 10.4 | 32 887 | 11.0 | 71 879 | 10.6 |
| 200 000–499 000 people | 38 362 | 10.2 | 32 722 | 10.9 | 71 084 | 10.6 |
| >500 000 people | 81 110 | 21.6 | 61 455 | 20.5 | 142 565 | 21.1 |
| Education | | | | | | |
| elementary and vocational | 39 588 | 10.5 | 28 574 | 9.5 | 68 162 | 10.1 |
| secondary | 147 419 | 39.2 | 111 824 | 37.3 | 259 243 | 38.3 |
| higher | 189 095 | 50.3 | 159 602 | 53.2 | 348 697 | 51.6 |
| Employment | | | | | | |
| employed | 266 862 | 71.0 | 195 575 | 65.2 | 462 437 | 68.4 |
| farmer | 5351 | 1.4 | 3933 | 1.3 | 9284 | 1.4 |
| retired/pensioner | 72 754 | 19.3 | 78 773 | 26.3 | 151 527 | 22.4 |
| unemployed | 19 906 | 5.3 | 14 415 | 4.8 | 34 321 | 5.1 |
| not working/student | 11 229 | 3.0 | 7304 | 2.4 | 18 533 | 2.7 |

group 35–44 years old: from 44.2% in the first wave to 38.6% in the second wave ($p < 0.0001$).

When respondents are divided by their education level the biggest changes can be observed in the most educated group (Figure 3). Percentage of respondents with higher education who engaged in ≥ 2 h/week of sport went from 29% in the first wave to 31.5% in the second ($p < 0.0001$). Additionally in this group it can be seen that a percentage of those who declared they did not engage in any sport decreased from 40.4% to 37.7% ($p < 0.0001$).

In the case of dwelling-place and engaging in sports, the biggest difference between the 2 waves can be observed in the countryside residents (Figures 4). Percentage of respondents from this group who engaged in ≥ 2 h/week of sport increases from 21.3% to 24.8% ($p < 0.0001$) and of those who did not engage in any sport decreased from 51.9% to 48.1% ($p < 0.0001$).

Unemployed respondents showed the biggest change in the level of physical activity between the 2 waves (Figures 5). In the first wave 15.7% of unemployed respondents claimed to spend ≥ 2 h/week engaging in physical activity in the form of sport, while in the second wave this percentage increased to 20.4% ($p < 0.0001$). Unemployed respondents who did not engage in sport decreased in number between 2 waves: from 64.4% to 57.4% ($p < 0.0001$).

Walking

Walking in the form of recreation or getting from place to place was practiced for >1 h/day by 17.8% of people in the first wave. In respondents of the second wave this percentage increased to 22.3% ($p < 0.0001$). Percentage of people who did not leave the house for medical or other reasons decreased between the 2 waves ($p < 0.0001$) (Figure 6).

Of all respondents who spent >2 h/day on walking, 37.2% were also engaging in sport activity for >2 h/week before the start of COVID-19 pandemic. During the sec-

