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COVID-19: Risk Factors and Protective Role of Resilience and Coping Strategies for Emergency Stress and Secondary Trauma in Medical Staff and Emergency Workers—An Online-Based Inquiry

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Abstract: The COVID-19 crisis has placed a heavy burden on medical staff and emergency workers, who may be at risk of developing psychological distress and secondary trauma. Coping and resilience to stress during a pandemic are protective factors that can mitigate the potential adverse psychological effects. Here, we investigated the direct and mediated effects of coping strategies and hardiness on secondary trauma among Italian medical staff (physicians and nurses, n = 140) and emergency workers (firefighters, civil protection, and ambulance personnel, n = 100) involved in the first phase of the pandemic. For this purpose, we collected data from participants through online questionnaires to measure emergency stress, coping strategies, hardiness, and secondary trauma. Other variables analyzed were age, sex, direct contact with COVID-19 patients, and use of personal protective equipment (PPE). We performed a correlational analysis, regressions, and a mediation analysis. The results show that nurses and physicians experienced higher levels of emergency stress than emergency workers. Direct contact with COVID-19 patients, female sex, unexpected events, and lack of PPE were risk factors for emergency stress, while resilience and coping strategies played a protective role. Mediation analysis shows that coping strategies and hardiness are protective factors and reduce the effect of stress on secondary trauma.

Keywords: emergency stress; coping strategies; resilience; COVID-19; secondary trauma; risk factors; healthcare and emergency workers

1. Introduction

The emergency situation linked to the COVID-19 pandemic required many health and emergency workers to guarantee protection, treatment, and safety measures for people who had contracted the virus and to limit the spread of the infection. Starting with phase 1 of the pandemic in Italy, medical staff and emergency workers (such as ambulance personnel, civil protection staff, and firefighters) had to complete grueling work shifts that were long and full of tension, facing both objective and emotional difficulties. During the first weeks of the pandemic, clear intervention protocols, adequate instruments, and the necessary personal protective equipment (PPE) were lacking. These objective difficulties were coupled with psychological difficulties linked to the fear of contracting the virus, infecting one's family members, and, above all, to one's sense of helplessness in the face of patient losses.

According to Folkman and Lazarus [1], stress tends to be associated with the risk of developing symptomatic manifestations when external demands are perceived as outweighing one's resources and coping skills. Previous studies conducted on healthcare workers involved in the SARS and MERS pandemics have found high levels of stress associated with other psychopathological manifestations,

such as anxiety, depression, and secondary trauma [2–5]. The high stress associated with post-traumatic symptoms tends to impact the sense of gratification in one's work and the loss of the ability to cope with difficulties and resistance.

Repeated exposure to unpredictable challenges at work, such as the COVID-19 emergency, can cause symptoms of anxiety, exhaustion, and stress in healthcare professionals (medical staff, nurses, and assistants), and can lead to the development of secondary trauma (ST). ST is an emotional response or tension due to treating those suffering from the consequences of traumatic events and is different from the primary post-traumatic stress disorder that may be diagnosed in an individual who has experienced a traumatic event. Medical staff and emergency workers are generally more at risk of developing secondary than primary trauma [6].

Several studies conducted during the COVID-19 epidemic have already highlighted the presence of high levels of psychopathological symptoms in medical staff and the prevalence of secondary trauma [7–11]. Arpacioglu et al. [7] highlighted that the secondary traumatization of healthcare workers working directly with COVID-19 patients should be taken into consideration.

In medical staff members treating COVID-19 patients, anxiety levels affected psychological well-being by increasing levels of distress and decreasing sleep quality and self-efficacy [12–14].

Other studies have indicated that among healthcare professionals, women report higher levels of ST than men, in line with previous research on sex and the most recent studies on pandemics in Italy [15], and that ST negatively impacts the mental health of healthcare professionals in terms of both anxiety and depression [6]. However, only a few studies have also included emergency workers, who have played a fundamental role in the management of the COVID-19 pandemic. Vgni et al. [16] compared the levels of stress and ST in a group of healthcare and emergency workers, noting that compared with the emergency worker group, the healthcare worker group had higher levels of emergency stress and arousal.

1.1. Risk Factors of Mental Health Outcomes in Healthcare and Emergency

Among the risk factors of developing psychopathological symptoms during the COVID-19 emergency, the literature highlights some sociodemographic variables, such as female sex [10,13,16–19]. Women tend to have higher fear and perception of the risk of infection, and this increases their risk of developing anxiety and distress [14]. Being in direct contact with COVID-19 patients also represents a risk factor for developing psychopathology. Some studies found that frontline healthcare workers had higher secondary traumatization scores than non-frontline health workers [10,13,20,21]. According to a review on the subject [18], the evidence suggests that female nurses with direct and close contact with COVID-19 patients may be at higher risk of adverse mental health outcomes during this pandemic.

Several studies have revealed that insufficient instruction and lack of personal protective equipment (PPE) are important predictors of stress for healthcare and emergency workers dealing with the COVID-19 emergency [8,18,22–24]. Some studies found that longer working hours [25], increased work intensity or patient load per hour [26], and heavy workload [27] can be considered risk factors.

During phase 1 of the lockdown, Italian medical staff and emergency workers dealt with a high number of sick and deceased patients despite the absence of clear intervention protocols, adequate instructions, and PPE. After the event, medical staff and emergency workers considered the consequences once the facts were known. Downward counterfactual thoughts tend to follow close calls or relatively satisfying outcomes, leading to a relatively positive affect, and theoretically provide behavioral prescriptions for how unsatisfying outcomes in the future might be prevented [28]. This way of thinking can favor the use of internal resources of resilience and self-efficacy to cope. However, upward counterfactual thoughts could follow relatively unsatisfying outcomes, and could thus lead to developing a negative affect.

