Comparison of stress perceptions and coping strategies among students exposed to COVID-19 in countries with different approaches to anti-pandemic activities

ANDRIEJ SZPAKOW[1, A–G], ELŻBIETA KRAJEWSKA-KUŁAK[2, A–F], MATEUSZ CYBULSKI[2, A, D, G],
ORCID ID: 0000-0003-4340-5211   ORCID ID: 0000-0002-9425-2430   ORCID ID: 0000-0002-5116-3497

MAŁGORZATA ANDRYSZCZYK[3, A, B, E], EWA KLESZCZEWSKA[3, B], YELENA LOGINOVICH[4, D, E],
ORCID ID: 0000-0002-5201-2359   ORCID ID: 0000-0001-8163-1477

EMILIA KOLARZYK[5, B, D, F], KRYSTYNA KOWALCZUK[2, B, D, E], JAKUB OWOC[6, A, E, F]
ORCID ID: 0000-0001-8519-5764   ORCID ID: 0000-0001-5680-8859   ORCID ID: 0000-0003-4897-1896

[1] Department of Nursing, International Academy of Applied Sciences in Lomza, Lomza, Poland
[2] Department of Integrated Medical Care, Medical University of Bialystok, Bialystok, Poland
[3] Department of Health Care, Prof. Edward F. Szczepanik State Vocational College in Suwalki, Poland
[4] Institute of Biology System and Genetic Research, Lithuanian University of Health Science, Kaunas, Lithuania
[5] Department of Dietetics, Cracow Higher School of the Health Promotion, Cracow, Poland
[6] Department of Gerontology, Public Health and Didactics, National Institute of Geriatrics, Rheumatology and Rehabilitation, Warsaw, Poland

A – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

Summary **Background.** Assessing stress and ways of coping with it during the COVID-19 pandemic may serve to mitigate the negative effects associated with the course of the disease.
Objectives. The objective was to compare stress perception and coping strategies in students affected and those not affected by COVID-19 from neighbouring countries with diverse anti-pandemic policies.
Material and methods. A cross-sectional online survey was conducted among 4,983 students (1,464 males and 3,519 females) from four neighbouring countries between April and May 2022. Students from countries implementing similar restrictive measures to prevent COVID-19 infections were grouped together (Group I: 1,822 students from northeastern Poland, 232 from Lithuania and 1,896 from the Russian exclave of Kaliningrad). Group II consisted of 1,033 students from Belarus, where minimal restrictive actions were implemented. The study assessed stress levels and coping strategies in students who had recovered from COVID-19. Standard questionnaires (Perceived Stress Scale-10 and Coping Orientations to Problems Experienced) were used for data collection.
Results. The COVID-19 incidence rate was lower among students in Group I compared to Group II, with rates of 34.2% and 39.7%, respectively. Additionally, the vaccination rate of 71.7% was higher in Group I than the 39.1% in Group II. Anti-pandemic policy-wise, the study showed that participants from Belarus were significantly more likely to try to "escape reality" and less actively engaging in stress coping activities. They had higher rates of helplessness and problem avoidance.
Conclusions. The study provides a starting point for further transnational research aimed at assessing the mental health of students and developing optimal actions for public health in populations affected by COVID-19.
Key words: students, coping skills, COVID-19, patients.

Background

Specific symptoms of COVID-19, such as fever, cough, fatigue, loss of smell and taste or symptoms of respiratory distress syndrome are usually found in adults [1] and much less frequently in young adults [2]. Nevertheless, its high infectiousness and potential to be life-threatening make it a significant issue for individuals of all ages [3]. Recent studies on the COVID-19 pandemic suggest that experiences of uncertainty, fear of infection and disease, self-isolation, quarantine or lack of physical activity are highly stress-inducing factors [4], triggering psychological reactions in people similar to those observed in other extreme situations [5]. Despite significant efforts to control the situation and the pandemic fading away, the virus is still present in many countries, manifesting via various clinical symptoms.

The spread of the disease has created an environment in which multiple factors with a potential impact on mental health indicators occur simultaneously. These include: (1) an unprecedented and potentially life-threatening situation of unknown duration; (2) widespread restrictive measures and a decrease in the "psychological flexibility of the population"; (3) the possibility of asymptomatic transmission of the virus; (4) an unstable information background with an excess of conflicting information; (5) uncertainty related to COVID-19 treatment; and (6) an unresolved situation regarding vaccinations [6]. The COVID-19 pandemic has caused a parallel epidemic of mental health disorders, both during the course of the disease and during recovery [7]. The current stressful situation, its significance and the overall scale of post-COVID consequences necessitate changes in a person's daily life and may lead to a cumulative negative effect of stress [8].

