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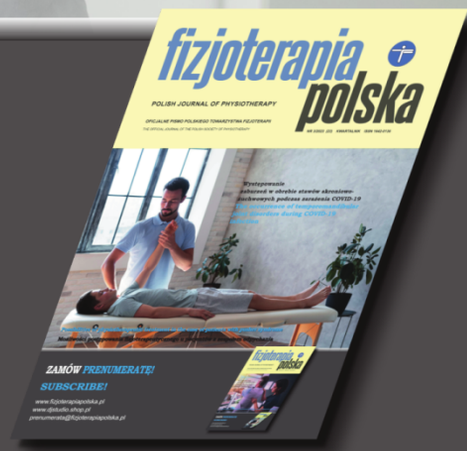

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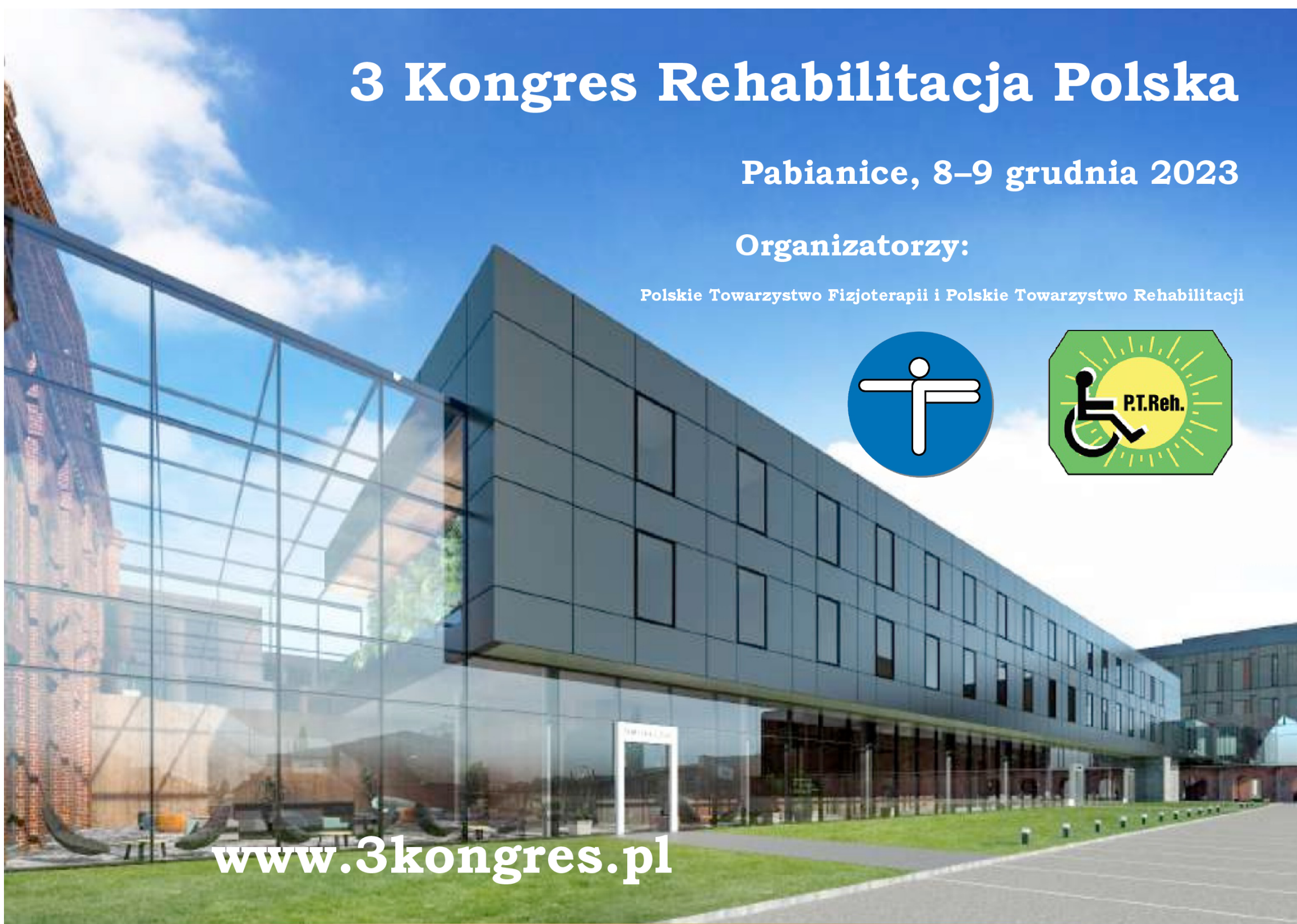

