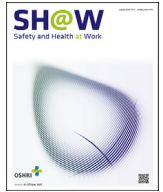




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## Original article

## Impact of COVID-19 Pandemic on Psychological Well-Being of Firefighters



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## ABSTRACT

**Background:** COVID-19 pandemic represented a unique stressful event that affected the physical health and psychological well-being (PWB) of individuals and communities. Monitoring PWB is essential not only to clarify the burden on mental health effects but also to define targeted psychological-supporting measures. This cross-sectional study evaluated the PWB of Italian firefighters during the pandemic.

**Methods:** Firefighters recruited during the pandemic period filled out a self-administered questionnaire, the Psychological General Well-Being Index, during the health surveillance medical examination. This tool is usually used to assess the global PWB and explores six subdomains: anxiety, depressed mood, positive well-being, self-control, general health, and vitality. The influencing roles of age, gender, working activities, COVID-19, and pandemic restrictive measures were also explored.

**Results:** A total of 742 firefighters completed the survey. The aggregate median PWB global score was in the "no distress" range ( $94.3 \pm 10.3$ ), which was higher than that observed in studies conducted using the same tool in the Italian general population during the same pandemic period. Similar findings were observed in the specific subdomains, thus suggesting that the investigated population was in good PWB condition. Interestingly, significantly better outcomes were detected in the younger firefighters.

**Conclusion:** Our data showed a satisfactory PWB situation in firefighters that could be related to different professional factors such as work organization and mental and physical training. In particular, our results would suggest the hypothesis that in firefighters, maintaining a minimum/moderate level of physical activity (consisting of even just going to work) might have a profoundly positive impact on psychological health and well-being.

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## 1. Introduction

In March 2020, the World Health Organization (WHO) declared coronavirus (COVID-19) pandemic. This global event, its adverse health effects, and also the prevention and protection measures adopted to avoid and contain the spread of the SARS-CoV-2 infection (e.g. lockdown, social distancing practices, constant use of face filters and masks) represented a unique stressful event that affected not only the physical health but also the psychological well-being (PWB) of individuals and communities [1,2].

Findings provided by several studies conducted in the last two years reported that high levels of distress, anxiety, and depression are major effects of the pandemic [3–8]. In Italy, the level of well-being in the general population during the COVID-19 emergency has been evaluated by some studies using the General Psychological Wellbeing Index (PGWBI) questionnaire, and their findings highlighted that the application of restrictive measures induced high levels of anxiety and depressive symptoms, loss of control or vitality, and a minor perception of general health [9–12], while on the other hand, vitality, positivity, and well-being are positively correlated

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with higher traits of dynamism and a lower perception of vulnerability [13]. Moreover, in the pandemic period, sports and general activities were drastically reduced, thus determining a reduction in physical activity and an increase in screen time and sedentary behaviors, which are factors proven to affect the PWB [11,12].

However, it should be emphasized that the several public health and socio-economic impacts of the COVID-19 pandemic seriously affected workers' PWB. Indeed, the adoption of different types of containment measures such as social distancing and telework has dramatically changed the way many people work, not to mention the fact that more stringent protective measures such as the closure of different non-essential working activities have forced many workers to remain inactive at home [14]. Lovreglio et al. [15], assessing the PWB of workers belonging to a multinational company during the COVID-19 pandemic, observed low levels of well-being in those cultural contexts in which the pandemic caused a significant discontinuity in workers' normal lifestyles. Interestingly, the level of psychological distress experienced during the pandemic emergency by different groups of first responder workers (known to have greater resilience), such as police, firefighters, and healthcare workers, was significantly lower than that observed in the general population [16]. On the other hand, several studies detected low mental well-being in healthcare workers who showed high levels of emergency stress and burnout, especially with regard to emotional exhaustion and depersonalization dimensions [17–19].

This cross-sectional study aimed to evaluate, during the COVID-19 pandemic, the PWB in firefighters who, representing a particular category of first responder workers, have not been subjected to lockdown restrictions due to the essential nature of their working activities in this emergency situation. However, while the fact of having continued to work may have lightened the psychological burden resulting from the application of the containment measures, it is plausible to hypothesize that, in this unique working context, the psychological strain was increased by the fear of contracting the virus, not to mention that the firefighters' PWB may also have been affected by additional difficulties and job responsibilities resulting from their active and direct involvement in the management of the pandemic emergency. Furthermore, it should also be considered that these subjects were still facing restrictions in their home lives. Therefore, knowledge of PWB levels, together with the identification of its main determinants, can provide particularly useful information to define and implement supportive interventions, promptly design updated mental health promotion programs, and promote adequate coping strategies both in the workplace and in the living environment. On the whole, the set of these targeted and evidence-based interventions would make it possible to not only better manage but also improve the PWB of people facing particularly stressful situations, such as the pandemic.