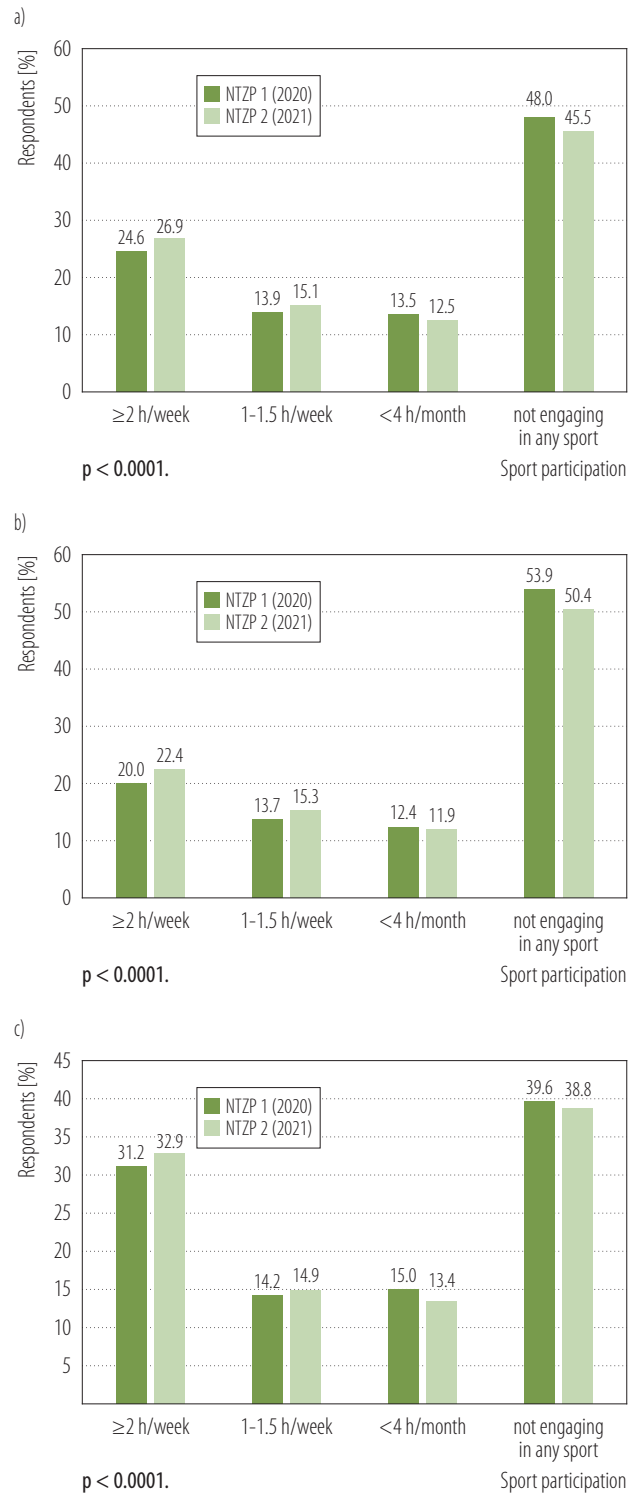


Figure 1. Sport participation in National Test for Poles' Health (Narodowy Test Zdrowia Polaków – NTZP) 1 (2020) and NTZP 2 (2021): a) total, b) women, and c) men

