

## Article

# Occupational Stress Among Italian Postgraduate Medical Trainees: A Pilot Study for the Validation of the SCOPE Questionnaire

Gianfranco Di Gennaro <sup>1,\*</sup> , Carla Comacchio <sup>2</sup>, Federico Beinat <sup>2</sup>, Maria Elisabetta Zanolin <sup>3</sup>, Matteo Balestrieri <sup>2</sup>, SCOPE Team <sup>†</sup> and Marco Colizzi <sup>2,\*</sup> 

<sup>1</sup> Department of Health Sciences, School of Medicine, University of Catanzaro “Magna Græcia”, 88100 Catanzaro, Italy

<sup>2</sup> Unit of Psychiatry and Eating Disorders, Department of Medicine (DMED), University of Udine, 33100 Udine, Italy

<sup>3</sup> Department of Diagnostics and Public Health, University of Verona, 37134 Verona, Italy; elisabetta.zanolin@univr.it

\* Correspondence: gianfranco.digennaro@unicz.it (G.D.G.); marco.colizzi@uniud.it (M.C.)

<sup>†</sup> Members of the SCOPE team are listed in the Acknowledgements.

**Abstract:** The occupational environment may affect one’s psychophysical health by leveraging both external workplace stressors and individual psychological responses. We developed a comprehensive questionnaire to assess occupational stress among postgraduate medical trainees, investigating both situational and personal aspects. Exploratory factor analysis was used to identify the constructs captured by the questionnaire, and reliability was assessed by estimating Cronbach’s alpha. Construct-specific scores were computed, and their correlation with established pre-validated scales (criterion validation) was assessed. Four factors—“stress”, “coping”, “empathy”, and “trauma”—explained 50% of data variability and demonstrated satisfactory overall internal consistency (Cronbach’s alpha = 0.76). Significant correlations were found between the “stress” score and the “emotional exhaustion” component of the Maslach Burnout Inventory (MBI) ( $r = -0.76$ ), the “coping” score and the “positive attitudes” component of the Coping Orientation to Problems Experienced Inventory (COPE) ( $r = 0.46$ ), and the “empathy” score with the “empathic concern” ( $r = 0.52$ ), “fantasy” ( $r = 0.41$ ), and “perspective taking” ( $r = 0.45$ ) components of the Interpersonal Reactivity Index (IRI). No significant differences in scores were found in terms of gender or medical specialization. This study suggests that the SCOPE questionnaire may be a promising tool for assessing workplace stress and psychological responses among medical residents.

**Keywords:** stress; coping; empathy; burnout; psychometrics



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## 1. Introduction

There is a growing interest into the detrimental effects of occupational stress on psychophysical health [1,2] because of either intrinsic aspects of workplaces and employees’ responses to the work environment [3,4]. Overwhelming job demands have been associated with a reduction in work performance [5], possibly due to a progressive consumption of the cognitive ability to face the increasing quantity of information to be managed [6,7]. While some studies indicate that structural interventions aimed at supporting employees working under stressful conditions may be of benefit [8], there is also other evidence that employees’ preexisting psychological characteristics may substantially differentiate how stressful the job will be perceived and how such occupational stress will be dealt with [9].

Among such individual characteristics that can make a difference are the person’s coping strategies [10], which can be functional or dysfunctional as well as problem- or emotion-oriented, with the latter being focused on either positive or negative emotions [11–14]. Also, self-care may widely differ across working individuals, ranging from neglecting the effects of a stressful job to

rearranging the work-life balance to protect one's own well-being [15–17]. In a larger perspective, activating virtuous responses to sustain occupational stress and preserve health, the so-called resilience, has proven to be effective in mitigating occupational stress [18,19], supporting the notion that providing workers with resilience skills may also be a successful strategy [20]. High self-care [21] and resilience [22] have both been found to promote positive coping mechanisms to contrast the occurrence of burnout, a complex phenomenon encompassing emotional exhaustion, cynicism, and a reduced sense of work-related personal accomplishment [23], as well as loss of empathy and rising of shame, anger, and guilt [24]. Psychological distress is thus very relevant in the experience of burnout, as the person perceives depleted emotional resources and energy, negative attitudes and feelings towards service recipients, and self-evaluated reduction in competence [23].

A recent literature reappraisal has clearly indicated that external job-related stressors and psychological mechanisms are intertwined in determining the poor health-inducing effects of occupational stress [25]. In particular, individual psychological processes have been suggested to modulate the effects of workplace structures and conditions on the employee's well-being. However, these two components have rarely been considered together, with studies privileging either one component or the other [25]. Thus, it is not surprising that there is a lack of validated, applicable, and sensitive scales to capture occupational stress across both its situational and individual aspects, while several instruments are available to singularly assess burnout [26–28] on the one hand, or coping [29] and empathy [30] outside of occupational stress on the other. Reviews of the evidence suggest that almost no studies approached the topic of occupational stress from a full-fledged model incorporating the multiple relevant aspects of the individual response to occupational stressors [23,25]. Reasons for such a gap include the numerous difficulties in carrying a similar investigation, like the need to combine different data collection methods and implement a more complex analysis approach as well as the absence of an established causal model of occupational stress [23,25].

