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# Portuguese nurses' stress, anxiety, and depression reduction strategies during the COVID-19 outbreak

**Lara Pinho [1,2]*, Francisco Sampaio [3,4], Carlos Sequeira [4,5], Laetitia Teixeira [6,7], César Fonseca [1,2] and Manuel Lopes [1,2]**

[1] S. João de Deus School of Nursing, University of Évora, Portugal;
[2] Comprehensive Health Research Centre (CHRC), Évora, Portugal;
[3] University Fernando Pessoa, Faculty of Health Sciences, Porto, Portugal;
[4] Center for Health Technology and Services Research, Research Group "NursID: Innovation & Development in Nursing", Porto, Portugal;
[5] Nursing School of Porto, Porto, Portugal;
[6] University of Porto, Abel Salazar Institute of Biomedical Sciences, Porto, Portugal;
[7] Center for Health Technology and Services Research, Research Group "AgeingC: AgeingCluster", Porto, Portugal
* Correspondence: lmgp@uevora.pt;

**Abstract:** The COVID-19 pandemic has contributed to mental health problems worldwide. Nurses are particularly prone to stress because they directly care for individuals with suspected or confirmed cases of COVID-19. The aim of this study is to explore the association between the mental health promotion strategies used by nurses during the coronavirus disease (COVID-19) outbreak and their symptoms of depression, anxiety, and stress, and to compare the strategies and symptoms of mental health nurses and non-mental health nurses. Cross-sectional study was conducted with a sample of 821 nurses. Portuguese nurses demonstrated high symptoms of depressive symptoms, stress, and anxiety. Healthy eating, physical activity, rest between shifts, maintaining social contacts, verbalizing feelings/emotions, and spending less time searching for information about COVID-19 are associated with better mental health. Mental health nurses have less depression, anxiety, and stress, and use more strategies to promote mental health than other nurses. We consider it important to promote nurses' mental health literacy by encouraging them to develop skills and strategies aimed at improving their resilience and ability to deal with difficult situations while caring for the population.

**Keywords:** anxiety; COVID-19; depression; mental health; mental health nurses; nurses; Portugal; stress

## 1. Introduction

Health professionals are on the frontlines combating the COVID-19 pandemic, and they are the ones who deal more directly with sick people throughout the care process [1]. The increasing number of individuals with confirmed or suspected cases, deficiency of protective equipment, work overload, media reporting, and the nonexistence of specific medications for the virus are risk factors for mental health problems in these professionals [1]. In previous pandemic outbreaks, the well-being of frontline professionals were affected [2]. For all these reasons, health professionals are at a higher risk of mental health issues, and symptoms of stress, anxiety, and depression may develop [1].

The caregiving process requires a capacity for discernment and critical reasoning, both interrelated [3] and disturbed in situations of stress and anxiety exacerbation. Nurses have an important role in providing healthcare during the pandemic and represent the largest number of health professionals in this sector [4]. Therefore, it is important and urgent to preserve their mental health. Epidemiological information on the mental health of nurses

and the factors that influence it during the COVID-19 pandemic are scarce, yet fundamental for the management of their actions in this context [2]. In addition, we consider that nations will be able to fight this long battle and ensure success for the future only if mental health is preserved through the reinforcement of resilience factors. Thus, it is useful to evaluate the mental health of these professionals by verifying the relationship between the use of strategies suggested by the WHO and the symptoms of depression, anxiety, and stress in nurses, to determine which strategies are the most effective.

Given that this study was conducted in Portugal, it seems relevant to discuss the geographical context of this country and to present data on the beginning and evolution of the pandemic. In 2019, Portugal had approximately 10.3 million residents [5]. The first case of COVID-19 infection appeared on March 3, 2020. The epidemiological evolution of the pandemic in the data collection period of this study was as follows: until March 30, 2020, at 12 AM, Portugal had registered 7 443 COVID-19 cases, 43 recovered cases, and 160 deaths; by February 3, 2021, there had been 726 321 confirmed COVID-19 cases, 534 384 recovered cases, and 12 757 deaths [6].

In a preliminary Portuguese study, with a sample of 767 nurses, it was found that by April 7, 12.3% had been mobilized to another service, and 3.5% to another unit. The average weekly working hours of the sample was 42 hours, with higher symptoms of anxiety, stress, and depression in those professionals working longer hours. Research has shown that unexpected changes in professional and family dynamics can have repercussions on mental health, causing symptoms of depression, anxiety, or stress [7].