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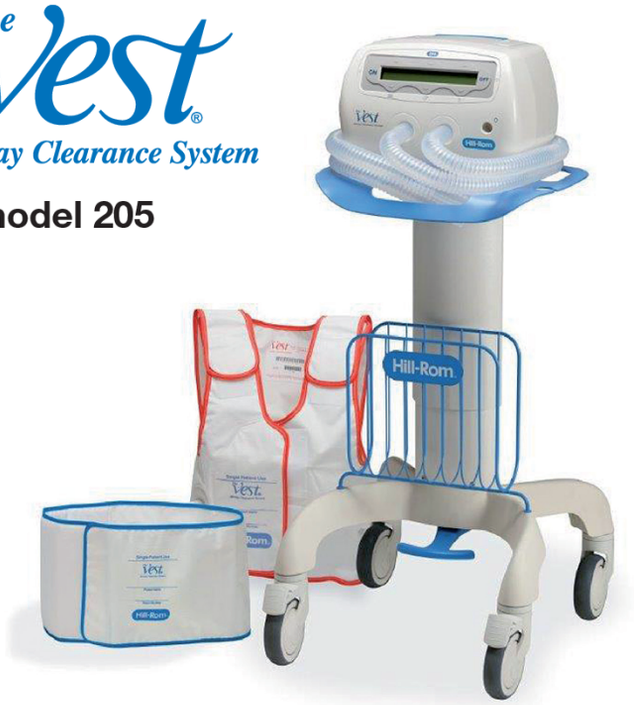

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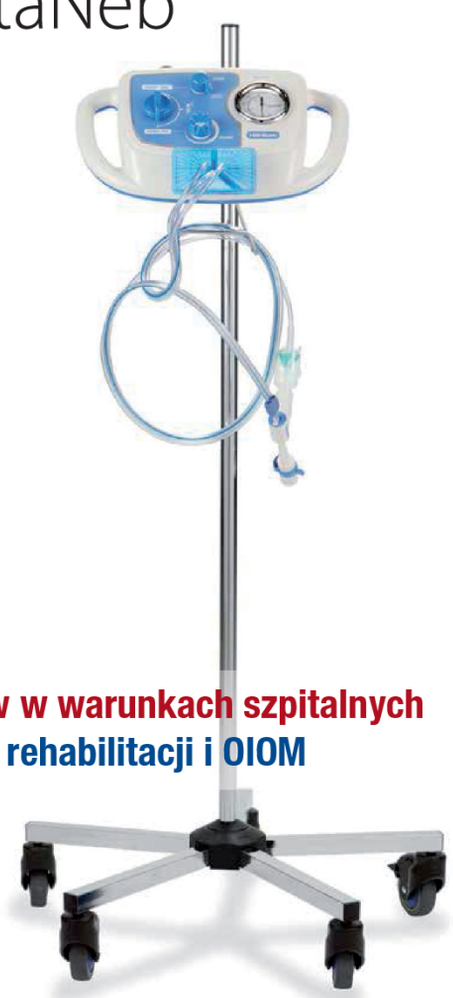

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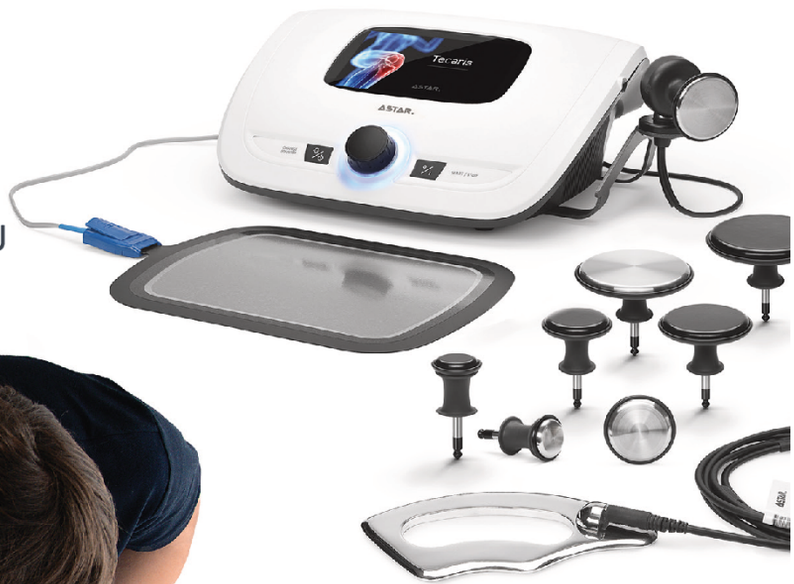