The purpose of this study was to develop a new questionnaire that would comprehensively assess occupational stress, encompassing both situational and individual aspects of the phenomenon. A scale supporting a better understanding of occupational stress would represent a step towards the identification of targeted strategies to handle work-related stress from an overall perspective including burnout, job dissatisfaction, and poor psychological health, with the final goal of sustaining the individual's productivity and service delivery as well service recipients' outcome. As a population representative of occupational stress, we selected postgraduate medical trainees who have been shown to suffer from unique levels of burnout when compared to overall population norms [31]. In fact, a systematic review and meta-analysis of 89 studies including 18,509 postgraduate trainees revealed significant emotional exhaustion and depersonalization, even higher than their medicine peers, associated with lower levels of personal accomplishment, and varying as a function of the specific medical specialty. Consequently, studies highlight the need for early reduction to prevent burnout during medical training, as well as developing interventions aimed at the specific characteristics of each medical specialty from a multidimensional perspective. Finally, evidence also indicates that burnout definition and assessment require standardization to progress in the field. [31]. To obtain such a questionnaire, we performed item selection, exploratory factor analysis, and criterion validity analysis by comparing the new questionnaire with previously validated and widely accepted questionnaires.

## 2. Materials and Methods

The creation of the questionnaire proceeded through the following steps, following the guidelines outlined in the literature [32]: (i) defining key concepts (evaluating various aspects of diminished workplace well-being, both environmental and individual), (ii) conducting a literature review to ensure the absence of any validated instrument already available to multidimensionally assess occupational stress, (iii) selecting the questionnaire's administration method (self-administered, employing clear and concise items), (iv) studying the questionnaire's dimensions, with each potential dimension deemed

equally significant, (v) determining the item structure (utilizing closed-ended items on a Likert scale to gauge event frequency [33]), (vi) establishing the questionnaire's desired length (a concise structure featuring items reflecting the targeted concept), (vii) crafting the items (creating straightforward and concise questions focused on singular issues revolving around occupational stress, coping mechanisms, and empathy, either newly composed or adapted from validated literature-based questionnaires).

A panel of experts (comprising two psychologists, a psychiatrist, and a biostatistician) contributed to this process, evaluating item relevance and clarity, culminating in the final item list. These experts deliberated collectively to reach a consensus at each stage. Additionally, demographic data including postgraduate medical trainees' age, gender, and year of specialization were collected. The following questionnaires validated in the literature were also administered to the postgraduate medical trainees and used as the gold standard for criterion validation: Coping Orientation to Problems Experienced Inventory (COPE) [34], Interpersonal Reactivity Index (IRI) [35], and Maslach Burnout Inventory (MBI) [36]. Such questionnaires were chosen based on previous evidence that the questionnaire under development may intercept such dimensions [37].

The questionnaire was sent by email to a convenience sample consisting of all postgraduate medical trainees of the University of Udine, Italy using the "Google Form" tool. "Google Form" automatically conducted a completeness check, ensuring that all questions were answered before submitting the response. Informed consent was obtained from all postgraduate medical trainees involved in the study. Participation was entirely voluntary, with no incentives offered and no promotional advertising conducted, and the study received approval from the local Ethics Committee. Participants responded to the questionnaire between September and December 2023.

### 2.1. Participants

The sample consisted of 123 postgraduate medical trainees, of whom 74 (60.2%) were females and 49 (39.8%) were males. Sixty-nine (56.1%) of the subjects were enrolled in a medical specialty, twenty-eight (22.8%) in a service-related specialty, and twenty-six (21.1%) in a surgical specialty. Regarding the specialization year, 25 (20.5%) subjects were enrolled in the first year, 41 (33.6%) in the second year, 40 (32.8%) in the third year, and 16 (13.1%) in the fourth year.

### 2.2. Statistical Analysis

Data were described using the mean and standard deviation for normally distributed continuous variables, while median and interquartile range were used in cases of skewness. Counts and percentages were used to summarize categorical variables.

Bartlett and Kaiser–Meyer–Olkin tests were used to assess the correlation structure of the data and determine its suitability for factor analysis. To better understand the structure of the questionnaire, we conducted an exploratory factor analysis (EFA), a statistical method used to uncover underlying factors, which are groups of related variables that together measure specific theoretical concepts. In this regard, a mathematical method named "principal component extraction" was performed. A visual tool, the scree plot, was used to determine the optimal number of factors to retain. This was followed by the application of varimax rotation, a technique that improves factor interpretation. The proportion of the total variance accounted for by the factors was estimated and we employed a factor loading threshold of  $5.152/\sqrt{(n-2)}$  to retain items with statistical significance at the 1% level, as suggested in the literature [38]. Moreover, in accordance with guidance from the literature, only items with a uniqueness score below 0.6, indicating an acceptable low level of shared variance with other items, were included [39]. The Cronbach's alpha coefficient was used to determine the reliability/internal consistency of the scales.

Scores for individual constructs were computed by summing the scores of each item, considering 1 point for the lowest Likert level and 5 for the highest. To evaluate the effectiveness of the questionnaire in quantifying the extracted factors, criterion validation was performed by estimating the correlation between the constructs and the results of the COPE,

IRI, and MBI questionnaires [34–36] using Pearson’s correlation coefficient. Additionally, to ensure that SCOPE can accurately capture variations in responses and prevent skewed results, the ceiling–floor effect was assessed by determining the proportion of participants with the highest (ceiling) or lowest (floor) scores within any domain. Proportions exceeding 15% were deemed significant [40]. Finally, we investigated differences in the detected domains’ scores between men and women, as well as among specialization areas (“surgical,” “services,” and “medical”). For this purpose, we used three multiple linear regression models in which sex and specialization area were introduced as independent variables, while the year of specialization was introduced as a potential confounding factor.

