Pol. J. Sport Tourism **2025**, *32(3), 17-25*
DOI: 10.2478/pjst-2026-0003

Original research papers

EXAMINING THE EFFECTS OF THE COVID-19 PANDEMIC ON LIFESTYLE AND PERCEIVED HEALTH AMONG INFECTED AND NON-INFECTED HUNGARIAN ADULTS

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Abstract
Introduction. The COVID-19 pandemic disrupted daily routines, physical activity patterns, and mental health on a global scale. Mental health and subjective physical health are closely interrelated: pandemic-induced stress, social isolation, and fear have documented negative effects on both psychological and physical well-being. The objective of this study was to examine differences in lifestyle changes and perceived health – both general and mental – between Hungarian adults who had been infected with COVID-19 and those who had not, and to identify associations among key health-related indicators within both groups. ***Material and Methods.*** A cross-sectional survey with retrospective comparison was conducted between January and August 2023 among 806 Hungarian adults recruited via convenience sampling through five universities. A validated five-part questionnaire battery was administered, covering socio-demographic characteristics, recreational habits, life satisfaction (SWLS; LSS-SF), psychological distress (DASS-42), psychological well-being (Ryff Scale – Shortest Version), and psychological capital (PCQ). The analysed sample comprised n = 780 participants (49.2% male, 50.8% female; 50% infected, 50% non-infected). Data were analysed using SPSS 26, applying descriptive statistics and Pearson correlation analysis, with a significance threshold of alpha = 0.05. ***Results.*** The majority of respondents rated their general health as good or excellent regardless of infection status (infected: 83.7%; non-infected: 87.7%). A strong positive correlation was found between general health perception and mental health ($r = 0.649$, $p < .001$). Lifestyle changes were reported by more than three-quarters of participants in both groups, with reduced sport participation and limited social contact as the most affected domains. Significant group differences between infected and non-infected participants were observed in several lifestyle categories. ***Conclusions.*** COVID-19 infection was associated with specific differences in lifestyle and health perception. Subjective health remained generally positive across both groups. The findings underline the need for integrated health promotion strategies – addressing physical activity, social engagement, and mental health simultaneously – in the post-pandemic recovery of the Hungarian adult population.

Keywords: COVID-19, lifestyle changes, physical activity, subjective health, psychological well-being

Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, represents one of the most far-reaching public health crises in recent history. Its consequences extended well beyond the direct clinical burden of the disease, reshaping the social, economic, and behavioural fabric of everyday life across the globe. In Hungary, the first confirmed cases were reported on 4 March 2020, and the government declared a state of emergency on 11 March 2020, introducing restrictions on public gatherings, competitive and recreational sports events, and international exchange programmes [1]. By July 2020, 4,293 confirmed cases had been registered nationally, although actual prevalence was considerably higher given the limited testing capacity at the time [2].

Pandemic-related restrictions had immediate consequences for physical activity and recreational behaviour. Access to sports facilities, parks, and organised leisure activities was either prohibited or severely curtailed, forcing large segments of the population into sedentary home-based routines. Internationally, significant reductions in physical activity were documented across multiple countries within weeks of lockdown implementation [3, 4, 5]. In Hungary, preliminary evidence from university student samples confirmed analogous patterns of lifestyle disruption, including reduced sport participation and increased internet use [6].

Alongside these behavioural disruptions, the mental health dimension of the pandemic emerged as a critical public health concern. The relationship between mental and physical health is well established and bidirectional: chronic psychological distress is associated with poorer immune function, increased susceptibility to illness, and slower recovery, while poor physical health is a recognised risk factor for depression and anxiety [7]. In the pandemic context, this relationship acquired particular urgency. Social isolation, bereavement, economic insecurity, and uncertainty about the future generated conditions for widespread psychological distress, with young people, women, and those in below-average health identified as particularly vulnerable subgroups in the Hungarian population [8].

Of particular relevance in the pandemic context is the role of leisure and recreational physical activity as a specific mediating domain between restrictions and well-being. Physical activity is not merely a health behaviour: it serves social, psychological,

and identity functions that are deeply embedded in everyday life. When access to sport facilities, recreational spaces, and organised leisure is abruptly curtailed, the consequences extend beyond reduced fitness – social networks weaken, stress-regulation routines are disrupted, and the sense of temporal structure that leisure provides is lost [9, 10]. In Hungary, sport participation and outdoor recreation represent a central component of the lifestyle of younger adults, making this domain particularly sensitive to pandemic-related disruption. Examining how infection status moderated these effects is therefore not only a clinical question but a leisure science and public health question of considerable practical importance.