It is widely accepted that health, well-being and the social mood of students reflect the level of prosperity, social stability and life satisfaction in society [9]. Due to the ongoing COVID-19 pandemic, with a inconstant and unpredictable course, and the fact that young students (especially females) are among the vulnerable demographic groups [10], it is essential to study coping strategies for the disease in order to provide necessary psychological assistance to infected individuals, those at risk of infection, as well as those who have recovered from the illness [11].

Efforts are being made worldwide to prevent and reduce the incidence of COVID-19 [12]. The restrictions and lockdowns in many countries have had a considerable impact on the mental state of the entire population, particularly young people [13], and some authors have described it as the largest psychological experiment conducted to date [14]. While transmission, symptom occurrence and mortality rates are lower among young people, they have been more severely affected by the strict measures necessary to limit the spread of the virus. These measures include the closure of universities, quarantine and self-isolation, social distancing, a significant reduction in physical activity, border closures and travel restrictions [15].

Poland, Lithuania and the Russian Kaliningrad Region have undergone multiple lockdowns and other restrictive pandemic measures. Belarus, on the other hand, is one of the few European countries that did not go into any lockdowns. It did not implement quarantines and continued with a "business as usual" policy without closing borders, businesses, restaurants, museums, schools or universities. The population was just warned about the need to adhere to certain safety measures in order to minimise panic, reduce anxiety and limit the psychological burden on society rather than implementing a substantial virus-containment strategy. As social distancing measures were not strictly enforced, it was up to individuals to decide whether and how they would change their behavioural patterns. The restrictions introduced in Belarus were very mild compared to neighbouring countries. Therefore, Belarusians experienced a polarisation of attitudes ranging from panic to complete denial [16].

A comparative study on coping with stress in populations from closely located cities in neighbouring countries may prove useful for selecting optimal public health actions [17]. The Kaliningrad region of Russia, Lithuania, north-eastern Poland and Belarus are suitable geographic comparators as they share a common history, culture, religion and even policies related to public health and medical care. The neighbouring Belarus was included in this study due to the different, much milder anti-pandemic measures, which provides even more comprehensive insights.

Objectives

The overarching objective was to compare stress perception and coping strategies in students affected and those not affected by COVID-19 from neighbouring countries with diverse anti-pandemic policies.

Material and methods

Sampling

The inclusion criteria were: being a student at a university in Kaliningrad (RU), Lithuania (LT), Poland (PL) or Belarus (BY); being over 18 years of age and having the ability to read the survey in one of the five languages (Russian, Polish, Lithuanian, English or Belarusian). In case of possible infection, it was confirmed with a RT-PCR test and through pathognomonic symptoms. There were no significant differences found in the incidence of COVID-19 among respondents in Poland, Lithuania and the Kaliningrad region, and thus, the group was considered homogenous (Group I). Respondents from Belarus were identified as a distinct group (Group II). The dividing factors were membership in Group I or II, healthy – COVID-19 survivors, disease severity and gender.

Procedure

This study is based on an online cross-sectional survey conducted between April and May 2022. The survey included 4,983 university students from Northeastern Poland (1,822), Lithuania (232), the Russian exclave of Kaliningrad (1896) (these countries used similar restrictive measures to combat infections during the pandemic) and Belarus (1,033) (the country's anti-pandemic strategy differed significantly and included minimal restrictive measures). The invitation to participate in the online survey (via Google Forms) was distributed through targeted advertising, including e-learning platforms (Moodle), Skype, Microsoft Teams and university social networks. These resources were available to students and widely used for teaching during the COVID-19 pandemic. Two subgroups were selected for further research using a clinical questionnaire and laboratory-confirmed RT-PCR tests: individuals with varying degrees of SARS-CoV-2 infection and survivors – 1,760 (35.3%) and 3,223 (64.7%) students who remained healthy.

Study instrument

The questionnaire assumed that the COVID-19 pandemic and its consequences were main stressors affecting daily life. Participants were asked to self-assess their stress levels over the past month using standardised language versions of the Perceived Stress Scale (PSS-10) questionnaire [18]. The subjective perception of life (based on 10 questions) was rated on a 5-point scale, with higher scores indicating greater stress. The overall score characterised the degree of perceived stress, ranging from low stress (0–13 points) through moderate stress (14–26 points) to high stress (27–40 points) [19]. The internal consistency of the questionnaire was measured using Cronbach's alpha, which yielded a value of $\alpha = 0.701$.

