Mental health patterns during COVID-19 in emergency medical services (EMS)

Sílvia Monteiro Fonseca and Sara Faria
Faculty of Psychology and Education Sciences, University of Porto, Porto, Portugal
Sónia Cunha, Márcio Silva, M. Joaquina Ramos, Guilherme Azevedo, Rui Campos and António Ruão Barbosa
National Institute of Medical Emergency, Porto, Portugal, and
Cristina Queirós
Faculty of Psychology and Education Sciences, University of Porto, Porto, Portugal

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Abstract

Purpose – This study aims to explore patterns of Emergency Medical Services (EMS) personnel's mental health, regarding their levels of anxiety, depression, stress, COVID-19 anxiety, obsessive-compulsive symptoms and well-being; and to explore variables that contribute to these patterns, among sociodemographic/professional and COVID-19 experience variables.

Design/methodology/approach – Participants were 214 EMS personnel, who answered the Patient-Health Questionnaire, Perceived Stress Scale, COVID-19 Anxiety Scale, Obsessive-Compulsive Inventory, Well-Being Questionnaire and COVID-19 related questions.

Findings – EMS personnel showed an adequate psychological adjustment during COVID-19. Two clusters/patterns were found: the poorly (34%) and the well (66%) psychologically-adjusted. Personnel's age, COVID-19 fear and workplace security measures' adequacy contributed to which pattern they were more likely to belong to.

Research limitations/implications – Despite being cross-sectional and not controlling for pre-COVID-19 data, this study adds to the COVID-19 literature. Findings call for the need to explore: other COVID-19 fears; how personnel perceive workplace security measures; COVID-19 valid instruments; pre-COVID-19 data; and mental health patterns with different rescuers.

Practical implications – Findings explored EMS personnel's patterns of mental health during the COVID-19, as well as its covariates. Results allow to better prepare emergency management, which can develop prevention strategies focused on older professionals, COVID-19 related fears and how personnel assess security measures.

Originality/value – This study contributes to the scarce literature focused on COVID-19 mental health patterns instead of focussing on isolated mental health variables, as well as what contributes to these patterns. Moreover, it is one of the few studies that focused on EMS personnel rather than hospital staff.

Keywords Emergency medical services, COVID-19 experience, Mental health patterns

Paper type Research paper

Emergency medical services (EMS) personnel have long been considered as a population at risk for mental health disorders (e.g. Petrie *et al.*, 2018). This risk increased (Li *et al.*, 2021; Sinclair *et al.*, 2020) with the novel coronavirus disease 2019 (COVID-19) and with the COVID-19 worldwide pandemic (WHO, 2020). EMS personnel were, and still are, exposed to several occupational hazards (risk of injury and infection by COVID-19, exposure to potentially

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traumatic incidents, among others), which have an impact on their mental health, as well as on their work performance, and consequently on the emergency organisation itself (e.g. Harrison, 2019; Regehr and LeBlanc, 2017). In addition, unfamiliar stressors related to the COVID-19 pandemic have changed how they live, psychologically experience and perform their work (e.g. EU-OSHA, 2020; EUROFOUND, 2021; IASC, 2020; Sinclair *et al.*, 2020). In fact, in addition to their usual tasks EMS personnel also must assist COVID-19 patients, which demands a different approach to all victims, with new security measures and cautions. These tasks increase their fear and the risk of being infected, which can ultimately have an impact on their well-being. Therefore, understanding EMS personnel's mental health during COVID-19, as well its contributing factors should be a concern for both the scientific community and emergency management. This knowledge can inform practices focused on the recovery from COVID-19 and similar outbreaks (e.g. Tehrani and Hesketh, 2019). Moreover, it adds to the growing, but still sparse knowledge on EMS personnel's mental health during this pandemic.

The COVID-19 pandemic has been shown to significantly impact several mental health indicators, namely stress, anxiety, depression, insomnia, traumatic stress, burnout, among others (e.g. Busch *et al.*, 2021; Giusti *et al.*, 2020; Li *et al.*, 2021; Luo *et al.*, 2020; Zhang *et al.*, 2020a, b). However, most studies have focused on hospital staff and have neglected other frontline workers such as EMS personnel. They are both highly exposed to COVID-19 and are key assets to healthcare systems (Ho *et al.*, 2020). With these professionals, some mental health indicators have been more explored than others, namely those stemming from the psychological impact of critical incidents, disasters and/or catastrophes. Stress, anxiety and depression were the most frequently studied. Stress arises from an imbalance between individual resources and contextual demands (Everly and Mitchell, 1997) and anxiety and depression result in significant impairments in different areas of functioning, with physiological, cognitive, affective and behavioural symptoms (APA, 2014).