According to Petrocelli [28], upward counterfactual thoughts lead to affective reactions, feelings of blame and responsibility, victim compensation, experienced/perceived regret, and judgments of causality. As argued by several authors, counterfactual thinking can be associated with the mental

states of rumination, regret, and distress [29–33]. Counterfactual thinking occurs especially when people are faced with critical situations or when they perceive that their actions are associated with failures, errors, and the inability to change external events. Counterfactual thinking intervenes in the decision-making processes of everyday life and belongs to both common sense and experts [34]; it tends to be associated with a higher risk of developing stress and psychopathological symptoms [33–35].

1.2. Protective Factors against Adverse Mental Health Outcomes in Healthcare and Emergency Workers: Coping and Hardiness

Several studies have shown that the use of coping strategies and hardiness can help medical staff and emergency workers to better cope with emergency situations. These factors can protect them from complications caused by traumatic events [36].

Coping strategies reduce stress levels and play a mediating role in lowering the risk of psychological symptoms. Several studies have shown how the risk of developing post-traumatic symptoms in stressful situations could be reduced by coping strategies [37–39]. Chesney et al. [40] discovered that stop unpleasant emotions and thoughts is the best coping strategy in terms of decreased levels of perceived stress and increased positive states of mind.

The literature suggests that a widely used coping strategy is avoidance, and that this strategy is associated with higher levels of stress [38,39,41–43] and the development of post-traumatic symptomatology [44]. Coping strategies focused on the problem usually tend to be correlated with lower stress levels in both healthcare workers [45–48] and other emergency workers [41]. Using active coping strategies during COVID-19 reduces stress and leads to using security protocols, seeking support from family and friends, and practicing social isolation measures, but these workers did not find it necessary to discuss their emotions with a professional [49,50].

Several studies found that problem-focused strategies are a protective factor when facing stress in medical staff [51,52], but during the peak of the COVID-19 emergency, the effect was reduced if not associated with adequate preparation [53].

Another protective factor against the adverse mental health outcomes of stress is hardiness, which is an individual attribute associated with resilience. Hardiness can be defined as a personality structure comprising the three related general dispositions of commitment, control, and challenge, and it functions as a resistance resource in encounters with stressful conditions [54]. Hardiness tends to be associated with positive internal states, leading people to consider external events as a challenge and an opportunity for change and self-improvement [55]. Generally, higher levels of hardiness lead to adaptive coping approaches and fewer maladaptive coping approaches to reduce stress levels [56]. Bartone [55] detected not only the link between hardiness and stress, but even the power of hardiness to preserve an individual from stress-related diseases. Hence, individuals with a higher level of hardiness experience lower levels of stress and secondary trauma [57,58]. A meta-analytic study [59] revealed the association between high hardiness and active coping approaches, as well as between low hardiness and avoidance coping [60].

Some studies have found a predictive and/or mediating effect of hardiness on stress and secondary trauma in terms of reducing its negative effects on the health of healthcare and emergency workers and in other contexts [37,61–68].

1.3. Mediating Role of Hardiness and Coping on Mental Health in Healthcare and Emergency Workers

Protective factors, such as resilience and coping strategies, have both direct and mediating effects in reducing the negative effects of stress on health workers. Heath at al. [69] investigated the mediating role of coping strategies and resilience to stress during a pandemic as well as the importance of increasing these factors in healthcare workers to mitigate or minimize potential adverse psychological effects. Most studies have analyzed the predictive and mediating effect of coping strategies and hardiness [65–67] singularly; few studies have analyzed the relationships between resilience, coping strategies, and mental health in healthcare and emergency workers [57,70].

Recent research conducted on stress in healthcare and emergency workers during the COVID-19 pandemic indicated that hardiness [16] and coping strategies [19] play a protective role in the development of secondary trauma [16].

For the purposes of this study, several studies [71–74] found that hardiness and coping strategies are predictors of stress among rescue workers. The results of these studies highlighted the importance of the concepts of stress, coping, and hardiness, as well as their interaction, in the work environment of rescue workers. Researchers such as Spoorthy et al. [72] and Judkins [73] showed that stress can be reduced by adopting coping strategies and increasing the level of hardiness. Only one study [75] analyzed the mediating role of hardiness and coping strategies on stress and secondary trauma in volunteer emergency workers recruited during phase 2 of the COVID-19 lockdown, verifying that hardiness, stop unpleasant emotions and thoughts, and focused on problems reduce the effect of stress in generating arousal and avoidance symptoms. However, a mediating role on aspects of intrusiveness was not recorded. This model builds on Jamal's results and appears to be applicable in emergency situations involving emergency workers, but probably also healthcare workers.

1.4. Study Aim and Hypotheses

Few studies have analyzed the interaction of coping strategies and hardiness on stress among frontline medical and emergency workers [65,75]. The main objective of this study was to identify the direct and mediating effects of hardiness and coping strategies used by both medical staff and emergency workers during the first phase of the COVID-19 pandemic lockdown in Italy to reduce stress factors that may induce the development of secondary trauma symptoms.

The abovementioned studies analyzed and highlighted the effects of some socio-demographic variables, the fact of having treated COVID-19 patients, and the lack of PPE as risk factors for stress reactions. In this study, additional risk factors were analyzed to verify their incidence on the stress perceived by emergency workers, physicians, and nurses.

According to some authors [16,19,22], medical staff and emergency workers can develop acute stress reactions during emergency medical situations, including emotional, cognitive, physical, and social relational reactions, but also ineffective decision-making [38]. Therefore, these factors were investigated our study. In addition, as found in other studies conducted on workers involved in interventions during the pandemic, the fear of contracting the virus and infecting their own families seems to play an important role in generating stress reactions; therefore, this aspect was specifically considered [22,23,57,76].