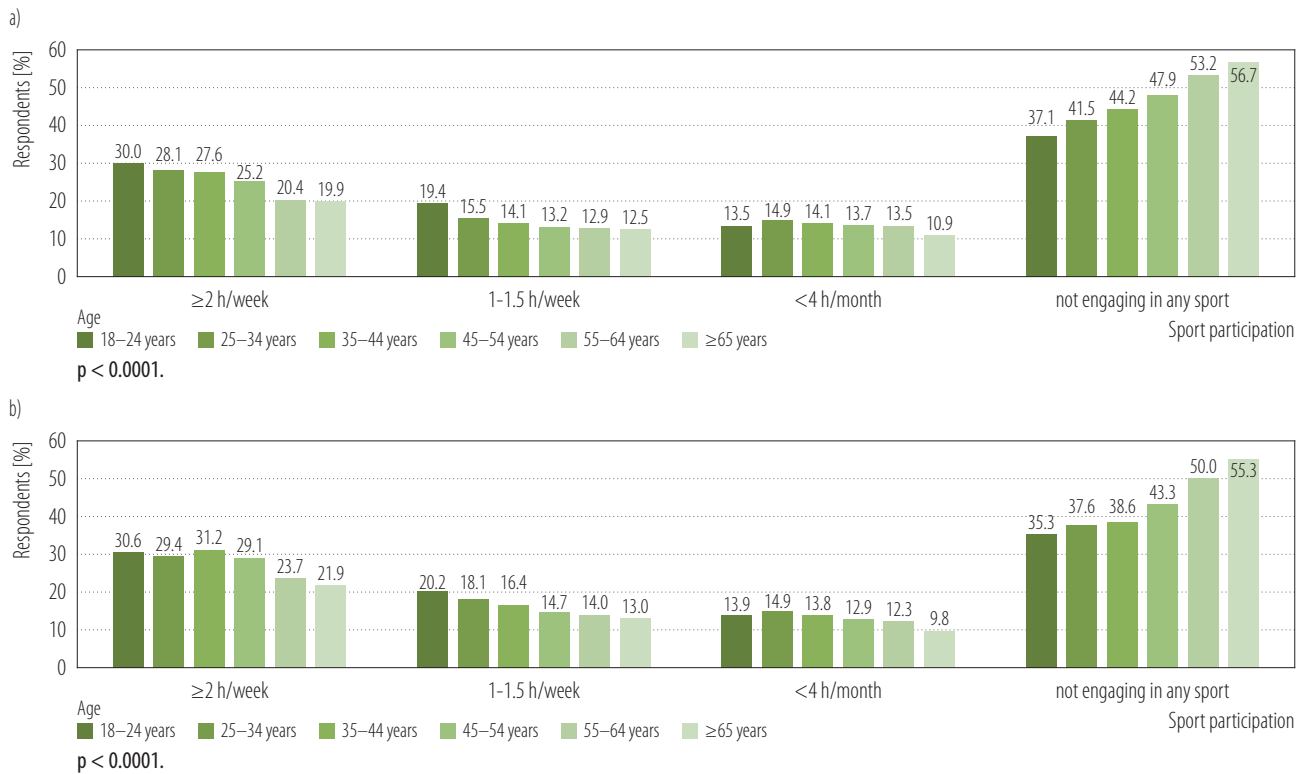


Figure 2. Sport participation by age – *National Test for Poles’ Health (Narodowy Test Zdrowia Polaków – NTZP)*: a) NTZP 1 (2020) and b) NTZP 2 (2021)

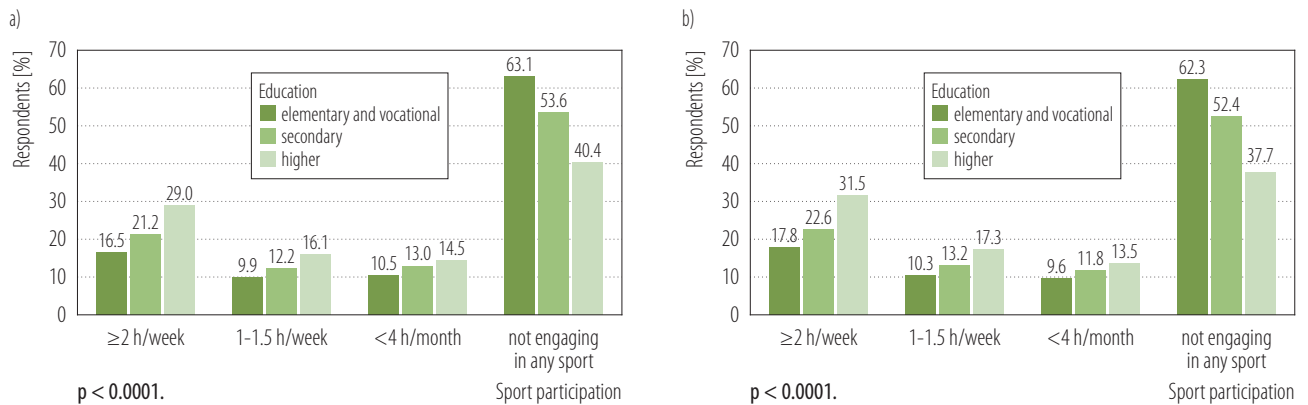


Figure 3. Sport participation by education – *National Test for Poles’ Health (Narodowy Test Zdrowia Polaków – NTZP)*: a) NTZP 1 (2020) and b) NTZP 2 (2021)

ond wave of NTZP this percentage increased to 42.1% ($p < 0.0001$). In the first wave 41.2% of the group that walked the most was not engaging in any sport activity. This percentage decreased to 37.6% in the second wave ($p < 0.0001$). Positive association was found between sport participation and walking time in both waves ($p < 0.0001$). Further results are presented in Tables 2 and 3.

