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Perceived stress, coping strategies and emotions during the anti-COVID-19 vaccination among Italian university students of health professions

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Abstract

Background. Following the COVID-19 pandemic, many studies have identified differences in college students' attitudes towards vaccination. The aim of the present study was to investigate the psychological, emotional and behavioral responses influenced by the administration of the COVID-19 vaccine in a sample of college students in the health professions. Method. The questionnaire administered through the Google Modules platform was created ad hoc in order to investigate perceived stress (PSS-10), coping strategies (BRIEF COPE) and pre and post vaccination emotions (7 items). Participants. A total of 344 students participated in the study (M age = 22.62, SD = 3.17; F = 67.2%): medicine and surgery (37.5%), nursing (32.8%), obstetrics (15.4%) and physiotherapy (14.2%). Results. From the qualitative and quantitative analysis it emerged that 56.7% of the sample has moderate stress levels. Emotional and avoidant coping, especially in females, is the most prominent strategy. In the pre-vaccination analysis, "fear" was the primary emotion most experienced by students, characterized by the use of avoidance strategies. The words "hope" and "vaccination" were most often recorded in the post-vaccination phase. Conclusions. Our results showed that the association of lemmas in the post-vaccination phase shows students' ability to adapt and be resilient through change and communicates that self-perception is important.

Keywords: perceived stress; coping strategies; emotions; COVID-19; healthcare professions; university students.

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Introduction

Many and recent studies have highlighted how the COVID-19 pandemic has negatively affected the mental health of the world's population (Asmundon & Taylor, 2020; Kelvin & Rubino, 2020). Because of the restrictions adopted (such as social distancing and suspension of in-person teaching activities) to limit SARS-CoV-2 infection, university students of health professions were the ones who suffered the most from psychological vulnerabilities, such as anxiety, stress, and depression (Carpinelli et al., 2021). These psychological discomforts, in most cases, have also influenced the acceptance or not of vaccination which, even today, turns out to be the only way out of the health emergency (Moccia et al., 2021; Pastorino et al., 2021).

Stress is a psychophysical response to very different tasks, of emotional, cognitive, or social nature, that the person perceives as excessive and that can be considered the basis of the onset of many disorders, not only psychological but also organic and somatic (D'Ambrosio et al., 2022). Lazarus and Folkman (1984) define the coping process by emphasizing the aspects of continual change in the cognitive and behavioral resources an individual draws upon to meet specific external and internal demands assessed as burdensome or excessive compared to their individual resources.

Further research on medical students (Abdulghani et al., 2020) studied the effects of the pandemic on both learning and stress levels, as well as coping strategies. Researchers identified a higher prevalence of stress in female medical students (especially those enrolled in the third year of the course) than in males. The perceived stress was exacerbated by the Emergency Remote Teaching (ERT). The prevailing coping modalities were emotion-focused strategies.

In a similar study (O'Byrne et al., 2021), a significant association emerged between perceived stress and online learning, as well as with major concerns for personal and family health. Students who reported higher stress levels were less confident in their government's handling of the crisis. Medical students reported lower stress than non-medical students, and researchers found that this correlated with claims that their university had an effective response to the crisis and had continued their training adequately. They were also shown to have had adequate information on the COVID-19 pandemic, which appears to be a major protective factor against stress. The same results were also obtained by Ye et al. (2020), who identified greater resilience, adaptive coping strategies and social support in university medical students.

With regard to graduate students in health professions, Aslan and Pekince (2021) identified that Turkish nursing students had very high levels of psychological distress, in addition to the many academic, social and psychological stressors. They also observed that the perceived stress level of female students was higher than that of male students. A further study (Patelarou et al., 2020) found, from interviews conducted in Greece, that nursing students preferred to receive information from valid sources rather than social media in order to reduce stressful situations, which also showed that they are at a high risk of having mental health issues during the pandemic. Aslan et al. (2020) found that anxiety and physical inactivity during various lockdowns were significant predictors of perceived high stress. Furthermore, a highly stressful factor for students in the health professions has been the limitation of clinical activities, which are essential for medical and health training (Cervera-Gasch et al., 2020).

The present study

The impact of an event as emotionally charged as the COVID-19 pandemic in university students of health professions results in a range of reactions related to both the developmental stage of "young adulthood" they are going through, the disruption of daily life and all that is familiar, and the disruption of relationships with people and the physical and social structures of the community. Silver et al. (2002) emphasize the importance of assessing coping skills after a traumatic event, as they are strongly associated with physiological hyperactivation due to increased perceived stress and the psychiatric outcomes that can occur, even after long periods of time.

This study suggests the importance of assessing the states of mind and type of coping strategies related to a stressful event such as vaccination following a pandemic, as it allows to delve into what may be the underlying resistance factors that, even today, have produced the opposition to participate in the vaccination campaign promoted by international governments to combat the COVID-19 pandemic (Moccia et al., 2022).

The Strategic Business Management of the University Hospital of Salerno, in agreement with the Campania Region (Italy), after the symbolic start on December 27th 2019, has scheduled the start of the anti-COVID-19 Vaccination Campaign which started on December 31st 2019, to then continue until the completion of prophylaxis. First the most exposed health workers of the COVID-19 Departments and the Emergency Unit were vaccinated, then all the remaining staff, as well as the students of faculties both medicine and helping professions of University of Salerno.

The objectives of this quantitative–qualitative study are to: a) investigate the perceived stress levels and coping strategies implemented prior to vaccine administration; b) check for any differences between the groups (gender and degree courses) and between the variables that emerged from the test results (indices of perceived stress and adaptive/maladaptive coping strategies); c) assess the perceived emotions and moods of the healthcare students before and after vaccination.