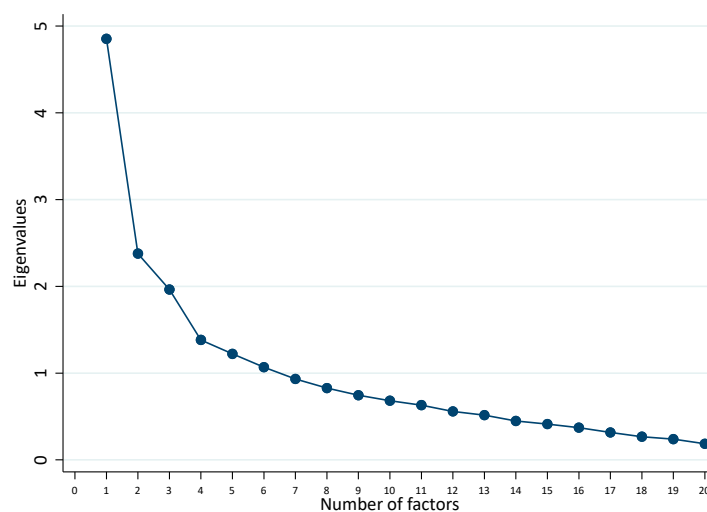
No formal power analysis was performed. Data analysis was contingent upon meeting the minimum number of participants suggested by the literature for exploratory factor analysis, which is at least 5 patients per item [41]. A significance level of 5% was employed. Statistical analyses were carried out using STATA16.0 software ([www.stata.com](http://www.stata.com); accessed on 13 July 2024) and Microsoft Excel 2021 ([www.microsoft.com](http://www.microsoft.com); accessed on 19 August 2024).

### 3. Results

In a two-round panel discussion, candidate items focusing on resilience, compassion fatigue, communication skills, anxiety, emotional intelligence, empathy, depression, and burnout were identified, and items deemed redundant or inappropriate were removed, leaving a total of 20 items.

#### 3.1. Exploratory Factor Analysis

Results from the Bartlett test ( $p < 0.001$ ) and the Kaiser–Meyer–Olkin test (KMO statistic = 0.779, which is classifiable as “middling”) supported the adequacy of the correlation matrix for the factorial analysis [42]. As shown in the scree plot (Figure 1), the exploratory factor analysis identified four factors, each consisting of four items, explaining 50% of the data variability. The first factor presented items investigating the subject’s occupational stress load (“stress”), the second identified their coping strategies regarding work-related distress (“coping”), the third identified their empathetic abilities (“empathy”), while a fourth factor pertained to work-related traumatic experiences (“trauma”) (Table 1). All uniqueness values were lower than 0.7, indicating common variance among items. The overall Cronbach’s alpha statistic was 0.76 while the domain-specific alpha values were 0.83 (“stress”), 0.67 (“coping”), 0.69 (“empathy”) and 0.62 (“trauma”), respectively. All alpha values were above the commonly used acceptability thresholds of 0.6–0.7 (Table 1). Based on previous evidence obtained from the same set of items [37], the fourth domain was unexpected. As it was not possible to compare it with a gold standard, being also considered outside of the scope of the questionnaire in development, it was excluded from subsequent analyses.



**Figure 1.** Scree plot of eigenvalues after factor analysis.

**Table 1.** List of SCOPE items, factor loadings, and uniqueness values after Exploratory Factor Analysis.

	Item	Score	Stress	Coping	Empathy	Trauma	Uniqueness
1	When something unexpected happens	1: I am often confused/5: I always find a solution	0.06	<b>0.67</b>	−0.03	0.36	0.3941
2	If I cannot control situations in my life	1: I constantly get anxious and worried/5: I cope with this	0.19	<b>0.75</b>	−0.10	0.04	0.3459
3	I have felt stucked in my job	1: very often/5: never/hardly ever	<b>0.83</b>	0.08	0.00	0.04	0.2733
4	I have felt hopeless with my job	1: very often/5: never/hardly ever	<b>0.85</b>	0.10	0.07	0.14	0.2200
5	In a stressful situation, I have felt upset	1: very often/5: never/hardly ever	0.38	<b>0.55</b>	−0.03	0.05	0.4963
6	I feel useless/frustrated at work	1: very often/5: never/hardly ever	<b>0.67</b>	0.15	0.00	0.41	0.3105
7	My communicative skills help my work relations	1: never/hardly ever/5: very often	−0.02	−0.29	−0.30	<b>0.57</b>	0.4622
* 8	In a stressful situation, I have felt mentally unbalanced	1: very often/5: never/hardly ever	−0.38	−0.46	0.06	−0.41	0.3923
9	I am conscious of my emotions	1: never/hardly ever/5: very often	−0.23	0.03	<b>0.49</b>	0.49	0.3518
10	I am aware of other people's emotions	1: never/hardly ever/5: very often	0.02	0.01	<b>0.81</b>	0.10	0.3222
11	I get easily involved in other people's feelings	1: never/hardly ever/5: very often	0.36	−0.18	<b>0.59</b>	−0.26	0.2538
12	I can easily empathize with other people's feelings	1: never/hardly ever/5: very often	−0.04	0.03	<b>0.88</b>	−0.05	0.2053
13	In general, I consider myself:	1: a pessimist/5: an optimist	−0.02	<b>0.72</b>	0.18	−0.01	0.4196
* 14	In general, I can get satisfaction from my interests	1: never/hardly ever/5: very often	0.01	0.32	0.28	0.08	0.4608
15	My job physically exhausts me	1: very often/5: never/hardly ever	<b>0.73</b>	0.06	−0.05	−0.12	0.3075
16	I have flashbacks to experiences with my customers	1: very often/5: never/hardly ever	0.27	0.09	−0.12	<b>0.65</b>	0.3367
17	While working, suddenly and involuntarily, I have recalled a dreadful experience of mine	1: very often/5: never/hardly ever	0.15	0.02	−0.07	<b>0.47</b>	0.4286
* 18	I can separate my job from my private life successfully	1: never/hardly ever/5: very often	0.31	0.01	−0.01	0.13	0.3648
19	I cannot sleep due to a traumatic experience at work	1: very often/5: never/hardly ever	0.38	0.14	−0.15	<b>0.52</b>	0.5177
* 20	I think visitors/customers are ungrateful	1: very often/5: never/hardly ever	−0.12	−0.10	−0.09	−0.06	0.2709