## 2. Materials and methods

### 2.1. Study design and participants

The study participants were recruited from firefighters (aged  $\geq 18$  years) belonging to the Campania Regional Command in Southern Italy. The total number of workers belonging to the Campania Regional Command was 2329. They are distributed throughout the territory and divided into provincial groups. The PGWBI questionnaire was proposed to 1371 firefighters who carried out the health surveillance medical examination, and the response rate was 54%, with the largest participation from the provincial command of Naples (238 firefighters who agreed to participate in the study). According to the Italian legislative framework on the protection of health and safety in the workplace, these workers have to undergo a health surveillance medical examination. In this regard, the

firefighters included in the study performed the health surveillance medical examination every two years. The voluntary participation and data collection process took place in the period from June 19, 2020, to June 14, 2021. The study participants were informed about the objectives and procedures of the study and were asked for their informed consent to participate. Personal information, including names, was not collected to maintain and protect confidentiality. During the data collection period, in Italy, various restrictive measures were implemented in order to contain the spread of the SARS-CoV-2 infection. The severity of these prevention and protection measures was periodically updated on the basis of the epidemiological trend of the COVID-19 pandemic however, regardless of the containment strategies adopted for the general population to tackle the diffusion of SARS-CoV-2, it is noteworthy to point out that most of the firefighters included in the study were not subjected to specific restrictions (i.e., lockdown) since they were involved in an essential public service. The cross-sectional study protocol was approved by the Ethics Committee of the University of Naples "Federico II" (ref. No. 278/20).

### 2.2. Measurement of PWB

PWB was assessed using the Italian-validated version of the PGWBI questionnaire [18] that was self-administered during the health surveillance medical examinations to firefighters who had decided to join the research project. This tool is a 22-item self-reported questionnaire aimed at measuring the subjective well-being or distress referred to during the last 4 weeks. It explores 6 different dimensions that are: anxiety (ANX), depressed mood (DEP), positive well-being (PW), self-control (SC), general health (GH), and vitality (VT). A 6-point Likert scale (from 0 to 5) is used for the evaluation of each item, and consequently, the global score including all the aforementioned specific areas could reach a maximum of 110 points. Higher scores indicate a better PWB, and in greater detail, overall scores  $\leq 54$  points, between 55 and 65, and between 66 and 100 indicate severe distress, moderate distress, and "no distress" or positive PWB, respectively. Dimensions of direction are described by a "positive option" with a high score and a "bad option" with a low score, and therefore, a high score in ANX and in DEP indicates low anxiety and low depressed mood, while higher scores in PW, SC, GH, and VT denote high positive well-being, self-control, good health perception, and vitality, respectively.

### 2.3. Statistical analysis

The data were presented as frequency (percentages) for the categorical variables, while they were indicated as mean  $\pm$  standard deviation for continuous variables. Differences between means were performed using the Student's *t* test or the Mann-Whitney *U* test, as appropriate. Associations between the considered factors and the outcome variables (PGWBI subscale and total scale scores) were evaluated using simple linear regression models. Those factors that were significant at the univariate regression analysis were then included in a multiple linear regression model. For all analyses, the significance level was set at  $\alpha = 0.05$  (two-sided). All analyses were performed using the statistical software R, version 4.0.3.