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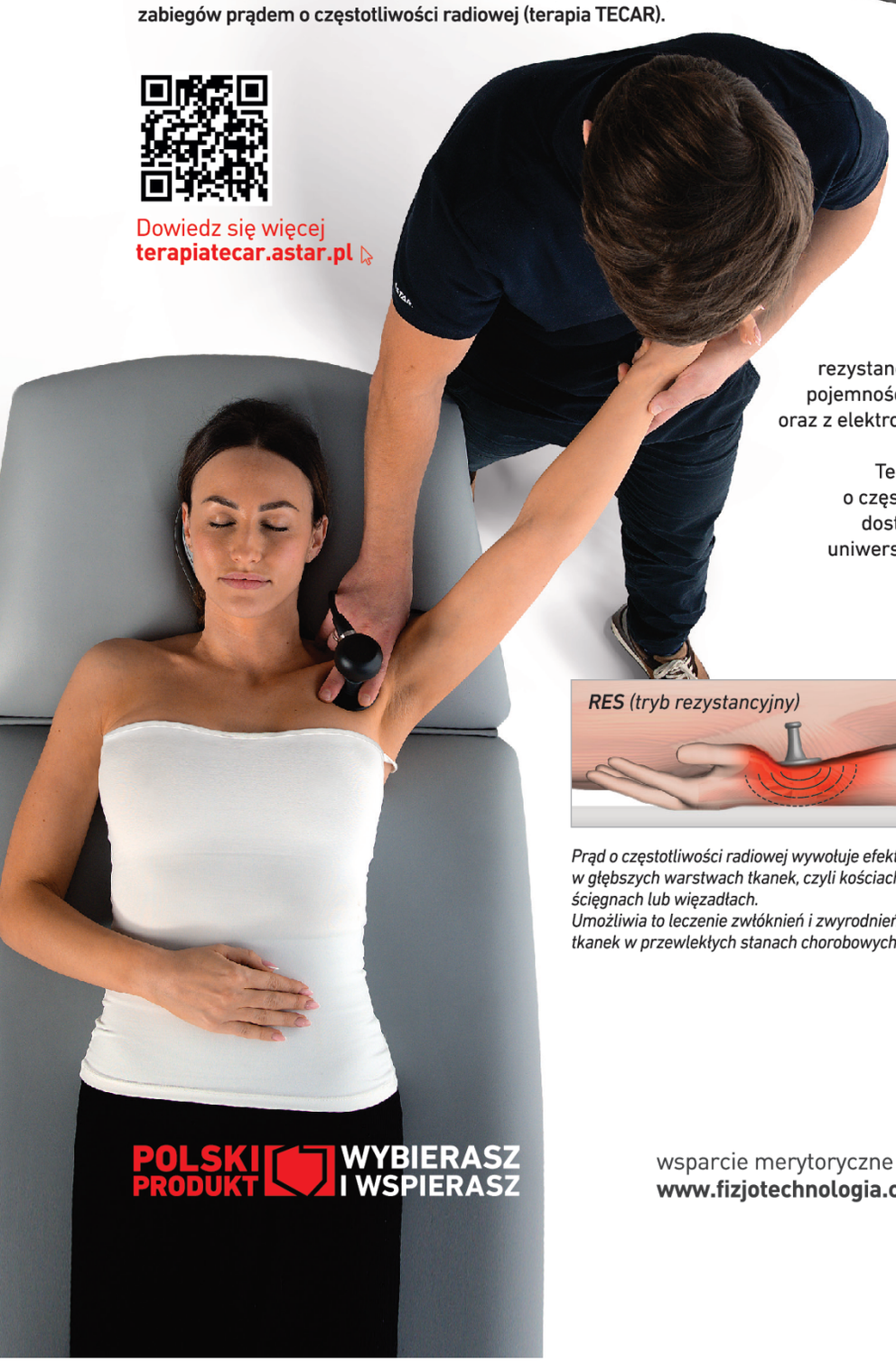