Factor loadings of the items for each of the four factors identified by the Exploratory Factor Analysis (Stress, Coping, Empathy, Trauma) and overall uniqueness. For each factor, items with factor loading above the cutoff (0.48) are identified in bold and were included in the factor with 1% statistical significance; \* Items 8, 14, 18, and 20 were removed after factor analysis and discarded from the final SCOPE questionnaire since they had no significant factor loading for any of the four factors.

### 3.2. Criterion Validation

As shown by the distribution of the three components in Figure 2A–C, no ceiling–floor effects emerged.

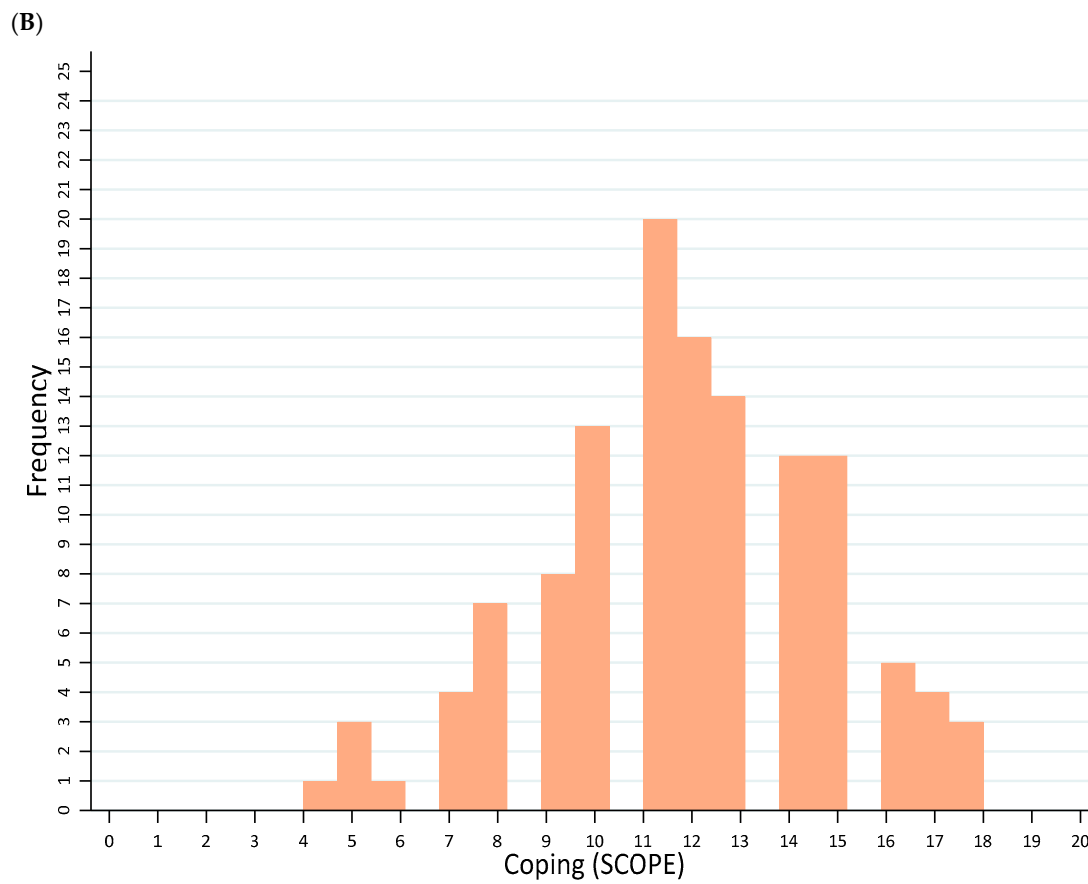
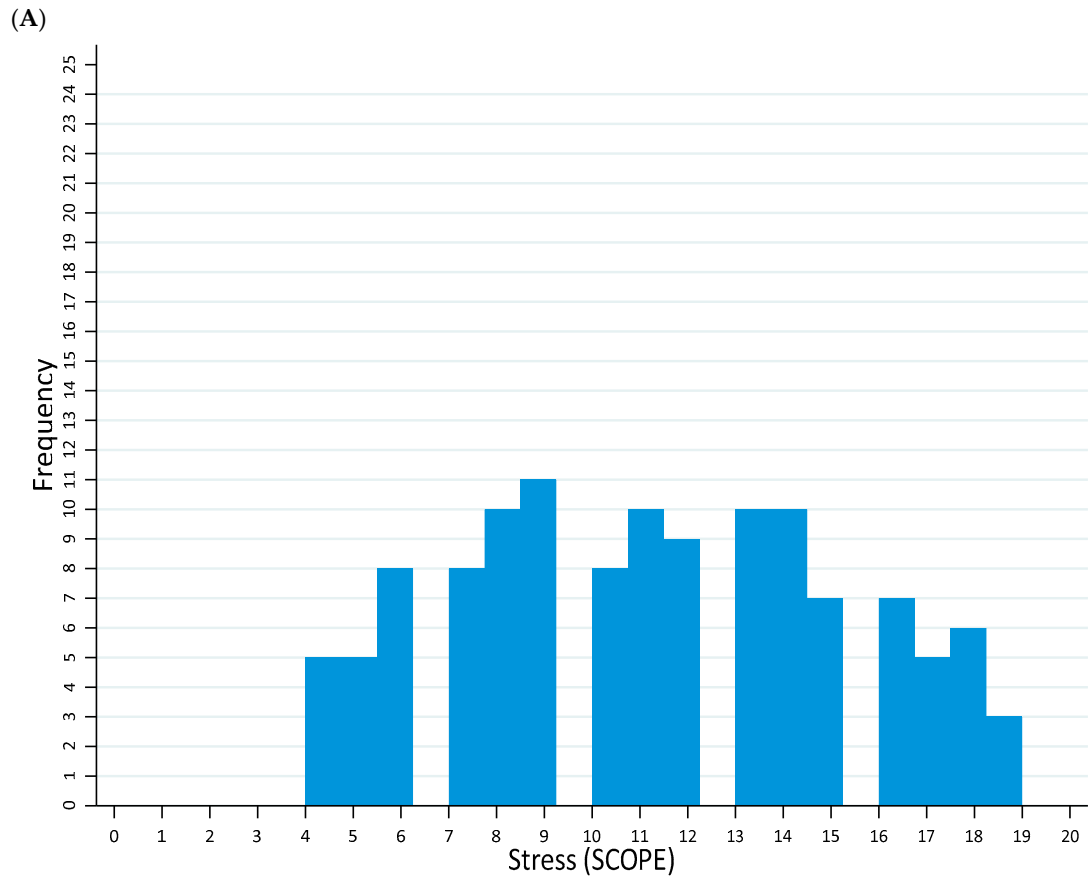
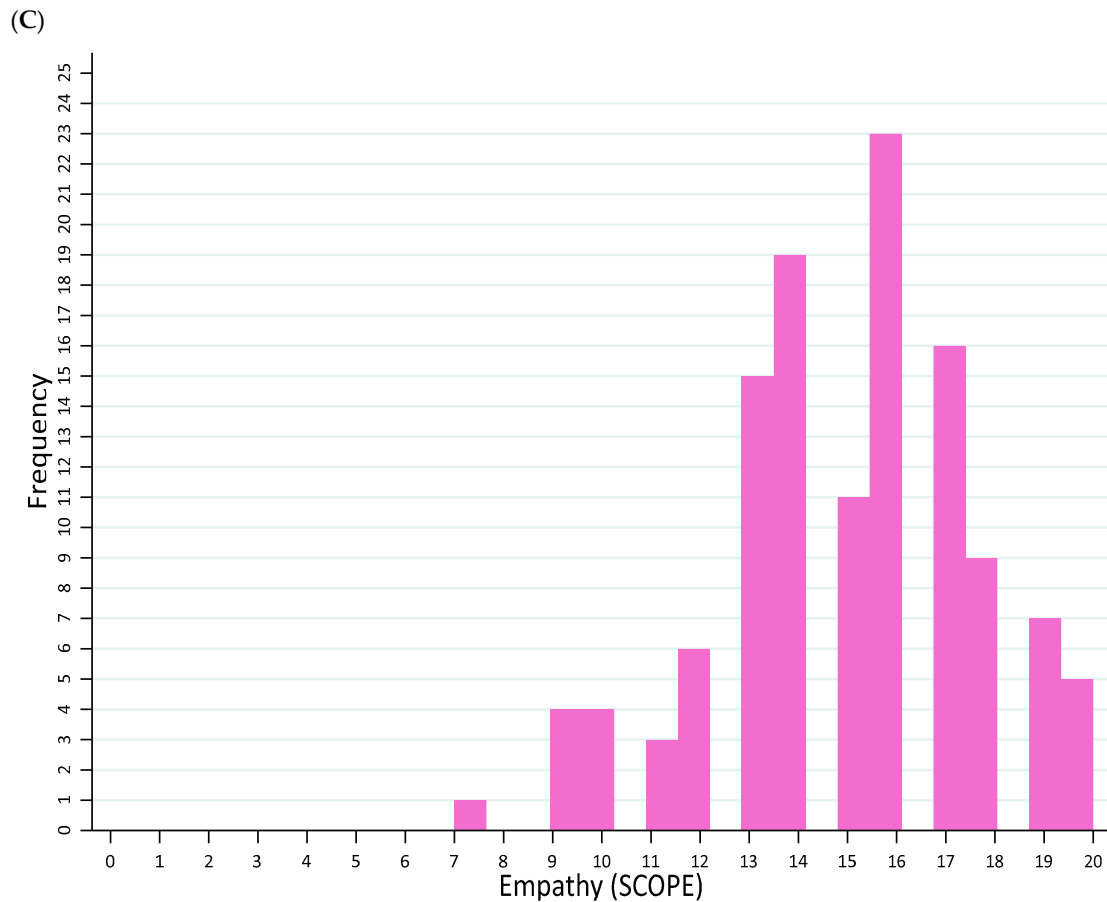


Figure 2. Cont.