During the COVID-19 pandemic, Que *et al.* (2020), with 2,285 healthcare workers, found the prevalence of 46% for anxiety and 44.4% for depression. They also found that frontline workers presented a higher risk for anxiety and depression than other healthcare workers (Que *et al.*, 2020). Lower levels were found by Giusti *et al.* (2020), with 330 health professionals, namely 31.3% for anxiety, 26.8% for depression and 34.3% for stress. Vagni *et al.* (2020), with 236 healthcare and emergency workers found the presence of high levels of stress. With a meta-analysis, Li *et al.* (2021) found the prevalence of 21.7% for depression and 22.1% for anxiety, with 97.333 healthcare professionals from 21 countries. Additionally, EMS personnel's professional and sociodemographic characteristics can also contribute to the variation of these mental health indicators. Some studies found differences on stress, anxiety and depression according to gender, age and professional experience (e.g. Alharthy *et al.*, 2017; Vagni *et al.*, 2020; Yahaya *et al.*, 2018) and others did not find any association (e.g. Que *et al.*, 2020; Wagner and Pasca, 2020).

Until now, COVID-19 related well-being and obsessive-compulsive symptoms have not been frequently studied. Well-being is conceptualised as a positive psychosocial state related to how life is felt and experienced (WHO, 2006), but usually studies refer to well-being only as the absence/presence of other mental health indicators (Marsh *et al.*, 2020). In occupational settings, well-being is perceived as a positive and satisfactory working experience, coupled with workers' physical and psychological health (Taheri *et al.*, 2018). Well-being can also be conceptualised from two perspectives that seem to be correlated, the hedonic and the eudaimonic perspective (Ryan and Deci, 2001; Waterman *et al.*, 2008). Hedonic well-being is perceived as a positive state and is focused on pleasure, satisfaction and enjoyment and eudaimonic well-being is perceived as a way of living and focused on personal growth and purpose (Meyer and Maltin, 2010; Ryan and Deci, 2001). Obsessive-compulsive symptoms refer to obsessions (thoughts, ideas, images - like worry or fear of being infected or infecting others) which can lead to compulsions that temporarily ease emotional suffering (APA, 2014), like compulsive hand-washing due to fear of the COVID-19. However, it is important to note

that worries and actions focused on cleaning only partially characterise obsessive-compulsive symptoms. Nevertheless, these symptoms need to be further assessed during a pandemic that demands repeated and specific actions and behaviours for protection from a potentially deathly virus.

Badahdah and collaborators (2020), with 194 healthcare workers, found low levels of well-being, but Greenberg *et al.* (2021) verified that 59% of 709 healthcare workers reported good levels of well-being. Zhang, Wang and collaborators (2020), with 2,182 healthcare workers, found a prevalence of 5.3% for obsessive-compulsive symptoms, higher than that of nonmedical workers. This can potentially be a result of a lack of protective equipment, feeling unsafe at work, increased workload, or exposure to infected patients (Zhang *et al.*, 2020a, b). Regarding the influence of sociodemographic and professional characteristics, studies showed the influence of professionals' age, gender and work experience on well-being and obsessive-compulsive symptoms (Badahdah *et al.*, 2020; Eiche *et al.*, 2019; Marsh *et al.*, 2020). Others did not find any associations (Wagner and Pasca, 2020; Zhang *et al.*, 2020a, b).

In Portugal, by June 31st, 2021, there were 879.557 confirmed cases and 17.096 deaths by COVID-19. The pandemic was declared on March 11th (WHO, 2020) but Portugal only declared a state of emergency on March 18th. Since then, Portugal experienced four COVID-19 waves, the first between March and May 2020, the second between October and December 2020, the third between January and February 2021 and the fourth which began in June 2021 and was still growing at this paper's time of writing. Even during times of reduced pressure, namely between the COVID-19 waves, throughout this pandemic EMS personnel's physical and psychological demands increased (e.g. Sinclair *et al.*, 2020; Urooj *et al.*, 2020). In the Portuguese emergency medical system, EMS personnel attend to victims' medical and psychological needs in pre-hospital settings, both in the field or by phone. In the COVID-19 pandemic they also transported suspected or infected COVID-19 patients to hospitals and collected biological samples for COVID-19 analysis (INEM, 2020). Thus, important aspects of EMS personnel's COVID-19 experience need to be studied, such as: what measures they took to protect their loved ones (such as changing households); whether they felt discriminated as a healthcare worker; how their job-related tasks changed; how they perceive the use of protective equipment and other security measures; and their level of fear while working a high-risk job (Busch *et al.*, 2021; Giusti *et al.*, 2020; IASC, 2020; Li *et al.*, 2021; Sinclair *et al.*, 2020; Urooj *et al.*, 2020; Zhang *et al.*, 2020a, b). However, until now, most of the studies only reported scarce empirical data related to these and other aspects which allow characterising the COVID-19 experience.