## 3. Results

### 3.1. Socio-demographic and occupational data

A total of 742 firefighters (corresponding to 32% of the total number of firefighters belonging to the Campania Regional Command) completed the survey, and the response rate was 54%. Most of the participants ( $n = 723$ , 99%) were male and engaged in field

**Table 1**

Socio-demographic and occupational characteristics of firefighters recruited in the study

Characteristics	N (%)	Mean (SD)
<b>Personal characteristic</b>		
<b>Age (years)</b>		47.0 (8)
<b>Gender</b>		
Male	723 (98.6%)	
Female	10 (1.4%)	
<b>Children</b>		
Yes	576 (84%)	
No	106 (16%)	
<b>Work-related characteristics</b>		
<b>Working mode</b>		
In presence	640 (91.8%)	
Mixed	41 (5.9%)	
Smart-working	16 (2.3%)	
<b>Role</b>		
Operational firefighter	607 (87.6%)	
Head of department	61 (8.8%)	
Administrative role	25 (3.6%)	
<b>Provincial command</b>		
Avellino	34 (7.1%)	
Benevento	63 (13%)	
Caserta	44 (9.1%)	
Naples	238 (49%)	
Salerno	73 (15%)	
Regional management command	29 (6.0%)	
<b>Pandemic characteristics</b>		
<b>Pandemic period</b>		
Light restrictions	169 (23%)	
Moderate restrictions	139 (19%)	
Severe restrictions	111 (15%)	
Lockdown	322 (43%)	

activities as operational firefighters ( $n = 607$ , 88%) with a mean age of  $47 \pm 8$  years (Table 1). Given the nature of the work activity and the specificity of the tasks (which require a first-person intervention in the field) carried out by the firefighters, it is not surprising that the predominant working mode was in presence ( $n = 640$ , 92%), while smart-working activities during the pandemic were

limited to the administrative staff. With regard to the restrictive pandemic containment measures, most firefighters were recruited during the pandemic periods when the most stringent measures were in place (in the lockdown, it was only possible to travel from home for work or health reasons, and most stores and businesses, with the exception of grocery stores and pharmacies, were closed). Similar percentages of workers participated when severe (allowed travel within the same municipality from 5 a.m. to 10 p.m. and closure of shopping centers and parks) and moderate (allowed travel within the same region from 5 a.m. to 10 p.m. and closing of shopping centers and parks only on holidays and pre-holidays) measures were applied (15% and 19%, respectively), whereas 23% of workers were recruited when light restrictions (no restrictions on travel within the same region and most businesses, including, cinemas and theaters remained open) were in place.

### 3.2. PWB perception: global score

The mean of the PGWBI total score of firefighters was  $94.3 \pm 10.31$  (Table 2), indicating a condition of “no distress” or, in other words, a situation of satisfactory PWB. In line with the PWB global perception, also in the analyses of the anxiety and depression scales, the mean aggregate scores (87.8 and 94.5, respectively) suggested that workers were in a non-distressed condition with respect to these domains. Similarly, the mean scores for the other domains, such as SC, GH, and VT, were higher than those observed in the Italian general population (Table 2).

### 3.3. PWB perception: sub-domains in subgroups

The evaluation of the PGWBI results in different subgroups of the study population (Table 3) indicated that younger male firefighters had the highest levels of PWB. Indeed, in this regard, it should be noted that the age variable is significantly associated with the general well-being index ( $\text{Beta (adj)} = -0.24$ ,  $p < 0.001$ ) (Table 4). Furthermore, all PGWBI subdomains are associated with age, and consequently, younger firefighters experience lower levels of anxiety ( $\text{Beta (adj)} = -0.20$ ,  $p = 0.001$ ) and depression ( $\text{Beta (adj)} = -0.16$ ,  $p < 0.001$ ) and higher levels of positive well-being ( $\text{Beta (adj)} = -0.23$ ,  $p < 0.001$ ), self-control ( $\text{Beta (adj)} = -0.16$ ,  $p = 0.003$ ), general health ( $\text{Beta (adj)} = -0.31$ ,  $p < 0.001$ ) and

**Table 2**

PGWBI global and sub-domain scores in firefighters: comparison with PGWBI values observed in the Italian general population