Previous studies related to the SARS outbreak in 2003 showed that health professionals had higher symptoms of depression, anxiety, and stress one year after the outbreak, compared to other professionals [8], indicating that the repercussions on mental health were prolonged over time. Given the importance of protecting the mental well-being and health of these professionals over the long term, concerns about the mental health and psychological recovery of health professionals, who are on the frontlines caring for individuals with COVID-19, have started to emerge [1,9,10]. However, evidence-based evaluations and interventions focused on the mental health of nurses are relatively scarce.

An investigation conducted in China, with 1257 health professionals, showed that a considerable percentage of the sample described symptoms of insomnia, depression, anxiety, and distress. This symptomatology was more frequent in nurses and health professionals who directly engaged in the diagnosis, treatment, or provision of nursing care to individuals with suspected or confirmed COVID-19 [1]. Other studies have reported higher symptoms of anxiety and higher prevalence in nurses, when compared with other health professionals [11,12]. Therefore, it is fundamental to address the mental health of nurses who treat patients with COVID-19 [1].

The WHO published a set of strategies to promote and protect the mental health of health professionals, including taking breaks and resting between work shifts, eating a healthy diet, participating in physical exercise, avoiding the use of substances (tobacco, alcohol, or other drugs) to deal with stress, and being in contact with family and friends, albeit virtually [13].

Considering the aforementioned concerns, the aim of this study was to explore the association between the mental health strategies used by nurses and symptoms of depression, anxiety, and stress, and to compare the strategies and symptoms of mental health nurses to those of other nurses. For this purpose, the following hypotheses are proposed:

(1) The use of strategies to promote mental health by nurses, in the context of the COVID-19 pandemic, is significantly associated with symptoms of depression, anxiety, and stress.

(2) The time that nurses spend searching for information about the COVID-19 pandemic is significantly associated with symptoms of depression, anxiety, and stress.

(3) Being a mental health nurse is significantly associated with fewer symptoms of depression, anxiety, and stress, compared to a non-mental health nurse.

(4) Being a mental health nurse is significantly associated with the use of more mental health promotion strategies, compared to a non-mental health nurse.

## 2. Materials and Methods

### Design

This is a cross-sectional study that followed the STrengthening the Reporting of OBservational studies in Epidemiology guidelines. It was administered as an online questionnaire to nurses working in clinical practices in Portugal, to evaluate depression, anxiety, and stress, as well as strategies for promoting mental health. Nurses who were teleworking, those who did not perform functions in clinical practice, and those who were absent from work due to medical discharge or other reasons, were excluded from the study.

### Data collection

We used the non-probabilistic snowball sampling method. An online questionnaire was sent via e-mail to a vast contact network of the researchers who, in turn, sent the questionnaire to their respective contact networks, and responses were obtained from nurses throughout the country.

Data were collected from March 31, 2020 to April 14, 2020, the period when Portugal was in a state of emergency, which was declared on March 18, 2020 [14], and in the mitigation phase of the COVID-19 pandemic.

The questionnaire consisted of four main sections, described in detail below: (1) sociodemographic data, (2) professional data, (3) data on the mental health promotion strategies used, and (4) measurement tools for depression, anxiety, and stress.

To characterize the sample, we collected sociodemographic data, such as gender, age, academic qualifications, marital status, nationality; and professional data, such as where they worked and their specialty. Data related to the use of strategies to promote mental health were collected using a questionnaire, and data related to their mental health were evaluated using the Depression Anxiety Stress Scale – short version (DASS-21).

### Strategies of mental health promotion

Mental health promotion strategies were evaluated using a questionnaire developed for this study, based on the indications of the WHO for the promotion of mental health [13]. The questions on the questionnaire were closed-ended and used an ordinal scale with the options never, rarely, sometimes, often, and always. This questionnaire comprised nine questions, each question corresponding to a strategy. We assessed mental health promotion strategies such as physical activity, relaxing activities, rest between work shifts, and maintenance of social connections.