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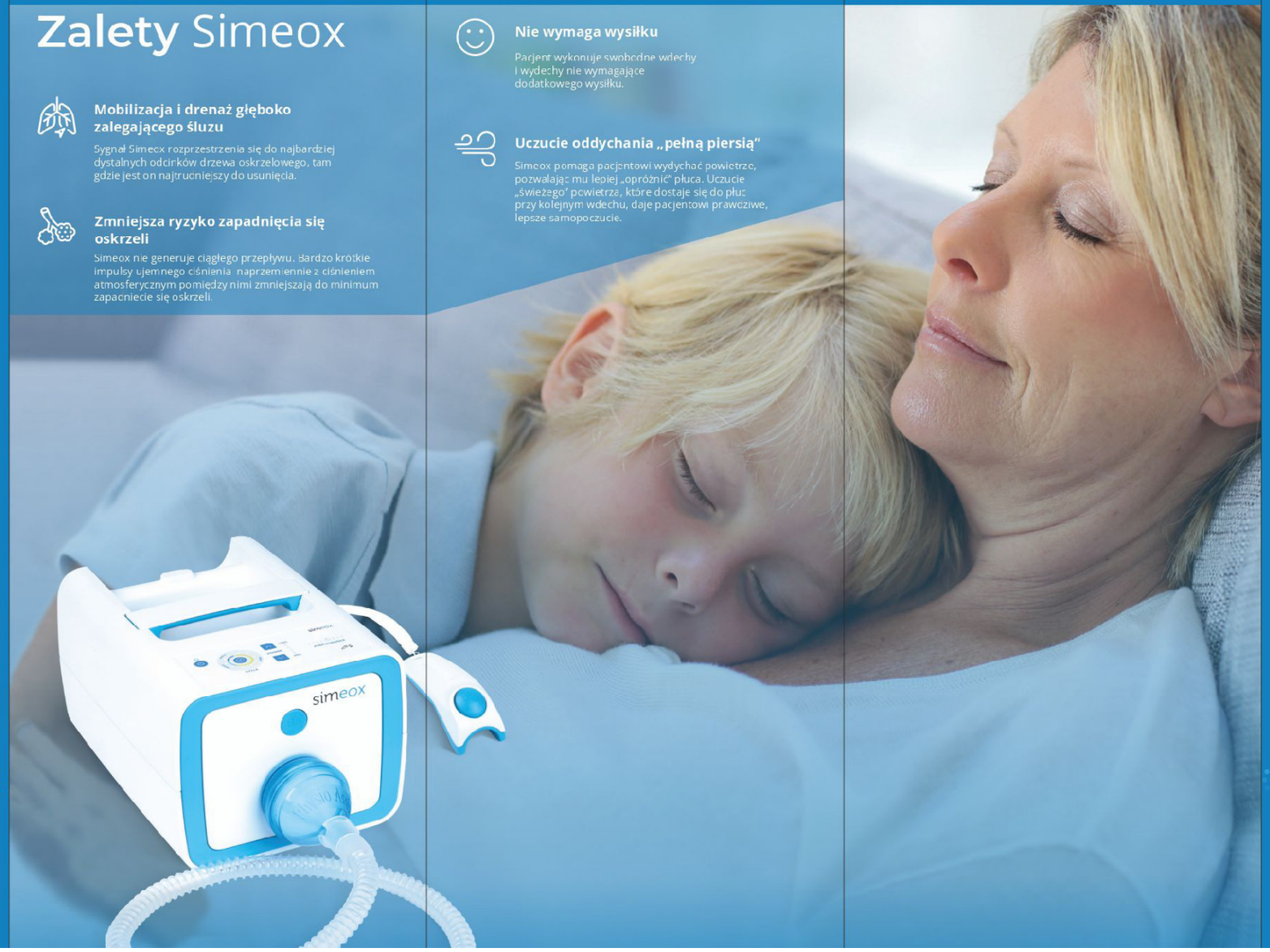

MEDICAL INNOVATION

PhysioAssist

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nr 4/2023 (23)

Assessment of dyspnoea and physical activity levels among Poles living in Poland and the United Kingdom in the third year of the COVID-19 pandemic – a pilot study

Ocena poziomu duszności i aktywności fizycznej wśród Polaków mieszkających w Polsce i w Wielkiej Brytanii podczas trzeciego roku pandemii COVID-19 – badanie pilotażowe

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Abstract

Objectives. The aim of this study was to assess the extent of dyspnoea and the relationship between dyspnoea and physical activity among Poles living in Poland and the United Kingdom (UK) in the third year of the COVID-19 pandemic. Methods. The pilot study was conducted in January 2023. The study authors received 200 questionnaires from respondents aged 18-69 years (104 from Poland and 96 from the UK). The level of dyspnoea was assessed using the Medical Research Council Dyspnoea Scale (MRC) questionnaire. Level of physical activity was measured using the International Physical Activity Questionnaire (IPAQ). Results. In the majority of cases, dyspnoea occurred only during heavy physical exertion and increased with age and more cases of COVID-19. A trend towards increasing dyspnoea with decreasing MET scores for moderate physical activity was observed. Respondents' country of residence was not correlated with dyspnoea level. Conclusions. The introduction of regular physical activity may have an impact on reducing dyspnoea. Dyspnoea is a factor that influences the reduction of physical activity and leads to a change to a sedentary lifestyle.

