Chronic Pain Has Little Effect on Physical Condition During the COVID-19 Pandemic in Japan: A Web-based Cross-Sectional Survey

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Abstract

**Background** Chronic pain affects people negatively, both mentally and physically. It is unclear how chronic pain affects people during social isolation and remote work due to the COVID-19 pandemic. The aim of this study was to analyze the effect of chronic pain on life during the COVID-19 pandemic.

**Methods** This retrospective study included 4,972 matched-participants with or without chronic pain (2,311 males, 2,661 females; mean age, 53.8 years). The participants were divided into a chronic pain group (n=2,486) and a control group (n=2,486). Participants with chronic pain for three months or more were classified into the chronic pain group. All participants completed self-reported questionnaires. Factors related to physical condition during the COVID-19 pandemic were identified by univariate and multivariate analyses.

**Results** Significant differences were found between participants with and without chronic pain for the pain that developed during the COVID-19 pandemic, lifestyle, interpersonal relationships, psychological factors related to COVID-19, and deterioration of physical condition. Multiple logistic regression analysis identified insomnia, poor work/study/housework performance, and anxiety/depression as factors related to deterioration of physical condition. Chronic pain was not identified as factor related to deterioration of physical condition.

**Conclusions** The effect of chronic pain on lifestyle and physical condition during the COVID-19 pandemic was limited. The factors related to deterioration of the physical condition were insomnia, poor work/study/housework performance, and anxiety/depression.

**Background**

As of the end of 2020, more than 80 million people have been diagnosed with Coronavirus disease 2019 (COVID-19) worldwide, and more than 200,000 people have been diagnosed in Japan [1]. Like influenza and tuberculosis, it spreads rapidly through social contact as people move from place to place. Similar to other pandemics that occurred in the past, COVID-19 has negative aspects apart from the disease itself. However, its effects are thought to be even larger in increasingly prosperous and highly productive, urbanized, and interconnected modern societies. The COVID-19 pandemic has led to the need for lifestyle changes, such as social distancing and remote work, with potential effects on both mental and physical. In fact, it is not known what has actually occurred as a result of behavioral changes with the widespread calls for people to restrict their activities due to the spread of COVID-19.

Chronic pain is the leading cause of disability and diminishes quality of life [2]. Chronic lower back pain (LBP) is one of the most common musculoskeletal disorders causing significant limitations of activities of daily living [3]. A lack of ability to continue to cope due to persistent symptoms is a major reason for medical consultation and leads to reduced productivity, work absence, early retirement, and economic losses [4]. Psychological factors play a role in the transition to chronic pain [4–6]. During the COVID-19 pandemic, people have been forced into social isolation, which is reported to have major psychological
impacts [7]. Despite the ongoing need for chronic pain patients to receive medical treatment during the COVID-19 pandemic, there is a possibility that some will not be able to visit a clinic for such treatment. The various mental and physical effects from social isolation and remote work during the COVID-19 pandemic are thought to be large. Although there are many reports about COVID-19, the effect of chronic pain on daily life during the COVID-19 pandemic has not been fully evaluated. In the present study, whether chronic pain affects physical condition during the COVID-19 pandemic was evaluated using data from a large cross-sectional internet survey.

**Methods**

**The internet survey**

Participants in the Japan COVID-19 and Society Internet Survey (JACSIS) were recruited by e-mail invitation from panelists who had been registered with a Japanese internet survey agency (Rakuten Insight, Inc., Tokyo, Japan https://in.m.aipsurveys.com). This internet research agency has been used in previous studies [8, 9]. The invitation was sent to candidates who were randomly selected from approximately 2.2 million panelists using a computer algorithm from August 25, 2020 to September 30, 2020 (37 days); the selection was consistent with the official Japanese demographic composition as of October 1, 2019 as reported in the Japanese Vital Statistics for each category of age, sex, and living area (i.e., prefecture) [10]. Candidates responded to the web-based questionnaire if they agreed to provide web-based informed consent and intended to participate in the JACSIS. A credit point known as “Ep0ints”, which could be used for internet shopping and cash conversion, was provided to the participants as an incentive. All procedures were conducted in accordance with the ethical standards of the Helsinki Declaration of 1975, as revised in 2013. Ethical approval was obtained from our institution’s Institutional Review Board. The internet survey agency respected the Act on the Protection of Personal Information in Japan.

