Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Journal of Affective Disorders 310 (2022) 422–428

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

Resilience and its impact on the mental health of physiotherapists during the COVID-19 pandemic in São Paulo, Brazil

Patricia Angeli da Silva Pigati [a,*], Renato Fraga Righetti [a,b], Bruna Tiemi Cunha Nisiaymamoto [a], Beatriz Mangueira Saraiva-Romanholo [c,d], Iolanda de Fátima Lopes Calvo Tibério [a]

[a] Faculdade de Medicina FMUSP, Universidade de São Paulo, São Paulo, SP, Brazil
[b] Hospital Sírio-Libanês, São Paulo, Brazil
[c] Department of Medicine (LIM-20), School of Medicine, University of São Paulo (FMUSP), São Paulo, SP, Brazil
[d] Public Employee of São Paulo (IAMSPE), São Paulo, Brazil

ARTICLE INFO

Keywords:
Physiotherapists
COVID-19
Resilience
Depression
Anxiety
Stress

ABSTRACT

Objective: To analyze whether resilience modulates the levels of depression, anxiety, stress and the impact of events in physiotherapists who work with COVID-19 patients with those who do not.
Methods: A cross-sectional study was conducted from August 2020 up to October 2020. A total of 519 physiotherapists were enrolled and divided according to resilience and whether they worked with COVID-19 patients. Volunteers answered sociodemographic questionnaires, rating their depression, anxiety, and stress on a scale (DASS-21). The impact of event scale revised (IES-R) and 14-item resilience scale (14-RS) were also used.
Results: Physiotherapists with low resilience present scores significantly high of depression, anxiety, stress and impact of event compared to the high resilience group ($P < .001$). Additionally, working with COVID-19 patients also resulted in increased levels of depression, anxiety, stress, and impact of event compared with the NO COVID-19 group ($P < .001$). These responses were modulated by age, sex, number of absences from work, whether or not personal protective equipment was received, host leadership, and the practice and maintenance of regular physical activity.
Limitations: The responses to the questionnaires were anonymous and self-administered. We cannot assess whether these people had a previous diagnosis of depression, anxiety and stress.
Conclusions: Low resilience and work with COVID-19 patients were associated with high levels of depression, anxiety, and stress and worse psychological impacts of events. Several aspects modulate these responses and can contribute to improving the resilience and mental health of physiotherapists who are responsible for the care of COVID-19 patients.

1. Introduction

When the first case of infection by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was confirmed in 2020 in the city of São Paulo, health professionals were prepared to cope with the pandemic (Battaglini et al., 2020; Corrêa et al., 2020; Righetti et al., 2020; Teich et al., 2020). Unfortunately, Brazil was also severely affected by the disease, with 22,167,781 confirmed cases and 616,251 deaths (World Health Organization, 2021).

Among the multitude of professional teams considered frontline in the care of patients demanding hospitalization are the physiotherapists who work to minimize or treat complications due to the long period of immobilization and mechanical ventilation (Dean et al., 2020; Kiekens et al., 2020; Pinto and Carvalho, 2020). With the COVID-19 pandemic, the demand for physiotherapist experts in intensive care unit (ICU) has increased exponentially in Brazil. The increase in the number of cases and the scarcity of human resources overloaded these professionals, which has increased their workload (Pergorari et al., 2020). Brazilian physiotherapists work in private and public institutions and are hired by the hospital. According to the size of the hospital service, they are allocated to ICU, inpatient units, and outpatient clinics (Emilia Nozawa et al., 2008). To be graduated in Brazil such professionals must complete five years in college afterwards two years of residency in critical patients. The Federal Council of Physiotherapy and Occupational Therapy

* Corresponding author at: Departamento de Clínica Médica, Faculdade de Medicina da Universidade de São Paulo, Av. Dr. Arnaldo, 455 – 1 andar, sala 1216, 02146 903 São Paulo, SP, Brazil.

https://doi.org/10.1016/j.jad.2022.05.049
Received 13 July 2021; Received in revised form 25 April 2022; Accepted 8 May 2022
Available online 13 May 2022

recommends the presence of one physiotherapist per ten hospital beds (Federal Council of Physiotherapy and Occupational Therapy (COFFITO), 2014). During the data collection of present study around 5373 infirmary beds and 9570 beds of ICU were available for patients with COVID-19. For the NO COVID-19 patients were available around 19,505 infirmary beds and 4895 of ICU beds (Governo do Estado de São Paulo, 2020). Based upon the numbers of hospital beds a total of approximately 9314 physiotherapists worked in the hospitals in the state of Sao Paulo, being 3945 in direct assistance and contact with patients with COVID-19 and 5369 physiotherapists dedicated to other illnesses.

It is already known that levels of emotional exhaustion are high among health professionals (O'Connor et al., 2018) however, symptoms of depression, anxiety, and stress can be intensified due to the pandemic (Chen and Huang, 2020; El-Hage et al., 2020; Lai et al., 2020). Interestingly, people who tend to be more resilient can better control and withstand adverse situations without suffering negative consequences from a physical, psychological, or social aspect (Haglund et al., 2007; Rutter, 2006). The resilience can be defined as a positive adaptation after stressful situations and represents coping mechanisms and overcoming difficult experiences, that is, a person's ability to successfully adapt to changes, resist the negative impact of stressors and avoid the occurrence of significant dysfunctions (Southwick et al., 2014). Strategies for increasing resilience can protect and reverse negative psychological effects such as feelings of depression, anxiety and fear (Chen and Bonanno, 2020; Wagnild, 2016).

Therefore, this study aimed to investigate levels of stress, depression, and anxiety, the impact of the event, and the resilience in physiotherapists who work with or are not in contact with patients with COVID-19. We also investigated the determinants and modulators of these responses.

2. Methods

2.1. Study design

This study was approved by the Ethics and Research Committee of the Hospital of Clinics of the Faculty of Medicine of the University of São Paulo (n.° 4,229,228). Data were collected from August 22, 2020, to October 22, 2020, through an anonymous online questionnaire using Google forms (Google LLC. USA). The form was distributed to the participants over the internet through a snowball sampling technique via e-mail and different social media platforms. All participants provided informed consent electronically prior to registration.

2.2. Participants

Eligible participants were physiotherapists who agreed with the free and informed consent form that worked in hospitals located in the state of São Paulo, Brazil. The participants were asked if they interacted with COVID-19 patients in the acute phase of disease or if they cared non-COVID-19 patients with other types of illnesses. Duplicates responses were excluded based on the collection of e-mail addresses from volunteers.