Key words:

COVID-19, dyspnoea, physical activity

Streszczenie

Cel. Celem badania była ocena poziomu duszności i związku pomiędzy dusznością a aktywnością fizyczną wśród Polaków mieszkających w Polsce i w Wielkiej Brytanii w trzecim roku pandemii COVID-19.
Metody. Badania pilotażowe zostały przeprowadzone w styczniu 2023 roku. Autorzy badań otrzymali 200 kwestionariuszy od ankietowanych, którzy byli w przedziale wiekowym 18–69 lat (104 z Polski oraz 96 z Wielkiej Brytanii). Poziom duszności oceniono za pomocą kwestionariusza MRC (Medical Research Council Dyspnoea Scale). Poziom aktywności fizycznej mierzono Międzynarodowym Kwestionariuszem Aktywności Fizycznej (IPAQ).
Wyniki. W większości przypadków duszność występowała jedynie podczas dużych wysiłków fizycznych, a jej poziom zwiększał się z wiekiem i większą liczba zachorowań na COVID-19. Zaobserwowano tendencję do narastania duszności z obniżeniem się wyników MET dla umiarkowanej aktywności fizycznej. Kraj zamieszkania badanych nie był powiązany z poziomem duszności.
Wnioski. Zgodnie z zaleceniami należy monitorować poziom duszności u pacjentów po COVID-19, zwłaszcza u pacjentów w wieku zaawansowanym oraz u osób, które kilkukrotnie chorowały na COVID-19. Wprowadzenie regularnej aktywności fizycznej może wpływać na zmniejszenie uczucia duszności.

Słowa kluczowe:

COVID-19, duszność, aktywność fizyczna

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Introduction

COVID-19 as a disease that was first detected in late 2019 in Wuhan has been defined by researchers worldwide as acute respiratory distress syndrome. In just a few months, the virus has spread to the rest of the continents, causing numerous changes in many areas of life. In most countries, governments have taken a number of measures to combat the spread of the infection. The quarantines and movement restrictions imposed have caused social and economic disruption worldwide [1]. Patients infected with the virus may experience the disease with symptoms such as fever, fatigue, shortness of breath, diarrhoea, loss of smell or taste, but may also be asymptomatic. The type of infection depends on several factors: Age, gender or concomitant diseases [2].The available literature contains articles describing specific physical and psychological symptoms (cough, lack of concentration, fatigue, shortness of breath, memory impairment) that patients report and that persist for more than three months after infection. This phenomenon is referred to as "Post COVID" [3].

In medicine, the term dyspnoea is usually defined as an individual shortness of breath. It is a fairly common and also worrying symptom reported by patients. In healthy people, it can occur during vigorous exertion and is considered a normal bodily response. In sick people, on the other hand, it can occur with mild exertion or even at rest [4]. However, in the vast majority of patients, the consequence of chronic dyspnoea is a reduced quality of life and reduced physical performance, which can occur even during light daily activities. Over time, this can contribute to a lifestyle shift towards a passive and sedentary lifestyle, developing the risk of many negative health conditions.The lack of regular physical activity can cause cardiovascular disease, some cancers, obesity, diabetes, osteoporosis, spinal and peripheral joint pain, and postural deformities in children as well as adults, among others [5]. Various instruments are used to assess the extent of dyspnoea, ranging from simple scales (Borg scale, visual analogue scale) to multidimensional questionnaires such as the Multidimensional Dyspnoea Profile. These tools are commonly used by various clinicians in diagnosing patients [4].

A widely accepted recommendation of the World Health Organisation (WHO) is that an adult should engage in at least 150 minutes of moderate or 75 minutes of vigorous physical activity per week. These recommendations for all age groups recommend regular exercise to strengthen muscles. Physical activity should be individually adapted to the pa-tient's physiological characteristics and health status [6]. Scientific research confirms the positive effects of physical activity on the prevention and treatment of numerous diseases such as diabetes, cancer, depression, obesity and cardiovascular disease [7]. An appropriate level of physical activity improves self-esteem and provides a sense of well-being that sometimes reduces depressive symptoms and anxiety. These positive effects of physical

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activity on the body are sub-stantial [8]. In contrast, a sedentary lifestyle and physical inactivity can be associated with negative health effects. Therefore, it has recently been observed that more and more health care providers are seeking to promote regular physical activity, especially among people recovering from COVID-19 [9].

The SARS-CoV-2 virus continues to pose a major social challenge today, as it has brought serious physical and psychological consequences to entire populations in different parts of the world. There are few studies in the literature on methods to prevent COVID-19, as well as studies that assess the extent of dyspnoea and its impact on people who have become infected with COVID-19 [10]. However, it is increasingly being discussed that adequate levels of physical activity can contribute to the prevention and treatment of COVID-19 and have a positive impact on reducing the chronic effects of the virus. A properly prepared and selected physical training programme can also be a useful complementary treatment tool for patients affected by COVID-19 and post COVID symptoms. It can also help to change abnormal exercise habits and restore pre-pandemic mental and physical health [11].

The study's objective was to ascertain the degree of respiratory distress among Poles residing in Poland and the United Kingdom (UK) in the third year of the COVID-19, as well as the association between dyspnea and physical activity.