**Detailed sampling method and participation rate**

The targeted final sample size (\(n = 28,000\)) in the present internet survey was determined based on a statistical presumption (sufficient numbers in each age and sex stratum were needed to estimate the proportion of events) and the available budget for the survey.

The participation rate is defined as the number of respondents who have provided an eligible response divided by the total number of initial personal invitations requesting participation [11]. In the JACSIS, the participation rate was defined as the proportion of the number of participants relative to the final number of invitations. A total of 224,389 invitations were delivered; thus, the participation rate in the JACSIS was 28,000/224,389 (12.5%). A total of 2,518 individuals showing invalid responses were excluded using the algorithm we developed. This retrospective study recruited 25,482 participants (12,673 males, 12,809 females, 91.0% of the total survey respondents). Of the 25,482 participants in the JACSIS, this retrospective study included participants with chronic pain and a control group. Chronic pain was defined as pain lasting more than three months.
Main outcome measures

Prevalence of chronic pain

Participants were asked if they had experienced chronic pain for three months or more; the responses were based on the following categorical options: “none,” “I have a history of chronic pain but have already recovered”, “yes, receiving treatment”, or “yes, without treatment.” The latter two categories (having chronic pain with or without treatment) were considered as indicating the presence of chronic pain, and the participants were classified into the following two categories: those without chronic pain and those with chronic pain.

Demographic factors

Data on age, sex, body mass index (BMI), and comorbidities (hypertension, diabetes, asthma, cardiovascular disease, stroke, chronic obstructive pulmonary disease, cancer, and depression) were collected.

Socioeconomic factors

Data on the level of education (junior high school, high school, vocational school, junior college, professional school, university, graduate school, or other), family members (living alone, marital partner, children, grandchildren, parents, grandparents, brother and sister, or other), and employment status (independent business, company employee, contract employee, dispatched employee, part-timer, student, or unemployed) were also collected.

Prevalence and incidence of pain

Participants were asked if they had neck or shoulder pain, upper limb pain, back pain, low back pain, or hip or knee pain; for each type of pain, the responses were categorized as follows: “none”, “yes, it developed before the COVID-19 outbreak”, or “yes, it developed during the COVID-19 pandemic.” Based on these responses, the participants were classified based on one of the following two categories: pain beginning during the COVID-19 pandemic and others.

Lifestyle

Data on body weight, sleep hours, insomnia, excluding breakfast, nutritionally balanced meal, disciplined life, sports viewing, going to a gym, and outdoor sports before and after the COVID-19 pandemic were collected.

Psychological factors related to COVID-19

The following were investigated as psychological factors related to COVID-19: whether respondents were afraid of COVID-19; whether respondents became uncomfortable when they thought about COVID-19; whether respondents feared dying from COVID-19; whether respondents developed tension and/or anxiety
with news of COVID-19; whether respondents had insomnia due to worry about COVID-19; and whether respondents had palpitations when they thought about COVID-19.

**Changes during the COVID-19 pandemic**

The following were examined as changes that occurred with the onset of the COVID-19 pandemic: whether anxiety/depression increased; whether respondents felt isolation; whether respondents went out less because they were worried about what other people think; whether respondents had anxiety about becoming infected with COVID-19 and being criticized by others; whether respondents had been discriminated against in relation to COVID-19; whether respondents felt that they were being under constant surveillance by others with respect to infection prevention; and whether respondents felt anxiety with regard to the behavior of others in relation to infection prevention.

**Physical condition during the COVID-19 pandemic**

Data on the respondents’ physical condition before and after the COVID-19 pandemic were collected.

**Statistical analysis**

Adjustments for the respondents’ demographics and prefecture fixed effects (effectively comparing individuals living in the same prefecture) were made. The demographic characteristics included age and sex. The samples were classified into chronic pain and non-chronic pain groups. Univariate analyses were then conducted between the groups in order to compare demographic factors, socioeconomic factors, pain during the COVID-19 pandemic, lifestyle factors, psychological factors, and the changes during the COVID-19 pandemic. Normally distributed variables were compared using Student’s $t$-tests. Chi-squared analysis was performed for categorical variables. Effect sizes (ESs) obtained using Cohen’s $d$ and Cramer’s $V$ measures were calculated for the groups. Cohen’s $d$ values were calculated to evaluate ESs, and ES values of $<0.5$, $0.5$ to $<0.8$, and $\geq 0.8$ have been suggested to represent small, medium, and large treatment effects, respectively [12]. Cramer’s $V$ values range from 0 (no association) to 1 (perfect association), and ES values of $<0.1$, $0.1$ to $<0.3$, and $\geq 0.5$ have been suggested to represent small, medium, and large treatment effects, respectively [13]. Factors associated with the physical condition were identified by univariate analyses comparing participants whose physical condition worsened and those whose physical condition had not worsened. Factors predicting physical condition were identified by multivariate analysis (multiple regression). Potential predictive variables were included in the multivariate model if values of $P<0.05$ were obtained on univariate analysis. A multiple regression model and 95% confidence intervals (CIs) were used to identify the risk factors affecting physical condition. Differences of $P<0.05$ were considered significant. Statistical analyses were conducted using SPSS software version 25.0 for Windows (IBM Corporation, Armonk, NY, USA).

