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RESEARCH PAPER

SECOND LINE VOLUNTEERING IN LOMBARDY COVID-19 EMERGENCY AS A PERSPECTIVE ON MEDICAL EDUCATION AND PSYCHOLOGICAL DISTRESS

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Abstract

Objective: Healthcare personnel across Italy were called to arms during COVID-19 emergency beginning March 2020. Despite their medical training, not all of them were able to fight in first line. Volunteering for COVID-19 Lombardy ICU Network Coordination Centre (C19-LINCC) was an opportunity to volunteer without being under biological threat: a smart-working in direct phone contact with the ICUs. Our aim was to investigate if second line volunteering during the COVID-19 outbreak had an impact on stress levels and whether medical training could mitigate them, along with personality factors, namely psychological flexibility.

Method: Volunteers of the C19-LINCC self-rated their own medical education related to SARS-CoV-2 and psychological response to the emergency. The questionnaire included five psychological scales (PSS, IES, MBI, AAQ-II, GHQ-12) addressing burnout, stress, general health, attention, cognitive fusion, and psychological flexibility.

Results: Psychological distress (GHQ p≤0,0001) and perception of personal achievement (MBI_p≤0,0001) change whether the subject is a volunteer or not, while perception of medical education does not have a significant impact between the two groups. No differences were found in acceptance, mindfulness, and psychological flexibility skills, however they inversely correlated with stress, burnout, and anxiety levels.

Conclusions: During this period of mandatory lockdown, trained and in-training doctors showed to benefit from this smart home-based volunteering in the C19-LINCC. In addition to volunteering, psychological flexibility, mindfulness, and acceptance skills can act as protective factors. Potentially, these are soft skills that could be added to medical education.

Key words: COVID-19, volunteering, medical education, psychological distress, lockdown, intensive care

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Introduction

To date, the world is still facing the consequences of the pandemic crisis determined by highly transmissible the Coronavirus disease (COVID-19), a systemic disease caused by the severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2). COVID-19 As of May 28th, 2020, 5.803.416 cases of COVID-19 had been confirmed worldwide, with 359.791 fatalities (WHO, 2019).

Beginning December 2019, the virus presence is documented in China, but only starting from January 2020 media and scientific journals reported news regarding the severity and diffusion of the disease (Zhu et al., 2020; Xu, Li, Tian, Li & Kong, 2020). From 12th to 25th of March 2020, Italy has been the country with the highest number of confirmed cases in the world (COVID-19 Map – Johns Hopkins Coronavirus Resource Center, May 2020). The first cases were registered in the second half of February 2020 in Lombardy, which still is the most affected region (Il Sole 24 ORE, May 2020). Here, the most severe cases were men, aged over

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50 years, whose majority needed mechanical ventilation and high levels of positive end-expiratory pressure (PEEP). Intensive Care Unit (ICU) fatality rate reached 26%[6] though is difficult to compare this number to the rate of other countries, since ICU request and availability change from country to country. On May 28th, 2020, overall, 231.732 Italians had tested positive for SARS-CoV-2, 38% were in Lombardy. In this region 4560 (5%) needed ICU hospitalization, an enormous burden for the public health service (Grasselli et al., 2020).

Volunteering for COVID-19 Lombardy ICU Network

Empowering containment protocols and increasing ICU capacity were the main goals since the beginning of the threat (Brooks et al., 2020). This means that data needs to be accurate. That is why the Public Health Office of the Lombardy regional government put in place the COVID-19 Lombardy ICU Network Coordination Centre (C19-LINCC). Forty among medical students, residents and consultants collected data from ICUs. The Center gives each volunteer a variable number of ICUs to contact twice a day. The morning call assesses the number of beds with COVID-19 positive patients and collects their personal data only. During the afternoon call clinical data are collected, so that a complementary team can manage intra- and extra-regional transfers and to fill the reports accordingly.

A medical background is the necessary condition for volunteering at C19-LINCC, since data on medical comorbidities, mode of respiratory support (invasive, mechanical ventilation, non-invasive mechanical ventilation, oxygen mask), level of PEEP, fraction of inspired oxygen (FIO2), arterial partial pressure of oxygen (PaO2), PaO2/FIO2 ratio, the use of extracorporeal membrane oxygenation (ECMO), and prone positioning are collected (Grasselli et al., 2020).

Psychological distress and COVID-19 pandemic

After almost a month following the COVID-19 pandemic and lockdown interventions, high rates of negative mental health outcomes were found in the general Italian population. These results were correlated with COVID-19 linked variables independently of prior mental illness or childhood trauma.

Nevertheless, still in April 2020, the scientific community had already invited to establish psychological help programs not only for frontline professionals, but also for those who have been deprived of independence and the ability to lend a hand from home; Acute stress, including extreme anxiety and resignation symptoms, had already been observed, aggravated by non-optimal disclosure of information about the pandemic (Marazziti, 2020; Shaukat, Ali & Razzak, 2020; Rossi et al., 2020; Zhang et al., 2020).