Present study		Grossi et al., 2002		Maugeri et al., 2020		Favieri et al., 2021		Rossi et al., 2021	
		Study population 1129 subjects (543 M and 586 F) aged between 15 and >65 years and belonging to the Italian general population.		Study population 2524 subjects (1098 M and 1426 F) aged between <21 and >60 years and belonging to the Italian general population.		Study population 1639 subjects (394 M and 1242 F) aged between 18 and >50 years and belonging to the Italian general population.		Study population 2103 subjects (757 M and 1346 F) aged between 18 and 70 years and belonging to the Italian general population.	
		Reference period This validation study of the Italian version of the PGWBI questionnaire was conducted in 2000.		Reference period This cross-sectional online survey was conducted from 1 April to 30 April 2020.		Reference period This cross-sectional online survey was conducted from 18 March to 25 March 2020.		Reference period This cross-sectional online survey was conducted from 09 March to 04 May 2020.	
PGWBI	mean (SD)	mean (SD)	$p$	mean (SD)	$p$	mean (SD)	$p$	mean (SD)	$p$
Anxiety (ANX)	87.8 (12.14)	69.2 (19.84)	<0.0001*	77.64 (2.8)	<0.0001*	62.35 (20.97)	<0.0001*	64.4 (18.8)	<0.0001*
Depressed mood (DEP)	94.5 (7.68)	82.7 (17.47)	<0.0001*	71.8 (1.6)	<0.0001*	79.06 (15.77)	<0.0001*	56.7 (10)	<0.0001*
Positive well-being (PW)	75.8 (13.8)	69 (20.1)	<0.0001*	74.15 (4.55)	0.001*	44.55 (17.23)	<0.0001*	49.5 (16)	<0.0001*
Self-control (SC)	90.6 (11.32)	78.7 (17.93)	<0.0001*	71.47 (7)	<0.0001*	69.83 (18.70)	<0.0001*	69.3 (18)	<0.0001*
General health (GH)	86.7 (10.18)	74 (20.47)	<0.0001*	70.27 (2.07)	<0.0001*	70.37 (15.84)	<0.0001*	49.3 (12)	<0.0001*
Vitality (VT)	82.2 (11.17)	67 (20)	<0.0001*	68.75 (2.05)	<0.0001*	58.29 (18.80)	<0.0001*	61 (16)	<0.0001*
TOTAL	94.3 (10.31)	70.9 (20)	<0.0001*	72.75 (12.47)	<0.0001*	62.77 (15.13)	<0.0001*	58.64 (11.91)	<0.0001*

**Table 3**  
Univariate linear regression analyses for different factors affecting the PWB perception in different sub-domains