Preferences for coping strategies were assessed using the mini-questionnaire COPE (The Coping Orientations to Problems Experienced) [20]. Coping strategies (14 in total) were evaluated using the abbreviated version Brief COPE – Mini COPE (28 questions) recommended in 1997 [21]. Using coping strategies among participants ranged from 0 (not using) to 3 (using most frequently) for each strategy. All responses were grouped into three main coping strategies: active coping, coping through avoiding and problem-focused and emotional-focused coping [22]. The Cronbach's alpha coefficient was calculated as $\alpha = 0.796$.

Statistical analyses

Statistical analyses were carried out using the STATISTICA software package ver. 13.0. Distribution of the quantitative data appeared to diverge from the normal pattern. Therefore, methods of nonparametric and parametric statistics were used. The mean (M) and standard deviation (SD) was calculated for dependent variables that follow the normal distribution. A comparative analysis was conducted between a group of individuals who had recovered from COVID-19 and a healthy control group. The independent samples t-Test and the nonparametric Mann-Whitney U test were used for continuous variables. Frequencies and percentages were used for qualitative variables, and categorical data was compared using the Pearson χ^2 test. For all of the analyses, p-values < 0.05 were considered statistically significant.

Ethics statement

The study received permissions from all participating universities and relevant ethics committees to conduct anonymous surveys of students. General ethical permission for the study was granted by the Bioethical Review Board at the Medical University of Bialystok, Poland, and registered under APK. 002. 1932. 2022.

Results

All data was analysed according to the following factors: age, gender, disease severity and vaccination history. These were considered *a-priori* to potentially influence anti-pandemic actions. The age of the student participants ranged from 18 to 25 years (mean age 20.5 ± 2.38). No differences between age were observed with regard to disease occurrence. There were no substantial quantitative differences in the incidence of illness among students in the three countries (PL, LT, RU). These respondents were thus treated as a single population group regardless of their nationality (Group I). The incidence of CO-VID-19 in Group I was significantly lower than among the respondents from Belarus (Group II) (Table 1).

The percentage of vaccinated individuals in Group II was almost half of that of Group I (39.1% vs 71.7%). This difference was also similar among the COVID-19 survivors (39.5% vs 72.0%). Among the 141 individuals who experienced a severe course of the disease (hospitalisation and supplemental oxygen), no significant differences were found between Group I and II depending on the degree of disease progression. The percentage of severe cases did not exceed 8.0% in both groups. While the percentage of patients with a severe course of the disease was approximately the same in the individual groups, the number of patients with moderate disease progression was significantly higher in Group II (70.2% vs 46.1% in Group I, χ^2 = 73.1; $p_{I-II} < 0.001$).

The ratio of males and females in Groups I and II and subgroups reflected those at university faculties in the region. Females constituted the majority of the sample (3,519–70.6%), also displaying a higher prevalence of COVID-19. The total number of respondents with a history of COVID-19 was 415 (28.3%) males and 1,345 (38.2%) females. Among female patients, 8.7% of cases (117) had a severe form of the disease, while among male patients, this number was 5.8% (24) ($p < 0.05$).

We also analysed the clinical symptoms of COVID-19 infection in relation to severity of the disease in groups and subgroups (Table 2).

No significant differences in symptom frequency were observed between Groups I and II, except for headaches, indicating a similar symptom profile. All COVID-19 patients, except those asymptomatic, experienced four or more symptoms. The correlation between symptom severity (smell or taste reduction, high fever, wheezing, cough, fatigue and headache) and disease severity was moderate to weak ($r = 0.20$–0.30, $p < 0.05$). The correlation between the leading symptoms and disease severity was high. Disease severity was most commonly linked to impaired sense of smell and taste, fever, wheezing, headache, fatigue and cough, either individually or in combination. The presence of these symptoms in combination significantly worsened the course of the disease ($r = 0.50$, $p < 0.01$).

Out of 4,983 participants surveyed with the PSS-10, 15.3% reported high levels of stress, 75.7% reported moderate levels, and 9.3% reported low levels. The presence of illness did not significantly affect these proportions. The mean PSS-10 score for stress intensity was significantly higher in Group I (21.0 ± 6.21) than in Group II (18.1 ± 5.87) ($p < 0.001$, *t*-Test and Mann-Whitney U test). High levels of stress were more common in respondents who had COVID-19 (21.0 ± 6.21 vs 20.0 ± 6.24, $p < 0.001$). There were also significant gender differences with affected males scoring 19.7 ± 6.63 and affected females scoring 21.4 ± 6.05 ($p < 0.001$). Meanwhile, healthy males scored 18.4 ± 6.42 and healthy females scored 20.8 ± 5.98 ($p < 0.001$). This suggests that being female increases the risk of experiencing stress. Table 3 presents the distribution of respondents according to the degree of stress categorised by the Perceived Stress Scale (PSS-10).