Burnout is a pervasive mental health condition that hits doctors at any level of their careers. This psychological plague is characterized by emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment. It can result in critical personal and professional consequences that put patient care at risk (Presti, McHugh, Gloster, Karekla & Hayes, 2020). The main symptom is the emotional exhaustion which is characterized by feelings of being emotionally overextended and exhausted by work, induced by an excessive emotional involvement in it. From a psychological point of view, the more workers are lacking in emotional resources, the more likely they will feel incapable to work. Depersonalization is seen as a detached, cynical, and sometimes negative and hostile attitude towards people (Presti et al., 2020). The reduced personal achievement is represented by feelings of worthlessness, incompetence, and weak desire for success in work. On the long run, burnout can have a serious impact on individuals and collectivity, as well as on well-being of doctors and patients. The above could undermine the quality-of-service provision (Ryan, 1971).

Biohazard, fear of infecting, caring for relatives, lack of personal protective equipment (PPE), and longer shifts in the clinical arena (Kazemi, Shapiro & Kavner, 2015; Robinson, 2020) are stressors caused by the COVID-19 pandemic. During this same pandemic, a study involving students from Changzhi medical college, in China (Cao et al., 2020), showed that 0.9% of subjects were experiencing severe anxiety, 2.7% moderate anxiety and 21.3% mild anxiety. Living in urban areas with parents seem to be a protective factor; on the other hand, having relatives or acquaintances infected with COVID-19 was a risk factor for increasing the anxiety.

Studies show that medical trainees can be a huge help in case of health emergencies. Few researches have investigated the psychological impact of health emergencies in medical students (Anderson et al., 2016). Since it activates personal resilience resources, extracurricular volunteering may foster willingness to carry on with their medical career, although during those experiences medical students have generally heightened levels of burnout (Almalki, Almojali, Alothman, Masuadi & Alaqeel, 2017). Following March 2011 Fukushima "triple disaster", undergraduate females from that city's Medical University felt more confused, depressed, and anxious, in the month following the emergency, but they were also more responsible and prone to help (Kazemi, Shapiro & Kavner, 2015) and all undergraduate volunteers revealed stronger willingness to get graduated in the month after the calamity (Herman et al., 2007).

Some of the C19-LINCC volunteers told us that during this assignment they obtained a clear and secure perception of the pandemic situation at the regional level and, consequently, a greater resilience in managing the difficult situation each in their own daily lives. From this our hypothesis: that those who have a medical knowledge and put it at the service of the community even just from home also have a softer psychological impact. An impact softer both than of those who work in close contact with the virus and of those who have medical knowledge but are obliged to remain inactive at home.

The aim of this study was to investigate the levels of stress generated by the exposure to COVID-19 emergency in second line medical educated volunteers, and if self-reported medical knowledge, skills, and other factors could have a psychologically mitigating function.

Methods and materials

Subjects

Seventy-five medical students, trainees and doctors took part to the study. Thirty-seven of them were at home volunteering for the C19-LINCC and the other 38 were inactive at home, following lockdown measures. The latter comparison group was recruited to match the characteristic of the volunteer group. The participants

joined the study on a voluntary basis and no payment nor compensation were offered to them.

Questionnaire distribution and data collection

From April 8th to 10th 2020, a month after the C-19 LINCC was established, self-reported data were collected with an online questionnaire. A link to this online questionnaire was shared via e-mail and social networks with subjects from both groups. The questionnaire had an introductory paragraph outlining the aims and goals of the study as well as instructions to complete the questionnaire. The first page of the questionnaire included the informed consent form. No access to the questionnaire was granted unless a formal approval was given on that page. The Institutional Review Board (IRB) at the Department of Human and Social Science of the University of Enna "Kore" approved the study protocol and the informed consent form with respect to scientific content and compliance with the Italian applicable research and human subjects' regulations. All data were stored in the secure servers of the University of Parma, linked to the account of the first author.

Questionnaire design

Section 1

The first part includes information on demographic data and briefly investigates the exposure of the subject to Coivd-19, for example whether he or someone else close to him had been infected or not. Other questions investigate how medical education impacted on subjects' relationship to the COVID-19 emergency, linking volunteering, health emergencies and educational effectiveness (Elrggal et al., 2018).

A modified version of the Fritschke's questionnaire (Fritschke, Greenhalgh & Falck-Ytter, 2002) investigated about participants' knowledge of pathology, radiology, pneumology, infectiology, anesthesiology, laboratory medicine, internal medicine, and public health. For each of these areas, they were asked to rate their knowledge and their competency on a four-point Likert scale, where 1 means "lowest level" and 4 for means "highest level". For each subject, the average score for all items in both subscales (knowledge and competency) was calculated. The average score for each participant was used as a proxy to evaluate the self-reported overall level of knowledge and skills.

The questionnaire, offered in Italian, was tested for clarity, and understanding with the help of senior psychology academics before being sent to the subjects.