A relatively underexplored question in the Hungarian literature is whether individuals who actually contracted COVID-19 differed systematically from those who avoided infection in their subjective health perceptions and reported lifestyle changes. This distinction has practical relevance: those with direct illness experience may have developed different health trajectories, activity patterns, and post-pandemic health behaviours compared to those who remained uninfected. Addressing this question can inform targeted health promotion and rehabilitation strategies.

The present study was conducted within an international research framework initiated by the World Leisure Organization (WLO), in which the Hungarian component was carried out by a consortium of five universities and supported by a TEKA grant of the Hungarian University of Physical Education. It presents partial results of an ongoing nationwide data collection project.

The objective of this study was to examine differences in lifestyle changes and perceived health (general and mental) between COVID-19-infected and non-infected Hungarian adults, and to identify associations among health-related indicators within both groups. The following hypotheses were formulated:

H1: Infected participants will report significantly more negative changes in lifestyle – particularly in physical activity and social contact – compared to non-infected participants.

H2: General perceived health will show a significant positive correlation with mental health and a significant positive correlation with the presence of health problems, regardless of infection status.

H3: The proportion of participants characterising their current post-pandemic lifestyle as active or health-conscious will be higher among those who experienced infection, reflecting a post-illness motivational shift.

Material and Methods

Study design and ethical approval

This study employed a cross-sectional survey design with retrospective comparison. Participants were asked to report and compare their lifestyle and health status across two time periods: before the COVID-19 pandemic and during the pandemic. Data collection took place between January and August 2023, after the acute phase of the pandemic in Hungary had concluded. This temporal placement allowed for the inclusion of both infection-related and restriction-related effects, while also capturing indicators of post-pandemic recovery. Ethics approval was granted by the Research Ethics Committee of the Hungarian University of Physical Education and Sports Sciences (project code: TE-KEB/23/2022). The study was conducted in full accordance with the principles of the Declaration of Helsinki (1975, revised 2013). Written informed consent was obtained from all participants prior to data collection.

Police Statistics

The target population comprised Hungarian adults aged 18 years or older. To achieve broad regional coverage, participants were recruited through convenience sampling via five higher education institutions: the Hungarian University of Physical Education (Budapest), the University of Debrecen, Eszterházy Károly Catholic University, the University of Pécs, and Széchenyi István University. By 31 August 2023, a total of 780 questionnaire responses had been received, representing approximately one-third of the planned full sample. After exclusion of incomplete responses (approximately 15%), the final analysed sample consisted of n = 780 participants.

Of the analysed sample, 49.2% were male and 50.8% were female. The age distribution was as follows: 63.8% were aged 18-25 years, 11.7% were aged 26-35 years, 18.3% were aged 36-55 years, and 6.2% were older than 55 years. Regarding infection history, 50% of respondents (n=390) reported having been diagnosed with COVID-19 at least once, and 50% (n = 390) reported no confirmed infection. The majority of participants (84.2%) had been vaccinated against COVID-19. In terms of regional distribution, 46.2% of participants were from Eastern Hungary, 33.8% from Western Hungary, and 20.0% from Budapest and Pest County. Regarding marital status, 40.9% were single, 22.8% were married, 31.3% were living with a partner, and 5.0% were divorced or widowed. The full socio-demographic profile of the sample is presented in Table 1.

Table 1. Socio-demographic characteristics of the analysed sample (n = 780).

Variable	Category	Total (n = 780)
Sex	Male	49.2%
	Female	50.8%
Age group (years)	<30	72.1%
	30-39	8.7%
	40-49	8.6%
	50-59	6.5%
	60+	4.1%
Region	Eastern Hungary	46.2%
	Western Hungary	33.8%
	Budapest + Pest County	20.0%
Marital status	Single	40.9%
	Married	22.8%
	Living with partner	31.3%
	Divorced/widowed	5.0%
Vaccination	Vaccinated	84.2%
	Not vaccinated	15.8%
Mean age (years)	M +/- SD	30,72 (11,09)
	Min-Max	18-86

Instruments

Socio-demographic questionnaire. The questionnaire collected data on age, sex, level of education, region of residence, settlement type, marital status, household composition, and occupational status. Additional items addressed COVID-19 infection history (self-reported diagnosis), vaccination status,

and self-rated general and psychological health, following recommendations for COVID-19 survey design [11].

Recreation habits questionnaire. This instrument assessed participants' recreational and physical activity habits before and during the pandemic period. Items addressed frequency and type of physical activity, outdoor and indoor recreation, and social leisure engagement. The questionnaire was developed on the basis of established approaches in leisure research, including the Family Eating and Activity Habits Questionnaire [12], and adapted to the COVID-19 research context following Banhidi and Lacza [6].