Table 1. Percentage of healthy individuals and those classified as having an illness, depending on the country and groups with different anti-pandemic approaches [n (%)]

Country	Have not had CO-VID-19 infection	Recovered from COVID-19 infection	χ^2 (Pearson's chi-squared test), p	Severe course	Vaccinated
Poland (PL) ($n = 1822$)	1222 (67.1)	600 (32.9)	$\chi^2 = 2.2$; $p_{PL-RU} > 0.1$; $\chi^2 = 0.5$; $p_{PL-LT} > 0.1$; $\chi^2 = 0.1$; $p_{LT-RU} > 0.1$	60 (10.0)	1191 (65.4)
Kaliningrad (RU) ($n = 1896$)	1228 (64.8)	668 (35.2)		40 (6.0)	1502 (79.2)
Lithuania (LT) ($n = 232$)	150 (64.7)	82 (35.3)		8 (9.8)	140 (60.3)
PL + RU + LT Group I (I) ($n = 3950$)	2600 (65.8)	1350 (34.2)	$\chi^2 = 10.9$; $p_{I-II} < 0.001$*	108 (8.0)	2833 (71.7)
Belarus Group II (BY) ($n = 1033$)	623 (60.3)	410 (39.7)		33 (8.0)	404 (39.1)
Total ($n = 4983$)	3223 (64.7)	1760 (35.3)		141 (8.0)	3237 (65.0)

Table 2. Characteristics and frequency of COVID-19 symptoms in infected individuals [n (%)]

Symptoms	Pl	RU	LT	Group I (Pl + RU + LT)	Group II (BY)	Total	χ^2 (p)
Smell reduction	439 (73.2)	471 (70.5)	46 (56.1)	956 (70.8)	297 (72.4)	1253 (71.2)	0.4 ($p_{I-II} > 0.1$)
Fatigue	390 (65.0)	465 (69.6)	29 (35.4)	884 (65.5)	275 (67.1)	1159 (65.9)	0.3 ($p_{I-II} > 0.1$)
Cough	395 (65.8)	403 (60.3)	49 (59.8)	847 (62.7)	261 (63.7)	1108 (63.0)	0.1 ($p_{I-II} > 0.1$)
High temperature	350 (58.3)	407 (60.9)	65 (79.3)	822 (60.9)	267 (65.1)	1089 (61.9)	2.4 ($p_{I-II} > 0.5$)
Headache	352 (58.7)	423 (63.3)	39 (47.6)	814 (60.3)	220 (53.7)	1034 (58.8)	5.7 ($p_{I-II} < 0.05$)
Taste reduction	326 (54.3)	412 (61.7)	48 (58.5)	786 (58.2)	244 (59.5)	1030 (58.5)	0.6 ($p_{I-II} > 0.1$)
Wheezing	281 (46.8)	296 (44.3)	43 (52.4)	620 (45.9)	192 (46.8)	812 (46.1)	0.1 ($p_{I-II} > 0.1$)
Sore throat	266 (44.3)	294 (44.0)	33 (40.2)	593 (43.9)	183 (44.6)	776 (44.1)	0.1 ($p_{I-II} > 0.1$)
Redness or irritation of the eyes	57 (9.5)	65 (12.7)	15 (18.3)	157 (11.6)	58 (14.2)	215 (12.2)	1.9 ($p_{I-II} > 0.1$)
Diarrhoea	60 (10.0)	62 (9.3)	1 (1.2)	123 (9.1)	33 (8.0)	156 (8.9)	0.6 ($p_{I-II} > 0.1$)
Rash or discolouration of the skin on the fingers	25 (4.2)	28 (4.2)	2 (2.4)	55 (4.1)	20 (4.9)	75 (4.3)	0.5 ($p_{I-II} > 0.1$)
Six most frequent symptoms	138 (23.0)	179 (26.8)	7 (8.5)	324 (24.0)	100 (24.4)	424 (24.1)	0.5 ($p_{I-II} > 0.1$)

Table 3. Level of stress (PSS-10) among healthy and recovered respondents (by Group I, Group II and gender)