Section 2

The second part of the questionnaire included seven psychological scales to explore perceived stress (PSS), impact of traumatic events (IES), degree of awareness of the present moment (MAAS), burnout symptoms (MBI), cognitive fusion (CFQ), psychological flexibility (AAQ-II), and general health (GHQ-12). Italian validated versions of the following scales were used.

PSS

The *Perceived Stress Scale - PSS* (Cohen, Kamarck & Mermelstein, 1983; Mondo, Sechi & Cabras, 2019) is a self-report questionnaire consisting of 10 items with a 5-point response where 0 means "*Never",* and 4 means *"Very often*", that measures stress perception (e.g., "In the last month, how often have you been upset because of something that happened unexpectedly?" or "In the last month, how often have you been able to control irritations in your life?"). Total scores ranged from 0 to 40, and a higher score indicates a higher level of perceived stress.

IES

The *Impact of Events Scale – IES* (Horowitz, Wilner & Alvarez, 1979; Giorgi et al., 2015) is a validated measure of post-traumatic stress symptoms and assesses the frequency of intrusion and avoidance phenomena. The 6 items are rated on a 5-point scale, where 0 means "Not at all" and 4 means Extremely. Respondents are asked to identify a specific stressful life event (COVID-19 in this case), and then to indicate how much they were distressed or bothered during the last week by each "difficulty" listed (e.g., "I thought about it when I did not mean to" or "I had trouble concentrating"). High scores indicate a significant stress response.

MBI

The *Maslach Burnout Inventory - MBI* (Maslach, Jackson, Leiter, Shaufeli & Schwab, 1986; Sirigatti & Stefanile, 1993) is a self-report questionnaire that consists of 22 items with a 7-point response scale, where 0 means "Never" and 6 means "Every day". The MBI assesses the three different dimensions of the burnout syndrome (e.g., "I feel emotionally drained from my work" or "I feel recipients blame me for some of their problems"). Elevated levels of burnout are indicated by high scores in emotional exhaustion and depersonalization subscales, and by low scores in personal accomplishment.

CFQ

The *Cognitive Fusion Questionnaire – CFQ* (Gillanders et al., 2014; Oppo et al., 2019) is a 7-item questionnaire with a 7-point Likert-type scale where 1 means "never true" and 7 means "always true", and that measures general cognitive fusion (e.g., "I tend to get very entangled in my thoughts" or "I over-analyse situations to the point where it is unhelpful to me"). Higher scores reflect higher degree of cognitive fusion. The CFQ showed strong positive correlations with measures of experiential avoidance, frequency of negative thoughts, depression and anxiety symptoms, burnout and so on. Conversely, CFQ scores showed negative correlations with measures of life satisfaction and mindfulness.

AAQ-II

The *Acceptance and Action Questionnaire-II* - AAQ-II (Bond et al., 2011; Pennato, Berrocal, Bernini & Rivas, 2013) is a measure of Psychological Flexibility. The items focus on willingness to experience unwanted private events, on the ability to be in the present moment and in the commitment to flexible value-directed actions while experiencing negative internal events. Higher scores in the scale indicate higher psychological inflexibility. The AAQ-II used in this study is the 7 items version, with a 7-point response scale, where 1 means "Never true" and 7 means "Always true" (e.g., I'm afraid of my feelings" or "Emotions cause problems in my life"). Psychological flexibility allows individuals to respond effectively to contingencies of reinforcement, both in life and at work, which often also has a positive impact on performance, job satisfaction, commitment, mental health and even the absence rate (Bond & Hayes, 2002).

GHQ

The *General Health Questionnaire-12 - GHQ-12* (Goldberg & Williams, 1988; Piccinelli, Bisoffi, Bon, Cunico & Tansella, 1993) is a self-administered screening questionnaire consisting of 12 items designed for use in consulting setting aimed at detecting individuals with a diagnosable psychiatric disorder (e.g, "Have you recently felt constantly under strain?" or "Have you recently been feeling reasonably happy, all things considered?"). This is one of the most extensively used screening instrument for mental disorders, as well as a general measure of psychiatric well-being. High scores in this questionnaire correspond to higher level of psychological distress or mental health difficulties.

Statistical analysis

Data were coded, entered, and analyzed using SPSS statistics 22 (IBM, USA). Descripting statistics were performed for age, gender, medical education's level, contact with COVID-19 positive individual. Descriptive statistics, frequencies and percentages were used to summarize data. To determine if the two groups were significantly different, we performed T-tests or Wilcoxon signed rank tests. Cronbach's alpha was carried out for each scale to assess internal consistency. The significance level was set at $p<0.05$. The multivariate analysis of variance (MANOVA) was carried out to assess differences between C19-LINCC and inactive groups and between student and medical doctors. Test t-student and correlations test were used to determine the association between psychosocial scale scores and stated perceptions of skills and knowledge. All statistical results were based on two-tailed tests using an alpha level of 0.05. The analysis does not represent a generalized trend, but it treasures the nature of the ongoing health emergency.