**Results**

*Patient background characteristics*
Of the 25,482 participants in the JACSIS, this retrospective study included 4,972 participants (2,311 males, 2,661 females). The mean age of the participants at the time of examination was 53.8 years (range, 15–79 years). The characteristics of the participants who were included in the final analysis are shown in Table 1. Participants were divided into two groups based on the presence or absence of chronic pain (Table 2). The chronic pain group consisted of 2,486 participants (1,144 males, 1,342 females), and the control group consisted of 2,486 participants without chronic pain (1,167 males, 1,319 females).

**Univariate analyses comparing participants with and without chronic pain**

Whether factors related to COVID-19 differed with and without chronic pain were examined by univariate analysis. There were no significant differences in age and sex between the participants with and without chronic pain (Table 2). Although significant differences were observed between participants with and without chronic pain, there were low effect sizes for all pain that occurred during the COVID-19 pandemic, lifestyle during the COVID-19 pandemic, human relationships, psychological factors related to COVID-19, and changes during the COVID-19 pandemic. Similarly, ES was low with deterioration of the physical condition, but among all the factors, it was the only one for which ES was ≥ 0.2.

**Correlations between deterioration of the physical condition and risk factors**

The data in Table 2 suggest that physical condition was associated with some of the risk factors. Therefore, factors associated with the physical condition were identified by univariate analyses. Univariate analyses of the deterioration of the physical condition showed low effects in the presence of chronic pain and pain that developed after the COVID-19 pandemic between the two groups (Table 3). The results of lifestyle during the COVID-19 pandemic analyses indicated that physical condition worsened in people with more insomnia than usual. Worsening relationships with family members among human relationships during the COVID-19 pandemic and decreased performance in work, study, and housework were related to deterioration of physical condition. Of the psychological factors associated with COVID-19, physical condition deteriorated in people with increased anxiety/depression compared to before the COVID-19 pandemic or who felt a sense of isolation.

A multiple logistic regression model yielding ORs and 95% CIs was used to identify predictors of deterioration of the physical condition. The model included variables showing a univariate association ($P < 0.05$, $ES \geq 0.3$) with deterioration of the physical condition. In a multiple logistic regression model for deterioration of the physical condition, insomnia, poor work/study/housework performance, and anxiety/depression were identified as factors related to deterioration of the physical condition during the COVID-19 pandemic (ORs, 3.20, 2.40, 2.94, and 1.96, respectively; $P < 0.0001$, Table 4).

**Discussion**

In this study, the effects of changes in lifestyle with COVID-19 and the COVID-19 pandemic were investigated in people with chronic pain, using the data from a large cross-sectional Internet survey. Chronic pain had little effect on physical condition during the COVID-19 pandemic. The factors affecting
deterioration of the physical condition were insomnia, poor work/study/housework performance, and anxiety/depression during the COVID-19 pandemic.

The spread of COVID-19 has caused the psychological damage, as well as the physical damage. After the COVID-19 pandemic hit, people felt a daily vague sense of anxiety about “when, where, and from whom” they could become infected with this unknown virus. The variety of information obtained from television and the Internet has greatly affected people due to social isolation. In this study, nearly 30% of respondents said that they felt tension and anxiety from news about the coronavirus.

People have spent more time at home in order to socially isolate, and this has increased their housework and childcare burden. With the exception of those continuing to work at their usual place of work, all of the women surveyed were spending more time on housework and childcare than before the COVID-19 pandemic [14]. Social isolation has led to various restrictions, and the stress from having to perform housework and childcare 24 hours a day is immeasurable. Del Boca et al. reported that most of the additional housework and childcare associated with COVID-19 fell on women, whereas childcare activities were more equally shared within the couple than housework activities [14]. In this study, poor housework performance was related to deterioration of physical condition during the COVID-19 pandemic. We consider that the COVID-19 pandemic has provided an opportunity to reconfirm the necessity and importance of expanding family members’ participation in childcare.