Perceived stress level (PSS-10)		Status [n (%)]		$\chi^2 p^*$
		Healthy (1)	COVID-19 patients (2)	
Low	Group I	207 (8.0)	89 (6.6)	$\chi^2 = 70.0$; $p_{I–II} < 0.001$
		296 (7.5) $\chi^2 = 2.4$; $p_{1–2} > 0.1^*$		
	Male	109 (12.4)	35 (10.4)	
	Female	98 (5.7)	54 (5.3)	
	Group II	104 (16.7)	61 (14.9)	
		165 (16.0) $\chi^2 = 0.6$; $p_{1–2} > 0.1^*$		
	Male	41 (23.8)	19 (23.8)	
	Female	63 (14.0)	42 (12.7)	
	Total	311 (9.6)	150 (8.5)	
Moderate	Group I	1971 (75.8)	1001 (74.1)	$\chi^2 = 2.4$; $p_{I–II} > 0.1$
		2972 (75.2); $\chi^2 = 1.3$; $p_{1–2} > 0.1^*$		
	Male	682 (77.8)	255 (76.1)	
	Female	1289 (74.8)	746 (73.5)	
	Group II	489 (78.5)	312 (76.1)	
		801 (77.5); $\chi^2 = 0.8$; $p_{1–2} > 0.1^*$		
	Male	128 (74.4)	52 (65.0)	
	Female	361 (80.0)	260 (78.8)	
	Total	2460 (76.3)	1313 (74.6)	
High	Group I	422 (16.2)	260 (19.3)	$\chi^2 = 73.3$; $p_{I–II} < 0.001$
		682 (17.3); $\chi^2 = 5.5$; $p_{1–2} < 0.05^*$		
	Male	86 (9.8)	45 (13.4)	
	Female	336 (19.5)	215 (21.2)	
	Group II	30 (4.8)	37 (9.0)	
		67 (6.5); $\chi^2 = 7.2$; $p_{1–2} < 0.01^*$		
	Male	3 (1.7)	9 (11.3)	
	Female	27 (6.0)	28 (8.5)	
	Total	452 (14.0)	297 (16.9)	

* Chi-square value for differences between status (subgroup 1, 2) and groups I and II.

Table 4. Coping strategies among the students according to COVID-19 exposure and gender (M ± SD)

Strategies of coping with stress (mini-COPE subscale)	Group	Healthy		COVID-19 patients		U Mann-Whitney Test, (for groups I and II), Z, p
		Male	Female	Male	Female	
1. Active coping	I	2.07 ± 0.74	2.09 ± 0.66	2.09 ± 0.77	2.07 ± 0.70	6.52, < 0.001
		2.07 ± 0.75		2.08 ± 0.68		6.05; < 0.001[+]
	II	1.77 ± 0.82	1.81 ± 0.73	1.96 ± 0.80	1.95 ± 0.75	2.93; < 0.001[++]
		1.79 ± 0.76		1.95 ± 0.76**		
2. Planning	I	1.96 ± 0.78	1.98 ± 0.70	1.96 ± 0.78	1.98 ± 0.69	5.0, < 0.001
		1.96 ± 0.78		1.98 ± 0.70		4.94; < 0.001[+]
	II	1.69 ± 0.87	1.81 ± 0.79	1.89 ± 0.79	1.88 ± 0.74	1.84; > 0.05[++]
		1.78 ± 0.82		1.88 ± 0.75*		
3. Positive reframing	I	1.64 ± 0.82	1.70 ± 0.79	1.67 ± 0.81	1.69 ± 0.81	-1.61, > 0.1
		1.65 ± 0.82		1.69 ± 0.80		0.61; > 0.1[+]
	II	1.55 ± 0.89	1.75 ± 0.85*	1.75 ± 0.78	1.77 ± 0.80	-1.77; > 0.05[++]
		1.69 ± 0.86		1.76 ± 0.80		
4. Acceptance	I	1.66 ± 0.80	1.73 ± 0.71*	1.76 ± 0.76	1.76 ± 0.72	4.09, < 0.001
		1.69 ± 0.79		1.74 ± 0.71*		3.72; < 0.001[+]
	II	1.47 ± 0.84	1.61 ± 0.77	1.60 ± 0.81	1.68 ± 0.77	2.09; < 0.001[++]
		1.57 ± 0.79		1.66 ± 0.78		
5. Humour	I	1.51 ± 0.91	1.27 ± 0.90*	1.65 ± 0.92	1.31 ± 0.91*	7.81, < 0.001
		1.55 ± 0.91		1.28 ± 0.90**		-5.22; < 0.001[+]
	II	1.60 ± 0.93	1.55 ± 0.91	1.83 ± 0.92	1.65 ± 0.83	-5.77; < 0.001[++]
		1.56 ± 0.92		1.68 ± 0.85**		