2.2.1. Demographic data

Basic demographic data included age, sex, pregnancy status, marital status, whether the participant has children, lives with seniors, lives with children, has experienced a death in the family or the death of a close friend due to COVID-19, graduation time, the practice of regular physical activity, the maintenance of physical activity during the pandemic period, previous chronic disease history, absence from work due to other diseases, COVID-19 diagnosis, needed hospitalization due to COVID-19, COVID-19 diagnostic method, the nature of the institution they work in, whether they were removed from work, the sector of the hospital they work in, weekly workload, wage/income, whether they had salary reduction during the pandemic period, received personal protective equipment, received host leadership, or received training.

2.2.2. Assessment of mental health and resilience

To evaluate the signs and symptoms of depression, anxiety, and stress, we used the depression, anxiety, and stress scale (DASS-21 Scale) (Wang et al., 2020). To evaluate symptoms of posttraumatic stress disorder, we used the 22-item Impact of Event Scale-Revised (IES-R) (Lee et al., 2018; Reynolds et al., 2008) and the 14-Item Resilience Scale (14-RS) to measure levels of resilience (Wagnild, 2009). The total scores for ranking each subscale of the DASS-21 were as follows: depression, normal (0–4), mild (5–6), moderate (7–10), severe (11−13), and extremely severe (14+); anxiety normal (0–3), mild (4–5), moderate (6–7), severe (8–9) and extremely severe (10+); and stress normal (0–7), mild (8–9), moderate (10−12), severe (13–16), and extremely severe (17+) (Lovibond and Lovibond, 1995). This 22-item IES-R questionnaire comprises three subscales and aims to measure mean avoidance, intrusion, and hyperarousal (Weiss, 2007). The total score is the sum of the scores of the subscales divided into 0–23 (normal), 24–32 (mild), 33–36 (moderate), and >37 (severe) to determine psychological impact (Beck et al., 2008). Resilience levels were defined as very low (14 to 56 points), low (57 to 64 points), moderately low (65 to 73 points), moderately high (74 to 81 points), high (82 to 90 points), and very high (91 to 98 points) (Wagnild and Young, 1993). We dichotomized the 14-RS in two ways: low (14–73) and high (74–98) resilience. All scales used in the study were translated and validated for the Portuguese language (Caiuby et al., 2012; Pesce et al., 2005; Vignola and Tucci, 2014).

2.3. Statistical analysis

Data were initially checked by description. The normality of the variables was evaluated by the Kolmogorov-Smirnov test. Continuous variables are presented as medians (interquartile ranges) due to the non-constant distribution of data. Categorical variables are presented as frequencies (percentages). We compared the studied variables between the low and high resilience groups, in addition to the COVID-19 and NO COVID-19 groups, via the Mann-Whitney test. Categorical variables were compared using the x^2 test between these groups. The correlation between the continuous variables studied was investigated using the rho coefficient of Spearman.

After analyzing univariate associations, we elaborated several patterns of multiple linear regression to investigate the influence of resilience on the mental health outcomes of the health professionals studied. The scores of the DASS-21 and IES-R questionnaires determined the outcomes. The score of resilience and working with COVID-19 patients were considered main predictors. After analysis, we adjusted all patterns to the following variables: age, sex, absence from work, receiving protective equipment, receiving host leadership, practicing regular physical activity, and maintaining physical activity during the pandemic period. Multicollinearities were avoided considering the variation inflation factor < 4 between the predictors and covariables. The calculation of the sample was performed using www.statstodo.com as per the patterns of multiple linear regression. It was considered one R multiple (i.e., size of the pattern effect) conservative of 0.20 and the inclusion up to 10 predictors in the pattern. Considering alpha $= 0.05$ and beta $= 0.20$ (i.e., statistical power $= 0.80$), we found a sample of 398 participants to be sufficient to answer our research questions. Taking this into account, the sample of the presented study is over 30.4% higher than the necessary calculated sample. All analyses were performed in the Statistical Package SPSS, version 24, and the r alpha probability error was established at 5%.

3. Results

A total of 603 physiotherapists responded to the questionnaires, but 84 were excluded due to not working in a hospital located in Sao Paulo. Therefore, the total sample that completed the survey was 519

participants who were divided according to low (145 [38.9%]) and high (374 [61.1%]) resilience and according to whether or not they worked with COVID-19 patients (COVID-19 group, 445 [72.7%] or NO COVID-19 group, 74 [27.3%]). All descriptions are presented in Fig. 1.

3.1. Demographic characteristics according to resilience and working with COVID-19 patients

Table 1 expresses the study participants' demographics, financial backgrounds, and clinic dates according to low and high resilience. In the analysis, we observed that the high-resilience group (374 [61.1%]) practiced more regular physical activity (203 [54.3%] vs. 64 [44.1%]) and had more support than the low-resilience group for coping with the pandemic through receiving host leadership (263 [70.3%] vs. 83 [57.2%]) and training (307 [82.1%] vs. 107 [73.8%]) ($P < .05$). Table 2 shows the same characteristics but according to whether or not the participant worked with COVID-19 patients, with 445 [72.7%] of the sample included in the COVID-19 group. We noticed that the NO COVID-19 group contained a higher percentage of pregnant woman (7 [9.5%] vs. 6 [1.3%]), people living with children (40 [54.1%] vs. 147 [33.0%]), people who graduated between 11 and 20 years ago (38 [51.4%] vs. 160 [36.0%]) or between 21 and 30 years ago (9 [12.2%] vs. 20 [4.5%]), those who practiced physical activity during the pandemic period (19 [25.7%] vs. 61 [13.7%]), and those with a salary up to 7.000 reais (13 [17.6%] vs. 35 [7.9%]). Also included in this group were those with a higher salary reduction. In addition, most of the participants in the NO COVID-19 group worked in private hospitals (28 [37.8%] vs. 130 [29.2%]), the infirmary (30 [40.5%] vs. 66 [14.8%]), ambulatory medicine (9 [12.2%] vs. 2 [0.4%]), and supervisor occupations (5 [6.8%] vs. 8 [1.8%]) and received more host leadership to support them in coping with the pandemic (62 [83.8%] vs. 284 [63.8%]) than the COVID-19 group ($P < .05$). Instead, in the COVID-19 group, it was relevant that their past graduation time was between 5 and 10 years ago (159 [35.7%] vs. 14 [18.9%]); they were absent from work due to other diseases (64 [14.4%] vs. 2 [2.7%]); they mostly worked in critical care units (348 [78.2%] vs. 26 [35.1%]); and the workload was between 51 and 60 h per week (68 [15.3%] vs. 3 [4.1%]) compared to the NO COVID-19 group ($P < .05$).