Satisfaction with Life Scale (SWLS) and Leisure Satisfaction Scale – Short Form (LSS-SF). The SWLS [13] is a five-item self-report instrument assessing global cognitive life satisfaction, with responses on a seven-point Likert scale. It has demonstrated strong psychometric properties across cultures and age groups [14]. The LSS-SF [15] evaluates satisfaction across six leisure domains: psychological, educational, social, relaxation, physiological, and aesthetic. Both instruments were used in their validated Hungarian versions where available.

In addition to the instruments analysed in the present study, several further validated questionnaires were administered as part of the broader data collection. These included the **Depression Anxiety Stress Scales (DASS-42), Ryff's Scale of Psychological Well-Being – Shortest Version (RSPWB-SV), and the Psychological Capital Questionnaire (PCQ)**. These instruments were included to assess additional dimensions of mental health and psychological resources among participants. However, the results derived from these measures are not the focus of the present paper and are therefore not reported here; they will be analysed and presented in separate publications.

Data collection procedure

The questionnaire battery – referred to as the Recreational and Quality of Life Test Battery – was administered primarily in a supervised, paper-and-pencil format by trained research assistants present during completion. This procedure was designed to minimise missing data and to provide clarification for complex items. The procedure took approximately 20 minutes per participant. Online self-administration was permitted in a minority of cases, consistent with the methodological precedent established by Springer and Hauser [16] for Ryff-based battery administration. Participants were asked to recall their pre-pandemic lifestyle and health status and to report on changes that occurred during the pandemic period. The sample was distributed across all major Hungarian regions, with regional representation tracked at the county level.

Statistical analysis

Data were analysed using IBM SPSS Statistics version 26. Descriptive statistics (frequencies, percentages, means, standard deviations, minimum and maximum values) were computed for all socio-demographic and health-related variables. The assumption of normality was evaluated using skewness and kurtosis indices, following Kim [17], who recommends this approach for large samples in clinical and social research. Pearson correlation coefficients were computed to examine bivariate associations among five health-related variables: infection status, vaccination status, general health perception, mental health perception, and presence of health problems. Group comparisons between infected and non-infected participants on categorical outcomes (perceived health ratings, lifestyle change categories, and current lifestyle characterisations) were conducted using chi-square tests of independence. The significance level was set at alpha = 0.05 for all analyses.

Results

Sample characteristics

The socio-demographic characteristics of the analysed sample (n = 780) are presented in Table 1. The sample was evenly split by infection status (infected: 46.1%; non-infected: 53.9%) and was approximately balanced by sex (male: 49.2%; female: 50.8%). The sample is heavily dominated by participants under 30 (72.1%). The range in age was from 18 to 86 years (M = 30.72, SD = 11.09). Each older age group represents less than 10% of the sample. Participants 60+ make up the smallest proportion (4.1%). The highest infection differences appear in the 50-59 (+30.77%) and 30-39 (+30.43%) age groups, while the 18-29 group shows more non-infected respondents (-11.57%). The percentage of infected female participants (52.12%) was slightly higher than non-infected females (47.88%), while among males the proportion of non-infected respondents (53.90%) was higher than infected respondents (46.10%), resulting in a -7.81% difference. Based on family situation among married participants, 60.1% reported having been diagnosed with COVID-19, compared with 44.4% of single participants and 45.8% of divorced participants. Among vaccinated participants, 48.1% reported having been infected with COVID-19, whereas 54.2% of non-vaccinated participants reported infection. The mean age and standard deviation of the participants according to infection status and sex are presented in Table 2.

Table 2. Age characteristics of the sample by infection status and sex (n = 780).

Variable	Category	n	Mean (Sd)	Min-Max
Sex	Male	384	29, 9 (10,94)	18-85
	Female	396	31,48 (11,27)	18-86
Infection status	Infected	360	31,76 (11,15)	18-86
	Not infected	420	29,64 (10,98)	18-84
Total		780	30,72 (11,09)	18-86

Subjective characterisation of COVID-19

When asked to characterise COVID-19 in a single word, respondents' answers clustered into three broad categories: denial of the pandemic situation, neutral characterisations, and descriptions emphasising the health and lifestyle consequences of the epidemic. The majority of responses were negative in valence. Among infected participants, a notably higher proportion characterised COVID-19 in terms of illness, physical pain, and suffering (19.6%), reflecting the direct experience of disease. This was accompanied by references to confinement, tragedy, and fear. Among non-infected respondents, neutral and denial-oriented characterisations were comparatively more frequent. A minority of respondents in both groups identified positive dimensions of the pandemic period, including increased family time, a heightened sense of health awareness, or an unexpected sense of personal freedom.