### Depression Anxiety Stress Scale – short version (DASS-21)

The DASS-21 was developed to assess the symptoms of depression, anxiety, and stress [15]. The self-report DASS instrument comprises a set of three scales with seven items rated on a 4-point scale of severity/frequency that assesses the extent to which the individual experienced each state in the previous week [16]. The depression, anxiety, and stress scores are calculated by summing the scores of the respective items [16]. Each scale ranges from 0 to 21 points, and the higher the score, the more severe the symptoms of depression, anxiety, and/or stress [16]. Given that the DASS-21 reduced version has a score from 0 to 21, one can use these cut-off points by multiplying the scale value by 2, which yields a score from 0 to 42 [16]. The Portuguese version of the DASS-21 has a Cronbach's alpha of 0.85 for the depression subscale, 0.74 for the anxiety subscale, and 0.81 for the stress subscale. The tridimensional solution explains 50.35% of the variance (34.78% for the stress subscale, 9.14% for the depression subscale, and 6.47% for the anxiety subscale). There is a high correlation between the DASS-21 and DASS-42 (long version) subscales, with explained variances of 89%, 90%, and 96% for the stress, anxiety, and depression subscales, respectively [15].

Analysis

Descriptive statistics (mean, standard deviation, and absolute and relative frequency) were used according to the type of variable to characterize the study sample. Univariate and multivariate regression models were developed to identify potential protective factors (strategies used, time seeking information, mental health nursing specialty, and sociodemographic characteristics) of depression, anxiety, and stress. The chi-square test was also used to compare the use of strategies among groups (mental health and non-mental health nurses). IBM SPSS version 24 for Windows was used to perform the statistical analyses. The threshold for statistical significance was set at 0.05.

## 3. Results

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

### *3.1. Sociodemographic and clinic characteristics*

The sample consisted of 821 participants (81.1% female) with an average age of 39.1 (SD = 9.6) years (range, 22–65 years), 54.2% were nursing specialists and 18.5% were mental health nursing specialists. The dynamics of care delivery has changed, and nurses provide care for people suspected or infected by COVID-19 in all health services. Therefore, the sample provided care for all patients, regardless of whether they were suspected or not of being infected with COVID-19. Moreover, 6.3% provided care in services created specifically to support people infected by COVID-19.

The respondents spent an average of 2.7 (2.2) hours per day seeking information about COVID-19.

The DASS-21 results indicated that, regarding symptoms within the normal range, 64.9% of participants presented with symptoms of depression, 54.3% with anxiety, and 36.4% with stress. In relation to severe or extremely severe symptoms, 18.5% of participants presented anxiety, 10.9% stress, and 7.4% depression symptoms. The DASS-21 results are provided in Table 1.

**Table 1.** Description of depression, anxiety, and stress (DASS-21)

| | Mean (sd) | Range | %Normal | %Mild | %Moderate | %Severe | %Extremely severe |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DASS-21 Depression | 4.00 (3.86) | 0–21 | 64.9 | 14.9 | 12.8 | 4.5 | 2.9 |
| DASS-21 Anxiety | 4.18 (4.06) | 0–21 | 54.3 | 9.6 | 17.5 | 7.7 | 10.8 |
| DASS-21 Stress | 7.32 (4.54) | 0–21 | 36.4 | 36.9 | 15.7 | 8.0 | 2.9 |

*3.2. Findings related to the hypotheses*

Considering the unadjusted linear regression models, all factors tested were statistically significant. The results of the adjusted models are shown in Table 2.

**Table 2.** Description of the survey demographics, professionals, mental health strategies, and mental health variables and the statistical results for the linear regression models.