All these risk factors were measured using a specific questionnaire [16,19] together with the operators' ability to perceive a sense of effectiveness in dealing with stress [40].

This study aimed to verify the following hypotheses:

Hypothesis 1 (H1). *Medical staff and emergency workers who have treated COVID-19 patients have higher stress and secondary trauma scores.*

Hypothesis 2 (H2). *Physicians and nurses have higher stress and secondary scores than emergency workers.*

Hypothesis 3 (H3). *Risk factors have a predictive effect on emergency stress.*

Hypothesis 4 (H4). *Hardiness and coping strategies are protective factors and have a negative predictive effect on emergency stress. Other contextual variables, such as groups, sex, and age, were considered as control variables.*

Hypothesis 5 (H5). *The predictive effect of emergency stress on secondary trauma is mediated by hardiness and coping strategies (stop unpleasant emotions and thoughts) that reduce the effect.*

2. Materials and Methods

2.1. Participants

Participants included healthcare and emergency workers selected during the pandemic emergency using social media, dedicated mailing lists, and forums. Participants were selected on a voluntary basis through a transversal sampling. Hospitals, fire brigade headquarters, various emergency agencies, residential facilities for patients, and civil protection from various Italian regions were contacted to request participation in the study, guaranteeing absolute anonymity of the participants. They completed questionnaires on an online platform that is easy to access for all (Google modules, Italy). The data were collected during the first weeks of the lockdown. All participants were asked to indicate: if they worked in direct contact with COVID-19 patients; if they worked in the hospital and in which department; if their department had been reorganized into a COVID department.

The sample consisted of 240 participants—141 women (58.8%) and 99 men (41.3%)—with a mean age of 43.18 years (SD = 11.05; range 22–67). Participants resided in all Italian regions, and their workplaces of origin could be divided as follows: 37.9%, 39.2%, and 22.9% were from North, Central, and South Italy, respectively. The participants were professionals who directly operated in various sectors during the COVID-19 emergency, such as emergency wards, COVID intensive care units, psychiatry departments, ambulance services, cardiology departments, and orthopedics departments. We divided them into two main groups with respect to the two principal variables of the study: a "workers group" (medical staff vs. emergency workers) and "COVID patients" (workers who treated patients with coronavirus vs. those who did not). In the present study, the variable "COVID patients" was considered important to distinguish workers who had direct contact with COVID-19 patients from those who were exposed to a lower risk of contagion.

The "healthcare and medical staff" subgroup consisted of 140 participants (58.3%) with a mean age of 42.03 years (SD = 11.43; range 22–66)—74 physicians (average age = 41.34; SD = 11.58; range 27–65) and 66 nurses (mean age = 41.09; SD = 10.43; range 23–62). The "emergency" subgroup consisted of 100 participants (41.7%): emergency workers, firefighters, and civil protection staff, whose average age was 44.80 years (SD = 10.35; range 22–67). The two subgroups showed no age differences ($t = -1.926$; p n.s.); even between physicians and nurses, there was no difference in age ($t = -0.132$; p n.s.), whereas a difference emerged in the distribution of the sex variable, with 95 women and 45 men in the medical staff group and 54 men and 46 women in the emergency group ($\chi^2 = 11.50$; $p < 0.001$). Furthermore, 146 (66%) medical staff and 54 (54%) emergency workers claimed to have worked directly with COVID-19 patients ($\chi^2 = 3.360$; p n.s.).

2.2. Procedures

We used an online transactional survey that was administered during phase 1 of the Italian pandemic. The online questionnaire obtained informed consent and baseline sociodemographic information, and asked a series of questions, as described in the next section. Participants' anonymity was maintained when collecting the data. The institutional ethics committee approved all the procedures.

2.3. Materials

In this study, several instruments were administered to evaluate the level of psychological hardiness, coping style, stress, and secondary trauma of each participant. We included the following questionnaires.

Dispositional Resilience Scale-15, Italian version (DRS-15) [77,78]: This is a self-reported questionnaire that measures hardiness. It consists of 15 items scored on a four-point scale ranging from 0 (not at all true) to 3 (completely true). The instrument includes positively and negatively keyed items covering the three conceptually important hardiness components: commitment, control, and challenge. The overall score ranges from 0 to 45, with higher scores indicating a greater level of hardiness. In addition to the total score, the DRS yields scores for three subscales: commitment, control, and challenge. The Alpha coefficients were calculated for this sample because previous Italian

standardization showed low values: 0.83 for the total score and 0.77, 0.71, and 0.70 for the commitment, control, and challenge subscales, respectively. The total DRS appears to be more stable, and only this was used in the present study.

The Coping Self-Efficacy Scale—Short Form (CSES-SF) [40]: This is a 13-item measure of perceived self-efficacy for coping with challenges and threats. This measure focuses on the changes in individuals' confidence in their ability to cope effectively based on self-efficacy theory [40,79]. Participants were asked to rate the extent to which they believed they could perform important behaviors for adaptive coping on an 11-point scale. The instrument yields three subscale scores: problem-focused, stop unpleasant emotions and thoughts, and support. In the absence of an Italian validation of the tool, an analysis of the main components with orthogonal rotation of factors (varimax) was conducted on the study sample. The number of factors to be extracted was initially verified through the unit's largest eigenvalue criterion and, subsequently, by the scree test, and the three components were confirmed. The Alpha coefficients obtained were: 0.81, 0.92, and 0.84 for problem-focused, stop unpleasant emotions and thoughts, and support, respectively. According to previous authors [40], the total score of this tool was not used in this study because individual scales tend to have different predictive effects on perceived stress. It is therefore preferable to keep the individual scales distinct.