3.2. DASS-21 and IES-R according to resilience and working with COVID-19 patients

The low-resilience group presented higher scores (median [IQR]) on the DASS-21 and on the IES-R compared to the high resilience group. As evaluated by subscales the average for depression was (9 [5–12] vs. 4 [2–8]), anxiety was (7 [5–12] vs. 5 [2–9]), and stress was (12 [8–15] vs. 9 [6–12]), in each group, respectively ($P < .001$). As evaluated by the IER-S subscales average avoidance was (13 [9–17] vs. 9 [5–14]), intrusion was (14 [9–19] vs. 9 [5–14]), hyperarousal was (12 [8–19] vs. 7 [5–13]) and total IES-R score (42 [28–55) vs.26 [16–42]), ($P < .001$) (Table 3).

Table 4 shows that working with COVID-19 patients resulted in higher scores on the DASS-21 and IES-R scales compared those who didn't work with COVID-19 patients (depression (7 [3−10] vs. 1 [0–2]), anxiety (7 [4–11] vs. 0 [0–1.25]), stress (11 [8–14] vs. 3 [2–4]), avoidance (11 [8–16] vs. 3 [1–7]), intrusion (11 [8–17] vs. 3 [1–7]), hyperarousal (10 [7–16] vs. 2[0–4]) and total IES-R score (33 [23–48) vs.8 [3–16]), $P < .001$. Not working with COVID-19 patients resulted in higher resilience scores compared to those who worked (90 [84–95] vs. 80 [72–88]), $P < .001$.

3.3. Spearman rho correlation

The Spearman rho correlation test demonstrated that depression, anxiety, stress, and the variables analyzed in the impact of the event: avoidance, intrusion, and hyperarousal variables, are all relevant and have moderate to strong associations among each other. Resilience presented a weak correlation but was significantly negative with the other variables. The correlation coefficients are expressed in Table 5.

3.4. Regression analysis

In the univariate analysis, unadjusted resilience and working with COVID-19 patients were significant predictors in the DASS-21 and IES-R scores. After multivariate analysis, these variables remained selected as significant predictors with coefficients of magnitude very similar to those not adjusted, showing the independence of these predictors. Resilience and work with COVID-19 patients explained between 26.1

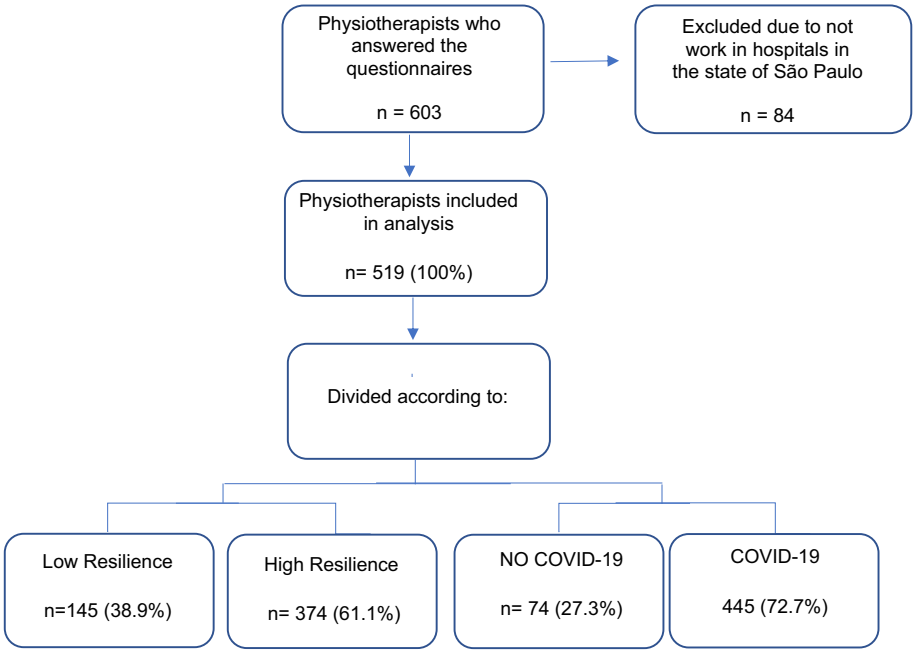

Fig. 1. Flow diaphragm of the physiotherapists inclusion in the process.

Table 1
Demographics, financial backgrounds and clinic dates according to low and high resilience.