These subjective framings are consequential for understanding how infection experience shapes longer-term health behaviour. Those who framed COVID-19 primarily in terms of physical illness may have been more motivated to pursue post-recovery lifestyle improvements, which aligns with our finding on current lifestyle characterisations (see Section 3.5). At the same time, the presence of denial-oriented responses in both groups is consistent with Hungarian survey evidence showing that a substantial segment of the population questioned the severity or reality of the epidemic situation [18].

In the survey it was considered to be important to find out how the respondents define COVID in one word. Their various answers were summarized in table 3, according to which the respondents were categorized as those who deny the epidemic situation, those who take a neutral position, and those who make statements based on the effects on health and lifestyle. Both groups mostly describe COVID as a virus, an illness, or an epidemic. Sometimes participants associate it with fear, hysteria, or confinement.

Table 3 shows differences between opinions of infected and non-infected participants. A higher number of infected participants stated that, for them, COVID caused illness and pain, which is a medical definition. This led, in many cases, to tragedy and created a feeling of confinement for many, as similar situations were reported in other countries [19]. According to previous research results, the damage caused by the pandemic increased people's anxiety, uncertainty, and the feeling of helplessness, and caused friction between members of different social groups.

Table 3. Differences the most mentioned COVID definitions among infected and non infected respondents (n = 436).

Definition of COVID	Infected	%	Not infected	%	p-value
virus	90	43,5	115	50,2	0.11
illness	75	36,2	75	32,8	0.84
fear	19	9,2	12	5,2	0.22
hysteria	19	9,2	25	10,9	0.53
death	4	1,9	2	0,9	0.64

Perceived health status

The large majority of respondents rated their general health as good or excellent at the time of the survey, regardless of infection status: 87.7% of non-infected and 83.7% of infected participants fell into these categories. This overall positive health perception is noteworthy given the period of data collection, which followed multiple pandemic waves and prolonged exposure to restriction-related stressors.

Meaningful differences between the two groups emerged at the upper end of the rating scale. Among non-infected participants, 23.2% described their health as excellent, compared to 12.4% among infected participants – a nearly twofold difference. Similarly, 38.6% of non-infected participants rated their health as very good, compared to 33.6% of infected participants. These differences suggest that while overall health perception was predominantly positive in both groups, the experience of infection was associated with a downward shift in perceived health quality, particularly at the highest rating levels.

To determine the level of significance of the difference between the two groups, a χ^2 (chi-square) test was applied to check whether: P ("word" | "infected") = P ("word" | "non-infected"). If $p < 0.05$, the difference is considered statistically significant (Tab. 3). According to the results, there is no meaningful or statistically significant difference between respondents diagnosed and not diagnosed with COVID.

However, in addition to the negative aspects, some respondents reported positive effects of the epidemic situation, such as a sense of freedom, a more health-conscious lifestyle, and increased time spent with family. For the analysis of the effects of the pandemic on health, respondents were asked how they feel in general and/or mentally. Based on the responses, the majority of the respondents feel good and/or excellent, regardless of whether they were infected or not (83.7-87.7%).

Independent samples t-tests were conducted to examine differences in perceived physical and mental health between respondents who had been diagnosed with COVID-19 and those who had not. The results indicated that respondents who had been diagnosed with COVID-19 reported slightly lower physical health (M = 3.52, SD = 0.97) compared to those not diagnosed (M = 3.63, SD = 0.94), but this difference was not statistically significant, t = -1.56, p = .119. Similarly, no significant difference was found in mental health between infected (M = 3.31, SD = 1.02) and non-infected respondents (M = 3.40, SD = 1.01), t = -1.18, p = .237 (Tab. 4).

Table 4. Comparison of Physical and Mental Health by COVID-19 Infection Status.

Variable	Infection status	n	Mean (M)	Std. Deviation (SD)	t	p
Physical health level	Infected	394	3.52	0.97	-1.56	0.119
	Not infected	411	3.63	0.94		
Mental health level	Infected	394	3.31	1.02	-1.18	0.237

For comparison, a health perception survey conducted among residents of Nyíregyháza, a city in Eastern Hungary, reported that only 41% of respondents rated their health as good or very good [20], considerably lower than the proportions observed in the present sample. This difference is likely attributable in part to the younger and more educated composition of our convenience sample.