Remote working has become the “new normal” after the COVID-19 pandemic. It is not known what people who are working remotely are feeling and what kinds of effects are being produced. Communication with people in the workplace is insufficient, and email, chats, and web meetings have become more frequently used. As a result, progress on the work they should be doing may be slow, greatly increasing working hours. Using survey data from employees working at home during the pandemic, Wang et al. found that virtual work characteristics are linked to worker’s performance and wellbeing [15]. Specifically, social support was positively correlated with lower levels of all remote working challenges; job autonomy was negatively related to loneliness; and workload and monitoring were both linked to higher work-home interference. Receiving social support during the period of working away from the office, for instance, can help remote workers overcome social isolation [16]. Lopez-Leon et al. recommended that remote workers create routines, be organized, have an adequate home office, enhance productivity, be responsible, avoid extreme multitasking, facilitate communication and networking, be balanced, and use available computer programs [17].

Lack of exercise due to remote work has become a major problem. Social isolation during the COVID-19 pandemic can increase physical inactivity and the global burden of cardiovascular disease [18]. Changes in body weight are inversely correlated with changes in steps per day and moderate or vigorous-intensity exercise during the quarantine [19]. Exercise not only improves physical fitness, but is also associated with higher levels of serotonin [20]. Serotonin has been implicated in the motivational control of behavior. On the other hand, low levels of serotonin due to lack of exercise have been associated with anxiety, depression, and insomnia [21, 22]. Social isolation due to the COVID-19 pandemic may have effects on
sleep rhythms, which play an important role in mental health [23]. In the present study, insomnia was one of the factors affecting the deterioration of the physical condition during the COVID-19 pandemic. Therefore, insomnia should be controlled to improve the physical condition. Daniele et al. reported that sleep deprivation increased depressive behavior, and exercise improved it [20]. This effect is explained by exercise reducing serotonin turnover associated with sleep deprivation [20].

Isolation and social distancing are important risk factors related to mental health [24–26]. The prevalence of stress, anxiety, and depression were reported to be 29.6%, 31.9%, and 33.7%, respectively, in the general population during the COVID-19 pandemic [27]. A considerable proportion of workers experience mood and sleep disturbances during this outbreak, stressing the need to establish ways to mitigate mental health risks and adjust interventions under pandemic conditions [28]. Social distancing and isolation “exit strategies” must account for the fact that, although some individuals will voluntarily or habitually continue to socially distance, others will seek high levels of social engagement as soon as possible [29].

Previous reports have explored the mental health status of patients with chronic pain and compared various psychological metrics in patients with acute versus chronic pain [30]. Pincus et al. examined the transition to chronic pain status and reported finding strong evidence for the role of negative mood (distress or depression) [6]. It has also been reported that depression and sleep disorders, which cause functional impairment [31], can lead to reduced pain thresholds [32]. Avoidance of pain leads individuals to minimize or avoid physical and social activities completely [33]. In the current study, chronic pain patients had little deterioration of the physical condition during the COVID-19 pandemic in Japan. These results were considered to be related to the fact that the participants who had chronic pain were originally in a state close to social isolation by the COVID-19 pandemic and their physical condition had already deteriorated. Therefore, physical condition of the participants who had chronic pain was less affected by the social isolation and remote work due to the COVID-19 pandemic.

The present study has some limitations. First, the survey sample was gathered through a Web-based survey and was thus limited to people with access to the Internet. Therefore, there is a possibility that the survey results cannot be generalized. Even so, differences in age, sex, and demographics were minimized by propensity score matching. The results of this survey are therefore thought to be close to national estimates. Second, this study analyzed participants with chronic pain. However, chronic pain in this study included many pain locations, which included the neck, shoulder, lumbar area, hip, knee, and headache. Therefore, the effects on activity of daily living are thought to have differed depending on the site of pain. Third, chronic pain in this study was defined as pain that had continued for at least three months, and it is not clear whether participants were receiving medication for their chronic pain. In cases when participants were receiving medication, there may have been effects from the lack of pain control. Finally, physical condition, which was taken as an outcome in this study, was assessed subjectively by the participants, and an objective assessment tool was not used. Thus, assessments in this study might be influenced by the participants’ mental state.
Conclusions

Chronic pain patients had little deterioration of the physical condition during the COVID-19 pandemic in Japan. The factors affecting the deterioration of the physical condition were insomnia, poor work/study/housework performance, and anxiety/depression during the COVID-19 pandemic in Japan.