Understanding mental health during this pandemic can support the process of coping with COVID-19 mental health outcomes, although data prior to COVID-19 need to be considered and controlled. This is especially relevant for EMS personnel, highly neglected in the COVID-19 literature despite being a population at risk for COVID-19 related psychological disorders (Busch *et al.*, 2021; Sinclair *et al.*, 2020). These disorders and symptoms of poorer mental health may result from inadequate or insufficient strategies and resources to face work-related demands and stressors, namely the ones brought on or increased by the COVID-19 pandemic, as stated by the Job Demands-Resources Model (Bakker and Demerouti, 2007; Schaufeli, 2017). In addition, this knowledge can inform emergency management policies from different emergency services focused on the recovery from COVID-19 or future outbreaks (e.g. Tehrani and Hesketh, 2019). To our knowledge this study contributes to the scarce COVID-19 literature on mental health patterns, as opposed to the isolated levels or the prevalence of each mental health indicator.

As such, the present study aims to explore patterns of EMS personnel's mental health (well-being, stress, anxiety, depression, obsessive-compulsive symptoms and COVID-19 related anxiety) during the COVID-19 pandemic, as well as what contributes to these patterns. Moreover, it aims to explore how these patterns vary according to sociodemographic/

professional variables (gender, age, living alone, being a parent, professional experience, occupational role and workplace) and to COVID-19 experience related variables (being monitored, changing household, changing or expecting changes in their job-related tasks, being a target of stigma/discrimination, COVID-19 related fear and COVID-19 security measures' adequacy). Despite this study being an exploratory one and despite the scarce literature, some hypothesis are proposed: most EMS personnel will present good levels of psychological adjustment during the COVID-19 given that data was collected after the first COVID-19 wave, at a time of reduced pressure (moderate levels of well-being and low to moderate levels of stress, anxiety, depression, obsessive-compulsive symptoms and COVID-19 related anxiety); and mental health patterns will vary and receive the contribution of sociodemographic/professional (especially for age, gender and professional experience) and COVID-19 experience variables (especially for the fear of being infected).

Method

Participants

A total of 214 Portuguese EMS personnel participated in this study. The majority was male (n = 142, 66%), lived with others (n = 188, 88%) and were parents (n = 144, 67%). Participants mostly worked in the north (n = 89, 42%) of Portugal, followed by south-Lisbon (n = 56, 26%), centre (n = 49, 23%) and south-Faro (n = 20, 9%) Most of them were pre-hospital emergency technicians (n = 144, 67%), followed by nurses (n = 56, 26%) and superior technicians (n = 14, 7%), such as emergency psychologists. Their average age was 39.00 years (Sd = 5.60; range 25–55) and they averaged 10.30 years of professional experience (Sd = 5.16; range 1–31). The majority (n = 171, 80%) was not monitored by a COVID-19 task force in their workplace (with emergency technicians, nurses and/or psychologists). This task force aimed to monitor and support professionals with suspected or confirmed COVID-19 and/or professionals in emotional or psychological distress.

Instruments

To reflect the COVID-19 impact on EMS personnel's mental health, instructions on all instruments were changed to encompass the time between the beginning of the pandemic and data collection. For assessing the COVID-19 experience, questions were created by researchers and EMS personnel regarding specific aspects/variables considered relevant by the COVID-19 literature and by EMS personnel in the field. Most of these variables were assessed by only one specific question, which is a major limitation of this study. However, at the time of planning this study and to our knowledge there were no reliable and valid instruments available. Thus, COVID-19 experience related questions were developed with a group of professionals from the target population, and questions were informed by their most relevant needs and experiences at the time. Despite being an exploratory study, this research can also contribute to the COVID-19 literature, supporting the development of more standardised measures based on the needs of field professionals. The majority were yes/no questions ("Are you or were you monitored by the COVID-19 task force?"; "During the COVID-19 pandemic, did you change households?"; "Do you consider your job-related tasks have changed or are going to change because of the COVID-19 pandemic?"; "As a healthcare professional during the COVID-19 pandemic, are you or were you ever a target of stigma/discrimination?"). The COVID-19 related fear variable was created from the average of 9 items measured on a 5-point Likert scale, from 0 = *nothing* to 4 = *a lot*. These items assess the fear of being infected and infecting relatives, friends and colleagues, the fear of failing, the fear of not knowing enough about COVID-19, the fear of being a target of stigma/discrimination and the fear of having difficulties in managing COVID-19 symptoms if infected and in assisting victims. Security measures' adequacy ("How do you assess

COVID-19 security measures provided in your workplace?") was assessed on a 5-point Likert scale from 0 = *none or insufficient* to 4 = *the best possible*.