**Figure 2.** Frequency distribution of Stress (A), Coping (B), and Empathy (C) scores.

As reported in Table 2, no significant differences emerged among the three domains (“stress”, “coping”, and “empathy”) in terms of gender or type of specialization.

**Table 2.** Mean and standard deviation (SD) of SCOPE sub-scores stratified by gender and specialization type.

		Empathy		Coping		Stress	
		Mean	Sd	Mean	Sd	Mean	Sd
Sex	Men	14.43	2.72	12.47	2.89	10.94	4.18
	Women	15.43	2.64	11.41	2.92	11.33	3.98
Specialization Type	Surgical	14.08	3.24	11.73	2.68	9.96	4.18
	Services	15.39	1.99	11.89	3.45	11.61	3.67
	Medical	15.25	2.7	11.84	2.86	11.46	4.12

All comparisons across the three domains (“stress”, “coping”, and “empathy”) for gender and specialization type were not statistically significant.

As reported in Figure 3A, the “stress” score correlation with the MBI scale was low for the “depersonalization” ( $r: -0.29$ ) and “accomplishment” ( $r: 0.27$ ) subscales, while being considerably high for the “emotional exhaustion” subscale ( $r: -0.76$ ). Further, the “coping” score correlation with the COPE inventory was moderately high for the “positive attitudes” subscale ( $r: 0.46$ ), while being low for the “social support” ( $r: -0.24$ ), “avoidance” ( $r: -0.22$ ), and “problem Orientation” ( $r: 0.19$ ) subscales, and nearly zero ( $r: -0.09$ ) for the “transcendent orientation” subscale (Figure 3B). Finally, the “empathy” score correlation with the IRI questionnaire was moderately high for the “empathic concern” ( $r: 0.52$ ),

“fantasy” ( $r: 0.41$ ), and “perspective taking” ( $r: 0.45$ ) subscales, while being nearly null for the “personal distress” subscale ( $r: 0.05$ ; Figure 3C).