| | Adjusted models | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DASS-21 - Depression | | | DASS-21 - Anxiety | | | DASS-21 - Stress | | |
| | B (se) | 95% CI | p | B (se) | 95% CI | p | B (se) | 95% CI | p |
| Sex: fem. [ref: male] | 0.73 (0.32) | 0.09–-1.37 | **0.025** | 1.35 (0.34) | 0.68–2.03 | **<0.001** | 1.50 (0.38) | 0.76–2.24 | **<0.001** |
| Age | -0.04 (0.01) | -0.06– -0.01 | **0.005** | -0.06 (0.01) | -0.09– -0.03 | **<0.001** | -0.10 (0.02) | -0.13– -0.07 | **<0.001** |
| Mental health specialty: yes [ref: no] | -0.76 (0.33) | -1.40– -0.12 | **0.020** | -0.78 (0.34) | -1.45– -0.10 | **0.024** | -0.74 (0.38) | -1.48–-0.01 | **0.048** |
| Time searching for information | 0.16 (0.06) | 0.05–0.27 | **0.005** | 0.17 (0.06) | 0.05–0.28 | **0.006** | 0.34 (0.07) | 0.22–0.47 | **<0.001** |
| Rest between work shifts [ref: often or always] | | | | | | | | | |
| Never or rarely | 0.54 (0.42) | -0.30–1.37 | 0.206 | 1.34 (0.45) | 0.46–2.23 | **0.003** | 0.98 (0.49) | 0.02–1.94 | **0.047** |
| Sometimes | 0.79 (0.30) | 0.20–1.38 | **0.009** | 0.69 (0.32) | 0.07–1.32 | **0.030** | 0.68 (0.35) | -0.004–1.36 | 0.051 |
| Eating healthy [ref: often or always] | | | | | | | | | |
| Never or rarely | 1.71 (0.46) | 0.80–2.62 | **<0.001** | 1.23 (0.49) | 0.26–2.19 | **0.013** | 1.42 (0.53) | 0.37–2.46 | **0.008** |
| Sometimes | 1.03 (0.32) | 0.42–1.65 | **0.001** | 0.66 (0.33) | 0.002–1.31 | **0.049** | 1.16 (0.36) | 0.45–1.88 | **0.001** |
| Adequate water intake [ref: often or always] | | | | | | | | | |
| Never or rarely | -0.08 (0.40) | -0.85–0.68 | 0.830 | -0.02 (0.41) | -0.83–0.79 | 0.967 | 0.30 (0.45) | -0.58–1.18 | 0.503 |
| Sometimes | 0.19 (0.30) | -0.40–0.78 | 0.518 | -0.22 (0.32) | -0.84–0.40 | 0.488 | 0.02 (0.35) | -0.66–0.69 | 0.964 |
| Physical activity [ref: often or always] | | | | | | | | | |
| Never or rarely | 0.68 (0.41) | -0.11–1.48 | 0.093 | 1.15 (0.43) | 0.31–1.99 | **0.007** | 0.78 (0.47) | -0.14–1.70 | 0.097 |
| Sometimes | 0.21 (0.42) | -0.61–1.03 | 0.613 | 0.55 (0.44) | -0.32–1.41 | 0.215 | 0.33 (0.48) | -0.62–1.27 | 0.497 |
| Relaxing activities [ref: often or always] | | | | | | | | | |
| Never or rarely | 0.48 (0.45) | -0.40–1.36 | 0.281 | 0.32 (0.47) | -0.61–1.25 | 0.501 | 0.82 (0.52) | -0.19–1.83 | 0.113 |
| Sometimes | 0.08 (0.44) | -0.78–0.93 | 0.856 | 0.31 (0.46) | -0.59–1.22 | 0.500 | 0.72 (0.50) | -0.26–1.71 | 0.151 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Recreational activities [ref: often or always] | | | | | | | | | |
| Never or rarely | 0.55 (0.40) | -0.22–1.33 | 0.164 | 0.63 (0.42) | -0.19–1.46 | 0.133 | 0.79 (0.46) | -0.11–1.68 | 0.086 |
| Sometimes | -0.19 (0.32) | -0.82–0.44 | 0.560 | -0.20 (0.34) | -0.87–0.47 | 0.551 | 0.02 (0.37) | -0.71–0.75 | 0.966 |
| Maintenance of social connections [ref: often or always] | | | | | | | | | |
| Never or rarely | 1.23 (0.44) | 0.37–2.08 | **0.005** | 0.81 (0.46) | -0.09–1.71 | 0.079 | 0.73 (0.50) | -0.25–1.72 | 0.144 |
| Sometimes | 0.14 (0.31) | -0.47–0.76 | 0.651 | 0.43 (0.33) | -0.22–1.08 | 0.199 | 0.28 (0.36) | -0.42–1.00 | 0.431 |
| Verbalization of feelings/emotions [ref: often or always] | | | | | | | | | |
| Never or rarely | 0.40 (0.35) | -0.30–1.09 | 0.263 | -0.04 (0.37) | -0.77–0.70 | 0.918 | 0.09 (0.41) | -0.71–0.89 | 0.817 |
| Sometimes | 0.69 (0.33) | 0.04–1.34 | **0.038** | 0.47 (0.35) | -0.22–1.15 | 0.183 | 0.52 (0.38) | -0.23–1.27 | 0.175 |
| Avoidance of access to information from unreliable sources [ref: often or always] | | | | | | | | | |
| Never or rarely | 0.16 (0.34) | -0.49–0.82 | 0.623 | 0.16 (0.36) | -0.54–0.86 | 0.659 | -0.39 (0.39) | -1.15–0.37 | 0.313 |
| Sometimes | 0.33 (0.33) | -0.31–0.97 | 0.312 | 0.45 (0.34) | -0.22–1.13 | 0.190 | -0.06 (0.38) | -0.79–0.68 | 0.880 |