DISCUSSION

The COVID-19 pandemic has brought about unprecedented challenges and disruptions to various aspects of daily life. It has resulted in widespread lockdown measures and social distancing guidelines, which have significantly limited individuals’ opportunities for physical activity. Numerous studies have reported a decline in physi-



Figure 4. Sport participation by place of residence – *National Test for Poles’ Health (Narodowy Test Zdrowia Polaków – NTZP)*: a) NTZP 1 (2020) and b) NTZP 2 (2021)

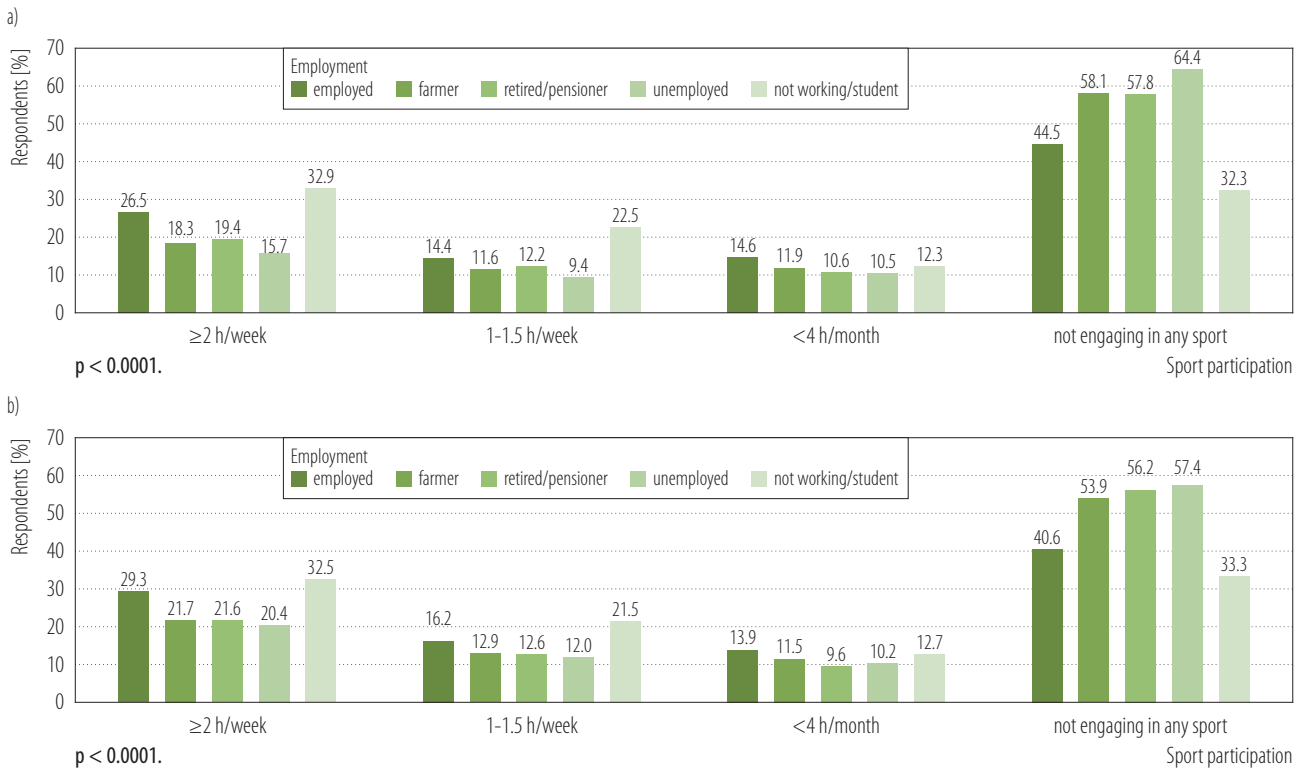


Figure 5. Sport participation by employment – *National Test for Poles’ Health (Narodowy Test Zdrowia Polaków – NTZP)*: a) NTZP 1 (2020) and b) NTZP 2 (2021)