Materials and methods

The detailed methodology and baseline characteristics of the study have been outlined in a previous publication [12]. For the sake of brevity, we provide here a summarized version.

Participants and procedure

A pilot online poll was conducted among Poles residing in Poland and the UK. Responses were collected via Google Forms in January 2023. The factors for inclusion in the study were: consent to participate in the study; age over 18; Polish citizenship; place of residence (Poland or UK); full completion of the form. The study authors received 200 completed correctly questionnaires from respondents who were aged between 18 and 69 years (104 questionnaires from Poland and 96 questionnaires from the UK).
The research project was approved by the Senate Committee on Research Ethics of the University of Lomza (number 5293400).

Methods of assessing the level of dyspnoea and physical activity

The research technique was a diagnostic survey method using standardized questionnaires assessing the level of dyspnoea (Medical Research Council Dyspnoea Scale – MRC) and the level of physical activity (International Physical Activity Questionnaire – IPAQ), as well as a metric inserted at the beginning of the questionnaire. The results of the questionnaires were subjected to comprehensive statistical analysis.

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Medical Research Council Dyspnoea Scale (MRC)
In medicine, one of the most commonly used scales to assess the extent of dyspnoea is the MRC Dyspnoea Scale. It consists of 5 questions, where 0 indicates dyspnoea only on exertion and 4 – denotes resting dyspnoea, which makes it impossible to perform daily activities independently or to leave the house [13]. The original scale was modified for Polish conditions [14]. The authors decided to use the MRC Dyspnoea Scale for the study, following the guidelines of the Polish Chamber of Physiotherapists (KIF) regarding the use of equipment to test patients with respiratory disorders and also in accordance with the guidelines for the application of treatment and rehabilitation in patients after COVID-19 [15].

International Physical Activity Questionnaire (IPAQ)
Physical activity was assessed using an abbreviated version of the IPAQ validated for Polish conditions. It contains 7 questions related to all types of daily physical activity [16]. It assesses activity during working hours, in and around the home and during leisure time. The questions in the questionnaire refer to time spent sitting, walking, and also moderate to vigorous physical activity, all of which last at least 10 minutes continuously. The activities performed are expressed in units of MET-min/week. It is designed for individuals aged 15–69 years [16].

Statistical methods
In order to characterize the structure of the study variables, basic descriptive statistics were calculated. Student's t-test for independent samples was used to test the significance of differences. Spearman's rank coefficients were calculated to determine the strength of the association between the variables. For variables measured on rank and nominal scales, the hypotheses that two qualitative characteristics are independent in the population were tested.

H 0: Characteristics X and Y are independent,
Confronted with the alternative hypothesis:
H 1: Characteristics X and Y are dependent on each other

For this purpose, Pearson's Chi-square test is usually used to test whether two variables are related. Cramer's V and Kendal's tau b coefficients were used to determine the strength the relationships between the variables. For all analyses, a significance level of 0.05 was assumed. Statistica v. 13.1 was used to perform statistical analysis.

Results

Characteristics of respondents
Of the 200 respondents aged 18 and 69 years (Table 1), 51.5% were female and 48.5% were male. 52% of the respondents lived in Poland, while 48% of the respondents lived in the UK. The majority of respondents had been vaccinated against COVID-19 (Table 2) and had undergone SARS-CoV-2 infection 2 times (Table 2).

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Table 1. Age of respondents

Age range [years]	Number of observations (percentage of observations)
18–25	22 (11%)
26–35	55 (27.5%)
36–45	54 (27%)
46–55	48 (24%)
56–65	20 (10%)
over 66	1 (0.5%)

Table 2. Characteristics of the respondents

	Class	Number of observations (percentage of observations)
Vaccination against COVID-19	yes	123 (61.5 %)
	no	77 (38.5 %)
How many times have you been ill with COVID-19?	3	5 (2.5 %)
	2	91 (45.5 %)
	1	84 (42 %)
	0	20 (10 %)

Level of dyspnoea and physical activity

Analysis of the results in the table (Table 3) shows that dyspnea in the study group occurred in the majority of cases (72%) only during vigorous physical exertion, and in 18% during fast walking or climbing a slight slope. 7% of subjects walked more slowly than their peers because of dyspnea, and in 3%, dyspnea prevented the subject from leaving the house. This characteristic was graded for further analysis with increasing dyspnea on a scale of 1–4.