Strategies of coping with stress (mini-COPE subscale)	Group	Healthy		COVID-19 patients		U Mann-Whitney Test, (for groups I and II), Z, p
		Male	Female	Male	Female	
6. Religion	I	0.60 ± 0.85	0,79 ± 0.71*	0.59 ± 0.82	0.90 ± 0.97*	-4.47, < 0.001 -3.39; < 0.001[+] -2.69; < 0.001[++]
		0.60 ± 0.84		0.83 ± 0.94**		
	II	0.75 ± 0.84	0.88 ± 0.91	0.80 ± 0.88	1.09 ± 0.96*	
		0.85 ± 0.90		0.99 ± 0.94**		
7. Use of emotional support	I	1.63 ± 0.87	1.96 ± 0.80*	1.67 ± 0.87	1.92 ± 0.80*	0.46, > 0.1 1.74; > 0.05[+] -1.35; > 0.1[++]
		1.64 ± 0.87		1.95 ± 0.80*		
	II	1.54 ± 0.83	1.87 ± 0.85*	1.76 ± 0.75	0.97 ± 0.81*	
		1.78 ± 0.86		1.93 ± 0.80*		
8. Use of instrumental support	I	1,49 ± 0.82	1.82 ± 0.77	1.51 ± 0.88	1.80 ± 0.79*	0.36, > 0.1 1.60; > 0.1[+] -1.25; > 0.1[++]
		1.49 ± 0.83		1.81 ± 0.78*		
	II	1.42 ± 0.81	1.73 ± 0.82*	1.59 ± 0.75	1.83 ± 0.79*	
		1.65 ± 0.83		1.79 ± 0.79*		
9. Self-distraction	I	0.97 ± 0.66	1,07 ± 0.65*	1.02 ± 0.70	1.13 ± 0.67*	-16.0, < 0.001 -12.38; < 0.001[+] -9.92; < 0.001[++]
		0.99 ± 0.67		1.09 ± 0.66*		
	II	1.26 ± 0.79	1.52 ± 0.76*	1.34 ± 0.74	1.55 ± 0.75*	
		1.45 ± 0.78		1.51 ± 0.75		
10. Denial	I	0.58 ± 0.69	0.73 ± 0.71*	0.62 ± 0.73	0.78 ± 0.76*	-12.0, < 0.001 -9.76; < 0.001[+] -6.86; < 0.001[++]
		0.59 ± 0.70		0.75 ± 0.73*		
	II	0.88 ± 0.81	1.05 ± 0.75*	0.97 ± 0.80	1.06 ± 0.81	
		1.0 ± 0.77		1.04 ± 0.81		
11. Venting	I	1,19 ± 0.71	1,45 ± 0.70	1.31 ± 0.73	1.49 ± 0.71*	-2.19, < 0.001 -1.91; > 0.05[+] -0.85; > 0.05[++]
		1.23 ± 0.71		1.46 ± 0.70*		
	II	1.19 ± 0.70	1.49 ± 0.69*	1.34 ± 0.65	1.50 ± 0.69	
		1.41 ± 0.70		1.47 ± 0.68		
12. Substance use	I	0,39 ± 0.70	0.36 ± 0.64	0.43 ± 0.71	0.44 ± 0.69	-5.71, < 0.001 -4.83; < 0.001[+] -2.88; < 0.001[++]
		0.40 ± 0.70		0.39 ± 0.66		
	II	0.60 ± 0.77	0.50 ± 0.73	0.58 ± 0.78	0.57 ± 0.79	
		0.53 ± 0.74		0.57 ± 0.79		
13. Behavioural disengagement	I	0.59 ± 0.65	0.67 ± 0.63*	0.61 ± 0.67	0.72 ± 0.66*	-7.66, < 0.001 -6.36; < 0.001[+] -4.15; < 0.001[++]
		0.59 ± 0.66		0.69 ± 0.65*		
	II	0.78 ± 0.68	0.86 ± 0.70	0.79 ± 0.72	0.87 ± 0.79	
		0.84 ± 0.69		0.85 ± 0.70		
14. Self-blame	I	1.24 ± 0.86	1.24 ± 0.87	1.30 ± 0.90	1.33 ± 0.89	-1.54, > 0.1 -1.50; > 0.1[+] -.039; > 0.1[++]
		1.25 ± 0.87		1.27 ± 0.88		
	II	1.22 ± 0.83	1.30 ± 0.86	1.41 ± 0.79	1.32 ± 0.90	
		1.28 ± 0.85		1.34 ± 0.88		
Active coping	I	1.89 ± 0.64	1.92 ± 0.58	1.91 ± 0.64	1.91 ± 0.59	3.25, < 0.001 3.58; < 0.001[+] 0.75; > 0.1[++]
		1.89 ± 0.64		1.92 ± 0.58		
	II	1.67 ± 0.78	1.82 ± 0.70*	1.87 ± 0.68	1.86 ± 0.68	
		1.78 ± 0.72		1.86 ± 0.68		
Helplessness	I	0.74 ± 0.56	0.76 ± 0.55	0.78 ± 0.58	0.83 ± 0.56	-6.16, < 0.001 -5.37; < 0.001[+] -2.92; < 0.001[++]
		0.75 ± 0.56		0.78 ± 0.55		
	II	0.87 ± 0.59	0.89 ± 0.60	0.93 ± 0.56	0.92 ± 0.64	
		0.88 ± 0.59		0.92 ± 0.63		
Seeking support	I	1.56 ± 0.79	1.89 ± 0.73*	1.59 ± 0.82	1.86 ± 0.73*	0.57, > 0.1 1.94; > 0.05[+] -1.38; > 0.1[++]
		1.57 ± 0.80		1.88 ± 0.73*		
	II	1.48 ± 0.77	1.80 ± 0.78*	1.68 ± 0.69	1.90 ± 0.75	
		1.71 ± 0.79		1.86 ± 0.75*		
Avoidance coping	I	0.92 ± 0.54	1.08 ± 0.50*	0.98 ± 0.57	1.13 ± 0.53*	-14.01, < 0.001 -11.1; < 0.001[+] -8.19; < 0.001[++]
		0.93 ± 0.55*		1.10 ± 0.51*		
	II	1.11 ± 0.63	1.35 ± 0.58*	1.22 ± 0.58	1.37 ± 0.56*	
		1.29 ± 0.60		1.34 ± 0.56		