Results

Thirty male (40%) and 45 females (60%) mean age 25.84 years (DS = 5.02) took part to our study. All of them were undergraduate (62.7%) or graduated medical doctors (37.3%). Exams on all the medical area related to COVID-19 emergency were passed by 17 (45.9%) volunteers and 9 (24.3%) of them collaborated to the operations of a clinical database similar to that of C19-LINCC. Two (2.7%) participants were positive to SARS-COV-2 and 10 (13.3%) have or had a relative or a friend infected, 2 (2.7%) of whom were treated in an intensive care unit. Twenty-one (28%) participants worked in emergency settings before the pandemic and 34 (45.3%) were specifically trained on COVID-19

All scales except PSS are characterized by Chronbach's alpha values greater than .80. Thus, considering the values suggested by Nunnally (1978) and De Vellis (1991) they show good values of internal consistency. The PSS, on the other hand, shows unacceptable levels.

The comparison group was recruited to match the characteristic of the volunteer group. Sociodemographic characteristics of the two groups are shown in **table 1**.

The distribution of medical education level was not different ($U = 545$; $p = .081$; $Z = .736$ $p = .651$) between the two groups, and there was no difference in other sociodemographic characteristics.

The Multivariate Analysis of Variance (MANOVA) between C19-LINCC and inactive groups allows us to state that the two groups differ in the variables investigated with significant effect ($F_{15,59} = 2.694$; $p = .003$; observed power = .981). Furthermore, the Multivariate Analysis of Variance (MANOVA) between student and medical doctors allows us to state that the two groups differ in the variables investigated with significant effect ($F_{15,59} = 2.811$; $p = .002$; observed power = .985).

Inactive group rated their skills significantly lower and showed significantly higher levels of psychological discomfort than C19-LINCC group at the personal achievement MBI subscale, total GHQ-12 score, and both its positive and negative symptoms subscales. No other statistically significant differences emerged between the two groups at the MAAS CFQ, AAQ II, PSS, IES scale, MBI exhaustion and depersonalization subscales.

While the mean total MBI score is not meaning-

Table 1. *Sociodemographic characteristics of the two groups. Junior medical undergraduate students (jU) are attending the first two clinical years of the degree course in medicine and surgery, senior undergraduate (sU) are attending the last two clinical years. Junior Medical Doctors (jMD) are graduated or residents, while senior doctors (sMD) have finished their specialization training after their degree in Medicine*

	C19-LINCC N = 37	Inactive N = 38
Age (M± DS)	26.89 (±6.62)	24.82 (± 2.37)
N male (%)	17 (45.9%)	13 (34.2%)
N female (%)	20 (54.1%)	25 (65.8%)
Medical education		
Student	20 (54.1%)	27 (71.1%)
jU	11 (24.3%)	16 (42.1)
sU	9 (24.3%)	11 (28.9%)
MD	17 (45.9%)	11 (28.9%)
jMD	9 (24.3%)	9 (23.7%)
sMD	8 (21.6%)	2 (5.3%)
Contact with COVID-19 positive individual		
Yes	4 (10.8%)	6 (15.8%)
No	33 (89.2%)	32 (84.2%)

Table 2. *Scores for knowledge, skills and psychological scales*

	α	C19-LINCC N = 37 M (± DS)	Inactive N = 38 M (± DS)	t (p)
Knowledge		2.078 (± .58)	1.82 (± .72)	1.676 (.098)
Skills		1.87 (± .62)	1.54 (± .78)	**2.010 (.048)**
PSS	.394	18.513 (±5.64)	20.921 (±5.66)	-1.844 (.069)
CFQ	.876	21.22 (± 9.23)	24.11 (± 9.08)	-.1.366 (.176)
MAAS	.877	3.92 (± .69)	3.80 (± .63)	.837 (.405)
AAQ-II	.924	18.35 (± 9.16)	20.11 (± 10.34)	-.776 (.440)
IES				
Total	.810	11.3 (± 4.69)	11.84 (± 4.91)	-.491 (.625)
Intrusion		4.38 (± 1.93)	4.21 (± 1.89)	.380 (.705)
Iperarousal		4.11 (± 2.39)	4.53 (± 1.93)	-.835 (.406)
Avoidance		2.81 (± 1.57)	3.11 (± 1.98)	-.710 (.480)
MBI				
Total	.906	49.81 (± 16.45)	41.45 (± 23.48)	1.781 (.079)
Exhaustion		14.32 (± 11.0)	16.24 (± 10,43)	-.770 (.444)
Depersonalization		6.57 (± 5.63)	6.53 (± 5.73)	.031 (.975)
Personal achievement		28.92 (± 6.86)	18.68 (± 10.82)	**4.876 (<.001)**
GHQ-12				
Total	.864	22.24 (± 5.35)	27.79 (± 6.48)	**-4.035 (<.001)**
Positive symptoms		1.32 (± 1.39)	2.37 (± 1.70)	**-2.904 (.005)**
Negative symptoms		3.27 (± 1.89)	4.18 (± 1,67)	**-2.215 (.030)**

ful from a clinical point of view (Maslach et al., 1986), mean values of the emotion exhaustion subscale are within the medium clinical range, and depersonalization and personal achievement subscales are above the highest level of clinical range. However, members of the volunteer group assess themselves significantly (<.001) better that the other group.