Variables	Low Resiliense ($N = 145$)	High Resiliense ($N = 374$)	*P* value
Age, n (%)			
20–30 years	35 (28.9)	115 (35.7)	N.S.
31–40 years	63 (52.1)	161 (50.0)	N.S.
41–50 years	20 (16.5)	39 (12.1)	N.S.
51–60 years	3 (2.5)	7 (2.2)	N.S.
Female, n (%)	127 (87.6)	327 (87.4)	N.S.
Pregnant status, n (%)	3 (2.1)	10 (2.7)	N.S.
Marital Status, n (%)			
Married	41 (33.9)	132 (41.0)	N.S.
Divorced	7 (5.8)	13 (4.0)	N.S.
Separeted	1 (0.8)	1 (0.3)	N.S.
Not married	59 (48.8)	150 (46.6)	N.S.
Stable Union	11 (9.1)	23 (7.1)	N.S.
Others	2 (1.7)	3 (0.9)	N.S.
Has children, n (%)	43 (35.5)	122 (37.7)	N.S.
Family members living together, n %			
Seniors	25 (17.2)	73 (19.5)	N.S.
Childrens	52 (35.9)	135 (36.1)	N.S.
Death in family or close friends due to COVID-19, n (%)	48 (33.1)	103 (27.5)	N.S.
Graduation time, n (%)			
<5 years	34 (23.4)	85 (22.7)	N.S.
5–10 years	54 (37.2)	119 (31.8)	N.S.
11–20 years	48 (33.1)	150 (40.1)	N.S.
21–30 years	9 (6.2)	20 (5.3)	N.S.
Physical activity, n (%)			
Practice of regular physical activity	64 (44.1)	203 (54.3)	<.05
Physical activity during the pandemic period	17 (13.3)	63 (18.5)	N.S.
Medical history, n (%)			
Previous chronic disease	28 (19.3)	57 (15.2)	N.S.
Absence from work due to other diseases	19 (13.1)	47 (12.6)	N.S.
COVID-19 diagnosis	33 (22.8)	98 (26.2)	N.S.
Needed for hospitalization due to COVID-19	5 (3.4)	5 (1.3)	N.S.
The nature of the institution they work in, n (%)			
Public	53 (39.0)	114 (35.7)	N.S.
Private	50 (36.8)	108 (33.9)	N.S.
Both	33 (24.3)	97 (30.4)	N.S.
Removed from work due to, n (%)			
Being Pregnant	2 (8.7)	5 (11.9)	N.S.
Having a chronic disease	3 (13.0)	2 (4.8)	N.S.
Adapted to work at home office	0	2 (4.8)	.[a]
Others reasons	18 (78.3)	33 (78.6)	N.S.
The sector of the hospital they work, n (%)			
Critical Care Unit	110 (75.9)	264 (70.6)	N.S.
Semi Intensive unit	4 (2.8)	13 (3.5)	N.S.
Infirmary	25 (17.2)	71 (19.0)	N.S.
Emergency Room	2 (1.4)	6 (1.6)	N.S.
Supervisor	2 (1.4)	11 (2.9)	N.S.
Ambulatory	2 (1.4)	9 (2.4)	N.S.
Weekly workload, n (%)			
<20 h	2 (1.4)	6 (1.6)	N.S.
20–30 h	64 (44.8)	155 (41.6)	N.S.
31–40 h	32 (22.4)	100 (26.8)	N.S.
41–50 h	13 (9.1)	32 (8.6)	N.S.
51–60 h	24 (16.8)	47 (12.6)	N.S.
>60 h	8 (5.6)	33 (8.8)	N.S.
Wage/income in real, n (%)			
<1500,00 real	2 (1.4)	6 (1.6)	N.S.
1500,00–3.000,00	29 (20.1)	70 (18.8)	N.S.
3.000,00 - 5.000,00	72 (50.0)	184 (49.3)	N.S.
5.000,00–7.000,00	27 (18.8)	79 (21.2)	N.S.
>7.000,00	14 (9.7)	34 (9.1)	N.S.
Salary reduction during the pandemic period, n (%)	25 (17.2)	84 (22.5)	N.S.
Support for coping with the pandemic, n (%)			
Received personal protective equipment	136 (93.8)	358 (95.7)	N.S.
Received host leadership	83 (57.2)	263 (70.3)	<.05
Received training	107 (73.8)	307 (82.1)	<.05

Abbreviation: N.S., difference is not significant.
(.[a]) This categorical is not used in comparisons because its column proportion is equal to zero or one.

and 49.0% of the total variability of domains of the DASS-21 scale and between 16.9 and 23.2% of the domains of the IES-R scale. We found a significant interaction between resilience and work with COVID-19 to depression and stress. Working with COVID-19 modified the relationship between resilience and these outcomes, decreasing its influence. In the case of stress, the correlation with resilience became non-significant. After multivariate adjustment, the remaining seven predictors added between 0.059(5.9% for stress) and 0.096 (i.e., 9.6% for depression) to the coefficient of determination, R2, in the case of the DASS-21 scale, and between 0.030 (i.e., 3% for avoidance) and 0.045 (i.e., 4.5% for intrusion) considering the IES-R scale. Many of the coefficients of determination of the multivariate models are assigned in Table 6.

4. Discussion

This study revealed that low resilience and working with COVID-19 patients significantly affect symptoms of depression, anxiety, stress, and a major impact of events. In addition, age, sex, absence from work, receiving personal protective equipment, receiving host leadership, practicing regular physical activity, and maintaining physical activity during the pandemic period were predictors of the scores on the DASS-21 and 22-item IES-R.

In the present study, mental health status was measured using the DASS-21. Physiotherapists who work with COVID-19 patients present higher levels of depression, anxiety, and stress symptoms than those working in hospitals with no COVID-19. Similarly, Yang et al. (2020) evaluated the mental health of 65 physiotherapists at three hospitals in South Korea and showed that 18.5% of the respondents experienced symptoms of anxiety and depression. A multicentric and multinational survey with 906 healthcare workers from hospitals in India and Singapore revealed that 5.3% screened positive for moderate to very severe depression, 8.7% for moderate to extremely severe anxiety, and 2.2% for moderate to extremely severe stress (Chew et al., 2020).

Since the beginning of the coronavirus outbreak, several scholars worldwide have been investigating healthcare workers' mental health (Arafa et al., 2021; Hummel et al., 2021; Tiete et al., 2021). A meta-analysis aimed to provide additional evidence of the psychological impact among healthcare workers caused by the COVID-19 pandemic. A total of 65 studies were included and showed a higher prevalence of anxiety, depression, stress, posttraumatic stress syndrome, insomnia, psychological distress, and burnout among these professionals (Batra et al., 2020).

Physical and emotional exhaustion in healthcare workers is caused by an increase in COVID-19 cases, an excessive workload, a lack of specialized health professionals, and a shortage of personal protective equipment (Hossain et al., 2020). In addition, these workers experience feelings of rejection from others, fear of contamination, fear of infecting their families and patients, and fear of the loss of coworkers and family members (Hall et al., 2008). All these factors can contribute to the appearance of psychological symptoms and posttraumatic stress disorder (Liu et al., 2021; Sarapultseva et al., 2021).

Symptoms of posttraumatic stress disorder (PTSD) were investigated in our research using the 22-item IES-R. We noticed higher median scores in the three subscales evaluated (intrusion, avoidance, and hyperarousal) in the COVID-19 and low-resilience groups. In the analysis, the physiotherapists who worked with COVID-19 reported worse psychological impact of the pandemic. Similarly, other pandemics and violent coronavirus outbreaks have caused fear and insecurity in frontline healthcare workers (Chong et al., 2004; Ji et al., 2017; Pollock et al., 2020). In an Italian study, 63% of the healthcare workers interviewed had experienced some traumatic events related to COVID-19; this percentage was larger in nurses and healthcare staff working in ICUs and

Table 2
Demographics, financial backgrounds and clinic dates according to working or not with COVID-19 patients.