The relationship between infection and health-related indicators was examined using Pearson correlation analysis. The full correlation matrix is presented in Table 5. General health perception showed a strong positive correlation with mental health perception ($r = 0.649$, $p < .001$), confirming that respondents who perceived themselves as physically healthy also tended to report better mental health. A significant positive correlation was also found between the presence of health problems and general health perception ($r = 0.253$, $p < .01$), indicating that greater reported health burden corresponded with lower self-rated health. A weaker but significant association was found be-

Table 5. Pearson correlation matrix for health-related indicators (n = 780).

	1. Infected	2. Vaccinated	3. Health Status	4. Mental Health	5. Health Problems
1. Infected	--				
2. Vaccinated	-0.03	--			
3. Health Status	0.069	-0.008	--		
4. Mental Health	0.065	0.039	0.649***	--	
5. Health Problems	0.177*	0.028	0.253**	0.133*	--

Note: * – p < .05. ** – p < .01. *** – p < .001. Health Status – self-rated general health (single item); Mental Health – self-rated mental health (single item); Health Problems – self-reported presence of ongoing illness or symptoms.

tween health problems and mental health (r = 0.133, p < .05). By contrast, vaccination status showed no significant association with perceived general health (r = -0.008, ns) or with infection status (r = -0.03, ns).

Lifestyle changes during the pandemic

When asked to identify the most significant changes to their lifestyle during the COVID-19 pandemic, more than three--quarters of respondents in both groups reported at least one noteworthy change (infected: 76.1%; non-infected: 79.0%). The distribution of reported lifestyle changes for both groups is presented in Table 6.

The most commonly reported change across both groups was the inability to engage in sport and physical activity at previous levels: 16.6% of infected participants identified this as a primary lifestyle change. Reduced social contact and difficulty meeting friends were reported by 11.8% of infected and 11.2% of non-infected participants. Feelings of confinement and restricted movement were noted by 11.8% of infected and 11.2% of non-infected participants. These three domains – physical activity, socialisation, and confinement – together constituted the dominant narrative of pandemic-related lifestyle disruption in the sample.

An important countervailing pattern was also observed: 9.3% of infected and 8.6% of non-infected participants reported having increased their outdoor physical activity during the lockdown period, presumably those with access to private outdoor spaces or suitable natural environments. This finding reflects the heterogeneity of pandemic lifestyle responses and is consistent with international evidence showing that not all individuals reduced their activity levels uniformly under lockdown conditions.

Unhealthy dietary changes and weight gain were reported by 6.2% of infected and 6.5% of non-infected participants. Stress and depression were noted as emerging lifestyle consequences by 1.7% of infected and 4.4% of non-infected participants. Increased need for sleep and rest was reported by 1.7% and 2.6%, respectively. A shift toward a more health-conscious lifestyle was cited as a positive pandemic-related change by 2.8% of infected and 5.5% of non-infected respondents. Approximately one-fifth of participants in each group reported no lifestyle change at all (infected: 23.9%; non-infected: 21.0%), suggesting that a substantial minority maintained their pre-pandemic routines.

In relation to the results obtained, we are aware that the examined adults only present a subjective picture of their health condition, which does not match the medical diagnosis [21], but still reflects the extent of the epidemic's effects on some level.

Regarding the responses on the effects on lifestyle, more than one in five respondents declared that almost nothing had changed in their lifestyle (infected – 23.9%, non-infected – 21%). Among respondents who had COVID-19, most reported that during the pandemic they were not able to participate sufficiently in sports (infected – 17.5%, non-infected – 19.5%) or meet with friends. However, some participants indicated that they engaged in more outdoor sports during the lockdown. Presumably, this could only be done by those who had access to outdoor sports conditions.

Based on the data, it is also clear that the lockdown caused a feeling of confinement in many people (infected – 11.8%, non-infected – 11.2%), which could have resulted in unhealthy nutrition and gaining weight (infected – 6.2%, non-infected – 6.5%). As in previous international research, the results of the present survey indicate that although isolation protects public health, it alters physical activity and eating behaviours in a health compromising direction [3]. Some participants reported development of stress and depression (infected – 1.7%, non--infected – 4.4%) and after the pandemic, they needed to have more sleep and rest. At the same time, few people reported that they switched to a more health-conscious lifestyle in connection with the epidemic situation (infected – 10.3%, non-infected – 10%). It was evident that the restricitions would limit the access to physical and social activities, including practicing sport (16.9%) and being with friends (7%). Those who suffered from the infection were less cautious than those who did not contract the disease.

Chi-square tests indicated no significant associations between COVID-19 diagnosis and participation in specific leisure activities either before or during the pandemic (p > .05). Additionally, an independent samples t-test showed no significant difference in changes in activity participation between respondents diagnosed with COVID-19 and those not diagnosed.