Abbreviations

COVID-19
Coronavirus disease 2019; LBP: lower back pain; JACSIS: Japan COVID-19 and Society Internet Survey; BMI: body mass index; ES: effect size; CI: confidence interval.

Declarations

Ethics approval and consent to participate

This research was approved by the ethics committee of the Okayama University.

Consent for publication

Candidates agreed to provide web-based informed consent.

Availability of data and materials

All data used and analyzed during this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors’ contributions

TT1 contributed to the study design, the writing of the paper, and drafting of the manuscript. TT2 participated in the design of the study. HM, HT and TT3 collected and analysed the data. TO reviewed and edited the manuscript. All authors read and approved the final manuscript.
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Tables
Table 1. Characteristics of the sample

| Sociodemographic characteristics | Number of respondents ($n=4,972$) |
|----------------------------------|----------------------------------|
| Age (years)                      | 53.8±15.5 (15–79)                |
| Sex, female/male                 | 2,661 / 2,311                    |
| BMI (kg/m$^2$)                   | 22.7±3.8 (10.7–55.5)             |
| Family                           |                                  |
| Single                           | 957                              |
| Marital partner                  | 3,118                            |
| Children                         | 1,825                            |
| Grandchildren                    | 902                              |
| Parents                          | 102                              |
| Grandparents                     | 72                               |
| Brother and sister               | 299                              |
| Others                           | 73                               |
| Education                        |                                  |
| Junior high school               | 79                               |
| High school                      | 1,497                            |
| Junior college, professional school | 1,217                          |
| University                       | 1,962                            |
| Graduate school                  | 210                              |
| Others                           | 7                                |
| Employment                       |                                  |
| Independent business             | 387                              |
| Company employee                 | 1,617                            |
| Contract employee, dispatched employee, and part-timer | 943                             |
| Students                         | 137                              |
| Unemployed                       | 1,888                            |
| Chronic disease                  |                                  |
| Condition                                | Count |
|-----------------------------------------|-------|
| Hypertension                            | 1,508 |
| Diabetes                                | 475   |
| Asthma                                  | 728   |
| Cardiovascular disease                  | 360   |
| Stroke                                  | 147   |
| Chronic obstructive pulmonary disease    | 96    |
| Cancer                                  | 358   |
| Depression                              | 641   |
| BMI, body mass index                    |       |
## Table 2. Univariate analyses comparing factors in patients with or without chronic pain