Emergency Stress Questionnaire (ESQ, see Appendix A) [16,19,75]: The ESQ is an original self-report instrument already published and validated in previous research to assess the level of stress in healthcare and emergency workers during phases 1 and 2 of the pandemic [16,19,75]. The ESQ consists of 33 items assessed on a five-point Likert scale, with scores ranging from 0 (not at all) to 4 (very much). It includes six scales that were built following several studies on stress factors of workers during emergency situations [22,23,58,72,80–83]: physical emotional, cognitive, decision-making, relational, organizational stress, and COVID stress. Each scale has its own score, and a total score can be calculated [75]. The internal consistency is the following for each scale: organizational–relational stress ($\alpha = 0.71$), physical stress ($\alpha = 0.82$), inefficacy decisional stress ($\alpha = 0.80$), emotional stress ($\alpha = 0.86$), cognitive stress ($\alpha = 0.72$), COVID-19 stress ($\alpha = 0.80$), and total ESQ ($\alpha = 0.93$).

Since the main purpose of this study was not to consider the components of stress perceived by the participants, but their association with secondary trauma and its ability to be mediated through hardiness and coping strategies, only the score for total stress was used in the subsequent analyses.

Secondary Traumatic Stress Scale—Italian Version (STSS-I) [84]: This instrument includes 17 items and detects the symptoms of secondary trauma: arousal, avoidance, and intrusion. The arousal items describe situations characterized by anxiety, confusion, physical, and psychological complaints, as well as agitation. Avoidance items describe the presence of persistent cognitive and affective avoidance of stimuli associated with trauma. Intrusion refers to the re-experiencing of the traumatic event—even if not directly suffered—through internal images and memories. The Italian validation has two scales, and the reliability coefficients were 0.87 and 0.81 for arousal and intrusion, respectively. The Alpha coefficients were calculated for this sample: 0.91, 0.86, and 0.80 for the total score and the arousal and intrusion subscales, respectively.

An original questionnaire/checklist on stressful factors: We constructed an ad hoc seven-item checklist referring to the factors considered in the literature that can increase stress reactions because they increase the feeling of loss of control and reduce the sense of self-efficacy. Often, rescuers, following their interventions, complete debriefings to evaluate the effectiveness of the intervention, also activating a counterfactual reasoning that can, in some cases, increase the sense of frustration associated with greater reactions of emotional, cognitive, and decision-making stress [22,28,33,79,85]. The checklist includes yes/no questions used to detect stress factors identified by the literature, such as:

- Having suggested solutions that have not been considered ("suggestions");
- Having had unexpected and unpredictable events ("unexpected events");
- Having received the necessary instructions to intervene ("instructions");
- Having PPE;
- Having made a decision that proved to be ineffective ("ineffective decision");

- Having received unclear information ("unclear information");
- In hindsight, believing that it would have been appropriate to intervene in a different way ("different behavior").

The last two variables were not considered due to numerous missing items.

2.4. Statistical Strategy

Pearson's correlation analyses were performed to identify the associations between the variables for the two groups considered in this study: ESQ, DRS, coping strategies, and secondary trauma. A multivariate analysis was performed to verify the effects of the "workers" ("emergency", "nurse," and "physician") and "COVID patients" (having treated COVID-patients vs. no COVID patients) groups with regards their total stress, hardiness, coping strategies, and secondary trauma.

We used hierarchical linear regression models to verify the predictive effect of the risk factors on the total stress. A second hierarchical linear regression model was used to verify the protective effect of hardiness and coping strategies on total stress. The models were controlled for age, sex, and group.

According to Baron and Kenny [86], the analysis of the mediating role of coping strategies and hardiness on stress in producing secondary trauma was carried out using correlational analysis, regression analysis, and the Sobel test to show whether indirect effects were significant or not [87].

3. Results

Preliminary analyses of the *t*-test between all groups and Pearson's correlations among emergency stress, hardiness, coping strategies, and secondary trauma were conducted (Tables A1 and A2).

A multivariate analysis was performed, assuming total stress, hardiness, coping strategies, and secondary trauma as dependent variables and "COVID patients" (COVID patients vs. no COVID patients) and "workers" groups (emergency workers, nurses, and physicians) as fixed factors. Age and sex were covariates. The model showed significant within-subject effects related to the COVID patients/no COVID patients group (Pillai's value = 0.222, F = 7.791, degrees of freedom (d f) = 8, 219, $p < 0.001$, $\eta^2 = 0.222$) and workers group (Pillai's value = 0.143, F = 2.11, d f = 16, 440, $p < 0.01$, $\eta^2 = 0.071$). An age-related effect also emerged (Pillai's value = 0.125, F = 3.928, d f = 8, 219, $p < 0.001$, $\eta^2 = 0.125$). Sex was significant (Pillai's value = 0.068, F = 2.010, d f = 8, 219, $p < 0.05$, $\eta^2 = 0.068$), and at the level of effects between subjects, we found that women had higher total stress scores than men (F = 7.213, $p < 0.01$, $\eta^2 = 0.031$).