Univariate linear regression	Anxiety (ANX)			Depressed mood (DEP)			Positive well-being (PW)			Self-control (SC)			General health (GH)			Vitality (VT)			TOTAL		
	Beta	95% CI	p	Beta	95% CI	p	Beta	95% CI	p	Beta	95% CI	p	Beta	95% CI	p	Beta	95% CI	p	Beta	95% CI	p
<b>Pandemic period</b>			<b>0.316</b>			<b>0.601</b>			<b>0.504</b>			<b>0.567</b>			<b>0.601</b>			<b>0.792</b>			<b>0.576</b>
Lockdown	—	—		—	—		—	—		—	—		—	—		—	—		—	—	
Severe restrictions	−2.3	−4.9, 0.35		−1.0	−2.6, 0.71		−2.3	−5.2, 0.73		−1.2	−3.7, 1.2		−1.0	−3.2, 1.2		−1.2	−3.6, 1.2		−1.5	−3.8, 0.69	
Moderate restrictions	−1.5	−3.9, 1.0		−0.77	−2.3, 0.76		−0.52	−3.3, 2.2		0.77	−1.5, 3.0		−1.3	−3.3, 0.77		−0.55	−2.8, 1.7		−0.78	−2.8, 1.3	
Light restrictions	−0.50	−2.8, 1.8		−0.15	−1.6, 1.3		−1.0	−3.6, 1.6		0.25	−1.9, 2.4		−0.34	−2.2, 1.6		−0.40	−2.5, 1.7		−0.46	−2.4, 1.5	
<b>Gender</b>			<b>0.007</b>			<b>0.015</b>			<b>0.065</b>			<b>0.062</b>			<b>0.048</b>			<b>0.017</b>			<b>0.007</b>
Female	—	—		—	—		—	—		—	—		—	—		—	—		—	—	
Male	10	2.9, 18		5.9	1.2, 11		8.1	−0.49, 17		6.7	−0.35, 14		6.3	0.05, 13		8.4	1.5, 15		8.8	2.4, 15	
<b>Age</b>	−0.17	−0.28, −0.05	<b>0.006</b>	−0.14	−0.22, −0.07	<b>&lt;0.001</b>	−0.23	−0.36, −0.09	<b>&lt;0.001</b>	−0.16	−0.27, −0.05	<b>0.003</b>	−0.30	−0.40, −0.21	<b>&lt;0.001</b>	−0.20	−0.30, −0.09	<b>&lt;0.001</b>	−0.21	−0.31, −0.12	<b>&lt;0.001</b>
<b>Children</b>			<b>0.891</b>			<b>0.707</b>			<b>0.995</b>			<b>0.772</b>			<b>0.932</b>			<b>0.363</b>			<b>0.886</b>
No	—	—		—	—		—	—		—	—		—	—		—	—		—	—	
Yes	0.18	−2.4, 2.7		−0.31	−1.9, 1.3		−0.01	−2.8, 2.8		−0.35	−2.7, 2.0		−0.09	−2.2, 2.0		1.1	−1.2, 3.3		0.15	−2.0, 2.3	
<b>Working mode</b>			<b>0.001</b>			<b>0.002</b>			<b>0.057</b>			<b>0.054</b>			<b>0.014</b>			<b>0.018</b>			<b>0.003</b>
In presence at workplace	—	—		—	—		—	—		—	—		—	—		—	—		—	—	
Mixed	−5.5	−9.3, −1.8		−3.7	−6.0, −1.3		−5.1	−9.4, −0.85		−4.3	−7.8, −0.78		−4.7	−7.8, −1.5		−5.0	−8.4, −1.5		−5.3	−8.5, −2.1	
Smart working	−7.4	−13, −1.5		−3.6	−7.3, 0.06		−1.8	−8.5, 4.9		0.71	−4.8, 6.2		−1.3	−6.2, 3.7		0.41	−5.0, 5.8		−2.5	−7.4, 2.5	
<b>Job role</b>			<b>0.207</b>			<b>0.158</b>			<b>0.142</b>			<b>0.163</b>			<b>0.348</b>			<b>0.447</b>			<b>0.131</b>
Firefighter in the field	—	—		—	—		—	—		—	—		—	—		—	—		—	—	
Head of department	−0.54	−3.7, 2.6		−0.95	−3.0, 1.1		−2.5	−6.1, 1.1		−2.2	−5.1, 0.73		−1.6	−4.2, 1.1		−0.54	−3.4, 2.4		−1.5	−4.1, 1.2	
Administrative role	−4.3	−9.2, 0.50		−2.7	−5.8, 0.35		−4.3	−9.8, 1.2		−3.0	−7.4, 1.5		−1.9	−5.9, 2.1		−2.8	−7.2, 1.6		−3.7	−7.8, 0.40	
<b>PROV</b>			<b>0.171</b>			<b>0.661</b>			<b>0.562</b>			<b>0.789</b>			<b>0.483</b>			<b>0.555</b>			<b>0.464</b>
AV	—	—		—	—		—	—		—	—		—	—		—	—		—	—	
BN	−0.36	−5.5, 4.8		−0.62	−3.8, 2.5		0.59	−5.1, 6.3		1.3	−3.5, 6.1		2.1	−2.1, 6.3		0.16	−4.3, 4.6		0.53	−3.7, 4.8	
CE	5.2	−0.36, 11		1.5	−1.9, 4.9		2.9	−3.2, 9.0		3.4	−1.7, 8.5		2.9	−1.6, 7.4		2.5	−2.3, 7.3		3.5	−1.0, 8.1	
NA	0.62	−3.8, 5.1		−0.59	−3.3, 2.1		0.11	−4.8, 5.0		0.90	−3.2, 5.0		3.6	−0.02, 7.2		1.5	−2.4, 5.4		1.1	−2.6, 4.7	
Regional management command	−0.91	−7.1, 5.2		0.04	−3.7, 3.8		−0.79	−7.5, 6.0		1.0	−4.7, 6.7		2.5	−2.5, 7.5		−1.0	−6.4, 4.3		0.08	−5.0, 5.1	
SA	2.3	−2.7, 7.4		0.26	−2.8, 3.3		2.9	−2.6, 8.5		1.9	−2.8, 6.5		3.3	−0.80, 7.4		2.4	−2.0, 6.8		2.5	−1.6, 6.7	

Values in bold indicate a statistically significant difference ( $p < 0.05$ ).