| Variables                                      | Chronic pain |             |       | ES     |
|------------------------------------------------|--------------|-------------|-------|--------|
|                                                | (+) (n=2,486)| (-) (n=2,486)|       | P value |       |
| Age (years)                                    | 53.7±15.5 (15–79) | 53.8±15.6 (15–79) | 0.8911\(a\) | 0.0039\(c\) |
| Sex, female/male                               | 1,342 / 1,144 | 1,319 / 1,167 | 0.5131\(b\) |        |
| BMI (kg/m²)                                    | 23.0±4.1 (10.7–55.5) | 23.2±3.9 (12.1–37.8) | <0.0001\(a\) | 0.1883\(c\) |
| Pain that developed during the COVID-19 pandemic |               |             |       |        |
| Neck/shoulder pain                             | 82 (3.3%) | 36 (1.4%) | <0.0001\(a\) | 0.0607\(d\) |
| Upper limb pain                                | 79 (3.2%) | 40 (1.6%) | <0.0001\(a\) | 0.0512\(d\) |
| Back pain                                      | 75 (3.0%) | 32 (1.3%) | <0.0001\(a\) | 0.0595\(d\) |
| Low back pain                                  | 94 (3.8%) | 47 (1.9%) | <0.0001\(a\) | 0.0568\(d\) |
| Hip/knee pain                                  | 79 (3.2%) | 30 (1.2%) | <0.0001\(a\) | 0.0672\(d\) |
| Lifestyle                                       |             |             |       |        |
| Body weight gain                               | 880 (35.3%) | 664 (26.7%) | <0.0001\(a\) | 0.0934\(d\) |
| Sleep more than usual                          | 236 (9.5%) | 195 (7.8%) | 0.04\(a\) | 0.0291\(d\) |
| Insomnia                                       | 717 (28.8%) | 411 (16.5%) | <0.0001\(a\) | 0.1465\(d\) |
| Excluding breakfast                            | 137 (5.5%) | 83 (3.3%) | <0.0001\(a\) | 0.0527\(d\) |
| Nutritionally balanced meal                    | 1,947 (78.2%) | 2,068 (83.2%) | <0.0001\(a\) | 0.0628\(d\) |
| Disciplined life                               | 1,934 (77.7%) | 2,089 (84.0%) | <0.0001\(a\) | 0.0804\(d\) |
| Sports viewing                                 | 80 (3.2%) | 96 (3.9%) | 0.2164\(a\) | 0.0175\(d\) |
| Going to a gym                                 | 151 (6.1%) | 173 (7.0%) | 0.2022\(a\) | 0.0181\(d\) |
| Outdoor sports                                 | 1,212 (48.7%) | 1,122 (45.1%) | 0.0119\(a\) | 0.0357\(d\) |
| Human relationships                                      |       |       |       |       |
|----------------------------------------------------------|-------|-------|-------|-------|
| Devoted more time to one's family members                | 603   | 504   | <0.0001<sup>a</sup> | 0.0475<sup>d</sup> |
| Worsening relationship with partner                      | 150   | 108   | 0.0075<sup>a</sup> | 0.0379<sup>d</sup> |
| Worsening relationship with children                     | 99    | 68    | 0.0150<sup>a</sup> | 0.0345<sup>d</sup> |
| Worsening relationship with family other than partner and children | 158   | 100   | <0.0001<sup>a</sup> | 0.0524<sup>d</sup> |
| Worsening relationship with friends                      | 178   | 100   | <0.0001<sup>a</sup> | 0.0681<sup>d</sup> |
| Work and/or study performance                            | 2,042 | 2,208 | <0.0001<sup>a</sup> | 0.0959<sup>d</sup> |
| Housework performance                                   | 2,110 | 2,290 | <0.0001<sup>a</sup> | 0.1146<sup>d</sup> |
| Find one's life worth living                             | 1,091 | 937   | <0.0001<sup>a</sup> | 0.0625<sup>d</sup> |

| Psychological factors related to COVID-19                |       |       |       |       |
|----------------------------------------------------------|-------|-------|-------|-------|
| Fear of COVID-19                                          | 1,767 | 1,621 | <0.0001<sup>a</sup> | 0.0620<sup>d</sup> |
| Uncomfortable thinking about COVID-19                     | 1,489 | 1,367 | <0.0001<sup>a</sup> | 0.0489<sup>d</sup> |
| Fear of dying from COVID-19                              | 150   | 220   | <0.0001<sup>a</sup> | 0.0538<sup>d</sup> |
| Tension and/or anxiety with news of COVID-19              | 725   | 656   | 0.0309<sup>a</sup> | 0.0306<sup>d</sup> |
| Insomnia due to worry about COVID-19                      | 132   | 164   | 0.0538<sup>a</sup> | 0.0273<sup>d</sup> |
| Palpitation when they thought about COVID-19              | 139   | 179   | 0.0198<sup>a</sup> | 0.0330<sup>d</sup> |

| Changes during the COVID-19 pandemic                      |       |       |       |       |
|----------------------------------------------------------|-------|-------|-------|-------|
| Increased anxiety/depression                             | 584   | 336   | <0.0001<sup>a</sup> | 0.1281<sup>d</sup> |
| Feeling isolated                                         | 500   | 311   | <0.0001<sup>a</sup> | 0.1026<sup>d</sup> |
| Refrained voluntarily from going out due to the scrutiny of others | 532   | 340   | <0.0001<sup>a</sup> | 0.1012<sup>d</sup> |
| Anxiety about becoming infected with COVID-19 and being criticized by others | 563   | 369   | <0.0001<sup>a</sup> | 0.0996<sup>d</sup> |
| Discriminated against in relation to COVID-19            | 106   | 69    | 0.0045<sup>a</sup> | 0.0402<sup>d</sup> |
| Feeling to be under constant surveillance by others with respect to infection prevention | 547 (22.0%) | 337 (13.6%) | <0.0001<sup>a</sup> | 0.1101<sup>d</sup> |
|-----------------------------------------------|-------------|-------------|----------------|-----------------|
| Anxiety with regard to the behavior of others in relation to infection prevention | 1,231 (49.4%) | 779 (31.3%) | <0.0001<sup>a</sup> | 0.1846<sup>d</sup> |
| Deterioration of physical condition           | 749 (30.1%) | 332 (13.3%) | <0.0001<sup>a</sup> | 0.2029<sup>d</sup> |