Variables	NO COVID-19 (*N* = 74)	COVID-19 (*N* = 445)	*P* value
Age, n (%)			
20–30 years	22 (36.1)	128 (33.5)	N.S.
31–40 years	31 (50.8)	193 (50.5)	N.S.
41–50 years	6 (9.8)	53 (13.9)	N.S.
51–60 years	2 (3.3)	8 (2.1)	N.S.
Female, n (%)	68 (91.9)	386 (86.7)	N.S.
Pregnant status, n (%)	7 (9.5)	6 (1.3)	<.001
Marital Status, n (%)			
Married	18 (29.5)	155 (40.6)	N.S.
Divorced	2 (3.3)	18 (4.7)	N.S.
Separeted	1 (1.6)	1 (0.3)	N.S.
Not married	33 (54.1)	176 (46.1)	N.S.
Stable Union	6 (9.8)	28 (7.3)	N.S.
Others	1 (1.6)	4 (1.0)	N.S.
Has children, n (%)	23 (37.1)	142 (37.1)	N.S.
Family members living together, n (%)			
Seniors	13 (17.6)	85 (19.1)	N.S.
Childrens	40 (54.1)	147 (33.0)	<.001
Death in family or close friends due to COVID-19, n (%)	22 (29.7)	129 (29)	N.S.
Graduation time, n (%)			
<5 years	13 (17.6)	106 (23.8)	N.S.
5–10 years	14 (18.9)	159 (35.7)	<.05
11–20 years	38 (51.4)	160 (36.0)	<.05
21–30 years	9 (12.2)	20 (4.5)	<.05
Physical activity, n (%)			
Practice of regular physical activity	40 (54.1)	227 (51)	N.S.
Physical activity during the pandemic period	19 (27.9)	61 (15.3)	<.05
Medical history, n (%)			
Previous chronic disease	12 (16.2)	73 (16.4)	N.S.
Absence from work due to other diseases	2 (2.7)	64 (14.4)	<.05
COVID-19 diagnosis	15 (20.3)	116 (26.1)	N.S.
Needed for hospitalization due to COVID-19	1 (1.4)	9 (2)	N.S.
The nature of the institution they work in, n (%)			
Public	15 (26.3)	152 (38.2)	N.S.
Private	28 (49.1)	130 (32.7)	<.05
Both	14 (24.6)	116 (29.1)	N.S.
Removed from work due to, n (%)			
Being Pregnant	5 (35.7)	2 (3.9)	<.05
Having a chronic disease	2 (14.3)	3 (5.9)	N.S.
Adapted to work at home office	1 (7.1)	1 (2.0)	N.S.
Other reasons	6 (42.9)	45 (88.2)	<.05
The sector of the hospital they work, n (%)			
Critical Care Unit	26 (35.1)	348 (78.2)	<.05
Semi Intensive Unit	4 (5.4)	13 (2.9)	N.S.
Infirmary	30 (40.5)	66 (14.8)	<.05
Emergency Room	0	8 (1.8)	.[a]
Supervisor	5 (6.8)	8 (1.8)	<.05
Ambulatory	9 (12.2)	2 (0.4)	<.05
Weekly workload, n (%)			
<20 h	2 (2.7)	6 (1.4)	N.S.
20–30 h	38 (52.1)	181 (40.9)	N.S.
31–40 h	19 (26.0)	113 (25.5)	N.S.
41–50 h	9 (12.3)	36 (8.1)	N.S.
51–60 h	3 (4.1)	68 (15.3)	<.05
>60 h	2 (2.7)	39 (8.8)	N.S.
Wage/income in real, n (%)			
<1500,00	0	8 (1.8)	.[a]
1500,00–3.000,00	18 (24.7)	81 (18.2)	N.S.
3.000,00–5.000,00	30 (41.1)	226 (50.9)	N.S.
5.000,00–7.000,00	12 (16.4)	94 (21.2)	N.S.
>7.000,00	13 (17.8)	35 (7.9)	<.05
Salary reduction during the pandemic period, n (%)	22 (29.7)	87 (19.6)	<.05
Support for coping with the pandemic, n (%)			
Received personal protective equipment	74 (100)	420 (94.4)	N.S.
Received host leadership	62 (83.8)	284 (63.8)	<.05
Received training	61 (82.4)	353 (79.3)	N.S.

Abbreviation: N.S., difference is not significant.
(.[a]) This categorical is not used in comparisons because its column proportion is equal to zero or one.

Table 3
Prevalence of DASS-21, IES-R and resilience between physiotherapists that presented low and high resilience.

	Resilience		
	Low	High	*P* value
DASS-21 subscales and score			
Depression, median (IQR)	9 (5–12)	4 (2–8)	<.001
Anxiety, median (IQR)	7 (5–12)	5 (2–9)	<.001
Stress, median (IQR)	12 (8–15)	9 (6–12)	<.001
IES- R subscales and score			
Avoidance, median (IQR)	13 (9–17)	9 (5–14)	<.001
Intrusion, median (IQR)	14 (9–19)	9 (5–14)	<.001
Hyperarousal, median (IQR)	12 (8–19)	7 (5–13)	<.001
Total IES-R score, median (IQR)	42 (28–55)	26 (16–42)	<.001

Abbreviations: IQR, interquartile range; IES-R, 22-item Impact of Event Scale-Revised.

Table 4
Prevalence of DASS-21, IER-S and resilience between physiotherapists that work or not with COVID-19 patients.

	Works in COVID-19		
	No	Yes	*P* value
DASS-21 subscales and score			
Depression, median (IQR)	1 (0–2)	7 (3−10)	<.001
Anxiety, median (IQR)	0 (0–1.25)	7 (4–11)	<.001
Stress, median (IQR)	3 (2–4)	11 (8–14)	<.001
IES- R subscales and score			
Avoidance, median (IQR)	2.5 (0–7.25)	11 (8–16)	<.001
Intrusion, median (IQR)	3 (1–7)	11 (8–17)	<.001
Hyperarousal, median (IQR)	2 (0–4)	10 (7–16)	<.001
Total IES-R score, median (IQR)	8 (3–16)	33 (23–48)	<.001
14-item Resilience Scale			
Total Score, median (IQR)	90 (84–95)	80 (72–88)	<.001

Abbreviations: IQR, interquartile range; IES-R, 22-item Impact of Event Scale-Revised.

sub-intensive COVID-19 units (Lasalvia et al., 2020). Another study with 270 doctors who were dispatched to Wuhan from a Shanghai hospital to work at the height of the pandemic showed that the prevalence of PTSD symptoms was 31.6% (Li et al., 2020). In the Republic of Cyprus, a country with a low SARS-CoV-2 burden, physicians, nurses, physiotherapists, and other healthcare workers reported 15% as having PTSD symptoms. This study argues that the traumatic impact depends on situations such as experience during previous outbreaks, pandemic control, and employment in COVID-19 units (Chatzittofis et al., 2021).