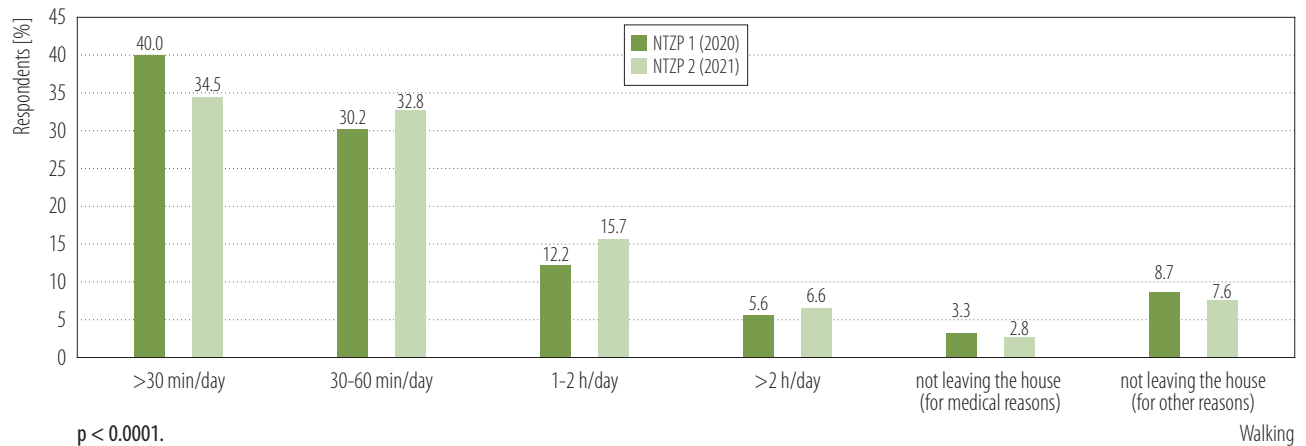


Figure 6. Time spent walking in *National Test for Poles' Health (Narodowy Test Zdrowia Polaków – NTZP)*: a) NTZP 1 (2020) and b) NTZP 2 (2021)

Table 2. The level of physical activity by time spent on walking of *National Test for Poles' Health (Narodowy Test Zdrowia Polaków – NTZP)* in 2020 (NTZP 1) and in 2021 (NTZP 2) conducted in Poland before the onset of the COVID-19 pandemic and 1 year later

| NTZP | Participants | | | | | | | | | | | |
|---------------------------|-----------------------|------|---------------|------|-----------|------|----------|------|-----------------------|------|-------------------|------|
| | time spent on walking | | | | | | | | not leaving the house | | | |
| | >30 min/day | | 30–60 min/day | | 1–2 h/day | | >2 h/day | | for medical reasons | | for other reasons | |
| | n | % | n | % | n | % | n | % | n | % | n | % |
| NTZP 1 | 150 396 | | 113 445 | | 45 979 | | 21 141 | | 12 269 | | 32 872 | |
| ≥2 h/week | 27 676 | 18.4 | 35 835 | 31.6 | 17 655 | 38.4 | 7853 | 37.2 | 1031 | 8.4 | 2603 | 7.9 |
| 1–1.5 h/week | 21 271 | 14.1 | 19 275 | 17.0 | 6713 | 14.6 | 2474 | 11.7 | 617 | 5.0 | 1874 | 5.7 |
| <4 h/month | 24 255 | 16.2 | 15 406 | 13.6 | 4832 | 10.5 | 2099 | 9.9 | 1117 | 9.1 | 3078 | 9.4 |
| not engaging in any sport | 77 194 | 51.3 | 42 929 | 37.8 | 16 779 | 36.5 | 8715 | 41.2 | 9504 | 77.5 | 25 317 | 77.0 |
| NTZP 2 | 103 542 | | 98 412 | | 46 975 | | 19 737 | | 8482 | | 22 852 | |
| ≥2 h/week | 19 228 | 18.6 | 31 820 | 32.3 | 18 558 | 39.5 | 8313 | 42.1 | 694 | 8.2 | 1974 | 8.6 |
| 1–1.5 h/week | 15 770 | 15.2 | 17 863 | 18.2 | 7389 | 15.7 | 2439 | 12.4 | 452 | 5.3 | 1418 | 6.3 |
| <4 h/month | 16 500 | 15.9 | 12 293 | 12.5 | 4438 | 9.5 | 1557 | 7.9 | 663 | 7.8 | 2177 | 9.5 |
| not engaging in any sport | 52 044 | 50.3 | 36 436 | 37.0 | 16 590 | 35.3 | 7428 | 37.6 | 6673 | 78.7 | 17 283 | 75.6 |