**Table 4**  
Multiple linear regression analyses for different factors affecting the PWB perception in different sub-domains

	Anxiety (ANX)			Depressed mood (DEP)			General health (GH)			Vitality (VT)			TOTAL		
	Beta (adj)	95% CI	p	Beta (adj)	95% CI	p	Beta (adj)	95% CI	p	Beta (adj)	95% CI	p	Beta (adj)	95% CI	p
<b>Gender</b>															
Female	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Male	8.9	0.43, 17	<b>0.039</b>	7.4	2.1, 13	<b>0.006</b>	6.8	-0.05, 14	0.052	8.2	0.50, 16	<b>0.037</b>	9.1	2.1, 16	<b>0.011</b>
<b>Age</b>	-0.20	-0.32, -0.08	<b>0.001</b>	-0.16	-0.23, -0.09	<b>&lt;0.001</b>	-0.31	-0.41, -0.22	<b>&lt;0.001</b>	-0.22	-0.33, -0.11	<b>&lt;0.001</b>	-0.24	-0.34, -0.14	<b>&lt;0.001</b>
<b>Working mode</b>															
In presence at workplace	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mixed	-2.8	-6.8, 1.2	0.174	-2.2	-4.7, 0.33	0.089	-2.1	-5.3, 1.2	0.210	-3.2	-6.8, 0.47	0.088	-2.9	-6.2, 0.46	0.091
Smart working	-6.3	-12, -0.10	<b>0.046</b>	-2.5	-6.4, 1.3	0.192	-0.02	-5.0, 4.9	0.993	1.6	-4.0, 7.1	0.580	-0.88	-6.0, 4.2	0.733

Values in bold indicate a statistically significant difference ( $p < 0.05$ ).

vitality (Beta (adj) = -0.22,  $p < 0.001$ ). Similarly, our findings suggested that also gender (i.e., male) is a predictor of general well-being (male subjects, Beta (adj) = 9.1,  $p = 0.011$ ), although this result should be considered with caution due to the small number of female samples. In greater detail, male firefighters had higher scores on the anxiety scale (male subjects, Beta (adj) = 8.9,  $p = 0.039$ ), depression (male subjects, Beta (adj) = 7.4,  $p = 0.006$ ), general health (male subjects, Beta (adj) = 6.8,  $p = 0.048$ ), and vitality (male subjects, Beta (adj) = 8.2,  $p = 0.037$ ). Finally, the type of working mode may also be able to affect the PWB of workers, and specifically firefighters engaged in the smart-working modality showed a statistically significant association with the anxiety scale (Beta (adj) = -6.3,  $p = 0.046$ ), whereby lower scores, observed in this specific category of workers, indicated higher levels of anxiety.

#### 4. Discussion

The assessment of PWB in Italian firefighters during the COVID-19 pandemic showed that these workers maintained PWB levels significantly higher than those observed in the general population (Table 2) [9,12,13]. Interestingly, firefighters showed a better PWB condition than the general population in normal conditions (Table 2) [20]. However, in this regard, it is important to emphasize that caution should be exercised in interpreting the comparison of these findings due to socio-demographic differences between the different studied populations (for example, our sample is heavily unbalanced towards the male gender). Nevertheless, this result is in good agreement with the data already published in the literature, which shows that first responders have high PWB levels despite the additional working difficulties and responsibilities experienced in these critical years [16]. Indeed, it should be noted that in several countries, during the COVID-19 pandemic, firefighters have been actively involved in the management of the pandemic emergency [16]. Also in Italy, firefighters were directly engaged in some particular aspects of the management of the pandemic event, such as sanitizing public places and outdoor areas, supporting the urgent transport of material, public rescue activities related to civil defense activities, assisting hospital activities, and supporting mayors in providing information to the population. In this particular working context, it is clear that firefighters were more likely to contract the SARS-CoV-2 infection, thus increasing the psychological burden of work due to the fear of contracting the virus and possibly transmitting it to their family members. Moreover, these psychological difficulties were further exacerbated by the fact that (especially in the first wave of the pandemic), emergency workers (including firefighters) had to work extremely long and exhausting shifts in which they were subjected to significant emotional strains and difficulties [21]. On the other hand, firefighters, as first responders, are usually exposed to potentially psychologically traumatic events that may increase the risk of negative mental health outcomes [22]. Several studies have found important associations with post-traumatic stress disorder (PTSD) symptoms, major depressive disorder, panic disorder, generalized anxiety, social anxiety, and alcohol use disorders, as well as symptoms of emotional exhaustion and depersonalization related to burnout phenomena [23–25]. Other studies, reporting higher rates of depression, PTSD, and risk of suicide in firefighters, considered them at greater risk of developing mental disorders as a result of being exposed to chronic stress and potentially traumatic events [26–29].