Table 3. Level of dyspnoea in the study population

Class	Number of observations	Percentage of observations
0 – dyspnoea occurs only during heavy physical exertion	144	72.00

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Klasa Class	Liczba obserwacji Number of observations	Procent obserwacji Percentage of observations
1 – shortness of breath occurs when walking quickly on flat ground or climbing a slight hill	36	18.00
2 – due to shortness of breath the patient walks slower than their peers or has to stop for breath when walking at their own pace on flat ground	14	7.00
3 – dyspnoea prevents the patient from leaving the house or occurs when dressing or undressing	6	3.00

Each sort of physical activity can be measured in MET-min/week units. In subsequent analyses, it was verified whether the scores regarding feelings related to dyspnoea correlated with the International Physical Activity Questionnaire scores (Table 4). A negative correlation was found with IPAQ MET questionnaire moderate intensity scores R = −0.21; p = 0.0048 meaning that MET scores for moderate activity decreased with increasing problems in dyspnoea sensations.

Table 4. Level of dyspnoea and physical activity

Pair of variables	R Spearman	t (N-2)	p
MET high int and dyspnoea	−0.12	−1.55	0.1227
MET moderate int and dyspnoea	**−0.21**	**−2.86**	**0.0048**
MET walking and dyspnoea	−0.04	−0.52	0.6003
Sitting and dyspnoea	0.06	0.87	0.3854
Physical activity level and dyspnoea	0.05	0.71	0.4760

Metabolic Equivalent of Task

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In the analyses that followed, it was verified whether the age of the subjects was associated with feelings of dyspnoea (Table 5). Analysis of the results in Table 5 revealed that age was strongly positively statistically significantly correlated with feelings of dyspnoea $p < 0.05$. It can therefore be concluded that feelings of dyspnoea worsened as the age of the subjects increased. In later studies, the number of COVID-19 occurrences in the individuals was revealed to be associated with the feeling of dyspnea (Table 5). The number of incidences of COVID-19 was positively and statistically significantly connected with the experience of dyspnea ($p < 0.05$), indicating that as the frequency of COVID-19 rose among individuals, the feeling of dyspnea also worsened.

Table 5. Age and number of cases of COVID-19 versus dyspnoea

Pair of variables	R Spearman	t (N-2)	p
Dyspnoea and age	**0.50**	**8.06**	**P < 0.0001**
Dyspnoea and number of cases of COVID-19	**0.22**	**3.12**	**0.0020**

Further analyses were performed to check whether the vaccination of the subjects made a significant difference in the results of the International Physical Activity Questionnaire (Table 6). Analysis of the results showed that there was no difference between vaccinated and non-vaccinated subjects in the level of physical activity.

Table 6. Vaccination status with level of dyspnoea

Variable	Mean yes	Mean no	SD yes	SD no	t	df	p
MET high int.	1254.90	1358.73	464.29	490.11	−1.37	163	0.17
MET moderate int.	702.70	733.33	249.89	231.79	−0.82	178	0.41
MET walking	585.26	707.27	378.85	474.92	−1.94	186	0.05
Seat	356.97	322.19	162.89	130.96	1.54	190	0.12

MET – Metabolic Equivalent of Task
SD – Standard deviation

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Subsequent analyses aimed to verify whether the gender of the subjects (Table 7) and the vaccination status (Table 8) were associated with the level of physical activity. Pearson's $\chi 2$ independence tests were performed to validate the connections. The study of the results in Tables 7 and 8 did not provide grounds to reject the null hypothesis of the studied variables' independence.

Table 7. Physical activity level and gender

Level of physical activity	Gender		Row total
	Woman	Man	
Low	18	9	27
% columns	17.48%	9.28%	
Sufficient	58	56	114
% columns	56.31%	57.73%	
High	27	32	59
% columns	26.21%	32.99%	
General	103	97	200
$\chi 2 = 3.33$; df = 2; p = 0.18			

Table 8. Level of physical activity versus vaccination status

Level of physical activity	Have you been vaccinated against COVID-19?		Row total
	No	Yes	
Low	11	16	27
% columns	14.29%	13.01%	
Sufficient	40	74	114
% columns	51.95%	60.16%	
High	26	33	59
% columns	33.77%	26.83%	
General	77	123	200
$\chi 2 = 1.38$; df = 2; p = 0.50			

In subsequent analyses, it was verified whether the country of residence was associated with feelings of dyspnoea (Table 9). The analysis of the results in Table 9 did not provide grounds for rejecting the null hypothesis of independence of the analyzed variables.