We also observed a significant association between lower resilience and higher scores of depression, anxiety, stress, and PTSD, confirming that people with low resilience were more likely to develop psychological disorders (Davydov et al., 2010). In our study, physiotherapists who worked in COVID-19 units had lower levels of resilience compared to those who did not work with coronavirus patients. The state of Sao Paulo has been the epicenter of the coronavirus disease in Brazil, and the number of physiotherapist specialists available to critical patients was not enough. Many of these professionals were transferred to other areas to work in intensive care units with a shorter graduation time, and most of our sample consisted of young people and women. Some studies have shown that younger healthcare workers and females are more vulnerable to stress disorders (Gilleen et al., 2021; Kisely et al., 2020; Luceño-Moreno et al., 2020).

A systematic review has shown that workplace-provided interventions that support basic daily needs, psychological support, and pharmacological interventions can increase the resilience and protect

Table 5
Spearman rho correlation between resilience and main outcomes studied.

	Resilience	Depression	Anxiety	Stress	Avoidance	Intrusion	Hyperarousal	IES-R total
Resilience	1							
Depression	−0.476[a]	1						
Anxiety	−0.317[a]	0.700[a]	1					
Stress	−0.322[a]	0.734[a]	0.784[a]	1				
Avoidance	−0.302[a]	0.542[a]	0.555[a]	0.576[a]	1			
Intrusion	−0.349[a]	0.601[a]	0.649[a]	0.652[a]	0.756[a]	1		
Hyperarousal	−0.398[a]	0.665[a]	0.730[a]	0.713[a]	0.773[a]	0.893[a]	1	
IES-R total	−0.375[a]	0.644[a]	0.691[a]	0.690[a]	0.899[a]	0.946[a]	0.949[a]	1

Abbreviation: IES-R, 22-item Impact of Event Scale-Revised.
[a] $p < .001$.

Table 6
Linear regression of DASS-21 and IES-R associated with resilience and COVID-19.

Outcomes	Unadjusted B (SE)		ΔR^2	Adjusted B (SE)[a]		R^2
	Resilience	COVID-19		Resilience	COVID-19	
Depression*	−0.128 (0.017)[b]	4.817 (0.575)[b]	0.289	0.002 (0.037)[b]	16.127 (3.552)[b]	0.385
Anxiety	−0.063 (0.017)[b]	5.810 (0.572)[b]	0.261	−0.046 (0.017)[c]	5.285 (0.567)[c]	0.316
Stress*	−0.065 (0.015)[b]	7.873 (0.509)[b]	0.431	0.014 (0.033)	14.237 (3.203)[b]	0.490
Avoidance	−0.094 (0.025)[b]	6.121 (0.854)[b]	0.169	−0.080 (0.026)[c]	5.512 (0.863)[b]	0.199
Intrusion	−0.115 (0.025)[b]	6.110 (0.838)[b]	0.192	−0.101 (0.025)[b]	5.323 (0.838)[b]	0.237
Hyperarousal	−0.133 (0.024)[b]	6.551 (0.817)[b]	0.232	−0.120 (−0.025)[b]	5.888 (0.820)[b]	0.269
IES-R total	−0.343 (0.068)[b]	18.781 (2.286)[b]	0.228	−0.301 (0.068)[b]	16.723 (2.286)[b]	0.269

Abbreviation: IES-R, 22-item Impact of Event Scale-Revised; B = coefficient; SE = standard error.
Works in COVID-19 unit is a factor (yes = 1; no = 0).
[a] Adjusted for age, sex, absence from work, received protective personal equipment, received host leadership, practice regular physical activity and maintenance of physical activity during the pandemic period.
[*] Significant interaction between resilience and working with COVID-19.
[b] $p < .001$.
[c] $p < .05$.

the mental health of frontline healthcare workers (Pollock et al., 2020).

Curiously, physiotherapists with high resilience practiced regular physical activity, received leadership support, and underwent training to face the pandemic. The regular practice of physical activity affects neurobiological factors that are involved with depression and resilience, increasing the scores (Cotman and Berchtold, 2002). Psychosocial actions are recommended to health service coordinators to protect the team from chronic stress and poor mental health (World Health Organization, 2020). Social and organizational support was able to increase levels of personal resilience and decrease levels of anxiety in health care workers during the COVID-19 pandemic (Labrague and De Los Santos, 2020; Rieckert et al., 2021).

There is a positive linear correlation between working with COVID-19 patients and symptoms of depression, anxiety, stress, avoidance, intrusion, and hyperarousal and a negative correlation between resilience and all of these variables. The fact of having found a significant interaction between working with COVID-19 and resilience, reducing the relationship of the resilience with depression and stress, reinforcing ever more the results of the importance of working with COVID-19 as a determinant of the studied outcomes.

Our study had some limitations and strengths. The responses to the questionnaires were anonymous and self-administered, and we cannot assess whether these people had a previous diagnosis of depression and anxiety. We are not aware of the number of questionnaires distributed and the recovery rate and the highest percentage of response was from the group of physiotherapists who worked with COVID-19 patients. In addition, this is the first cross-sectional study to evaluate the psychological impact of the COVID-19 pandemic on the mental health and resilience of Brazilian physiotherapists. This study included a large number of physiotherapists who worked either in public or private hospitals. Another strong point is the fact that we included a control group that did not attend patients with COVID-19.

In conclusion, low resilience and work with COVID-19 patients were associated with high levels of depression, anxiety, and stress and worse psychological impacts of events. Several aspects modulate these responses and can contribute to improving the resilience and mental health of physiotherapists who are responsible for the care of COVID-19 patients. This way, there is an urgent need to design strategies and propose effective interventions to improve resilience on frontline physiotherapists. The development of strategies can protect professionals who are in contact with patients with COVID-19 from psychological disorders and minimize the posttraumatic effect.

Funding source

Fundação de Amparo à Pesquisa do Estado de São Paulo (number 2018/02537-5).

Conflict of Interest

All authors are in accordance with this submission and I take this responsibility in their names, and we declare that there is no conflict of interest.