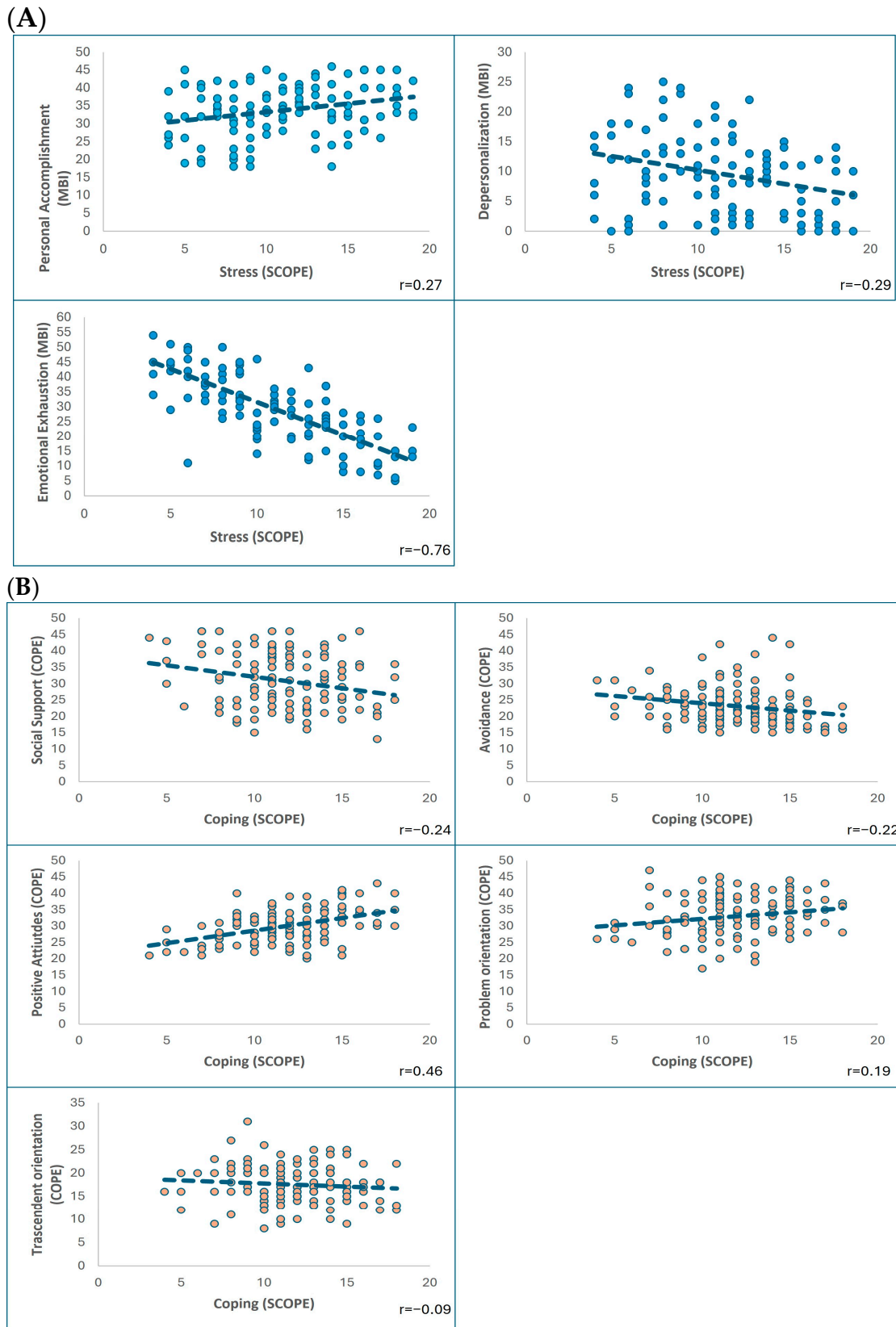
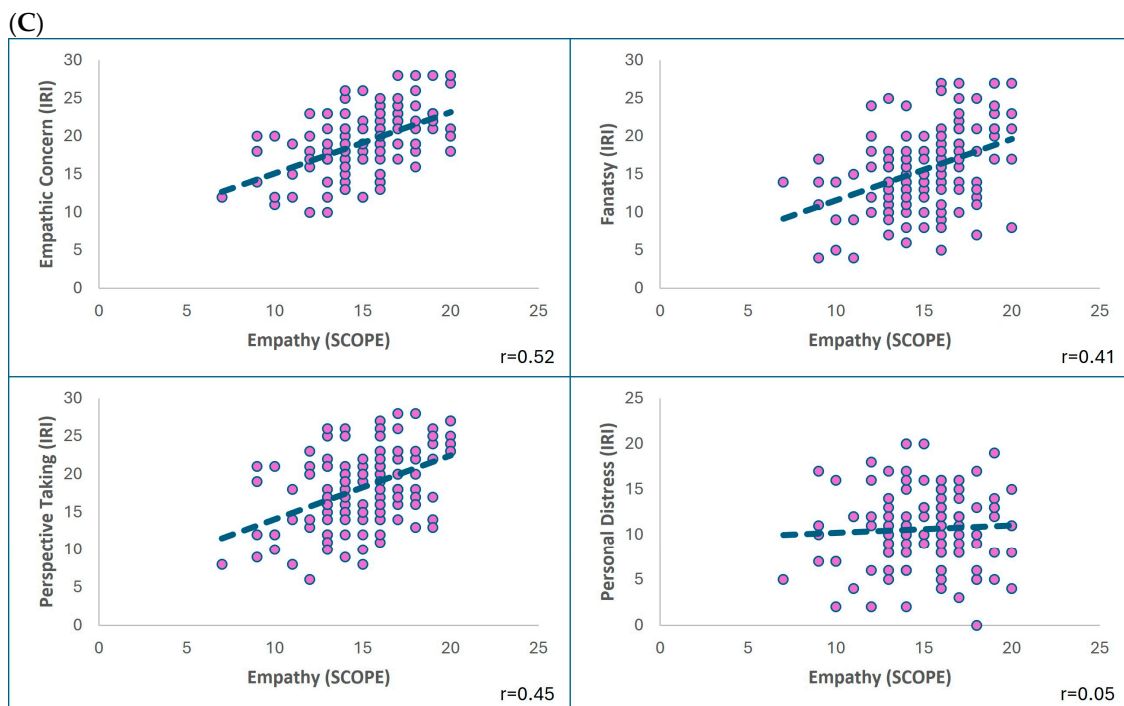


Figure 3. Cont.





**Figure 3.** Scatterplot of SCOPE scores: Stress (A), Coping (B), and Empathy (C) with corresponding gold standard scores (MBI, COPE, and IRI Questionnaires).  $r$ : Pearson’s correlation coefficient.

#### 4. Discussion

To the best of our knowledge, this is the first study aimed at developing and validating a scale that assesses workers’ occupational stress from both an external (i.e., stressful situations within the working context) and internal (i.e., the way the employee reacts to occupational stress in terms of psychological resources) perspective. Postgraduate medical trainees have already been shown to present elevated occupational stress and burnout when compared to normative samples [31], making them an ideal population to test such an instrument. The exploratory factor analysis obtained four factors, three of which had been obtained with a previous analysis among a population of veterinarians [37]—“stress”, “coping”, and “empathy”—plus a fourth focusing on “trauma”. The factors were found to show good internal consistency, and the criterion validation suggested that the SCOPE scale can capture burnout-related elements, adaptive coping mechanisms, and facets of empathy. Despite some overlap with the previous validation of the SCOPE questionnaire performed among veterinarians [37], some differences also emerged both in terms of items contributing to each factor and the number of the factors itself. While both postgraduate trainees and veterinarians have been found to suffer from high levels of occupational stress, differences have also been reported as a function of the medical specialty on one hand (e.g., surgical vs. non-surgical specialties) [31] and the veterinarian workplace on the other (e.g., ambulatories vs. health districts) [37]. Thus, even retaining its main characteristics, it cannot be excluded that the SCOPE scale performs slightly differently depending on the population of interest.

In terms of domains to be investigated through the questionnaire being developed, we focused specifically on occupational stress, coping, and empathy, based on limitations of the existing tools. In fact, objective aspects of work experience may be assessed by several different scales, even though they oversee the subjective experience of occupational stress in terms of personal resources and vulnerabilities [43]. On the other hand, coping abilities are also widely studied, especially to assess how people face long-lasting health problems [29], with instruments generally built to catch the response to a stressful event [34,44], but without contemplating occupational stress. Finally, over the years, empathy has also been extensively studied in different populations [45], ranging from youth to clinical

samples [30] as well as among healthcare professionals [46], but again, not in the context of occupational stress.