Within subjects, we found an effect linked to the interaction of the two group variables (COVID patients vs. no COVID patients × workers, Pillai's value = 0.119, F = 1.743, d f = 16.440, $p < 0.05$, $\eta^2 = 0.060$), and at the level of effects between subjects, we found a slight significance at the level of total stress (F = 4.153, $p < 0.05$, $\eta^2 = 0.035$), with emergency workers showing lower stress levels than nurses and physicians (t = -3.873, $p < 0.001$, $\eta^2 = 0.062$). Emergency workers and nurses who directly treated COVID patients had slightly higher total stress scores (COVID patients × emergency workers, $t = 2.360$, $p < 0.05$, $\eta^2 = 0.024$; COVID patients × nurses, $t = 2.602$, $p < 0.05$, $\eta^2 = 0.029$). The analysis of the effects between subjects also showed that those who directly treated COVID patients had significantly higher total stress scores (F = 41.088, $p < 0.001$, $\eta^2 = 0.154$), and had significant focused problem (F = 13.926, $p < 0.001$, $\eta^2 = 0.058$), stop unpleasant emotions and thoughts (F = 19.103, $p < 0.001$, $\eta^2 = 0.078$), support (F = 6.596, $p < 0.05$, $\eta^2 = 0.028$), arousal (F = 13.012, $p < 0.001$, $\eta^2 = 0.054$), intrusion (F = 3.588, $p < 0.05$, $\eta^2 = 0.019$), and total trauma (F = 12.840, $p < 0.001$, $\eta^2 = 0.054$) scores. The workers group variable showed effects between subjects only at the ESQ (F = 7.650, $p < 0.01$, $\eta^2 = 0.063$) and stop unpleasant emotions and thoughts (F = 6.047, $p < 0.01$, $\eta^2 = 0.051$) levels. Older workers showed greater use of stop unpleasant emotions/thoughts (F = 4.881, $p < 0.05$, $\eta^2 = 0.021$, $t = 2.608$, $p < 0.05$) and total DRS (F = 4.863, $p < 0.05$, $\eta^2 = 0.021$, $t = 2.205$, $p < 0.05$), but had higher arousal scores (F = 6.785, $p < 0.05$, $\eta^2 = 0.030$, $t = 2.605$, $p < 0.05$).

The distribution of risk factors in the groups was verified, and 126 medical staff and 66 emergency workers had unexpected events ($\chi^2 = 21.00$; $p < 0.001$), whereas 87 healthcare and 45 emergency

workers did not have the necessary instructions ($\chi^2 = 6.93$; $p < 0.05$). For the other variables, we found no differences in their distribution. Within the groups of COVID patients vs. no COVID patients, there were no differences.

Considering both the correlations shown in Table A2 and the effect recorded using MANOVA at the level of the workers group variable, two hierarchical linear regression models were generated to verify Hypotheses 3 and 4, which were then checked for age, sex, and group (workers (emergency workers, physicians, and nurses) and COVID patients vs. no COVID patients). Stress was assumed to be a dependent variable, and risk and protective factors were predictors in the two separate models (Table 1).

Table 1. Hierarchical regressions of risk and protective factors on stress ($n = 240$).

EMERGENCY STRESS (ESQ)					
RISK FACTORS			**PROTECTIVE FACTORS**		
	Exp (B)	***B***		***Exp (B)***	***B***
Model 1			Model 1		
Age	−0.125	−0.084	Age	−0.123	−0.082
Sex [1]	7.196	0.217 ***	Sex [1]	6.905	0.206 ***
Workers [2]	3.299	0.171 **	Workers [2]	3.502	0.179 **
COVID patients/No COVID patients	−13.500	−0.397 ***	COVID patients/No COVID patients	−13.808	−0.402 ***
	$R^2 = 0.262$			$R^2 = 0.263$	
	$F = 20.785$ ***			$F = 21.088$ ***	
Model 2			Model 2		
Age	−0.203	−0.137 *	Age	−0.108	−0.072
Sex [1]	8.584	0.259 ***	Sex [1]	6.299	0.188 **
Workers [2]	0.928	0.048	Workers [2]	2.407	0.123 *
COVID patients/No COVID patients	−11.942	−0.351 ***	COVID patients/No COVID patients	−12.214	−0.355 ***
Suggestions [3]	−3.964	−0.119 *	DRS	−0.749	−0.194 **
Unexpected events [4]	−9.322	−0.229 ***	problem focused	−0.053	−0.020
Instructions [5]	1.504	0.046	Stop unpleasant emotions/thoughts	−0.328	−0.192 **
PPE [6]	4.570	0.138 *	Support	0.173	0.063
Ineffective decision [7]	−3.015	−0.087			
	$R^2 = 0.409$			$R^2 = 0.356$	
	$\Delta R^2 = 0.147$ ***			$\Delta R^2 = 0.093$ ***	
	$F = 17.584$ ***			$F = 15.078$ ***	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; [1] Sex (1 = male; 2 = female); [2] Workers (1 = emergency; 2 = physician; 3 = nurse); [3] Suggestions (1 = yes; 2 = no); [4] Unexpected eve nts (1 = yes, 2 = no); [5] Instructions (1 = yes; 2 = no); [6] PPE, personal protective equipment (1 = yes; 2 = no); [7] Ineffective decision (1 = yes; 2 = no).

Mediation models were constructed to verify the main research hypothesis. Since total stress, hardiness, and coping strategies had significant correlations with arousal, intrusion, and total secondary trauma in the mediation model, the total STSS-I score was considered as a dependent variable. In the mediation model, total stress was assumed to be an independent variable; total DRS and coping strategies were mediators.

The regression models showed that total stress was a significant predictor of secondary trauma, hardiness, focused problem, and stop unpleasant emotions/thoughts coping strategies. Total stress was used as a predictor (at the end of paper, the results of the individual regressions are reported as additional analyses (see Appendix B)).

The Sobel test detected significance in the model when total DRS was used as a mediator (Z = 2.35, $p < 0.05$, EM = 0.015, pEM = 0.10), reducing the effect of total stress on secondary trauma (B = 0.136, β = 0.351, $t = 5.748$, $p < 0.001$). The total stress effect was also found to be mediated by stop unpleasant emotions/thoughts (B = 0.119, β = 0.307, $t = 4.879$, $p < 0.001$, Z = 3.16, $p < 0.01$, EM = 0.034, pEM = 0.23), whereas problem focused did not pay a mediating role.