The factors associated with fewer symptoms of depression were: being older ($p < 0.01$), being a mental health nurse ($p < 0.05$), being male ($p < 0.05$), spending less time searching for information about COVID-19 ($p < 0.01$), resting often/always between work shifts, compared with only a few times ($p < 0.01$), eating healthily often/always, compared with never or rarely ($p < 0.001$) and sometimes ($p < 0.01$), frequently/always verbalizing feelings/emotions, compared with sometimes ($p < 0.05$), and often/always maintaining social connections, compared with sometimes ($p < 0.05$).

The factors associated with fewer symptoms of anxiety included: being male ($p < 0.001$), being older ($p < 0.001$), being a mental health nurse ($p < 0.05$), spending less time searching for information about COVID-19 ($p < 0.01$), eating healthily frequent/always, compared to never or rarely ($p < 0.05$) and sometimes ($p < 0.05$), often/always resting between work shifts, compared to never/rarely ($p < 0.05$) and sometimes ($p < 0.05$), and often/always participating in physical activity, compared with never or rarely ($p < 0.01$).

The factors associated with fewer symptoms of stress were: being male ($p < 0.001$), being older ($p < 0.001$), being a mental health nurse ($p < 0.05$), spending less time searching for information about COVID-19 ($p < 0.001$), eating healthily often/always, compared to never or rarely ($p = 0.008$) and sometimes ($p = 0.001$), and frequent/always resting between work shifts, compared with never/rarely ($p < 0.05$).

The results regarding the use of mental health promotion strategies by mental health nurses and non-mental health nurses are presented in Table 3. Mental health nurses used the following strategies more frequently: healthy eating ($p < 0.01$), adequate water intake ($p < 0.05$), relaxing activities ($p < 0.001$), recreational activities ($p < 0.001$), maintenance of social contacts (at a distance; $p < 0.001$), and verbalization of feelings/emotions ($p < 0.01$).

**Table 3. Strategies used for promoting mental health (n = 821)**

| | Never | Rarely | Sometimes | Often | Always | *p* value * |
|---|---|---|---|---|---|---|
| | | | n (%) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Rest between work shifts* | | | | | | |
| Mental health nurses | 3 (2.0) | 13 (8.6) | 36 (23.7) | 64 (42.1) | 36 (23.7) | |
| Non-mental health nurses | 27 (4.0) | 52 (7.8) | 190 (28.4) | 260 (38.9) | 140 (20.9) | $p = 0.196$ |
| *Eating healthy* | | | | | | |
| Mental health nurses | 1 (0.7) | 11 (7.2) | 36 (23.7) | 71 (46.7) | 33 (21.7) | |
| Non-mental health nurses | 4 (0.6) | 77 (11.5) | 203 (30.3) | 283 (42.3) | 102 (15.2) | **$p = 0.006$** |
| *Adequate water intake* | | | | | | |
| Mental health nurses | 2 (1.3) | 20 (13.2) | 51 (33.6) | 55 (36.2) | 24 (15.8) | |
| Non-mental health nurses | 12 (1.8) | 137 (20.5) | 232 (34.7) | 214 (32.0) | 74 (11.1) | **$p = 0.013$** |
| *Physical activity* | | | | | | |
| Mental health nurses | 29 (19.1) | 58 (38.2) | 36 (23.7) | 20 (13.2) | 9 (5.9) | |
| Non-mental health nurses | 167 (25) | 223 (33.3) | 176 (26.3) | 75 (11.2) | 28 (4.2) | $p = 0.253$ |
| *Relaxing activities* | | | | | | |
| Mental health nurses | 13 (8.6) | 52 (34.2) | 54 (35.5) | 26 (17.1) | 7 (4.6) | |
| Non-mental health nurses | 162 (24.2) | 245 (36.6) | 179 (26.8) | 71 (10.6) | 12 (1.8) | **$p < 0.001$** |
| *Recreational activities* | | | | | | |
| Mental health nurses | 4 (2.6) | 20 (13.2) | 51 (33.6) | 56 (36.8) | 21 (13.8) | |
| Non-mental health nurses | 44 (6.6) | 135 (20.2) | 230 (34.4) | 216 (32.3) | 44 (6.6) | **$p < 0.001$** |
| *Maintenance of social connections (while social distancing)* | | | | | | |
| Mental health nurses | 1 (0.7) | 14 (9.2) | 49 (32.2) | 62 (40.8) | 26 (17.1) | |
| Non-mental health nurses | 13 (1.9) | 94 (14.1) | 275 (41.1) | 222 (33.2) | 65 (9.7) | **$p < 0.001$** |
| *Verbalization of feelings/emotions* | | | | | | |
| Mental health nurses | 5 (3.3) | 29 (19.1) | 55 (36.2) | 47 (30.9) | 16 (10.5) | |
| Non-mental health nurses | 43 (6.4) | 184 (27.5) | 222 (33.2) | 180 (26.9) | 40 (6.0) | **$p = 0.003$** |
| *Avoidance of access to information from unreliable sources about COVID-19* | | | | | | |
| Mental health nurses | 12 (7.9) | 17 (11.2) | 33 (21.7) | 53 (34.9) | 37 (24.3) | |
| Non-mental health nurses | 47 (7.0) | 86 (12.9) | 138 (20.6) | 211 (31.1) | 187 (28) | $p = 0.661$ |