#### 4.1. Theoretical Implications

Research evidence indicates that more needs to be done to make workers aware of occupational stress and its consequences [47,48]. In fact, when lacking adequate psychological instruments to manage stress at work, people may face a reduction in their well-being [49–51]. Despite such evidence, a valid tool to assess structural difficulties in work settings and how employees face them is missing. The iterative phases of the questionnaire being developed were based on converging evidence that both objective (e.g., unpleasant, traumatic events at work causing flashbacks and sleep disturbances) and subjective (e.g., being emotionally overwhelmed by other people's suffering) experiences in the work setting may impact the employee's well-being. Consistently, organizational and systems-level elements [52–58] have been found to interact with personal and interpersonal-level elements [59–65] in affecting people's ability to sustain stressful conditions at work and preserve their health status. Thus, results from this study come with important theoretical implications in terms of future research, as they suggest that further investigations must provide a much more comprehensive approach to occupational stress by including well-being-related components that are generally understudied when investigating levels of stress in workplaces. More specifically, traditional models of occupational stress have become outdated, following the evidence that environmental stressors are only a component of a much more complex and multi-dimensional phenomenon encompassing cognitive, emotional, and behavioral factors [66]. Theoretically, such psychological components may underlie personal differences in stress response. Acknowledging such variability in how workers face occupational stress is the first step toward a personalized intervention in its identification and management.

#### 4.2. Practical Implications

Even though the study of the SCOPE questionnaire is still in its infancy, results can already offer practical implications for workplaces because they imply different responses to occupational stress among workers that are not necessarily related to their job roles and responsibilities, but rather associated with their psychological skills and characteristics. Therefore, including psychological constructs in assessing occupational stress may help going beyond its external causes (e.g., workload), taking into account cognitive and emotional responses (e.g., feeling unable to cope) and offering more tailored therapeutic options (e.g., aiming at enhancing the worker's coping strategies). By registering the psychological components of occupational stress, instruments like the SCOPE questionnaire may also implement organizational and mental health policies among workplaces as well as engage employees in screenings oriented on their well-being.

#### 4.3. Study Limitations and Strengths

As it is still limited to specific working populations, this scale cannot be generalized to the wider population of workers. Also, it lacks test–retest reliability measures, which thus require further investigations. Further, the sample size was relatively small to carry a factorial structure, which must be confirmed in larger samples that are also better balanced in terms of gender, specialization type, and year of training. The major strength of the study consists of having the new scale externally validated against gold standards, supporting the usefulness of such an instrument in investigating both objective and subjective work-related aspects.

#### 4.4. Future Directions

Results from this study suggest that future research about workers' well-being may need to focus on occupational stress in a wider perspective encompassing psychological resources and weaknesses. The SCOPE questionnaire may represent an easy, quick, and useful tool to investigate occupational stress along with coping and empathy skills, and possibly post-traumatic status, offering a multifaceted overview of workplace difficulties [67,68]. In fact, this questionnaire has the potential merit of disentangling the contribution of individual reactions to stress among workers exposed to the same stress-inducing employment context. Future studies will expand the investigation of the questionnaire in a larger population to confirm its structure. Also, carrying out similar investigations in different working settings will support the scale's ability to catch occupational stress and psychological responses to it in multiple contexts.

#### 5. Conclusions

This study was designed to develop and validate the SCOPE questionnaire, a comprehensive tool designed to assess occupational stress among medical residents, addressing both external job-related factors and individual psychological responses. The questionnaire consists of three factors—"stress", "coping", "empathy"—and a potential fourth factor, "trauma", each demonstrating satisfactory internal consistency and relevance. Criterion validation showed that the SCOPE scale effectively captures elements of burnout, adaptive coping mechanisms, and empathy, with no differences across genders or different medical specializations. The SCOPE questionnaire can thus represent a promising tool to rapidly identify medical residents at risk of detrimental consequences from occupational stress in order to implement multidimensional interventions to sustain well-being. The SCOPE questionnaire can possibly provide its usefulness for assessing occupational stress in various work contexts, though further studies with larger samples and different populations are needed to confirm its reliability and generalizability.

**Author Contributions:** Conceptualization, G.D.G., C.C., F.B., M.E.Z., M.B. and M.C.; methodology, G.D.G., C.C., F.B. and M.C.; software, G.D.G., C.C., F.B. and M.C.; validation, G.D.G., C.C., F.B., M.E.Z., M.B., Scope team and M.C.; formal analysis, G.D.G.; investigation, G.D.G., C.C., F.B. and M.C.; resources, G.D.G., C.C., F.B., M.E.Z., M.B., Scope team and M.C.; data curation, G.D.G., C.C., F.B. and M.C.; writing—original draft preparation, G.D.G. and M.C.; writing—review and editing, G.D.G., C.C., F.B., M.E.Z., M.B., Scope team and M.C.; visualization, G.D.G., C.C., F.B., M.E.Z., M.B., Scope team and M.C.; supervision, M.C.; project administration, G.D.G. and M.C. All authors have read and agreed to the published version of the manuscript.

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**Data Availability Statement:** Data available on request due to restrictions, e.g., privacy or ethical.

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