Table 4. Coping strategies among the students according to COVID-19 exposure and gender (M ± SD)

M – mean value, SD – standard deviation, *differences between males or between females from subgroups (healthy and COVID-19 patients) are significant (p < 0.05); test probability value calculated using t-Test, **significant differences between subgroups of respondents: healthy and COVID-19 patients, [+]differences between students from group I and II (healthy), [++]differences between students from group I and II (exposed to COVID-19).

In Belarus, where less strict anti-pandemic measures were implemented, high stress levels were less common among both healthy and convalescent individuals, with less gender-related differences. However, female students in Group I experienced significantly more stress than males. Coping strategies were ranked to better specify stress scenarios.

Active coping strategies were the most frequently used scenarios in Groups I and II, with no significant differences between genders. In addition to problem-solving strategies, the most commonly used coping strategies in both groups (I and II) were positive reframing, acceptance, planning, active coping strategies and humour.

Psychoactive substances were rarely used by respondents in Groups I and II, with higher rates among students who had experienced illness, particularly females. Among females who had recovered from illness, there was a stronger tendency toward religion. The choice of active coping strategies among non-ill and ill individuals was similar not only across countries but also across genders. Females had a broader selection of coping strategies than males, particularly in terms of their focus on emotions and expressing feelings (Table 4).

The risk of infection and disease often activated coping strategies related to active functioning. Males, unlike females, avoided seeking instrumental social support, help or information. Notably, participants who turned to religion and denied negative feelings associated with the illness coped better in the case of a severe course of illness.

Discussion

Stress is a prevalent phenomenon worldwide, and its levels typically increase during extraordinary situations such as the COVID-19 pandemic [22]. Our study focused on male and female students from neighbouring countries along the eastern border of the European Union, aiming to identify stress factors and coping mechanisms in relation to COVID-19, its severity and national anti-pandemic strategies.

We selected the student population as the study group because their physical and mental health status, social mood and overall well-being reflect the level of prosperity, social stability and satisfaction with life in society [23]. Students are a unique and distinct group with a sense of in-group community and strict organisation [24]. The rigidity and disproportionality of anti-pandemic actions have significantly affected them in comparison to different age- and social-groups. Interestingly, the first student mental health studies during COVID-19 were conducted in the early weeks of the pandemic in China. The results suggested a considerable impact on the mental health of students. Those affected by the disease presented symptoms of disorders similar to those seen after traumatic stress [25].

We selected the region on the eastern border of the European Union where several countries converge with almost identical populations of youth in closely located university cities [26] and differing anti-pandemic measures taken by the governments. As there were no differences in prevalence of COVID-19 between three countries (Poland, Lithuania, Russia), we were able to group these respondents into one cohort. The less restrictive policy in Belarus resulted in higher incidence and significantly lower vaccination rate.

The results indicate two implications for mental health indicators among students. First of all, there is a clear negative impact of COVID-19 on mental health manifested via high stress levels. Interestingly, the level of stress was significantly higher among students from countries implementing restrictive anti-pandemic measures and among respondents who have had the disease.

Another implication refers to the use of active coping mechanisms that may be dynamic and change as people interact with their environment. Our research confirms a high degree of anti-stress adaptation among students during the COVID-19 pandemic. Adaptive coping is a protective factor for students' mental health and can buffer against the negative impact of COVID-19-related stressors. The pandemic and relevant restrictive measures contributed to accepting the reality and evaluating the problem's significance. Our findings indicate that the level of stress among students was high compared to other countries. For example, in Sweden, less than half of the population suffered from stress [27]. The level of stress was highest in the early waves of the pandemic but gradually decreased, possibly due to people's adaptation to the circumstances. According to our research, 16.2% and 4.8% of students unaffected by COVID-19 also reported high levels of stress. Students who recovered from the virus had even higher levels of stress, 19.3% and 9.0%, respectively. This can be attributed to the additional and genuine fear from infection.