Therefore, we would have expected that the psychological burden deriving from the need to carry out work activities related to the COVID-19 emergency would have significantly worsened the firefighters' PWB. On the contrary, our results have shown that, during the pandemic period, these workers exhibited lower levels of



anxiety and depression, as well as higher levels of self-control, with respect to the PWB levels observed in the general population by other studies. Obviously, as previously underlined, these different results can be attributable to the different socio-demographic characteristics of these populations, but, nevertheless, the possibility that the firefighters would be able to implement effective coping strategies and tools to face the psychological difficulties caused by the pandemic should be explored and further investigated. The knowledge of the determinants underlying this more incisive and efficient reacting ability should be useful as it would allow helpful information to be drawn for the development of prevention strategies (which could be exploited both in living and working environments) for psychosocial risks induced by prolonged and sustained emergency situations. One possible explanation for the lower stress and psychological disturbance levels detected in firefighters could be represented by the fact that they are specifically trained workers who, precisely as a function of this training, acquire skills and abilities in handling dangerous situations [30]. In addition, it should be pointed out that following a firefighting training program probably prevents people with high levels of anxiety or emotional instability from entering this job, thus determining a natural selection that favors subjects who have stronger control over their emotions, especially the negative ones [31]. This interpretation of our data also be corroborated by literature data, which have shown the presence of a positive correlation between PWB and training and/or work capacity [32]. Similarly, there is also a positive relationship between work commitment and workers' PWB that, considering the high commitment that firefighters have to their work, could explain the excellent PGWBI scores obtained in this study [32]. Moreover, firefighters are generally recognized by people as extremely positive figures since, in carrying out their job, they risk their lives to save other people, and for this reason, they enjoy important social support from the community. Regarding this last concept, it is noteworthy that several studies have demonstrated how social support can play a key role in reducing the severity of psychological disorders, especially in firefighters [33–36].

The firefighters recruited in this study also provided high scores in all the different questionnaire sub-domains, which therefore deserve some specific consideration. For instance, in the SC domain, our findings showed good self-control levels, and this finding is not surprising if we consider that firefighters must engage in adaptive emotion regulation strategies in order to optimize their working performances and thus adequately carry out their tasks [37]. The information here presented is in line with the literature that considers the regulation of emotions as a construct comprising the ability to control impulsive behaviors and the ability to flexibly access strategies for containing emotions for the achievement of individual objectives and situational demands, even adverse ones [37,38]. In our opinion, it is important to underline that a particularly important role in increasing self-control values was played by conducting internal, informal, and formal debriefing sessions following accidents or critical events [38]. In some studies, it has been noted that high levels of neurosis are associated with poor general health (especially in firefighters) [39]. Anxiety would seem to be a characteristic underlying neuroticism and would be moderately increased in firefighters [38,40] but it was also observed that demanding work activities, such as those carried out by firefighters, may stimulate neurotic workers to channel their anxiety into positive and proactive health behaviors [41]. Similarly, subjects with high levels of neuroticism are characterized by higher levels of "work anxiety", which contributes to increasing the levels of commitment in their work activities and favors the achievement of objectives, particularly in the execution of difficult tasks [42]. The aforementioned considerations could explain the low levels of anxiety detected in our study.