ES, effect size; BMI, body mass index. Data are expressed as mean ± standard deviation, and range, or number of patients and percentage. <sup>a</sup>Student’s t-test; <sup>b</sup>Chi-squared test; <sup>c</sup>Cohen’s d; <sup>d</sup>Cramer’s V.
### Table 3. Univariate analyses comparing factors in patients with good or bad physical condition

| Variables                                   | Physical condition | P value      | ES       |
|---------------------------------------------|--------------------|--------------|----------|
|                                             | Good (n=3,891)     | Bad (n=1,081) |          |
|                                             | Age (years)        |              | <0.0001<sup>a</sup> | 0.1993<sup>c</sup> |
|                                             | 54.4±15.4 (15–79)  | 51.4±15.7 (15–79) |          |
|                                             | Sex, female/male   |              | <0.0001<sup>b</sup> |          |
|                                             | 2,018 / 1,873      | 643 / 438    |          |
|                                             | BMI (kg/m<sup>2</sup>) |            | 0.0223<sup>a</sup> | 0.0783<sup>c</sup> |
|                                             | 22.6±3.6 (12.1–55.5) | 22.9±4.4 (10.7–51.1) |          |
|                                             | Chronic pain       |              | <0.0001<sup>a</sup> | 0.2033<sup>d</sup> |
|                                             | 1,737 (44.6%)      | 749 (69.3%)  |          |
| Pain that developed during the COVID-19 pandemic |                   |              |          |
| Neck pain                                   | 61 (1.6%)          | 56 (5.2%)    | <0.0001<sup>a</sup> | 0.0983<sup>d</sup> |
| Upper pain                                  | 64 (1.6%)          | 55 (5.1%)    | <0.0001<sup>a</sup> | 0.0929<sup>d</sup> |
| Back pain                                   | 53 (1.4%)          | 54 (5.0%)    | <0.0001<sup>a</sup> | 0.1033<sup>d</sup> |
| Low back pain                               | 67 (1.7%)          | 74 (6.8%)    | <0.0001<sup>a</sup> | 0.1273<sup>d</sup> |
| Hip/knee pain                               | 49 (1.3%)          | 60 (5.6%)    | <0.0001<sup>a</sup> | 0.1209<sup>d</sup> |
| Lifestyle                                    |                    |              |          |
| Body weight gain                            | 1,047 (26.9%)      | 496 (45.9%)  | <0.0001<sup>a</sup> | 0.1692<sup>d</sup> |
| Sleep more than usual                       | 303 (7.8%)         | 127 (11.7%)  | <0.0001<sup>a</sup> | 0.0581<sup>d</sup> |
| Insomnia                                    | 587 (15.1%)        | 541 (50.0%)  | <0.0001<sup>a</sup> | 0.3443<sup>d</sup> |
| Excluding breakfast                         | 124 (3.2%)         | 96 (8.9%)    | <0.0001<sup>a</sup> | 0.1142<sup>d</sup> |
| Nutritionally balanced meal                 | 3,177 (81.6%)      | 836 (77.3%)  | 0.0015<sup>a</sup> | 0.0451<sup>d</sup> |
| Disciplined life                            | 3,212 (82.5%)      | 809 (74.8%)  | <0.0001<sup>a</sup> | 0.0809<sup>d</sup> |
| Sports viewing                              | 132 (3.4%)         | 44 (4.1%)    | 0.2860<sup>a</sup> | 0.0151<sup>d</sup> |
| Going to a gym                              | 245 (6.3%)         | 79 (7.3%)    | 0.2333<sup>a</sup> | 0.0169<sup>d</sup> |
|                          | Before (n, %) | After (n, %) | p-value | a     | d     |
|--------------------------|---------------|--------------|---------|-------|-------|
| **Outdoor sports**       | 1,837 (47.2%) | 496 (45.9%)  | 0.4389  | 0.0110|       |
| **Human relationships**  |               |              |         |       |       |