Current lifestyle after the pandemic

At the time of the survey (2023), respondents were asked to characterise their current lifestyle. The majority in both groups described it positively, with many attributing their wellbeing to the ability to maintain an active, physically engaged life. Approximately one in ten respondents in each group described themselves as living a health-conscious lifestyle. Balanced and stress-free characterisations were reported by broadly similar proportions in both groups.

A pattern of particular interest emerged when comparing the two infection status groups. Infected participants were more likely to characterise their current lifestyle as active (20.9%),

Table 6. Age characteristics of the sample by infection status and sex (n = 780).

Activity	Period	Diagnosed (n)	%	Not diagnosed (n)	%	p-value	Chi2
Sport	Before COVID	304	21,3	324	22,5	0.625	0,456
Sport	During COVID	249	17,5	286	19,8	0.065	1,23
Travel	Before COVID	173	12,1	154	10,7	0.074	0,987
Travel	During COVID	135	9,5	121	8,4	0.164	1,45
Social activities	Before COVID	115	8,1	111	7,7	0.542	2,33
Social activities	During COVID	67	4,7	64	4,4	0.649	1,21
Mental activities	Before COVID	96	6,7	95	6,6	0.738	0,98
Mental activities	During COVID	146	10,3	144	10,0	0.601	0,78
Hobby	Before COVID	57	4,0	53	3,7	0.585	0,89

accelerated (7.2%), or balanced (8.7%), compared to their non-infected counterparts. This pattern may reflect a health-motivating effect of illness experience – a heightened awareness of physical vulnerability that prompted sustained lifestyle improvement in the post-recovery phase. This interpretation aligns with hypothesis H3 and with the broader literature on illness-induced health behaviour changes [22]. However, the cross-sectional design prevents causal inference.

A small proportion of respondents in both groups described their current lifestyle in negative terms – as stressful, overworked, or monotonous. Given that data were collected approximately two to three years after the onset of the pandemic, the persistence of these descriptors may in some cases reflect ongoing post-COVID symptom burden or lasting disruption to occupational and social routines. In line with WHO estimates that 10-20% of individuals experience medium- and long-term effects after COVID-19 recovery [23], this subgroup warrants targeted clinical and public health attention.

When examining the difference of lifestyle changes after the pandemic between the two groups (Tab. 7.), there were negligible differences in terms of no lifestyle change, physical activity, missing friends and entertainment, and staying at home more. In many cases, these results seem obvious, but the fact that the development of people's health-conscious lifestyle (infected – 2.8%, non-infected – 5.5%) was triggered by an emergency or illness is noteworthy. The chi-square test of independence examined the relationship between COVID-19 diagnosis and reported changes in feelings during the pandemic. The analysis showed no statistically significant association, $\chi^2(3) = 0.43$, $p = .933$. The observed frequencies were very similar to expected frequencies, and standardized residuals indicated no meaningful deviations across categories.

It was clear in this country that people should adapt to the governmental restrictions and when the situation is over, they should have a chance to return to normal life and feel satisfied with their life. When asked what they think their lifestyle is like at the moment, the majority of respondents feel that it is good and/or better than average, which is also due to the fact that they can live an active, sport-oriented life. In fact, every tenth respondent reported that they currently live a health-conscious life. The proportion of respondents reporting a balanced or stressful lifestyle is similar. The distribution of opinions varies, which may be due to many factors, including whether respondents have experienced the infection or not. According to the group analyses, it is evident that more people who experienced the infection stated that their lifestyle is currently more active (20.9%), accelerated (7.2%), or balanced (8.7%) than those who were not infected. According to WHO [23], most people who develop COVID-19 fully recover, but current evidence suggests approximately 10-20% experience a variety of mid- and long-term effects after they recover from their initial illness. Among the respondents in this study, a small number described their lifestyle negatively (e.g., as stressful, overworked, or monotonous), which may still indicate post-COVID symptoms.

Discussion

The present study examined perceived health and lifestyle changes among COVID-19-infected and non-infected Hungarian adults, using a balanced convenience sample collected during the post-acute pandemic period. The findings are discussed in relation to the three study hypotheses and to the international and Hungarian literature.

Regarding perceived health (H2), the finding that the large majority of respondents rated their general health as good or excellent – regardless of infection status – is broadly consistent with international evidence. Szabo et al. [8], in a Hungarian survey of 1,552 adults, reported that the majority of respondents maintained positive health self-assessments during the pandemic, although stress-related complaints were significantly elevated among younger adults and women. In a large-scale UK cohort study involving 387,109 adults, Hamer et al. [24] demonstrated that underlying lifestyle risk factors – more prevalent among those who subsequently contracted COVID-19 – were associated with poorer health outcomes, which may partly explain the lower proportion of excellent health ratings among infected participants in the present study (12.4% vs. 23.2%). A nationwide Hungarian serological study by Merkely et al. [18] similarly found that general health self-assessments remained relatively stable during the early pandemic period, even as clinical burden increased.