Of the total stress effect on secondary trauma, 33% was found to be mediated by hardiness and coping strategies.

4. Discussion

This study involved physicians, nurses, and emergency workers involved in the rescue and treatment of COVID-19 patients during phase 1 of the pandemic in Italy. The comparisons made between the three categories of operators showed a difference in total stress, albeit small, indicating that physicians, nurses, and rescuers were exposed to similar levels of organizational, cognitive, social, and emotional stress. Nurses and physicians had the highest total stress scores, similar to the findings in other studies [16,18]. This is linked to the fact that, despite being the persons who dealt with the physical and material needs of patients throughout their hospital stay, they were most directly exposed to the patients' suffering and, in many cases, to their death.

The factor that seems to have had the most influence in the reference sample was having directly assisted COVID-19 patients. Workers who have treated COVID-19 patients have an increased risk of developing secondary trauma symptoms [10,13,20,21]. The use of cognitive and emotional avoidance strategies, especially in a first emergency phase, as in this case, would seem to allow these workers to limit their sense of helplessness and inability, favoring resilience and the activation of proactive attitudes. Stop negative emotions and thoughts would seem to allow not only a reduction in stress levels, but also the attenuation of arousal and intrusive aspects of the trauma. This efficacy has also been reported in other studies [40].

As found by other authors [10,13,14,16–19], in this study, women also seemed to show higher stress levels than men (Table 1).

Older workers showed a greater tendency to adopt avoidance strategies toward negative thoughts and emotions, but simultaneously exhibited higher levels of arousal. Age, which is also associated with greater personal and professional competence and experience, seems to allow health and emergency workers to block the intrusive aspects of the trauma, thus making them more committed to the intervention and less influenced by the consequences. In other words, this leads them to be less influenced by the intrusive components of their traumatic experiences [88]. However, age seems to be associated with higher arousal levels, and it seems likely that older workers have a greater awareness of the risks associated with the pandemic, as well as a greater sense of responsibility toward patients.

In the present study, we identified the predictive effects on stress of both risk factors and protective factors. The latter refer to personal resources, such as coping strategies, e.g., a sense of self-efficacy in dealing with critical situations or events, and hardiness. As the latter is a component of resilience, it refers to personality characteristics and is generally one of the first components in rescuers to be activated in emergency situations.

Hardiness and stop unpleasant emotions and thoughts presented a negative predictivity with respect to stress and secondary trauma. In the model shown in Table 1, the factor with the most important predictive effect was having directly treated COVID-19 patients; this had a strong impact on the total stress level. Workers who had treated COVID patients, precisely in consideration of the greater organizational, emotional, cognitive, and physical difficulties they experienced, seemed to have limited access to their personal resources in the first phase of the pandemic. Notably, in phase 1 of the pandemic, Italian health workers suffered from a lack of clear and specific intervention protocols, both in operational and pharmacological terms, as well as difficulties with reorganizing departments, a lack of necessary equipment, and little knowledge about the characteristics of the virus. The extent of these difficulties in the first phase of the pandemic may have limited the externalization of individual resources so that the results seem to reveal an absence of significance or protective efficacy of other coping strategies, such as focused problem and support, which normally tend to be more functional in interventions by rescuers, especially in the long term [57,60,69].

Among the risk factors considered in this study, the lack of PPE and the unpredictability experienced in the initial phase produced a predictive effect in terms of increasing the level of stress [18,23,24,28]. The first weeks of intervention in COVID-19 cases also seemed to have been characterized by unexpected events, significantly influencing the high level of stress. In this context of uncertainty and a lack of adequate knowledge, workers provided suggestions based on their

previous experiences and skills, which were not considered, thus increasing their sense of frustration, ineffectiveness, and helplessness, which led to a higher level of stress.

The main stress reduction effect of avoiding negative thoughts may be explained by, especially in phase 1 of an emergency, medical staff and emergency workers experiencing pressure to provide answers as soon as possible. They do not have time to reflect on their own suffering, and, therefore, are not fully aware of their own emotional reactions. Because they are engaged in fast-paced work and constantly focused on what to do, avoiding negative and distracting thoughts can be adaptive for workers. This functioning leads to the suspension of the processes of reflection, brooding, and emotional and cognitive self-awareness [56,60]. This is why stress factors related to counterfactual thinking do not seem to have had a particular impact on stress levels in this first phase, whereas more objective operational aspects, such as lack of PPE and instructions, had a direct and immediate effect on the perception of stress. People who have high hardiness appear to have a broader repertoire of coping strategies and are better at deciding which approaches to use and when. The mental process of ruling out negative thoughts and emotions when responding to a crisis may be facilitated by hardy people's sense of commitment, which involves confidence in their skills and the ability to deal with the challenges being faced [56,60].

Considering the protective function of hardiness and coping strategies found not only in this study, but also in others [16,19,65,67], the mediating role of these factors on the incidence of stress in secondary trauma was also verified [75]. The results obtained from the mediation confirm these hypotheses, even though the effects were small. The same mediation model was tested by Vagni et al. [75] on a sample of emergency workers, which showed wider mediation effects. The difference in findings may be that the participants of the previous study had been recruited in the second phase of the pandemic when necessary procedures and information were already available to workers, favoring increased use of hardiness and coping strategies. In the second phase of the pandemic, the number of patients and victims was significantly lower; conversely, the participants involved in this study were recruited during the lockdown period, and the results showed that one of the main predictive factors of stress was having treated COVID patients, and that, above all, healthcare workers reported higher levels of stress.