The Well-Being Questionnaire (Koch *et al.*, 2012; Pouwer *et al.*, 2000) was used to measure the frequency of well-being since the beginning of the pandemic. It has 12 items measured on a 4-point Likert scale (0 = *never* to 3 = *all the time*) and grouped into three dimensions and a total score (e.g. "I live the life I want."). In this study only the total score was considered, for a more comprehensive approach, and higher scores represent a higher well-being.

The Perceived Stress Scale (Cohen *et al.*, 1983; Trigo *et al.*, 2010) was used to measure stress and it has 4 items measured on a 5-point Likert scale (0 = *never* to 4 = *very often*) and grouped into an overall score. The higher the overall score (e.g. "I feel afraid for no reason."), the higher the perception of stress since the beginning of the pandemic.

The Patient Health Questionnaire (Kroenke *et al.*, 2009; Torres *et al.*, 2016) was used to measure anxiety and depression with 4 items assessed on a 4-point Likert scale (0 = *not at all* to 3 = *nearly every day*). Two items measure anxiety (e.g. "Feeling nervous, anxious, or on edge.") and the other two measure depression (e.g. "Feeling down, depressed, or hopeless"). Higher scores represent higher anxiety and depression since the beginning of the pandemic.

The Obsessive-Compulsive Inventory – Revised (Faria and Cardoso, 2017; Foa *et al.*, 2002) was used to measure obsessive-compulsive symptoms with 18 items assessed on a 5-point Likert scale (0 = *not at all* to 4 = *extremely*). These items are grouped into a total score (e.g. "I sometimes have to wash or clean myself simply because I feel contaminated.") and six dimensions with 3 items each: washing, ordering, obsessing, hoarding, checking and neutralising. However, only the total score was considered, for a more comprehensive approach. Higher scores represent a higher degree of emotional suffering when facing these symptoms, since the beginning of the pandemic.

Finally, the Coronavirus Anxiety Scale (Lee, 2020) was used to measure COVID-19 anxiety with 5 items assessed on a 5-point Likert scale (0 = *not at all* to 4 = *nearly every day*) and grouped into an overall score (e.g. "I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus."). As no Portuguese version was available at the time, three psychologists and experts on anxiety, stress and psychometrics translated this scale. Another researcher with a different expertise back translated the scale and compared it to the original. Then, all three psychologists discussed each item with another psychologist (experienced with anxious disorders), to agree on a meaningful and consensual translated scale.

Procedures

This study was approved by the University's Ethics Committee and by the board of the medical emergency organisation. All data was collected online between June and July 2020 (after the first wave of COVID-19 in Portugal, at a time of reduced pressure) and was confidential and anonymous. Informed consents were also presented online, due to physical limitations underlying the COVID-19 pandemic. All professionals received an email inviting them to participate in this study, but only professionals with at least one year of professional experience within the current emergency organisation were considered. This is a common requisite for studying the psychological impact of rescue work.

All statistical analyses were performed with IBM SPSS Statistics for Windows (v.26.0). Extreme outliers were not found, and univariate normality was confirmed with Kline's criteria (2011). For some analysis, dichotomic were transformed into dummy variables. Descriptive/frequency analysis, cluster analysis (combining hierarchical and non-hierarchical methods; Hair *et al.*, 2014), parametric tests for independent samples (*t*-Student's test), Pearson's bivariate correlations, analysis of variance (ANOVAs) and binary logistic regression were conducted. To interpret effect sizes, Ferguson's guidelines

(2009) were considered. In ANOVAs, Games-Howell post-hoc test was used (non-homogeneous variances; Field, 2009). For the binary logistic regression all assumptions were assured: linearity (Hosmer and Lemeshow test - χ^2 (8) = 5.17, p = 0.740), independence of errors and non-multicollinearity (Field, 2009).

Results

The descriptive statistics of EMS personnel's mental health indicators (Table 1) showed that they presented moderate levels of well-being, and low levels of stress, anxiety, depression, obsessive-compulsive symptoms and COVID-19 anxiety. Among the lowest levels, stress presented the highest average. Regarding COVID-19 experience variables, findings show that most of these professionals did not change households (n = 179, 84%) and did not feel stigma/discrimination (n = 140, 65%). The majority considered job-related tasks had changed or were going to change because of this pandemic (n = 188, 88%). EMS personnel also presented moderate levels of COVID-19 fear (M = 1.95, Sd = 0.93, range 0–4) and assessed COVID-19 security measures as moderately adequate (M = 2.37, Sd = 1.03, range 0–4).