CRediT authorship contribution statement

Patricia Angeli da Silva Pigati: Investigation, Writing – original draft, Formal analysis. **Renato Fraga Righetti:** Conceptualization, Writing – original draft, Supervision, Formal analysis, Project administration. **Bruna Tiemi Cunha Nisiaymamoto:** Investigation, Writing – original draft, Formal analysis. **Beatriz Mangueira Saraiva-Romanholo:** Investigation, Validation, Writing – review & editing. **Iolanda de Fatima Lopes Calvo Tibério:** Conceptualization, Formal analysis, Writing – review & editing, Supervision, Visualization.

Acknowledgements

The authors immensely grateful to all physiotherapists who dedicated themselves to answer the questionnaires.

References

Arafa, A., Mohammed, Z., Mahmoud, O., Elshazley, M., Ewis, A., 2021. Depressed, anxious, and stressed: what have healthcare workers on the frontlines in Egypt and Saudi Arabia experienced during the COVID-19 pandemic? J. Affect. Disord. 278, 365–371.

Batra, K., Singh, T.P., Sharma, M., Batra, R., Schvaneveldt, N., 2020. Investigating the psychological impact of COVID-19 among healthcare workers: a meta-analysis. Int. J. Environ. Res. Public Health 17 (23), 9096.

Battaglini, D., Robba, C., Caiffa, S., et al., 2020. Chest physiotherapy: an important adjuvant in critically ill mechanically ventilated patients with COVID-19. Respir. Physiol. Neurobiol. 282, 103529.

Beck, J.G., Grant, D.M., Read, J.P., et al., 2008. The impact of event scale-revised: psychometric properties in a sample of motor vehicle accident survivors. J. Anxiety Disord. 22 (2), 187–198.

Caiuby, A.V.S., Lacerda, S.S., Quintana, M.I., Torii, T.S., Andreoli, S.B., 2012. Cross-cultural adaptation of the Brazilian version of the impact of events scale-revised (IES-R). Cad Saude Publica. 28 (3), 597–603.

Chatzittofis, A., Karanikola, M., Michailidou, K., Constantinidou, A., 2021. Impact of the COVID-19 pandemic on the mental health of healthcare workers. Int. J. Environ. Res. Public Health 18 (4), 1435.

Chen, S., Bonanno, G.A., 2020. Psychological adjustment during the global outbreak of COVID-19: a resilience perspective. Psychol. Trauma 12 (S1), S51–S54.

Chen, W., Huang, Y., 2020. To protect health care workers better, to save more lives with COVID-19. Anesth. Analg. 131 (1), 97–101.

Chew, N.W.S., Lee, G.K.H., Tan, B.Y.Q., et al., 2020. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID19 outbreak. Brain Behav. Immun. 88, 559–565.

Chong, M.Y., Wang, W.C., Hsieh, W.C., et al., 2004. Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospitalI SH. Br. J. Psychiatry 185, 127–133.

Corrêa, T.D., GFJ, Matos, Bravim, B.A., et al., 2020. Intensive support recommendations for critically-ill patients with suspected or confirmed COVID-19 infection. Einstein (Sao Paulo) 18, eAE5793.

Cotman, C.W., Berchtold, N.C., 2002. Exercise: a behavioral intervention to enhance brain health and plasticity. Trends Neurosci. 25 (6), 295–301.

Davydov, D.M., Stewart, R., Ritchie, K., Chaudieu, I., 2010. Resilience and mental health. ClinicalPsychol. Rev. 30 (5), 479–495.

Dean, E., Jones, A., Yu, H.P.-M., Gosselink, R., Skinner, M., 2020. Translating COVID-19 evidence to maximize physical therapists' impact and public health response. Phys. Ther. 100 (9), 1458–1464.

do Estado de São Paulo, Governo. Secretaria do Estado da Saúde. http://portal.saude.sp.gov.br/resources/ses/perfil/cidadao/homepage-new/outros-destaques/covid-19/delib_cib_planilha_covid_09_04_2020.pdf. (Accessed 20 April 2022).

El-Hage, W., Hingray, C., Lemogne, C., et al., 2020. Les professionnels de santé face à la pandémie de la maladie à coronavirus (COVID-19): quels risques pour leur santé mentale ? Encéphale 46 (3S), S73–S80.

Emilia Nozawa, E., Sarmento, G.J.V., Vega, J.M., Costa, D., Silva, J.E.P., Feltrim, M.I.Z., 2008. A profile of Brazilian physical therapists in intensive care units. Fisioter. Pesqui. 15 (2), 177–182.

Federal Council of Physiotherapy and Occupational Therapy (COFFITO), 2014. Resolution N°444. https://www.coffito.gov.br/nsite/?p=3208. (Accessed 22 April 2022).

Gilleen, J., Santaolalla, A., Valdearenas, L., Salice, C., Fusté, M., 2021. Impact of the COVID-19 pandemic on the mental health and well-being of UK healthcare workers. BJPsych Open. 7 (3), e88.

Haglund, M.E.M., Nestadt, P.S., Cooper, N.S., Southwick, S.M., Charney, D.S., 2007. Psychobiological mechanisms of resilience: relevance to prevention and treatment of stress-related psychopathology. Development and Psychopathology 19, 889–920. Published online.

Hall, R.C., Hall, R.C., Chapman, M.J., 2008. The 1995 Kikwit ebola outbreak: lesson's hospitals and physicians can apply to future viral epidemics. Gen. Hosp. Psychiatry 30 (5), 446–452.

Hossain, M.M., Tasnim, S., Sultana, A., et al., 2020. Epidemiology of mental health problems in COVID-19: a review. F1000Res. 9 (636).

Hummel, S., Oetjen, N., Du, J., et al., 2021. Mental health among medical professionals during the COVID-19 pandemic in eight European countries: cross-sectional survey study. J. Med. Internet Res. 23 (1), e24983.

Ji, D., Ji, Y.J., Duan, X.Z., et al., 2017. Prevalence of psychological symptoms among ebola survivors and healthcare workers during the 2014–2015 ebola outbreak in Sierra Leone: a cross-sectional study. Oncotarget 8 (8), 12784–12791.

Kiekens, C., Boldrini, P., Andreoli, A., et al., 2020. Rehabilitation and respiratory management in the acute and early post-acute phase. "Instant paper from the field" on rehabilitation answers to the COVID-19 emergency. Eur. J. Phys. Rehabil. Med. 56 (3), 323–326.

Kisely, S., Warren, N., McMahon, L., Dalais, C., Henry, I., Siskind, D., 2020. Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: rapid review and meta-analysis. BMJ 369, m1642.