As the disease progressed, the incidence of high stress increased from 14.7% to 30.6% in Group I, while in Group II it remained around 10%.

Unlike early COVID-related studies [28], we evaluated long-term outcomes throughout the pandemic, providing a detailed characterisation of the situation by gender. The prevalence of high stress levels was higher in females (20.1%) than in males (10.8%, $p < 0.001$) for both groups and did not depend on the severity of the disease. The study from Turkey confirmed that nearly half of the participants experienced anxiety and high levels of stress [29], with females more often at risk.

A significant proportion of COVID-19 patients reported symptoms of psychological distress. The coping mechanisms depend on personal resources, social support, attitudes towards disease and severity of symptoms [30]. We believe that higher levels of stress among students compared to the general population may be related to their academic involvement and challenges, which is consistent with other studies [31]. The percentage of those affected by the disease with high levels of stress is comparable to rates found in recent studies [32].

Studies have consistently shown that stress levels are higher among female students [33]. Therefore, we believe that females are the vulnerable group in COVID-19, which should be accounted for in the treatment of post-COVID syndrome or in rehabilitation standards. The COVID-19 pandemic has not only increased the intensity of stress but has also influenced and diversified coping strategies for stress.

The study on 577 Polish students conducted during the pandemic showed that the most often used coping strategies included: acceptance, planning and seeking emotional support [34]. Respondents from our study focused on active coping strategies and positive reframing regardless of their attitude towards the disease. This included problem-focused coping and seeking instrumental support (i.e. seeking and receiving advice and help from others).

No significant differences were found in the choice of active coping strategies according to gender. The measures implemented during quarantine, the severity of illness and insufficient information about the epidemic situation influenced the choice of coping strategies: health students more often chose active coping and planning. Respondents who had experienced coronavirus infection differed in their actions and more often turned to avoidant strategies, less often planning their actions. This trend is likely to be caused by the asthenic syndrome that involves chronic and rapid fatigue. Additionally, both groups typically exhibited depressive moods, loss of energy and decreased interests.

Another notable aspect is that convalescents displayed maladaptive behaviours resulting from distress, most likely caused by lack of understanding their future actions [35]. A statistically significant difference was found for the strategy of engaging in other activities to avoid thinking about unpleasant situations. This was more frequent among COVID-19 survivors. They accepted reality but more often turned to substance abuse to

cope with the situation. In addition to problem-solving activities, the most commonly used coping strategies in both groups (I and II) were positive reframing and personal growth (attempting to think positively about stressful situations), acceptance, planning, active coping strategies and a use of humour.

We observed the following gender-related differences in coping strategies: females tended to use emotion-focused coping, focused on negative experiences and withdrew themselves psychologically and behaviourally. The interaction of gender and distress determined specific coping traits in females: they sought not only emotional support but also instrumental support, such as advice, help and information on coping with difficulties. Females who had not been affected by the disease found it harder to accept the situation and denied the reality of the pandemic. Meanwhile, males tended to divert their attention from negative thoughts and used physical activity as a positive coping mechanism. Males were also less likely to seek instrumental and emotional social support.

Limitations of the study

This study has some limitations that are typical for online surveys. We should be careful when comparing our findings to previous research. The results are also limited to students and may not be applied to other age groups or the general population. We collected data using self-reported questionnaires that are commonly used; however, they may not provide a complete picture of mental health. It is also important to note that professional and accurate assessment of mental disorders can only be done by professional psychologists or psychotherapists. Finally, it is important to note that the study captures a relatively narrow time window, which may not apply to other, possibly longer waves of the pandemic.

Conclusions

The results emphasise the need for designing preventative and intervention programmes aimed at reducing the negative consequences of COVID-19. There is a need to inform populations about available resources and practical methods of coping with emerging problems and the ongoing stress associated with COVID-19. As pandemics disrupt the functioning of communities worldwide, further research and a deep understanding of effective coping strategies are crucial for mitigating the short- and long-term impact on the mental health of young people. This study may be a starting point for further cross-border studies aimed at assessing the physical and mental health not only of students but also of other social groups.

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Address for correspondence:
Andriej Szpakow, MD, PhD
23A Waszyngtona St 11
15-304 Bialystok
Poland
Tel.: +48 735818355
E-mail: shpakofff@tut.by