* Mann–Whitney U test

## 4. Discussion

This study explored the association between the use of strategies that promote positive mental health outcomes by nurses and their symptoms of depression, anxiety, and stress. In addition, this study aimed to determine the existence of differences in these symptoms between mental health nurses and non-mental health nurses.

Healthcare professionals are more exposed to traumatic events such as the suffering and death of patients due to direct contact with individuals infected by COVID-19 [17], which can aggravate symptoms of anxiety [18]. A meta-analysis of 13 Asian studies suggested a prevalence rate of anxiety and depression among health care professionals as 23.2% and 22.8%, respectively [17], and another meta-analysis of 62 studies from 17 countries found a similar prevalence rate of depression and anxiety in health care professionals. Compared with the results of this study, we observed a higher prevalence of anxiety (36.0%), while the prevalence of depression is generally in line with previous studies (20.2%). These results may be because nurses are on the frontline of the pandemic, whether in the diagnosis, treatment, or care of infected individuals, in addition to the social representation of the disease. Another possible explanation may be related to the perceived threat of COVID-19. A study conducted with nurses showed that those who with the greatest perceived threat of the pandemic had the most anxiety, insomnia, depression, and social dysfunction [19]. These results must be analyzed with caution because we do not have data about depression, anxiety, and stress before the pandemic for this population group, so we cannot assign a direct cause. Moreover, differences in anxiety, stress, and depression between nurses and the general population may not be exclusively related to the period of the pandemic but may also exist outside of this context. It is important to monitor the mental health of nurses and other health professionals in the post-COVID-19 context, to determine whether these results are due to the current circumstances or if they persist over time, and to evaluate the possible need for intervention to prevent disease and promote mental health, especially because an impairment in the mental health of these professionals can affect the quality of care they provide [20,21].

Sociodemographic variables

In this study, female and younger male nurses showed higher symptoms of depression, anxiety, and stress, compared to male and older nurses. Other studies conducted in the general population corroborate these results, indicating that women had higher symptoms of depression, anxiety, and stress during the COVID-19 outbreak [1,12,22,23]. Another study performed in Portugal during the same period with the general population, showed that females had more symptoms of anxiety and stress [24]. In addition, an epidemiological study on the prevalence of depression between 1994 and 2014, which analyzed 90 studies from different countries (n = 1,112,573 adults), showed that female sex is at higher risk of depression. Data from the present study are in line with these global data in periods outside the pandemic [25]. It is also reported in the literature that women have a higher prevalence of anxiety disorders [26]. Thus, the results of our study, with respect to sex, do not seem to be specific to nursing or the COVID-19 context, as they are in agreement with studies conducted during non-pandemic periods and with the general population.

We now analyze the remaining results based on the hypotheses.

(1) The use of strategies to promote mental health by nurses, in the context of the COVID-19 pandemic, is significantly associated with symptoms of depression, anxiety, and stress.