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Table 9. Country of residence and dyspnoea

Dyspnoea	Country of residence		Row total
	Poland	UK	
Dyspnoea occurs only during heavy physical exertion	77	67	144
% columns	74.04%	69.79%	
Shortness of breath occurs when walking quickly on flat ground or climbing a slight hill	16	20	36
% kolumny / % columns	15.38%	20.83%	
Due to shortness of breath the patient walks slower than their peers or has to stop for breath when walking at their own pace on flat ground	9	5	14
% columns	8.65%	5.21%	
Dyspnoea prevents the patient from leaving the house or occurs when dressing or undressing	2	4	6
% columns	1.92%	4.17%	
General	104	96	200
$\chi 2 = 2.65$; df = 3; p = 0.44			

Discussion

The restrictions associated with the COVID-19 pandemic adversely affected many elements of lifestyle, particularly during the lockdown. These were typically associated with reduced levels of physical activity in the majority of the population and a sedentary lifestyle. The ability to engage in physical activity also decreased in people with complications after COVID-19. Dyspnea has been reported as one of the most common complications after SARS-CoV-2 infection. The occurrence of dyspnoea is a factor that contributes to reduced health-related quality of life [17]. Studies indicate that up to 45% of people experience dyspnoea one year after discharge from hospital due to COVID-19 [18]. Dyspnea is observed in patients with severe acute COVID-19 infection as well as in patients with only mild infection. It is also one of the most common symptoms of post-COVID syndrome [19].

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Physical activity, on the other hand, is an important health promotion measure, as well as a factor that increases quality of life. In addition to its positive effects on cardiovascular and respiratory functions, it carries many benefits in terms of avoiding infectious diseases [20]. In the study group, dyspnoea occurred in most cases only during vigorous exercise. However, it was observed that as the frequency of COVID-19 increased, the feeling of dyspnoea also worsened [21].

The authors observed a trend towards increasing feelings of dyspnoea with a concomitant decrease in MET moderate physical activity scores. In the available literature on dyspnoea, even before the COVID-19 pandemic, it was found that subjective feelings of dyspnoea, as assessed by the MRC Dyspnoea Scale, were significantly higher in patients with low levels of physical activity [22]. In a multivariate model, dyspnoea is also considered one of the most important factors for physical activity limitation. It is important to note that physical rehabilitation is also an important intervention in patients with persistent symptoms after COVID-19, such as dyspnoea [23].

In our study, we found that the sensations of dyspnoea worsened with increasing age of the subjects. These results are in line with other studies by the authors [24] and with studies available in the literature in which age was positively correlated with Medical Research Council Dyspnoea Scale scores. Articles can also be found that state that dyspnoea-related symptoms in patients during the pandemic COVID-19 were largely independent of age [25].

Previous studies conducted prior to the COVID-19 pandemic in different countries of the world participating in the BOLD study showed significant differences in the prevalence of dyspnoea according to geographical location. At that time, it was recommended to confirm the cross-cultural validity of studies based on dyspnoea as an outcome [26].

In the study group, vaccination also had no effect on the level of dyspnea or physical activity. However, vaccination has been shown in the literature to significantly reduce disease burden and severity, independent of comorbidities [27]. The authors acknowledge several limitations in the study presented that need to be highlighted. The most important is the cross-sectional nature of the study. A second limitation was the use of the exclusively questionnaire – based, subjective Medical Research Council Dyspnoea Scale and International Physical Activity Questionnaire scales. A third limitation was the small sample size, preliminary findings and the online form of the survey conducted, in which the identity of the Polish respondents from both countries is unknown. Another limitation that the authors acknowledge might be a selection bias of people who accepted the invitation to participate, such as those with a high symptomatic burden, thus not representing the real dyspnea and activity in the general population. The authors' assumption was to investigate dyspnea levels during the COVID-19 pandemic rather than the direct impact of the SARS-CoV-2 virus on dyspnea levels The included respondents may have had additional comorbidities or illnesses exacerbated by their previous COVID-19 illness, which may have influenced their questionnaire responses.

The strengths of the study were the increased knowledge about dyspnoea and physical activity in the aftermath of

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the pandemic, as well as the easy access to the study group, the speed of the survey and its low cost. The authors believe that the standardised and validated survey instruments used are also a strength of the study. Future studies should be conducted on a much larger group of Poles living in different parts of the world, use more objective survey instruments, and be designed as a cohort study.

Conclusions

The prevalence of dyspnea may vary by geographic location and may also correlate with age, sex, or burden of chronic disease causing dyspnea. This correlation has become particularly topical in recent years. When COVID-19 became a leading cause of dyspnea among people worldwide. The authors set out to ascertain the degree of dyspnea in a sample of the Polish population living in geographically remote areas, citing the 2014 study BOLD, which employed the MRC scales, and recommendations on the validity of cross-cultural studies that rely on dyspnea as an outcome. The authors did not find any comparable reports of studies of dyspnea in samples of the same nation living in different geographical areas when they were designing this study. Therefore, the authors believe that the study fills a gap and makes it possible to extend it to other samples. Positive health behaviours, such as those related to physical activity, have still not recovered to pre-2020 levels-that is, before the prevalence of COVID -19. At the same time, negative health effects related to SARS-CoV-2 are being observed. The introduction of regular physical activity may have an impact on reducing the feeling of dyspnoea. It is also important to consider that dyspnea itself is also a factor in reducing physical activity, leading to a switch to a sedentary lifestyle.

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