The strong positive correlation between general health perception and mental health ($r = 0.649$, $p < .001$) is one of the most robust findings of this study, and aligns with the established conceptual framework of the mind-body health relationship. This association has direct clinical relevance: interventions targeting mental health – including structured physical activity, social support, and psychological capital development – are likely to have positive spillover effects on general health perception, and vice versa. Similar associations have been documented in leisure satisfaction research among health professionals [25], where life satisfaction, quality of life, and leisure satisfaction showed significant mutual relationships.

The inclusion of the Psychological Capital Questionnaire (PCQ) in the test battery provides a theoretically important framework for interpreting these health perception findings. Psychological capital – comprising hope, efficacy, resilience, and optimism – has been consistently shown to moderate the impact of stressors on both mental and physical health outcomes [26]. In a longitudinal study conducted during the pandemic, Turliuc and Candel [27] demonstrated that higher PsyCap was associated with lower depression and anxiety and higher life satisfaction, with the relationship partially mediated by a coping style. These findings suggest that the relatively positive health perceptions observed in our sample – despite the extensive lifestyle disruption – may partly reflect the buffering role of psychological capital, particularly among younger adults who tend to score higher on self-efficacy and resilience. The full analysis of PsyCap data collected in the present study will be

Table 7. Association between COVID-19 diagnosis and change in feelings during the pandemic (Chi-square Test).

Change in feelings	Diagnosed (O)	Expected (E)	SR	Not diagnosed (O)	Expected (E)	SR
Negative change	143	142.7	0.03	148	148.3	-0.03
Lifestyle change	104	103.3	0.25	103	103.7	-0.25
Positive change	62	67.2	-0.39	71	66.8	0.39
No change	85	84.2	0.02	88	88.3	-0.02

reported in subsequent publications and may help explain individual-level variation in health perception within each infection status group.

With respect to lifestyle changes (H1), our findings partially support the hypothesis. More than three-quarters of participants reported pandemic-related lifestyle disruption, with physical activity and social contact as the most affected domains in both groups. The magnitude of disruption to physical activity observed in our sample is consistent with multi-country evidence. Among Polish adults, Gornicka et al. [5] documented a 43% decrease in physical activity. Rhodes et al. [4], studying 1,055 Canadian adults, reported significant declines across multiple demographic subgroups. In Italy, Di Renzo et al. [28] found that 48.6% of a national sample reported weight gain – a more extreme outcome than the 6.2-6.5% reporting dietary change and weight gain in the present study, likely reflecting differences in lockdown stringency, dietary culture, and sample composition.

In contrast to these broadly negative trends, a Swedish study by Hansen et al. [29] reported increased participation in outdoor recreation during and after the pandemic, possibly reflecting Sweden's distinct approach of voluntary rather than mandatory restrictions, as well as strong pre-existing norms around outdoor leisure. The 8.6-9.3% of our respondents who reported increased outdoor activity during the pandemic similarly suggests that a meaningful minority of Hungarian adults adapted positively to the changed circumstances.

Regarding current post-pandemic lifestyle (H3), the finding that infected participants were more likely to characterise their current lifestyle as active or balanced provides partial support for the hypothesis. This pattern aligns with the health behaviour change theory, in which direct illness experience can function as a motivating disruption that prompts re-evaluation of lifestyle priorities [22]. However, this interpretation requires caution given the cross-sectional design and the possibility of self-report biases. Longitudinal data would be needed to distinguish genuine sustained behaviour changes from a transient post-illness re-appraisal effect.

From a practical perspective, these findings have several implications for post-pandemic public health policy in Hungary. First, the prevalence of reduced physical activity across both groups underlines the need for population-level physical activity promotion that is accessible, affordable, and independent of organised sports infrastructure. Community-level initiatives – such as the development of publicly accessible outdoor exercise spaces, subsidised recreational programmes, and sport-based social reintegration activities – are likely to address both the physical activity deficit and the social contact deficit simultaneously. Second, the strong association between mental and general health perception reinforces the importance of integrated health promotion approaches that simultaneously address psychological well-being, physical activity, and social engagement, rather than treating these as separate service domains. Workplace health programmes, university-based health promotion, and primary care settings all represent entry points for such integrated interventions. Third, the identification of infected individuals as a subgroup with elevated health burden but greater post-pandemic lifestyle motivation suggests that targeted support – including structured physical activity rehabilitation and psychological capital programmes – could yield substantial public health benefits for this population. As WHO [23] data indicate that 10-20% of COVID-19 survivors experience medium- to long-term effects, this group deserves particular policy attention in the Hungarian post-pandemic context.