Correlations between all mental health indicators, sociodemographic/professional and COVID-19 experience variables are presented in Table 2. All mental health variables correlated with each other: low levels of well-being correlated with higher stress, anxiety, depression, obsessive-compulsive symptoms and COVID-19 anxiety, all of which correlated positively with each other. Mental health indicators also correlated with COVID-19 security measures' adequacy and fear. Moreover, specific mental health indicators (well-being, anxiety, depression and COVID-19 anxiety) correlated with gender, changing household, changes or expecting changes in job-related tasks, being a target of stigma/discrimination and being a mother/father (Table 2). Regarding correlations between sociodemographic/professional and COVID-19 related variables, results show that personnel's age correlated negatively with COVID-19 changes and/or expected changes in their job-related tasks. Living alone correlated positively with COVID-19 security measures' adequacy and feeling stigma/discrimination correlated positively with COVID-19 fear. Additionally, changing households due to COVID-19 correlated negatively to how EMS personnel perceived their workplace security measures' adequacy (Table 2).

To identify patterns of EMS personnel's mental health during the COVID-19 pandemic, a cluster analysis was performed considering all mental health indicators. First, an exploratory and hierarchical method was used to explore and determine the number of clusters in this sample and second a non-hierarchical method (K-Means) was used to analyse the clusters identified (Hair *et al.*, 2014). However, only the clusters that were centres of the hierarchical method were used on the non-hierarchical one. Finally, the final clusters were validated with t-Student's tests for independent samples. Two patterns emerged and the characterisation of each cluster and the differences between the two clusters are presented in Table 3. The first cluster, named as "poorly-adjusted", includes EMS personnel with the worst levels of

Table 1.
Mental health indicators: Descriptive statistics

Variables	α	M	Sd	Min	Max
Well-being[a]	0.88	1.97	0.49	0.33	3.00
Stress[b]	0.72	1.26	0.69	0.00	3.50
Anxiety[a]	0.76	0.51	0.60	0.00	3.00
Depression[a]	0.72	0.60	0.65	0.00	3.00
Obsessive-compulsive symptoms[b]	0.89	0.77	0.57	0.00	3.33
COVID-19 anxiety[b]	0.88	0.34	0.57	0.00	3.50

Note(s): [a] Range:0–3. [b] Range:0–4

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Well-being[a]																
2. Stress[b]	−0.61***															
3. Anxiety[a]	−0.61***	0.52***														
4. Depression[a]	−0.70***	0.54***	0.67***													
5. Obsessive-compulsive symp[b]	−0.50***	0.41***	0.40***	0.44***												
6. COVID-19 anxiety[b]	−0.54***	0.44***	0.62***	0.55***	0.45***											
7. Age	−0.00	0.04	0.06	−0.01	0.06	0.09										
8. Gender (woman)[c]	−0.15*	0.01	0.09	0.05	−0.01	0.01	−0.08									
9. Mother/ Father (yes)[d]	0.06	−0.01	0.10	−0.04	−0.02	0.17*	0.30***	−0.14*								
10. Lived alone (yes)[d]	−0.07	0.04	−0.10	0.00	−0.01	−0.12	−0.16*	0.22**	−0.50***							
11. Professional experience	0.04	−0.03	0.01	−0.03	−0.01	0.15	0.49***	0.01	0.27***	−0.06						
12. COVID-19 monitored (yes)[d]	−0.01	−0.06	0.05	0.02	0.02	0.01	0.05	−0.06	0.00	−0.04	−0.02					
13. Job changes (yes)[d]	−0.04	0.11	0.14*	0.09	0.02	0.05	−0.16*	−0.01	0.08	−0.08	−0.08	0.04				
14. Changed household (yes)[d]	−0.17*	0.13	0.12	0.07	−0.08	0.10	−0.06	−0.05	−0.07	0.07	−0.07	0.09	−0.03			
15. Target of stigma (yes)[d]	−0.07	0.13	0.14*	0.18**	0.09	0.09	−0.07	−0.04	−0.08	−0.03	0.04	0.08	−0.06	0.10		
16. Security measures[b]	0.27***	−0.31***	−24***	−0.28***	−0.16*	−0.20**	0.09	0.11	−0.07	0.17*	−0.02	0.07	−0.02	−0.17*	−0.12	
17. Fear[b]	−0.25***	0.25***	0.26***	0.25***	0.23**	0.22**	−0.00	−0.02	0.04	−0.01	0.03	−0.08	0.02	0.02	0.19**	−0.09

Note(s): [a] Range:0–3. [b] Range:0–4. [c] Dummy (0 = man, 1 = woman). [d] Dummy (0 = no, 1 = yes); $*p < 0.05$. $**p < 0.01$. $***p < 0.001$

Table 2.
Correlations matrix: mental health, sociodemographic/ professional and COVID-19 experience variables

psychological adjustment and mental health during COVID-19 (34%). The second cluster, named as "well-adjusted", includes personnel with the better levels of psychological adjustment during COVID-19 (66%).