Pearson's correlation was used to investigate if there was a link between mindfulness related psychological constructs (MAAS; CFQ; AAQ II), self-rating of knowledge and skills (Skills and Knowledge) and the self-rating of stress and burnout (PSS; IES; MBI) for total group (**table 3**), C19-LINCC group (**table 4**) and inactive group (**table 5**).

Since the two groups statistically differ only at the GHQ-12 (p<.001; positive symptoms p = .005; negative symptoms p = .030) and the personal achievement subscale of MBI (p<.001) and show no difference for mindfulness, acceptance and defusion skills, correlation analyses on these skills and measures of mental health, were carried out considering the two groups as one, except for GHQ-12 and personal achievement subscale of MBI, at a first point.

Higher level of self-reported stress (GHQ-12) are correlated to higher level of intrusion, iperarousal and avoidance of events (IES subscales), cognitive fusion (CFQ), exhaustion (MBI subscale), and psychological inflexibility (AAQ II). Higher level of exhaustion (MBI subscale) is correlated to lower level of attention to present moment (MAAS) and higher level of cognitive fusion (CFQ), psychological inflexibility (AAQ II), intrusion, iperarousal and avoidance of COVID-19 related events (IES subscales), self-reporting of personal skill and knowledge and more frequent and intense mental symptoms (GHQ 12, positive and negative subscales). Higher level of depersonalization (MBI subscale) are correlated to higher levels of exhaustion (MBI subscale), psychological inflexibility (AAQ II), and self-reporting of one's skill and to lower levels of attention to the present moment (MAAS).

Higher levels of intrusive thoughts about COVID-19 situation (IES scale) are correlated to higher level of cognitive fusion (CFQ), psychological inflexibility (AAQ II), exhaustion and more frequent and intense mental symptoms (GHQ-12) and dysphoria (GHQ-12 negative). Higher level of iperarousal and avoidance (IES subscale) are correlated to higher of level cognitive fusion (CFQ), psychological inflexibility (AAQ II) and exhaustion (MBI subscale) and to lower level of attention to the present moment (MAAS).

On the C19-LINCC group, the following correlations are observed: high levels of negative symptoms (GHQ negative symptoms) correspond to low levels of attention to the present moment (MAAS), high levels of cognitive fusion (CFQ) and psychological inflexibility (AAQ), but also to high levels of perceived stress (PSS). High levels of perceived stress (PSS) correspond to high levels of psychological inflexibility (AAQ) and cognitive fusion (CFQ), intrusive thoughts (IES intrusion), avoidance (IES avoidance), and low levels of attention to the present moment (MAAS). High levels of Burnout correspond to higher presence of negative symptoms (GHQ negative symptoms), lower perception of one's own skills, high levels of iperarousal (IES Iperarousal), cognitive fusion (CFQ) and lower attention to the present moment (MAAS). The results on the subscales of the MBI allow us to observe that in this group high levels of exhaustion correspond to higher levels of psychological inflexibility (AAQ) and cognitive fusion (CFQ), negative symptoms (GHQ negative symptoms), perceived stress (PSS), hyperarousal (subscale IES) and depersonalitation (subscale MBI) and burnout (MBI) and less attention to the present moment (MAAS). High levels of depersonalization (MBI subscale) correspond to higher levels of burnout (MBI), psychological inflexibility (AAQ), hyperarousal (IES subscale) and less attention to the present moment (MAAS). High levels of personal achievement (MBI subscale) correspond to

Table 3. *Pearson correlation coefficient*

	Intrusion (IES)	Iperarousal (IES)	Avoidance (IES)	PSS	CFQ	MAAS	Exhaustion (MBI)	Depersonalization (MBI)	Personal achievement (MBI)	AAQ II	GHQ-12	Positive symptoms (GHQ-12)	Negative symptoms (GHQ-12)	Knowledge	Skills
Intrusion (IES)	1														
Iperarousal (IES)	**.506 *** **	1													
Avoidance (IES)	**.468 *** **	**.513 *** **	1												
PSS	**.803 *** **	**.846 *** **	**.793 *** **	1											
CFQ	**.258 ***	**.334 ** **	**.244 ***	**.514 *** **	1										
MAAS	-.191	**-.312 ** **	**-.284 ***	**-.332 ** **	**-.473 *** **	1									
Exhaustion (MBI)	**.335 ** **	**.309 ** **	**.278 ***	**.342 ** **	**.304 ** **	**-.336 ** **	1								
Depersonalization (MBI)	0.092	0.189	0.048	.027	0.158	**-.280 ***	**.618 *** **	1							
Personal achievement (MBI)	0.12	0.074	0.034	- .21	-0.124	0.105	**.324 ** **	0.202	1						
AAQ II	**.238 ***	**.264 ***	0.223	**.443 *** **	**.715 *** **	**-.284 ***	**.305 ** **	**.275 ***	-0.067	1					
GHQ-12	**.265 ***	**.378 ** **	**.476 *** **	**.589 *** **	**.492 *** **	**-.294 ** **	**.281 ***	0.022	**-.282 ***	**.424 *** **	1				
Positive symptoms (GHQ-12)	0.075	**.316 ** **	**.410 *** **	**.425 *** **	**.361 ** **	-0.17	0.077	-0.107	-0.176	**.256 ***	**.827 *** **	1			
Negative symptoms (GHQ-12)	**.267 ***	**.301 ** **	**.380 ** **	**.521 *** **	**.627 *** **	**-.389 ** **	**.468 *** **	**.320 ** **	-0.092	**.554 *** **	**.716 *** **	**.434 *** **	1		
Knowledge	0.063	0.044	-0.031	- .211	-0.107	0.119	**.259 ***	0.175	**.529 *** **	-0.068	-0.199	-0.18	-0.078	1	
Skills	0.109	0.121	0.008	- .169	-0.041	0.057	**.292 ***	**.232 ***	**.547 *** **	-0.075	-0.202	-0.211	-0.067	**.924 *** **	1