Having treated COVID patients led to the development of greater levels of arousal and intrusiveness. The sample analyzed in this study reported having operated with a lack of PPE and sufficient information. These factors, as mentioned, may have had a negative impact, at least in the first phase of the pandemic, on the activation of personal resources in terms of hardiness and coping strategies, resulting in both a lower level of protection and mediation of these factors in stress [60]. A little-known emergency can lead medical staff and emergency workers to experience difficulties in activating both practical and emotional psychological personal resources. Moreover, to protect themselves from the more traumatic aspects related to anxiety and a sense of helplessness due to the high number of deaths, workers used the positive reframing coping strategy, which is the most effective strategy for blocking negative emotions and thoughts. This coping strategy, as also noted by Chesney et al. [40], allowed workers to reinforce positive and optimistic attitudes from which they could draw precisely those hardiness and coping skills useful for actively and functionally dealing with critical events.

During the pandemic, the general population was exposed to several risk factors [89], and medical staff and emergency workers experienced main stressors such as working with COVID-19 patients, the lack of PPE, and some socio-demographic variables. We considered the emergency stress of physicians, nurses, and emergency workers measured using a specific tool and examined the incidence of additional risk factors on their well-being that had not yet been analyzed in other studies. The sample involved is specific and was recruited during the first weeks of the pandemic, when operators were in the phase of greatest pressure in their work. We also focused on individual protection factors that can be implemented through targeted interventions. The main aim of the study was not only to show the incidence of individual factors, but also to offer an understanding of their relationship patterns.

5. Limitations

There are some limitations to this study. The first limitation is that the research was conducted through an online platform, so the compilation of the questionnaires was not structured and probably influenced by distraction factors. A second limitation is the small sample, and this may have affected the extent of the significance of the effects obtained in the analysis. A third limitation is that this was a cross-sectional study, whereas a longitudinal study would allow for a better analysis of phenomena, such as the development of symptoms of secondary trauma. The mediation analysis showed small effects. To register a greater capacity for self-efficacy and hardiness in managing emergency stress and preventing secondary trauma, it would be appropriate to construct longitudinal studies to better understand the protective mechanisms that limit traumatic outcomes over time. A final limitation is the use of a self-report questionnaire and participants' lack of knowledge about the presence of previous psychological problems.

6. Conclusions

In this study, we aimed to illustrate the difficult situation faced by medical staff and emergency workers during phase 1 of the COVID-19 pandemic in Italy. As described by many studies, not only the direct victims of traumatic events of different nature develop post-traumatic disorder (inter alia, [90–95]), but also the medical staff and emergency workers who care for these victims (inter alia, [96–99]) may develop severe post-traumatic symptoms, as we showed in our study about this health emergency.

The results of this study highlighted how emergency workers, and especially healthcare workers who worked with COVID patients, were exposed to sources of high stress and to the risk of developing secondary trauma. The results showed that nurses and physicians experienced greater levels of emergency stress than emergency workers. Direct contact with COVID-19 patients, female sex, unexpected events, and lack of PPE were risk factors for emergency stress, while resilience and coping strategies played a protective role, reducing the levels of emergency stress that led to the risk of developing secondary trauma. Mediation analysis showed that coping strategies, especially stop unpleasant emotions and thoughts, and hardiness are protective factors and reduce the effect of stress on secondary trauma.

These results suggest that it is necessary to implement immediate interventions that aim to increase the activation of protective factors that can mitigate and prevent the development of serious psychological consequences. Immediate interventions are essential to activate psychological resilience and guide workers in the use of the most effective long-term coping strategies to protect their mental health. Prevention interventions must be developed to guide operators to better deal with traumatic events at work. To this end, hardiness training should be developed for nurses, nursing managers, police, and armed forces [97–99]. Hardiness training should include providing information on hardiness and analyzing case studies with an emphasis on detecting threats, coping strategies, and stress management concepts [100–103].

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Appendix A

Emergency Stress Questionnaire
(ESQ; Vagni, Maiorano, Giostra, Pajardi, 2020)

The following questions refer specifically to your intervention during the COVID-19 emergency. Please consider that there are no right or wrong answers, and it is important that you answer all questions. In answering the following questions, 0 corresponds to "not at all " and 4 to "very". Please mark only one number. Thank you for your collaboration.

	Not at all				Very
1. Did you feel agitated during your work/shift?	0	1	2	3	4
2. Do you think you weren't able to keep everything under control as you would have liked?	0	1	2	3	4
3. Did you feel more nervous or irritable than usual?	0	1	2	3	4
4. During your work, did you feel tension trying to do your job to the best of your ability?	0	1	2	3	4
5. During the various activities, to what extent did you have the perception that things were going according to your expectations?	0	1	2	3	4
6. In time spent outside your work, were there any situations that irritated you?	0	1	2	3	4
7. Did you get angry at someone else's actions or reactions?	0	1	2	3	4
8. Did you find yourself rethinking about what had happened?	0	1	2	3	4
9. Are there any images of what happened that come back to your mind involuntarily?	0	1	2	3	4
10. Did you notice any tension within your work team?	0	1	2	3	4
11. Did you feel any physical tiredness?	0	1	2	3	4
12. Did you feel any muscle tension?	0	1	2	3	4
13. At work, did you notice any tension in your relationship with others?	0	1	2	3	4
14. Did you feel team spirit?	0	1	2	3	4
15. Did you perceive that your professional experience was in contrast with the work organization set up for the COVID-19 emergency?	0	1	2	3	4
16. Did you receive pressure (or criticism) from colleagues or superiors about how you did your job?	0	1	2	3	4
17. Did you have difficulty concentrating at times?	0	1	2	3	4
18. Did you ever have a stomach ache?	0	1	2	3	4
19. Were the provisions and indications for intervention timely?	0	1	2	3	4
20. Did you ever have headaches?	0	1	2	3	4
21. Do you regret some decisions you made because you had no choice?	0	1	2	3	4
22. Were you not always able to accurately predict all the effects of your decisions/interventions?	0	1	2	3	4
23. Do you think that coordination between the various professional figures was more difficult than expected?	0	1	2	3	4
24. Would you have acted differently in retrospect?	0	1	2	3	4
25. Did you find yourself doing things you had never done before?	0	1	2	3	4
26. Are you fully satisfied with how you worked?	0	1	2	3	4
27. Did you find yourself working in unpredictable tcircumstances?	0	1	2	3	4
28. Did you try to carry out your tasks perfectly but take longer to decide/execute?	0	1	2	3	4
29. Given the conditions in which you found yourself working, did you have to make decisions intuitively/instinctively, having little time available to reflect and ponder the choices?	0	1	2	3	4
30. Did you worry about putting your family/loved ones at risk of contagion because of your job?	0	1	2	3	4
31. Were you afraid of getting infected because of your job?	0	1	2	3	4
32. Did you have sleep disturbances (e.g., insomnia, difficulty falling asleep, early awakening)?	0	1	2	3	4
33. Did you worry that your colleagues contracted or may contract the infection?	0	1	2	3	4