To explore if these clusters varied according to sociodemographic/professional and COVID-19 experience related variables, ANOVAs and Pearson's correlations were conducted. Regarding ANOVAs, clusters did not vary according to occupational role or workplace. Regarding Pearson's correlations, belonging to cluster 2 (psychologically well-adjusted) was positively correlated to security measures' adequacy (r [214] = 0.21, p = 0.002) and negatively correlated with COVID-19 fear (r [214] = −0.22, p = 0.001) and being a target of stigma/discrimination (r [214] = −0.17, p = 0.014).

The contributing variables for both clusters (EMS personnel poorly and well psychologically-adjusted) were explored with a binary logistic regression. Clusters were transformed into a dummy variable (0 = poorly-adjusted and 1 = well-adjusted) and both sociodemographic/professional and COVID-19 experience variables were considered. Findings show that the model was statistically significant, χ^2 (11) = 31.11, p = 0.001, R^2_{McFadden} = 0.115, and it correctly classifies 67% of EMS personnel (Table 4). Among the

Table 3.
Mental health patterns during COVID-19: Clusters characterisation and differences between clusters

	Cluster 1 (n = 72) Poorly-adjusted M (Sd)	Cluster 2 (n = 142) Well-adjusted M (Sd)	Differences between clusters t	df	95% CI	d
Well-being[a]	1.49 (0.36)	2.22 (0.35)	−14.29***	212	[−0.83, −0.63]	2.06
Stress[b]	1.84 (0.61)	0.95 (0.53)	11.11***	212	[0.73, 1.05]	1.56
Anxiety[a]	1.27 (0.57)	0.26 (0.37)	13.66***	101.62	[0.86, 1.15]	2.10
Depression[a]	1.10 (0.56)	0.21 (0.34)	14.39***	212	[0.77, 1.01]	1.92
Obsessive-compulsive symptoms[b]	1.23 (0.61)	0.54 (0.37)	8.73***	98.88	[0.53, 0.84]	1.37
COVID-19 anxiety[b]	0.79 (0.77)	0.11 (0.20)	7.30***	75.81	[0.49, 0.86]	1.21

Note(s): According to Ferguson (2009): d = 0.41, recommended minimum effect size; d = 1.15, moderate effect; d = 2.70, strong effect; [a] Range:0–3. [b] Range:0–4; ***p < 0.001

Table 4.
Covariates of mental health patterns during COVID-19: Sociodemographic/professional and COVID-19 experience variables

Covariates	B	$SE\ B$	Wald	p	OR	95% CI
Sociodemographic/Professional						
Age	−0.08	0.03	5.34*	0.021	0.93	[0.87, 0.99]
Gender (woman)	−0.51	0.34	2.19	0.139	0.60	[0.31, 1.18]
Mother/Father (yes)	0.06	0.41	0.02	0.877	1.07	[0.48, 2.38]
Lived alone (yes)	−0.01	0.59	0.00	0.993	1.00	[0.31, 3.19]
Professional experience	0.03	0.04	0.83	0.364	1.03	[0.96, 1.11]
COVID-19 experience						
COVID-19 monitored (yes)	−0.45	0.39	1.36	0.244	0.64	[0.30, 1.36]
Job changes (yes)	−0.78	0.54	2.12	0.145	0.46	[0.16, 1.31]
Changed household (yes)	0.09	0.43	0.04	0.844	1.09	[0.47, 2.55]
Target of stigma (yes)	−0.63	0.34	3.40	0.065	0.53	[0.27, 1.04]
Security measures	0.48	0.17	8.52**	0.004	1.62	[1.17, 2.24]
COVID-19 fear	−0.46	0.18	6.91**	0.009	0.63	[0.45, 0.89]

Note(s): Dependent variable: Clusters dummy (0 = cluster 1: poorly-adjusted, 1 = cluster 2: well–adjusted); OR = Odds Ratio; *p < 0.05. **p < 0.01

sociodemographic/professional variables, only personnel's age significantly contributed to belonging to each cluster. Older professionals were more prone to belong to the psychologically poorly-adjusted cluster. Among the COVID-19 experience variables, only the personnel's perceived security measures' adequacy and COVID-19 fear were significant. Professionals who perceived COVID-19 security measures as more adequate were more prone to belong to the well-adjusted cluster. Professionals with higher levels of COVID-19 fear were more prone to belong to the psychologically poorly-adjusted cluster.