* p<.05; ** p<.01; *** p<.001

Table 4. *Pearson correlation coefficient of C19-LINCC group*

	Intrusion (IES)	Iperarousal (IES)	Avoidance (IES)	IES	CFQ	MAAS	Exhaustion (MBI)	Depersonalization (MBI)	Personal achievement (MBI)	MBI	AAQ2	GHQ_12	Positive symptoms (GHQ-12)	Negative symptoms (GHQ-12)	PSS	Knowledge	Skilles
Intrusion (IES)	1																
Iperarousal (IES)	**0.436 ** **	1															
Avoidance (IES)	**0.406 ***	**0.47 ** **	1														
IES	**0.771 *** **	**0.847 *** **	**0.743 *** **	1													
CFQ	**0.327 ***	**0.563 *** **	0.247	**0.505 ** **	1												
MAAS	**-0.374 ***	**-0.495 ** **	**-0.372 ***	**-0.532 ** **	**-0.558 *** **	1											
Exhaustion (MBI)	**0.443 ** **	**0.335 ***	0.314	**0.459 ** **	**0.438 ** **	**-0.456 ** **	1										
Depersonalization (MBI)	0.245	**0.369 ***	0.078	0.315	0.265	**-0.358 ***	**0.557 *** **	1									
Personal achievement (MBI)	-0.058	0.05	0.083	0.029	-0.027	- 0.27	0.084	-0.143	1								
MBI	**0.356 ***	**0.371 ***	0.271	**0.427 ** **	**0.373 ***	**-0.439 ** **	**0.895 *** **	**0.655 *** **	**0.425 ** **	1							
AAQ2	0.313	**0.403 ***	0.181	**0.396 ***	**0.62 *** **	-0.299	**0.347 ***	**0.468 ** **	-0.184	0.316	1						
GHQ_12	0.262	**0.412 ***	**0.387***	**0.448 ** **	**0.453 ** **	-0.316	**0.446 ** **	0.032	-0.126	0.257	0.214	1					
Positive symptoms (GHQ-12)	-0.026	0.322	0.167	0.21	0.266	-0.146	0.026	-0.222	-0.003	-0.06	-0.081	**0.792 *** **	1				
Negative symptoms (GHQ-12)	0.282	**0.46 ** **	**0.417 ***	**0.491 ** **	**0.719 *** **	**-0.471 ** **	**0.542 ** **	0.277	-0.175	**0.384 ***	**0.541 ** **	**0.708 *** **	**0.344 ***	1			
PSS	**0.335 ***	0.241	**0.441 ** **	**0.41 ***	**0.507 ** **	**-0.377 ***	**0.523 ** **	0.204	-0.239	0.32	**0.369 ***	**0.494 ** **	0.169	**0.631*** **	1		
Knowledge	-0.021	0.026	0.217	0.078	-0.052	-0.017	0.159	-0.078	**0.484 ** **	0.281	-0.265	-0.05	-0.122	-0.026	0.032	**1**	
Skilles	0.054	0.12	0.308	0.188	0.089	-0.097	0.237	-0.036	**0.527 ** **	**0.366 ***	-0.197	0.013	-0.107	0.041	-0.027	0.091	**1**