A particularly interesting finding was the observation of significantly lower levels of anxiety in firefighters engaged in fieldwork tasks than colleagues who had administrative positions. In the interpretation of these results, it should be considered that operational firefighters continued to carry out their usual work duties during all the different phases of the pandemic, whereas, on the contrary, administrative workers carried out their work in smart-working mode especially during the most critical phases of the pandemic, which required the adoption of tightening measures that limited the freedom of movement, such as during the lockdown. Then, considering that operational firefighters have not suffered significant changes in their lifestyle and/or working activities, it is plausible to hypothesize that the maintenance of this condition has supported and facilitated in these workers the perception of being able to deal with stressful situations, in line with what has been found in previous studies conducted on workers during the pandemic [15]. Furthermore, firefighters are essential workers (even more so in emergency conditions), and this would seem to represent a significant protective factor with respect to anxiety and PWB since the awareness of their indispensability translates into the certainty of maintaining their occupation [43]. Some studies that have analyzed the ability to cope with catastrophic situations in relation to the current COVID-19 pandemic, trying to identify both risk and protective factors developed by this situation, proved that maintaining healthy lifestyles and social contacts, together with the acceptance of anxiety and negative emotions, are other important protective factors aimed at promoting greater self-control [44]. The higher level of PWB in firefighters could also be due to their high habitual physical activity since this factor softens the negative impact of traumatic experiences and daily stressors and may be able to reduce depression symptoms and addictive tendencies [45,46]. This hypothesis would be supported not only by the fact that these workers, regardless of the different phases of the pandemic, being considered essential workers, had continued to go to work (thus maintaining a minimum of physical activity), but also by the fact that information gathered during the health surveillance medical examination confirmed that most of the firefighters included in the study had continued to carry out moderate physical training (i.e., cardio and strength workouts).

In our study, younger firefighters showed fewer anxiety symptoms and a better mood than their older colleagues, thus suggesting a positive association between age and levels of anxiety and/or depression. This observation is consistent with the results of previous studies [47]. A possible explanation could lie in the negative influence that the length of service may have on PWB, as suggested by some studies showing that newly recruited firefighters have very little chance of developing a diagnosis of PTSD, depression, or generalized anxiety disorder after exposure to trauma [48,49]. On the other hand, new recruits, as demonstrated by Regehr et al. [50], had significantly lower levels of traumatic symptoms and were significantly less depressed than their older counterparts. Taken together, these data suggest an association between emotional distress and length of service, and this hypothesis would be further corroborated by the high scores on the PW scale inherent to working life and interest in daily activities obtained by younger firefighters in our study.

Despite the interesting results obtained in this study, it is important also take into account its limitations. First of all, being a cross-sectional study, it is difficult to derive causal relationships between PWB and job characteristics of firefighters, and then prospective studies will need to make causal inferences. Second, we studied a specific category of workers, which obviously limits the generalizability of our results to the larger Italian population. Furthermore, it was not possible to compare the PWB of firefighters

before and after the pandemic due to the lack of data relating to the sample examined before the emergency situation. Finally, the possibility of bias due to the selection process (voluntary participation) and self-report questionnaires should be considered since self-report measures might be influenced by such factors as social desirability and self-interpretation of the items. We are also aware that there is the possibility that the questionnaire, in producing a self-perceived evaluation of PWB expressed as a summary score, undervalued some aspects of the psychological condition of firefighters. However, despite these limitations, the PGWBI questionnaire might represent a good compromise to obtain a global assessment of the psychological conditions of firefighters, thanks to the simplicity of the questions, the intuitiveness of the Likert scale, and the validation/use of the questionnaire in other contexts.

## 5. Conclusions

According to our findings, firefighters' PWB would seem to have been influenced during the pandemic period by multiple factors belonging to different professional and personal contexts. As for the former, the work organization would seem to be particularly important since, aiming to provide social support in critical situations, it trains workers on how to adopt appropriate strategies for processing emotions related to first responses in emergency conditions. In addition, continuing to be physically active (if only to keep going to work) would also seem to have a positive impact on firefighters' PWB. Personal factors are linked to the prevalence of certain personality characteristics that facilitate the ability to reduce the perception of anxiety in a hectic work environment and support a positive attitude towards work. In our opinion, further investigations are needed to better explore the role of gender, length of service, personality characteristics, lifestyles and personal history in the PWB of firefighters. Nevertheless, in our opinion, the data obtained in this study, allowing the identification of some determinants (e.g., working mode, age, job role) capable of influencing the firefighters' PWB, provide useful insights for identifying research areas toward which future studies should be oriented, especially to pinpoint possible preventive interventions and coping strategies that are able to help workers manage emergency situations and protect them from psychological complications of traumatic events. In this regard, for example, our data suggest that special attention should be given to interventions based on maintaining minimal/moderate physical activity but also to those that can inspire and replicate the main features of firefighters' work organization (maybe mental coaching, psychological training, and reduction of isolation).

## Funding and competing interests

Francesco Vassallo receives a salary from Regional Direction of Campania Firefighters where he is employed as a medical officer. The other authors have no financial or non-financial interests to disclose.

## Data availability

All data and materials generated or analyzed during this study are included in this published article.

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