Discussion

This study aimed to explore patterns of EMS personnel's mental health during COVID-19, as well as what contributes to these patterns among sociodemographic/professional and COVID-19 experience variables. Findings show two groups of EMS personnel: the psychologically poorly-adjusted and the psychologically well-adjusted during the COVID-19 pandemic. Most participants were included in the well-adjusted group (66%), and therefore presented low stress, anxiety, depression, obsessive-compulsive symptoms and COVID-19 anxiety, as well as high well-being. The variables that contributed to belonging to each pattern were personnel's age, how they perceive the adequacy of COVID-19 security measures and COVID-19 fear. Nevertheless, controlling for pre-COVID-19 data may help to explain findings or even change these results.

Regarding the analysis of isolated mental health indicators, results show that EMS personnel presented a good psychological adjustment to stressors during the COVID-19 pandemic. They presented low anxiety and COVID-19 related anxiety, depression, stress and obsessive-compulsive symptoms. Other studies have found high levels for frontline healthcare workers during COVID-19 (Giusti *et al.*, 2020; Li *et al.*, 2021; Que *et al.*, 2020; Vagni *et al.*, 2020; Zhang *et al.*, 2020a, b) and even prior to this pandemic, especially for stress, anxiety and depression (e.g. Petrie *et al.*, 2018). However, stress was near moderate levels. Personnel also presented moderate well-being, as Greenberg *et al.* (2021) found in healthcare workers. Therefore, these findings bring a new perspective on the mental health of Portuguese healthcare workers during COVID-19, especially EMS personnel. However, it is important to note that findings were not controlled for levels prior to this pandemic.

Concerning COVID-19 experience, EMS personnel reported moderate COVID-19 fear and perceiving COVID-19 workplace security measures as moderately adequate. Due to COVID-19, most participants suffered changes and were expecting changes in their job-related tasks, were not a target of stigma/discrimination and did not change households. In addition, some of these variables correlated to each other: personnel who were a target of stigma/discrimination presented higher COVID-19 fear and personnel who changed households assessed COVID-19 security measures less adequately. Combined with findings from mental health indicators, EMS personnel showed a moderate adjustment to the COVID-19 pandemic. In fact, only 20% were monitored by the COVID-19 task force, which aimed to support EMS personnel who displayed dysfunctional acute stress reactions and/or personnel who were with suspected or confirmed COVID-19. These findings may be a result of COVID-19's softer impact on Portugal, after the first COVID-19 wave, and/or of the emergency policies' good adjustment to personnel's psychological needs. Levels of COVID-19 fear were the most concerning despite being moderate and expected in this abnormal situation. This study is one of the few that explored these questions empirically in Portugal.

The exploration of mental health patterns during COVID-19 confirms the above findings and conclusions. Only 34% of EMS personnel had worst results on mental health indicators during this pandemic, contrary to reports from other studies (e.g. Busch *et al.*, 2021; Li *et al.*, 2021; Sinclair *et al.*, 2020). All mental health indicators clustered in two patterns: the psychological poorly-adjusted and the psychological well-adjusted, which differed on

anxiety, depression, stress, obsessive-compulsive symptoms, COVID-19 anxiety and well-being. Until now, the analysis of mental health patterns during COVID-19 was scarce in healthcare workers, as opposed to the isolated study of mental health variables. This approach is important to better understand EMS personnel's psychological experience, as well as to better inform emergency management of which groups of professionals are at a higher risk for psychological disorders (e.g. Tehrani and Hesketh, 2019). It is important to note that all mental health variables included in these patterns correlated with each other but moderately, and no multicollinearity issues were found (Ferguson, 2009).

The correlation between sociodemographic/professional and COVID-19 experience variables with mental health patterns was explored. Only COVID-19 fear, security measures' adequacy and being a target of stigma/discrimination showed significant findings. Psychologically well-adjusted EMS personnel were more prone to perceive security measures as more adequate, to present lower COVID-19 fear and to not be a target of stigma/discrimination. Thus, these results show the importance of how personnel experienced COVID-19, revealing that the impact of their work stressors and demands has extended to their personal lives and mental health (EUROFOUND, 2021; Harrison, 2019; Sinclair *et al.*, 2020). Nevertheless, it is important to note that for some mental health indicators included in these patterns other correlations were found, namely with being a female and changing household due to the COVID-19 (with well-being), experiencing or expecting job changes as a result of COVID-19 (with anxiety) and being a mother/father (with COVID-19 anxiety). Therefore, these added vulnerability factors also need to be analysed in future studies, namely by controlling for pre-COVID-19 data.