* p<.05; ** p<.01; *** p<.001

Table 5. *Pearson correlation coefficient of inactive group*

	Intrusion (IES)	Iperarousal (IES)	Avoidance (IES)	IES	CFQ	MAAS	Exhaustion (MBI)	Depersonalization (MBI)	Personal achievement (MBI)	MBI	AAQ2	GHQ_12	Positive symptoms (GHQ-12)	Negative symptoms (GHQ-12)	PSS	Knowledge	Skilles
Intrusion (IES)	1																
Iperarousal (IES)	**0.614 *** **	1															
Avoidance (IES)	**0.534 *** **	0.572	1														
IES	**0.842 *** **	**0.86 *** **	**0.835 *** **	1													
CFQ	0.21	0.035	0.229	0.187	1												
MAAS	-0.001	-0.052	-0.204	-0.103	**-0.364 ***	1											
Exhaustion (MBI)	0.234	0.265	0.244	0.293	0.146	-0.188	1										
Depersonalization (MBI)	-0.058	-0.018	0.026	-0.019	0.059	-0.202	**0.686 *** **	1									
Personal achievement (MBI)	0.225	0.226	0.09	0.212	-0.071	0.133	**0.669 *** **	**0.466 ** **	1								
MBI	0.194	0.218	0.157	0.224	0.046	-0.072	**0.922 *** **	**0.765 *** **	**0.873*** **	1							
AAQ2	0.183	0.11	0.242	0.211	**0.797 *** **	-0.261	0.258	0.114	0.061	0.171	1						
GHQ_12	**0.361 ***	**0.351 ***	**0.555 *** **	**0.501 ** **	**0.498 ** **	-0.254	0.124	0.022	-0.073	0.027	**0.581 *** **	1					
Positive symptoms (GHQ-12)	0.194	0.294	**0.557 *** **	**0.416 ** **	**0.388 ***	-0.151	0.074	-0.026	-0.029	0.013	**0.468 ** **	**0.815 *** **	1				
Negative symptoms (GHQ-12)	0.295	0.053	**0.344 ***	0.273	**0.5 ** **	-0.266	**0.37 ***	**0.393 ***	0.19	**0.348 ***	**0.569 *** **	**0.702 *** **	**0.431****	1			
PSS	**0.408 ***	**0.4 ***	**0.701*** **	**0.598 *** **	**0.488 ** **	-0.259	0.138	-0.139	-0.058	0.001	**.494****	**0.626 *** **	**0.562 *** **	**0.346 ***	1		
Knowledge	0.116	0.105	-0.16	0.021	-0.102	0.208	**0.389 ***	**0.376 ***	**0.526 ** **	**0.507 ** **	0.096	-0.185	-0.131	-0.036	**-0.343***	1	
Skilles	0.14	0.181	-0.148	0.066	-0.081	0.152	**0.397 ***	**0.451 ** **	**0.511 ** **	**0.523 ** **	0.041	-0.203	-0.177	-0.056	-0.298	**0.936 *** **	1

* p<.05; ** p<.01; *** p<.001

high levels of Burnout (MBI) and a greater perception of one's own knowledge and skills. On the IES the results allow us to observe a link between the different components investigated by the subscales of the test and that high levels of intrusion correspond to higher levels of cognitive fusion (CFQ) and less attention to the present moment (MAAS). High levels of hyperarousal correspond to higher levels of psychological inflexibility (AAQ), cognitive fusion (CFQ) and perception of positive and negative symptoms of the GHQ, less attention to the present moment (MAAS). Higher levels of avoidance correspond to lower attention to the present moment (MAAS) and higher perception of positive and negative GHQ symptoms. Considering the relationship between psychological variables, it is observed that greater levels of cognitive fusion (CFQ) correspond to greater levels of cognitive fusion (AAQ) and less attention to the present moment (MAAS). Furthermore, a greater perception of one's knowledge corresponds to a greater perception of one's skills.

The inactive group shows that higher perceptions of their skills and knowledge are matched by higher levels of exhaustion, depersonalization, personal achievement and Burnout in general. In addition, a higher perception of their knowledge corresponds to a lower perception of perceived stress. A higher perception of perceived stress (PSS) corresponds to higher levels of intrusion, hyperarousal, avoidance (IES subscales), cognitive fusion (CFQ), psychological inflexibility (AAQ) and perception of positive and negative symptoms at the GHQ. Higher perceptions of negative symptoms (GHQ negative symptoms) correspond to higher levels of psychological inflexibility (AAQ), cognitive fusion (CFQ), burnout (MBI), exhaustion and depersonalization (MBI subscales), and perceptions of positive symptoms at GHQ. Higher perceptions of positive symptoms (GHQ positive symptoms) were matched by higher levels of psychological inflexibility (AAQ), cognitive fusion (CFQ), and avoidance (IES subscale). For this group, the MBI and IES results show a correlation of the total with the respective subscales. High levels of cognitive fusion (CFQ) correspond to higher levels of psychological inflexibility (AAQ) and lower levels of attention to the present moment (MAAS).

Discussion

Studies about the weight of medical education during emergencies and pandemics have already been conducted. We were interested on how medical education could help personal levels of perceived stress during COVID-19. Usually in published literature students self-report knowledge as higher than skills, in other terms they declare that they know more than what they can actually do (Eyal & Cohen, 2006; Everwijn, Bomers & Knubben, 1993). In our study, indeed, self-rating of skills and knowledge go hand in hand, whether the subjects are volunteering in the C19-LINCC or not. However, neither knowledge nor skill levels positively counteract mental stress during COVID-19 emergency.