Fewer depressive symptomatologies were associated with the most frequent use of the following strategies: healthy eating, maintenance of social connections, rest between work shifts, and verbalization of feelings/emotions. Healthy eating and physical activity were related with lower anxiety. Stress was lower in those who more frequently ate a healthy diet and rested between work shifts. As we can observe, healthy eating was associated with fewer symptoms of depression, anxiety, and stress. Some studies indicate that the ingestion of vitamins and minerals is effective for reducing symptoms of depression, anxiety, and stress [27,28]. Therefore, considering that a healthy diet presupposes the consumption of vitamins and minerals, this association may be related to the higher consumption of these nutrients. In addition, other recent studies indicate that healthy nutrients (e.g., fructo-oligosaccharides, galacto-oligosaccharides, legumes, fruits, and nuts) help reduce symptoms of depression, anxiety, and stress in an individual [29]. Thus, the data are consistent with those in the literature. Regarding physical activity, another study conducted with nurses, reported that physical inactivity is significantly positively related to anxiety symptoms [30], which is in line with the results of our study, given that nurses who participated in physical activity exhibited less anxiety symptoms. Resting between work shifts was associated with fewer symptoms of depression and stress. These data are in line with a scoping review that concluded that rest periods in the nursing profession positively influence mental well-being [31]. Maintenance of social connections was associated with fewer symptoms of depression, which is corroborated by studies that indicate that the absence of social contacts is heavily associated with current depression, and heightened vulnerability to future depression [32]. Another factor associated with fewer symptoms of depression was the verbalization of feelings or emotions, which is associated with improved well-being and decreased depressive symptoms, as observed in other studies [33].

Regarding relaxing and recreational activities and adequate water intake, we observed that these strategies did not have statistically significant differences in the regression model when we compared the frequency of their use by nurses and symptoms of depression, anxiety, and stress; this result was not expected and may be because there has been a pandemic-induced change in work routines and even in family dynamics. This may have led to the inability of nurses to relax as they usually would, even though some participated in relaxing and recreational activities. This may also be related to changes in how often these activities were performed during the pandemic, compared to previous period. As we do not have these data, we do not know whether the frequency decreased, was maintained, or increased. In any case, given the changes in work and family dynamics, it is likely that some nurses eventually decreased their frequency of participation in activities.

(2) The time that nurses spend searching for information about the COVID-19 pandemic is significantly associated with symptoms of depression, anxiety, and stress.

Health information on the COVID-19 pandemic should be based on evidence to prevent adverse mental health reactions [23]. Our study showed that nurses who spent more time searching for information on the COVID-19 outbreak presented more symptoms of depression, anxiety, and stress than those who spent less time searching for such information. Similar data were found for the Portuguese population [24]. Another study conducted in China found that health professionals who spent more than three hours per day thinking about the COVID-19 pandemic, had higher prevalence of psychological problems than those who spent less time doing the same [34]. Another study reported a high prevalence of psychological problems associated with the frequency of exposure to social media during the COVID-19 pandemic [35]. In addition, a recent meta-analysis showed that one of the risk factors for a higher psychological burden, including anxiety and depression, was spending more time watching news related to COVID-19 [12]. Therefore, our results are in line with the existing literature, and there seems to be a positive association

between time spent watching news associated to the COVID-19 outbreak and symptoms of anxiety, stress, or depression.

Regarding the sources of information, this study did not obtain statistically significant results concerning the avoidance of access to information about COVID-19 from unreliable sources; therefore, further studies are needed to define whether the type of search source is associated with mental health. However, a study conducted with the Chinese population showed that accurate and up-to-date information on health, particularly on the number of people who recovered from COVID-19, was related with lower symptoms of stress. Information on medications or vaccines, transmission routes, and being informed on the number of infected people and their location, were related with lower symptoms of anxiety [23]. In addition, a recent meta-analysis concluded that having up-to-date and accurate health information seems to be a protective factor for psychological health [12]. Based on the current results, in comparison with existing literature, we consider it advisable to moderate the time spent searching for this information.

(3) Being a mental health nurse is significantly associated with fewer symptoms of depression, anxiety, and stress, compared to a non-mental health nurse.

Mental health nurses acquire a series of skills in their specialized training, that allow them to have "high knowledge and self-awareness as individuals and nurses, through experiences and processes of self-knowledge and personal and professional development" [36]. It is expected that these competencies provide them with the tools necessary to deal with adverse and unexpected situations, making them resilient, not only in the provision of mental health care to patients but also in their mental self-care, implementing effective strategies for promoting mental health and preventing mental illness. A study conducted with nurses during the COVID-19 outbreak proved that resilience was associated with less anxiety related to COVID-19 [18].