Among sociodemographic/professional and COVID-19 experience variables, only professionals' age, COVID-19 security measures' adequacy, as well as COVID-19 fear significantly contributed to EMS personnel's mental health patterns during COVID-19. As such, being fearful of COVID-19 related aspects and EMS personnel's age were risk factors for having a worst psychological adjustment during this pandemic. The adequacy of COVID-19 security measures was a protective factor. Older professionals and with high levels of fear were more likely to belong to the poorly psychological-adjusted group and therefore more likely to present low well-being and high anxiety, stress, depression, COVID-19 related anxiety and obsessive-compulsive symptoms. Professionals who assessed COVID-19 security measures as more adequate were more likely to present high well-being and low anxiety, stress, depression, COVID-19 related anxiety and obsessive-compulsive symptoms, and were, therefore, more likely to belong to the well-adjusted group.

The role of personnel's age as a risk factor was already found by some pre-COVID-19 studies (e.g. Alharthy *et al.*, 2017; Eiche *et al.*, 2019; Wagner and Pasca, 2020). The contribution of COVID-19 experience variables is a novel information to the scientific literature, although fear of being infected was already explored as a mental health predictor (e.g. Giusti *et al.*, 2020; Zhang *et al.*, 2020a, b). Nevertheless, this study went beyond the fear of being infected and focused on the fear of infecting relatives/friends/colleagues and on the fear of not knowing enough about COVID-19, among others. Additionally, the COVID-19 literature aimed at identifying factors that can contribute to mental health only studied each variable separately and not mental health patterns. However, these contributing factors need to be analysed considering the impact of pre-COVID-19 working experiences. For example, it may be that EMS personnel's security measures were already perceived as inadequate previously to the COVID-19 pandemic, and these results did not control for these changes and relationships.

Additionally, is important to consider that the variables that contributed to belonging to each mental health pattern also correlated with other sociodemographic/professional and COVID-19 experience variables. Older EMS personnel were more likely to have experienced or to have expected changes in their job-related tasks due to COVID-19. Moreover, personnel

with higher levels of COVID-19 fear were more likely to have been a target of stigma/discrimination during COVID-19. Personnel who perceive more adequately the COVID-19 security measures were more likely to live alone and to have changed household due to COVID-19. As such, future studies ought to control these complex relationships, in addition to control for pre-COVID-19 data.

Research and practical implications

The limitations of this study need to be considered when analysing these findings, namely the cross-sectional, self-reported design and not having controlled for pre-COVID data. Moreover, another important limitation is having only used isolated questions to measure each COVID-19 experience variable, as very few valid COVID-19 instruments were available at the time of planning this study. Nevertheless, this study adds knowledge to the COVID-19 literature, especially for EMS personnel. These frontline healthcare workers have been neglected by researchers, despite being key elements against COVID-19 (e.g. Ho *et al.*, 2020). The complex interactions between mental health indicators have also been neglected when exploring mental health patterns. However, considering these patterns has its advantages, namely by following a more comprehensive approach. Findings also call for the need to explore these patterns with different high-risk occupational groups.

For research implications, the dynamic character of the COVID-19 pandemic, as well as the potentially long-term and cumulative effects on EMS personnel's mental health, call for the need to longitudinally monitor their mental health (e.g. Tehrany and Kesketh, 2019). This is especially true to assess the impact of other, and more severe COVID-19 waves, as was the case of the third wave in Portugal. Data collected with EMS personnel previously to the COVID-19 pandemic also need to be considered and controlled for in the literature. Further and more complex statistical analysis, after increasing the number of participants, also needs to be conducted, namely by using more recent and valid instruments on the COVID-19 experience. Other relevant mental health indicators for EMS personnel, such as trauma and burnout, can also be considered in future studies. The replication and exploration of these results and variables with different high-risk professionals is also important. Moreover, this study brings attention to the importance of considering other COVID-19 related fears, as well as how professionals assess workplace security measures for COVID-19.

Regarding practical implications, this study provides some relevant information. Findings explored EMS personnel's patterns of mental health during the COVID-19, specifically after the first wave of COVID-19 in Portugal. This information is key to better prepare emergency and human resources management for future COVID-19 waves or other outbreaks, namely by developing prevention strategies and interventions, and by signalling occupational groups and EMS personnel at greater risk, who need to be more closely and frequently monitored. In addition, the knowledge of the variables that can significantly contribute to mental health patterns during COVID-19 allows for emergency management to better focus their attention and to better respond to personnel's needs. Thus, during the COVID-19 pandemic older personnel should be more closely monitored. Fears related to different aspects of this pandemic need to be directly addressed by emergency organisations, namely by promoting communication between peers and between professionals and supervisors, as well as by providing and clarifying information (IASC, 2020). Workplace security measures related to COVID-19 also need to be properly explained to all professionals so that they can understand the purpose of each measure (IASC, 2020).

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Corresponding author
Cristina Queirós can be contacted at cqueiros@fpce.up.pt