Table A1. Average scores on ESQ, DRS, CSES-SF, and STSS-I by group.

	Emergency Group	Medical Staff Group	Nurse Group	Physician Group
	(*n* = 100) Mean (SD)	(*n* = 140) Mean (SD)	(*n* = 66) Mean (SD)	(*n* = 74) Mean (SD)
ESQ	69.58 (13.78)	84.62 (15.61)	85.74 (16.88)	81.10 (14.73)
DRS	29.20 (4.04)	27.94 (4.33)	27.79 (4.42)	28.43 (3.81)
CSES-SF				
Problem-Focused	37.88 (6.50)	36.53 (6.11)	35.92 (6.41)	36.68 (5.86)
Stop Unpleasant Emotions/Thoughts	36.79 (8.80)	32.51 (10.13)	33.21 (10.61)	31.18 (9.58)
Support	20.92 (6.39)	21.01 (5.78)	21.02 (6.43)	20.45 (5.74)
STSS-I				
Arousal	24.03 (4.04)	26.40 (24.03)	26.38 (4.53)	25.47 (3.67)
Intrusion	14.40 (4.63)	15.15 (4.92)	14.30 (5.27)	15.43 (5.00)
Total STSS-I	38.85 (6.08)	40.47 (6.42)	40.46 (6.65)	40.47 (6.37)

ESQ, Emergency Stress Questionnaire; DRS-15, Dispositional Resilience Scale; CSES-SF, Coping Self-Efficacy Scale—Short Form; STSS-I, Secondary Traumatic Stress Scale—Italian Version.

Table A2. Pearson's correlation between ESQ, DRS-15, CSES-SF, and STSS-I (*n* = 240).

	DRS-15	CSES-SF			STSS-I		
	Total DRS	Problem-Focused	Stop Unpleasant Emotions/Thoughts	Support	Arousal	Intrusion	Total STSS-I
ESQ							
Total Stress	−0.177 **	−0.268 ***	−0.348 ***	−0.095	0.418 ***	0.204 **	0.391 ***
Tot DRS	1	0.146 *	0.150 *	0.056	−0.283 ***	0.005	−0.253 ***
CSES-SF							
Problem-Focused	0.146 *	1	0.479 ***	0.273 ***	−0.161 **	−0.133 *	−0.219 **
Stop Unpleasant Emotions -Thoughts	0.150 *	0.479 ***	1	0.392 ***	−0.271 ***	−0.197 **	−0.344 ***
Support	0.56	0.273 ***	0.392 ***	1	−0.180 **	−0.136 *	−0.196 **
STSSI							
Arousal	−0.283 ***	−0.161 **	−0.271 ***	−0.180 **	1	0.486 ***	0.683 ***
Intrusion	0.005	−0.133 *	−0.197 **	−0.136 *	0.486 ***	1	0.611 ***
Total STSS-I	−0.253 ***	-0.219 **	−0.344 ***	−0.196 **	0.683 ***	0.611 ***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ESQ, Emergency Stress Questionnaire; DRS-15, Dispositional Resilience Scale; CSES-SF, Coping Self-Efficacy Scale—Short Form; STSS-I, Secondary Traumatic Stress Scale—Italian Version.

Appendix B

Additional Analyses

The regression models showed that total stress is a significant predictor of total STSS-I (B = 0.151, β = 0.391, $t = 6.514$, $p < 0.001$, $R^2 = 0.153$, F = 42.433). Total stress has predictive effects on total DRS (B = −0.062, β = −0.240, $t = -3.820$, $p < 0.001$, $R^2 = 0.058$, F = 14.590), being problem-focused (B = −0.102, β = −0.268, $t = -4.290$, $p < 0.001$, $R^2 = 0.072$, F = 18.406), and stop unpleasant emotions/thoughts (B = −0.205, β = −0.348, $t = -5.716$, $p < 0.001$, $R^2 = 0.121$, F = 32.668). Support coping was excluded because total stress was not shown to have a significant effect. The following variables are significant predictors of total STSS-I: total DRS (B = −0.374, β = −0.253, $t = -4.001$, $p < 0.001$, $R^2 = 0.074$, F = 16.004), being problem-focused (B = −0.223, β = −0.219, $t = -3.433$, $p < 0.01$, $R^2 = 0.048$, F = 11.788), and stop unpleasant emotions/thoughts (B = −0.227, β = −0.344, $t = -5.606$, $p < 0.001$, $R^2 = 0.118$, F = 31.427).

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