Our data show that while levels of stress and burnout are clinically relevant in both groups – that were

quarantined during lockdown – lower levels of psychological distress and discomfort were detected in C19-LINCC volunteers. Emotion exhaustion values are within the medium clinical range, and depersonalization and personal achievement are above the highest level of clinical range in our sample. However, members of the volunteer group assess themselves significantly better than the inactive group in personal achievement. In another study during COVID-19 emergency, clinical levels of anxiety (28.0%), depression (30.6%), and distress (20.1%) in healthcare first-line workers were detected (Zhang et al., 2020). A study by Argentero (Argentero, Bonfiglio & Pasero, 2006) investigated burnout on volunteer health workers, showing the highest level of burnout mostly in emergency staff personal achievement subscale. This is the same level detected in our sample, where we found instead higher levels of burnout in emotional exhaustion and depersonalization. The statistically significant levels in the personal achievement subscales between volunteers and inactive groups probably means that the latter are less satisfied by their role. Therefore, putting professionalism at the service of the community can make the difference.

A systematic review underlined that volunteering – even if highly context-dependent – could offer health benefits: improvement in mental health, coping ability, social interaction, self-rated health, and life satisfaction were shown (Casiday, Kinsman, Fisher & Bambra, 2008). Research on volunteering demonstrates that medical students feel a moral and professional obligation to volunteer during an epidemic, with different degrees in case of a natural disaster - higher - or infectious outbreak - lower (Gouda, Kirk, Sweeney & O'Donovan,2019). Even if protective measures are guaranteed, professionals seem reluctant to step forward in first-line activities during viral outbreaks, as it happened for SARS-CoV-1 and MERS emergencies, which are the closest analogues to SARS- CoV-2 (Aoyagi, Beck, Dingwall & Nguyen-Van-Tam, 2015). Medical students and professionals show a discrepancy between declaring their willingness to participate and playing an active role in the clinical arena (Shi et al., 2018). So, second line "smart-working" volunteering could be a viable yet protective alternative.

Both groups do not differ in terms of psychological flexibility and mindfulness skills, even if inactive group self-rate these skills at a lower level than the subjects in the volunteer group. Research demonstrates that psychological flexibility mitigates burnout symptoms, enhances well-being, and affects perceived stress (Vilardaga et al., 2011; Frögéli, Djordjevic, Rudman, Livheim & Gustavsson, 2016; Poulakanaho, Tolvanen, Kinnunen & Lappalainen, 2018). Also Internalizing mental disorder levels of mindfulness and psychological inflexibility can be screened (Oppo et al., 201). Given the absence of differences in these dimensions, we looked if our data were in line with the previously published literature, which shows that to higher levels of mindfulness, acceptance and defusion correspond lower levels of anxiety, burnout and distress (Kinnunen, Poulakanaho, Tolvanen, Mäkikangas & Lappalainen, 2019). Correlational analysis show that this holds true even in our subjects. Since existing literature demonstrates that increasing mindfulness and acceptance skills reduce anxiety disorder (Greco, Blackledge, Coyne & Ehrenreich, 2005; Hofmann, Sawyer, Witt & Oh, 2010; Ciarrochi, Kashdan, Leeson, Heaven & Jordan, 2011; Venta, Sharp & Hart, 2012) and psychological distress (Fladderus, Bohlmeijer, Fox, Schreurs & Spinhoven, 2013), a specific training on these skills could potentially be a further protection for students and medical staff during emergencies. Interventions that improve these abilities help people to interact differently with stressors and simultaneously build new behavioural repertoires, making it more likely to quickly disengage from problematic responses and turn towards adaptive responses (Gloster, Meyer & Lieb, 2017).

Limitations and perspectives

The study has many limitations and results cannot be generalized to the population of health care volunteers that offered their support in second line during the COVID-19 emergency, nor to the health workers who remained inactive at home. Subjects were not randomized, except for the inactive group. Responders may amplify, misrepresent, minimize or under-report symptoms to make their condition apparently worse or different. Pre-COVID-19 psychological status is unknown and might have an influence on reported symptoms, skills, and knowledge. However, our results are in line with other studies concerning second line healthcare staff, with respect to stress and anxiety measures, burnout and the documented negative relationship between mindfulness, acceptance and psychological flexibility (Argentero et al., 2006; Rossi et al., 2020; Lai et al., 2020; Li et al., 2020).

Further studies could deepen the role of second line volunteering not only as a public resource but as an educational tool to shape the character of medical students and the health professions: strengthening them in their vocation and showing them in perspective how useful their efforts in study are.

Conclusions

During COVID-19 emergency, C19-LINCC second line volunteering has proven to be a protective factor for the psyche of the training and trained doctors. Although based on a limited and specific sample, data show a promising direction to protect mental health by fostering volunteering and psychological flexibility, considering the latter as one of the so called "soft skills" to be developed during academic training in medicine. And this is an empirical matter for further studies.

Contribution

P Mandarano: conception of the study, design of the medical education components, data acquisition and interpretation. Squatrito V: Design of the psychological components of the study, data analysis and interpretation. Mariotti A: Interpretation of data and drafting the article. G Presti: Revising and supervising the study design and the article critically for important intellectual content.

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