In this study, nurses who were not specialized in mental health had more symptoms of depression, anxiety, and stress than those who were. This is a novel finding, with no major studies having obtained comparable results; we only found one study conducted in Hong Kong in 2015, which concluded that generalist nurses were 1.6 times more likely to suffer from anxiety symptoms and 2.2 times more likely to suffer from depression than mental health nurses [30].

(4) Being a mental health nurse is significantly associated with the use of more mental health promotion strategies, compared to a non-mental health nurse.

Our results indicate that mental health nurses use the following strategies more frequently than nurses in other areas: healthy eating, adequate water intake, participation in relaxing and recreational activities, maintenance of social connections (while maintaining social distancing), and verbalization of feelings/emotions. However, since our results are not cause-effect, the fact that these professionals use mental health promotion strategies more often may also be because they have less symptoms of depression, anxiety, and stress. A recent qualitative research study verified that support from family, friends, colleagues, organizations, and the public is crucial to promote nurses' well-being during the COVID-19 pandemic. The same study suggests that institutions implement communication strategies between managers and nurses, to promote the use of strategies to reduce stress and provide accurate information; provide support in basic daily needs; and promote psychosocial support, such as groups to express emotions [37]. Another recent study suggests psychoeducational interventions for nurses to promote coping strategies and reduce psychological symptomatology [19]. Notably, only 42.1% of our sample of mental health nurses worked in psychiatric services, while the remainder were distributed among non-psychiatric services. Some of these nurses were mobilized during the pandemic, which indicates

that the differences observed may be related to the type of specific mental health training that the nurses underwent, which may have increased resilience to stressful situations, such as the COVID-19 pandemic, leading to improved resistance to depression, anxiety, and stress factors. As the literature indicates, cognitive competencies and problem-solving skills are important precursors of resilience [38], and despite these challenges, resilience allows nurses to deal with stressors in their work environment and maintain healthy and stable psychological functioning [39]. Thus, promoting resilience is crucial for nurses coping with work-related stress [40]. Furthermore, a strong support system is essential to promote resilience in nurses [37].

### Limitations

One of the limitations of the study is that it used the non-probabilistic snowball sampling method, which may have led to a potential sampling bias. However, despite this limitation, we were able to obtain a sample from different parts of the country. Furthermore, because the study involved self-reporting by participants, we should consider the risk of response bias. Another limitation is that the results come from a cross-sectional study, which makes it impossible to determine the temporal sequence of events. In other words, the results allow the identification of the association between variables but cannot determine cause-effect relationships.

## 5. Conclusions

Healthy eating, physical activity, rest between work shifts, maintenance of social connections, verbalization of feelings/emotions, and a shorter time spent searching for information about the COVID-19 pandemic were associated with better mental health in nurses. Therefore, taking these factors into account, it is important to promote healthy lifestyle habits and to help reduce the symptoms and prevent the onset of depression, anxiety, and stress. This study leads us to conclude that it is extremely important to encourage nurses to adopt these mental health-promoting strategies, especially nurses with no specific training in mental health, as they tend to be more prone to depression, anxiety, and stress, than their counterparts. This result leads us to believe that a greater focus on mental health literacy, directed at all nurses, is important to promote resilience and the consequent ability to solve problems which in turn may improve the quality of care provided to the population, especially in extreme situations such as a pandemic.

Considering the effectiveness of the strategies identified here, which agree with the literature, we believe that it is crucial to promote their use among health professionals and the general population, in view of the maintenance or improvement of mental health. In addition, these strategies are accessible to everyone, because they are part of self-care and do not require substantial resources. Therefore, health professionals must promote the adoption of these strategies as self-care measures, for themselves and patients alike.

Future studies should conduct longitudinal investigations to establish cause-effect relationships between the variables, and thus, better plan interventions that promote the mental health of nurses. It is also important to understand whether symptoms of depression, anxiety, and stress decrease, increase, or remain the same in a post-pandemic context, to assess the possible need for intervention.

**Author Contributions:**

**Institutional Review Board Statement:** "The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the the Ethics Committee of the School of Health of

the Polytechnic Institute of Setúbal (56/AFP/2020), and the Ethics Committee of Fernando Pessoa University (FCS/PI-63/20).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data available on request due to ethical restrictions.

**Conflicts of Interest:** The authors declare no conflict of interest.

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