$p < 0.0001$.

cal activity levels during the pandemic, with reductions in both moderate-to-vigorous intensity physical activity and overall sedentary behavior [14–16]. These reductions are concerning, as lack of adequate level of physical activity has been consistently linked to various negative health outcomes, including cardiovascular diseases, obesity, mental health disorders, and compromised immune function [9].

From the beginning of pandemic until July 2021 4.2 million deaths from SARS-CoV-2 have been reported in countries around the world [17]. The COVID-19 pandemic resulted in approx. 1 million excess deaths in 2020 in 29 high income countries analyzed by Islam et al. [18]. Researchers found that Poland was among the 5 countries with the highest number of excess deaths (>60 000 excess deaths

in 2020). The death rate in 2020 in Poland was the highest in 70 years and it was the highest in fourth quarter of 2020. It was estimated that deaths caused by COVID-19 were 9% of all deaths at that time. In all age groups, but especially in the older ones (>60 years old), men were more likely to die than women [19]. In 2021 in Poland 42 000 more people died compared to 2020. Almost every fifth death in that time was caused by the COVID-19 pandemic [20].

The NTZP results presented in this article show a general trend of improvement in the quantity of physical activity in the form of sport participation and walking between the 2 waves of NTZP study. The general trend in similar research has been the decline of physical activity and increase of sedentary time due to the pandemic [21–24].

A study from Brazil on 4290 individuals found that, compared to before the pandemic, there was a 72% reduction in physical activity related to commuting and an increase of 145% in physical inactivity [25]. Interestingly, the authors found that 14.8% of people adhering to social-distancing met physical activity recommendations (≥ 150 min/week), compared to 26.9% of those not complying. There was also a negative correlation between meeting the physical activity recommendations and level of fear of the pandemic reported by the respondents, with less fear associated with more frequent physical activity. This tendency may partially explain the reason for the results of this study. It is possible that some people were not adhering to the social-distancing and other pandemic-related measures as they were not experiencing a great level of fear of the pandemic. Working from home was found to be a protective factor against physical inactivity, as seen in a study by Moura et al. [26]. Additionally, leisure-time physical activity levels declined the least when compared to other types of physical activity, such as commuting. The study focused on engaging in sport as form of physical activity, which is a type of leisure-time physical activity.

A group that is especially vulnerable to complications of COVID-19 infection is the elderly. This group is often

characterized by insufficient levels of physical activity, as observed in a more in-depth analysis of physical activity in the elderly who completed the NTZP survey [12]. Research on Italian and Swedish populations also indicates gender disparities, with men more engaged in leisure-time activities than women [27,28]. In the authors' study the oldest group of respondents (>65 years old) showed an increase by 2% of those engaging in ≥ 2 h/week of sport (from 19.9% to 21.9%). This percentage of active older people is, however, still very low.