| Devoted more time to one's family members | 795 (20.4%) | 311 (28.8%)  | <0.0001a | 0.0827d|       |
| Worsening relationship with partner | 117 (3.0%) | 141 (13.0%)  | <0.0001a | 0.1866d|       |
| Worsening relationship with children | 70 (1.8%) | 97 (9.0%)    | <0.0001a | 0.1643d|       |
| Worsening relationship with family other than partner and children | 93 (2.4%) | 165 (15.3%)  | <0.0001a | 0.2394d|       |
| Worsening relationship with friends | 125 (3.2%) | 153 (14.2%)  | <0.0001a | 0.1964d|       |
| Deterioration of work and/or study performance | 3,546 (91.1%) | 703 (65.0%)  | <0.0001a | 0.3054d|       |
| Deterioration of housework performance | 3,655 (93.9%) | 743 (68.7%)  | <0.0001a | 0.3253d|       |
| Find one's life worth living | 1,434 (36.9%) | 593 (54.9%)  | <0.0001a | 0.1511d|       |
| **Psychological factors related to COVID-19** |               |              |         |       |       |
| Fear of COVID-19 | 2,562 (65.8%) | 824 (76.2%)  | <0.0001a | 0.0919d|       |
| Uncomfortable thinking about COVID-19 | 2,095 (53.8%) | 759 (70.2%)  | <0.0001a | 0.1366d|       |
| Fear of dying from COVID-19 | 1,362 (35.0%) | 505 (46.7%)  | <0.0001a | 0.0998d|       |
| Tension and/or anxiety with news of COVID-19 | 970 (24.9%) | 411 (38.0%)  | <0.0001a | 0.1206d|       |
| Insomnia due to worry about COVID-19 | 190 (4.9%) | 106 (9.8%)   | <0.0001a | 0.0858d|       |
| Palpitation when they thought about COVID-19 | 197 (5.1%) | 121 (11.2%)  | <0.0001a | 0.1033d|       |
| **Changes during the COVID-19 pandemic** |               |              |         |       |       |
| Increased anxiety/depression | 483 (12.4%) | 437 (40.4%)  | <0.0001a | 0.2976d|       |
| Feeling isolated | 441 (11.3%) | 370 (34.2%)  | <0.0001a | 0.2556d|       |
| Refrained voluntarily from going out due to the scrutiny of others | 542 (13.9%) | 330 (30.5%)  | <0.0001a | 0.1800d|       |
| Anxiety about becoming infected with COVID-19 and being criticized by others | 601 (15.4%) | 331 (30.6%) | <0.0001<sup>a</sup> | 0.1604<sup>d</sup> |
|-----------------------------|-------------|-------------|-------------------|------------------|
| Discriminated against in relation to COVID-19 | 103 (2.6%) | 72 (6.7%) | <0.0001<sup>a</sup> | 0.0898<sup>d</sup> |
| Feeling to be under constant surveillance by others with respect to infection prevention | 569 (14.6%) | 314 (29.0%) | <0.0001<sup>a</sup> | 0.1557<sup>d</sup> |
| Anxiety with regard to the behavior of others in relation to infection prevention | 1,396 (35.9%) | 613 (56.7%) | <0.0001<sup>a</sup> | 0.1751<sup>d</sup> |

BMI, body mass index. Data are expressed as mean ± standard deviation, and range, or number of patients and percentage. <sup>a</sup>Student’s t-test; <sup>b</sup>Chi-squared test; <sup>c</sup>Cohen’s d; <sup>d</sup>Cramer’s V.

### Table 4. Multiple logistic regression analysis for physical condition.

| Variables | Partial regression coefficient | Standard error | OR  | 95% CI          | P value |
|-----------|-------------------------------|----------------|-----|-----------------|---------|
|           |                               |                |     | Lower | Upper |         |
| Insomnia  | 1.16                          | 0.09           | 3.20| 2.67  | 3.83  | < 0.001 |
| Deterioration of work and/or study performance | 0.88              | 0.11           | 2.40| 1.94  | 2.97  | < 0.001 |
| Deterioration of housework performance | 1.08              | 0.12           | 2.94| 2.33  | 3.70  | < 0.001 |
| Increased anxiety/depression | 0.67              | 0.098          | 1.96| 1.61  | 2.37  | < 0.001 |
| Constant term | -2.13                        | 0.052          | 0.12| 0.11  | 0.13  | < 0.001 |

OR, odds ratio; CI, confidence interval.