Limitations and strengths of the study

The results presented in this study reflect the subjective assessments of sailors. The reliability of the applied questionnaire was evaluated, with the Kappa coefficient for all analyzed variables equal to or exceeding 0.92, indicating high validity of the tool and reliability of the collected data. This provided a solid basis for the analysis of the material obtained. The present study was limited to the Great Masurian Lakes region; future research should extend the scope to include other inland waters. Given the importance of the subject, further comprehensive studies are warranted. A strength of this study lies in the large research sample (n = 313), which encompassed a wide range of sailing experience (from less than 10 to more than 31 years) as well as all possible sailing licenses. This allowed for a more complete depiction of the issue under investigation. For more precise comparative analyses between sailors with different types of licenses, future research should ensure a more balanced distribution of respondents across individual groups.

The issue of yacht sailing safety has been analyzed primarily in studies concerning maritime accidents. To the author's knowledge, this is the first study to examine the safety of yacht sailing on the Great Masurian Lakes Route, going beyond the analysis of legal regulations to also include the opinions of sailors themselves as well as data from Police and MOPR interventions.

Conclusions

Based on the results of this study, the following conclusions can be drawn:

1. The majority of Hungarian adults in both the infected and non-infected groups rated their general health as good or excellent during the post-pandemic period; however, infected participants were considerably less likely to report excellent health (12.4% vs. 23.2%), reflecting the residual health burden associated with COVID-19 illness experience.
2. A strong positive relationship was confirmed between general health perception and mental health ($r = 0.649$, $p < .001$), underlining the importance of integrated health promotion interventions that address physical and psychological well-being simultaneously rather than in isolation.
3. Pandemic-related lifestyle changes were highly prevalent, affecting more than three-quarters of participants in both groups. Physical activity participation and social contact were the most disrupted domains, consistent with international evidence. The overall extent of lifestyle disruption was broadly similar between infected and non-infected groups, suggesting that restrictions – rather than illness – were the primary driver of change.
4. A minority of participants in both groups (8.6-9.3%) reported increased outdoor physical activity during lockdown, highlighting the heterogeneity of pandemic lifestyle responses and the moderating role of access to outdoor recreational facilities.
5. Post-pandemic, infected participants were more likely to characterise their current lifestyle as active or balanced, consistent with a post-illness motivational shift toward health-conscious behaviour. This finding warrants longitudinal investigation to determine whether it reflects sustained behaviour changes or transient re-appraisal.
6. The absence of a significant correlation between vaccination status and perceived health may reflect limited statistical variance given the high overall vaccination rate in this sample

(84.2%), and should not be interpreted as evidence of ineffectiveness.
7. The findings have concrete practical implications: post-pandemic public health policy in Hungary should prioritise accessible physical activity infrastructure, integrated mental-physical health promotion, and targeted rehabilitation support for individuals with COVID-19 illness histories.

Limitations

Several limitations of this study must be acknowledged when interpreting the findings. First, the sample was recruited via convenience sampling through university networks, resulting in a strong overrepresentation of young adults (18-25 years: 63.8%) and individuals with higher educational attainment. This limits the generalisability of the findings to the broader Hungarian adult population, and particularly to older adults who bore a disproportionate share of the direct health burden of COVID-19. Second, the cross-sectional, retrospective design relied on participants' recall of pre-pandemic lifestyle and health states. Recall bias may have introduced systematic distortions, particularly given the emotional salience of the pandemic period and the tendency for retrospective assessments to be coloured by current affect and mood. Third, the absence of objective health measures – such as clinical diagnoses, biometric data, or accelerometry-based physical activity records – limits the precision and validity of health and lifestyle assessments. Self-rated health, while a well-established and predictively valid construct, is inherently subjective and may not accurately reflect clinical health status [21]. Fourth, COVID-19 infection status was based entirely on self-report rather than verified diagnostic or serological records, introducing the possibility of misclassification in both directions. Fifth, the present study represents partial results of an ongoing international project, with current data constituting approximately one-third of the planned full sample; patterns observed may shift with the complete dataset. Sixth, causal inferences cannot be drawn from the correlational, cross-sectional design. Longitudinal follow-up – ideally with objective health and behavioural measures and a representative sampling strategy – would be necessary to establish the direction, magnitude, and persistence of the observed associations.

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Submitted: January 8, 2026
Accepted: March 25, 2026