Joseph et al. [29] noticed a decrease in the level of physical activity in respondents in the second wave of their study, which was conducted mid-May – early June 2020. Third wave, conducted mid-June – early July 2020 showed, however, a slight increase in moderate- and vigorous-intensity physical activity, remaining significantly below pre-pandemic levels, which were reported by the respondents in the second wave. Authors suggest that this increase may have been caused by more information being available to the public on how the novel coronavirus was being transmitted as well as on the ways to minimize the risk of infection. The study was conducted in waves separated by a year (mid-January – mid-March 2020 for the first NTZP and the same time in 2021 for the second NTZP). During that first year of pandemic, the amount of information presented to the public regarding the SARS-CoV-2 virus was increasing every week. As news of the vaccine started to be published, there is a possibility that for some people it resulted in more willingness to engage in behaviors directed on improving their health, such as sport participation. A British qualitative study on 40 participants [30] conducted using phone interviews in May–July 2020 found that participants initially engaging in unhealthy behaviors during lockdown (like comfort eating and increased alcohol intake) attempted to reduce these habits as restrictions persisted. Remote work and more flexible working times allowed for more physical activity for some respondents. It was also reported that physical activity

acted as an opportunity for social interaction during these times. With some participants claiming willingness to continue choosing less sedentary means of social interaction even after the restrictions were lifted. The study suggests that the pandemic highlighted the importance of staying active for physical and mental health during challenging times.

As Czyż and Starościk [31] pointed out, moderate physical activity tends to be over-estimated by respondents in questionnaires, which may affect the results as this kind of activity is usually the most common. These authors have also hypothesized that the increase in physical activity during the pandemic could have been caused by people starting to be more active at home doing renovations, as do-it-yourself stores remained opened during lockdowns. There have also been reports on the impact COVID-19 has on physical activity in recovering patients [32]. The article describes findings from online long-COVID-19 peer support groups. A reduction in self-reported walking time among participants 6 months after the onset of symptoms has been observed. However, in contrast, there was an increase in the proportion of participants who reported engaging in indoor walking or cycling during the same 6-month period after the onset of symptoms. This may be another reason for the increase in physical activity despite the pandemic-related restrictions: people switched to at-home sport activities, therefore their overall physical activity increased. Another reason for the increase in time spent on sport and walking observed in the study may be the switch to remote work that many companies made in the pandemic. Schools and universities also started implementing remote solutions. For many people this resulted in added time during the day that would normally be spent on commuting to and from work or school. This saved time could then be spent on engaging in physical activity.

Walking, a simple and accessible form of exercise, has gained increased attention due to its potential benefits for

both physical and mental health during the COVID-19 pandemic. It has been widely observed that time spent walking has decreased due to pandemic-related restrictions [24]. The authors' study has found that respondents tended to spend more time on walking a year after the first pandemic restrictions were put in place in Poland, compared to before. These findings may be an effect of over-estimation of the time spent on walking by the respondents. However, the largest part of respondents in both waves claim they spend <30 min/day on walking (either in the form of walks or as a means of getting from one place to another). As walking is one of the most accessible forms of physical activity, there should be an effort to promote it among the general population, along with ensuring appropriate infrastructure enabling people to participate in such activity [33].

Engaging in regular physical exercise has been shown to have positive effects on mood, self-esteem, and stress reduction, primarily through the release of endorphins and other neurotransmitters [34]. Existing literature indicates that physical activity plays a significant role in preventing and treating COVID-19 as well as helping in the recovery of physical function and alleviating symptoms of post-acute COVID-19 syndrome [35]. It has also been proposed that physical activity may be a coadjuvant treatment to the COVID-19 vaccinations, boosting antibody responses [36]. Additionally, physical inactivity in people that were later infected by the COVID-19 was connected with greater probability of hospitalization, admission to the intensive care unit, and death as a result of this disease [37]. Thus, promoting physical activity during the pandemic could serve as an essential strategy to mitigate the detrimental effects on mental well-being. Efforts focused on promoting physical activity and active lifestyle have been made during the COVID-19 pandemic in Poland. Videos with exercises to perform at home were published on the National Nutrition Education Center's YouTube profile, financed by the Ministry of Health. Also Medonet, the

Internet platform that conducted the NTZP study, published a number of articles encouraging readers to remain active during the lockdown. It cannot be denied that these efforts reached a number of people, possibly encouraging them to improve their lifestyle.