Labrague, L.J., De Los Santos, J.A.A., 2020. Covid-19 anxiety among frontline nurses: predictive role of organizational support, personal resilience and social support. J. Nurs. Manag. 28 (7), 1653–1661.

Lai, J., Ma, S., Wang, Y., et al., 2020. Mental health outcomes among health care workers exposed to COVID-19. JAMA Netw. Open 3 (3), e203976.

Lasalvia, A., Bonetto, C., Porru, S., et al., 2020. Psychological impact of COVID-19 pandemic on healthcare workers in a highly burdened area of north-East Italy. Epidemiol. Psychiatr. Sci. 30 (e1).

Lee, S.M., Kang, W.S., Cho, A.-R., Kim, T., Park, J.K., 2018. Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. Compr. Psychiatry 87, 123–127.

Li, X., Li, S., Xiang, M., et al., 2020. The prevalence and risk factors of PTSD symptoms among medical assistance workers during the COVID-19 pandemic. J. Psychosom. Res. 139, 110270.

Liu, Y., Chen, H., Zhang, N., et al., 2021. Anxiety and depression symptoms of medical staff under COVID-19 epidemic in China. J. Affect. Disord. 278, 144–148.

Lovibond, S.H., Lovibond, P.F., 1995. Manual for the Depression Anxiety Stress Scales, 2nd. ed. Psychology Foundation, Sydney.

Luceño-Moreno, L., Talavera-Velasco, B., García-Albuerne, Y., Martín-García, J., 2020. Symptoms of posttraumatic stress, anxiety, depression, levels of resilience and burnout in Spanish health personnel during the COVID-19 pandemic. Int. J. Environ. Res. Public Health 17 (15), 5514.

O'Connor, K., Muller Neff, D., Pitman, S., 2018. Burnout in mental health professionals: a systematic review and meta-analysis of prevalence and determinants. Eur Psychiatry 53, 74–99.

Pergorari, M.S., Ohara, D.G., Matos, A.P., Iosimuta, N.C.R., Ferreira, V.T.K., Pinto, A.C.P.N., 2020. Barries and challenges faced by Brazilian physiotherapists during the COVID-19 pandemic and innovative solutions:lessons learned and to be shared with other countries. Physiother. Theor. Prat. 36 (10), 1069–1076.

Pesce, R.P., Assis, S.G., Avanci, J.Q., Santos, N.C., Malaquias, J.V., Carvalhaes, R., 2005. Cross-cultural adaptation, reliability, and validity of the resilience scale. Cad Saude Publica. 21 (2), 436–448.

Pinto, T.F., Carvalho, C.R.F., 2020. SARS CoV-2 (COVID-19): lessons to be learned by Brazilian physical therapists. Braz. J. Phys. Ther. 24 (3), 185–186.

Pollock, A., Campbell, P., Cheyne, J., et al., 2020. Interventions to support the resilience and mental health of frontline health and social care professionals during and after a disease outbreak, epidemic or pandemic: a mixed methods systematic review. Cochrane Database Syst. Rev. 11, CD013779.

Reynolds, D.L., Garay, J.R., Deamond, S.L., Moran, M.K., Gold, W., Styra, R., 2008. Understanding, compliance and psychological impact of the SARS quarantine experience. Epidemiol. Infect. 136 (7), 997–1007.

Rieckert, A., Schuit, E., Bleijenberg, N., et al., 2021. How can we build and maintain the resilience of our health care professionals during COVID-19? Recommendations based on a scoping review. BMJ Open 11, e043718.

Righetti, R.F., Onoue, M.A., Politi, F.V.A., et al., 2020. Physiotherapy care of patients with coronavirus disease 2019 (COVID-19) - a brazilian experience. Clinics (Sao Paulo). 75, e2017.

Rutter, M., 2006. Implications of resilience concepts for scientific understanding. Ann. N. Y. Acad. Sci. 1094, 1–12.

Sarapultseva, M., Zolotareva, A., Kritsky, I., Nasretdinova, N., Sarapultsev, A., 2021. Psychological distress and post-traumatic symptomatology among dental healthcare workers in Russia: results of a pilot study. Int. J. Environ. Res. Public Health 18 (2), 708.

Southwick, S.M., Bonanno, G.A., Masten, A.S., Panter-Brick, C., Yehuda, R., 2014. Resilience definitions, theory, and challenges: interdisciplinary perspectives. Eur. J. Psychotraumatol. 5 https://doi.org/10.3402/ejpt.v5.25338.

Teich, V.D., Klajner, S., Almeida, F.A.Z., et al., 2020. Epidemiologic and clinical features of patients with COVID-19 in Brazil. Einstein (Sao Paulo) 18, eAO6022.

Tiete, J., Guatteri, M., Lachaux, A., et al., 2021. Mental health outcomes in healthcare workers in COVID-19 and non-COVID-19 care units: a cross-sectional survey in Belgium. Front. Psychol. 11, 612241.

Vignola, R.C., Tucci, A.M., 2014. Adaptation and validation of the depression, anxiety and stress scale (DASS) to Brazilian Portuguese. J. Affect. Disord. 155, 104–109.

Wagnild, G., 2009. A review of the resilience scale. J. Nurs. Meas. 17 (2), 105–113.

Wagnild, G., 2016. The Resilience Scale User's Guide for the US English Version of the Resilience Scale and the 14-Item Resilience Scale, 14. Published online.

Wagnild, G.M., Young, H.M., 1993. Development and psychometric evaluation of the resilience scale. J. Nurs. Meas. 1 (2), 165–178.

Wang, C., Pan, R., Wan, X., et al., 2020. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int. J. Environ. Res. Public Health 17 (5), 1729.

Weiss, D.S., 2007. The impact of event scale: revised. In: Cross-cultural Assessment of Psychological Trauma and PTSD. Springer, US, pp. 219–238.

World Health Organization, 2020. Mental health and psychosocial considerations during the COVID-19 outbreak. https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf. Accessed 2 May 2021.

World Health Organization, 2021. Coronavirus Disease (COVID-19) Dashboard With Vaccination Data. https://covid19.who.int/region/amro/country/br. (Accessed 14 December 2021).

Yang, S., Kwak, S.G., Ko, E.J., Chang, M.C., 2020. The mental health burden of the COVID-19 pandemic on physical therapists. Int. J. Environ. Res. Public Health 17 (10), 3723.