The advantage of NTZP, as an online survey conducted by Medonet, one of Poland's largest health-oriented Internet platforms, is its accessibility for potential participants, which provides a substantial sample size. Over 300 000 people took part in the 2020 and the 2021 editions of NTZP. To the best of the authors' knowledge this is the largest study devoted to physical activity level during COVID-19 pandemics in Europe, probably also in the whole world. What is more, the respondents groups were highly representative of the Polish population in age, sex, place of dwelling and employment status, which makes it one of the biggest sources of valuable information on the population's health. Respondents groups were also highly similar between the 2 waves of NTZP study. Interpreting results of survey studies with large sample sizes should always be exercised with caution as also minor changes in percentages, while statistically significant, are frequently observed. The questionnaire was constructed to be easy to understand for any respondent, avoiding specialized language. However, there are also limitations associated with this approach, such as the inability to verify the credibility of respondents' identities and their responses. While the questions have been designed to be easily understandable for all, there is a possibility that some respondents may not fully comprehend them, potentially impacting their answers. The form of questions may have also limited the accuracy of responses. This test focused on the 2 most common physical activities: sport participation and walking. It did not however include domestic physical activity such as doing house chores. During the COVID-19 pandemic, online surveys were the safest means of gathering information from a large group of respondents due to the necessary restrictions and social-distancing measures. The authors

also acknowledge the fact that the validity of the questionnaire was not measured. Furthermore, a limitation of the study was that the questionnaires were self-administered, and there was no supervision to ensure the accuracy of responses. Additionally, the questionnaire did not include a measure of the intensity of physical activity.

Contrary to most research in this area, the study found that there was a small, but statistically significant, increase in time spent on sport participation and walking in all groups of the respondents. However, overall level of physical activity in Poland remains too low and is not sufficient. Most Polish people do not meet the recommended level of physical activity, which is one among important reasons for a high number of many non-communicable diseases in this country [13]. The NTZP published results of the third and fourth wave, conducted in 2022 and 2023. Unstandardized results of these surveys show that sport participation decreased and started to reach similar levels to those from before the pandemic. This is however a subject for further analysis that the authors of this article are working on. Insufficient level of physical activity is a problem for public health and there is a need for efforts to combat this. Overall, the study provides valuable information on the effect the COVID-19 may have had on selected health behaviors and habits of the Polish population, which could serve as a guide in health promotion during challenging times of pandemic.

CONCLUSIONS

Results of this large study involving >676 000 men and women strongly demonstrate that unlike in many other countries, time spent on engaging in sport and walking significantly increased 1 year after the onset of the COVID-19 pandemic in Poland. It was also observed across different age, sex, dwelling-place, education level, and employment groups. However, the level of overall physical activity remains too low, which has a negative impact on the health of Polish people. The impact of these

changes on public health remains to be seen, but it is clear that efforts are needed to encourage individuals to maintain their physical activity levels in ways that are possible and safe during necessary restrictions. This may include promoting physical activity that can be done at home, such as online workouts or yoga, as well as encouraging individuals to take breaks from sedentary behavior and engage in physical activity and walks whenever possible. Levels of physical activity in the form of sport participation and walking remain very low in Poland, which has a negative impact of the overall health of the Polish population, number of non-communicable diseases and deaths.

Author contributions

Research concept: Agnieszka Szychowska, Anna Zimny-Zajac, Tomasz Grodzicki, Tomasz Zdrojewski, Wojciech Drygas, Robert Gajda, Magdalena Kwaśniewska

Research methodology: Agnieszka Szychowska, Anna Zimny-Zajac, Wojciech Drygas

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Interpretation of results: Agnieszka Szychowska, Elżbieta Dzionkowska-Zaborszczyk

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