Understanding which coping mechanisms are undermined by exposure to a traumatic event and which remain unchanged may allow the planning of interventions aimed at reducing psychological distress in order to prevent further problems.

Methods

Setting and procedures

The University Campus of Health Professions of the University of Salerno (Italy) located at the University Hospital "San Giovanni di Dio and Ruggi d'Aragona" (Salerno, Italy), during

the pandemic became the "COVID Vaccinal Center", organized on the basis of organizational models for the control and management of the epidemiological context of SARS-CoV-2.

The vaccination of university students of the health professions was part of the vaccination plan for staff operating in hospitals pursuant to Legislative Decree 81/08, as equated to hospital staff in terms of risk and safety. The anti-COVID-19 vaccination campaign began on December 27, 2020 and continued until the completion of the prophylaxis on January 14, 2021, through the administration of approximately 700 doses of the Comirnaty vaccine (Pfizer/BioNTech).

In this way, the vaccination coverage of 1300 students enrolled in the III, IV, V and VI years of the Degree Course in Medicine and Surgery and Surgery, students of the health professions, doctoral students and fellows involved in professional internships in hospital was guaranteed.

All study procedures were approved by the ethical commission of the University Hospital "San Giovanni di Dio and Ruggi d'Aragona" (Salerno, Italy) and were conducted in accordance with the Declaration of Helsinki. The sample was recruited through a public announcement email containing an invitation to join an online survey on the Google Modules platform entitled "COVID representations and vaccines for students". The first part of the online survey described the study's objectives and the ethical issues underpinning the study. Participants were informed that their involvement was anonymous and that no information that could identify them would be collected. Only individuals who agreed to the study's conditions completed the survey. All participation was totally voluntary. The online survey was available from January to March 2021.

Participants

The total sample of reference was composed of n° 344 students (mean age=22.62±3.17; F=67.2%) studying the following degree courses: medicine and surgery (37.5%), nursing (32.8%), obstetrics (15.4%) and physiotherapy (14.2%). Furthermore, with regard to the year of attendance of the university course, most of the sample is enrolled in the third year of university studies. All participants are of Italian nationality. Specific features are shown in Table 1.

Tab. 1. Characteristics of the participants

Variables		%
Gender	Male	32.8
	Female	67.2
Degree course	Medicine and Surgery	37.5
	Nursing sciences	32.8
	Obstetrics	15.4
	Phisiotherapy	14.2

Variables		%
Year of attendance	I	19
	II	14.2
	III	35.9
	IV	9.4
	V	11.8
	VI	1.9
Outside prescibed time		7.8

Instruments

An ad hoc questionnaire was used consisting of the following.

The Perceived Stress Scale – PSS-10 (Cohen et al., 1983) is the psychological tool most used to measure the degree to which situations in a person's life are evaluated as stressful, unpredictable, uncontrollable or overloaded. The scale contains ten items directed on current levels of perceived stress related to the feelings and thoughts associated with the previous month. For each item, people are asked to indicate how often they felt a certain way on a 5-point Likert scale (0 = never; 4 = very often). The total score is used to measure the level of perceived stress, a higher score indicates higher stress. The cut-offs of 13 and 26 were used to categorize the total score into low, moderate and high level of stress. A high level of reliability and validity of the test was demonstrated in studies with different populations and reference contexts (Lee, 2012; Cavallo, Carpinelli & Savarese, 2016). Cronbach's alphas (>0.60) were computed to measure the internal consistency of the PSS-10 factors.

The Brief Coping Orientation to the Problems Experienced - Brief COPE (Carver, 1997) is a 28-item self-report questionnaire designed to measure effective and ineffective ways to cope with a stressful life event. "Coping" is defined broadly as the effort used to minimize distress associated with negative life experiences. The scale can determine someone's primary coping styles with scores on the following subscales: self-distraction, denial, substance use, behavioral disengagement, emotional support, venting, humor, acceptance, self-blame, religion, active coping, use of instrumental support, positive reframing and planning. These dimensions showed adequate internal structure and consistency (Garcia et al., 2018). Scores are presented for three overarching coping styles (problem-focused coping, emotion-focused coping and avoidant coping) as average scores (sum of item scores divided by number of items), indicating the degree to which the respondent has been engaging in that coping style (I haven't been doing this at all, A little bit, A medium amount or I've been doing this a lot). High or low scores are not uniformly associated with psychological health or ill health, but can be used to inform a wider formulation of the respondent's coping styles. Cronbach's alpha coefficient shows good internal consistency (≥0.70).

The last part of the survey named "*Representation of the COVID-19 pandemic and vaccination in students of the health*

professions" consists of seven questions created ad hoc in multiple response mode (for example, "Please indicate your prevailing emotional state after receiving the vaccine") and open-ended answers (for example, "Tell (even in a few words) your thoughts and emotions before and after the vaccination"). The questions investigate emotions and moods before and after vaccination. The questionnaire was constructed according to the CHERRIE criteria (Eysenbach, 2012).

Statistical analysis – Quantitative data

The calculated scores of the PSS-10 and BRIEF-COPE tests were compared through the mean±standard deviation using the *t* test or ANOVA where appropriate and compared between groups based on gender and degree course attended. Correlations have been made, of which significant scores of 0.05 are reported. The IBM SPSS v.23 software was used for the quantitative statistical analysis.

Statistical analysis – Qualitative data

For the qualitative procedure, the T-Lab Plus software (Lancia, 2012) was used to identify the qualitative aspects of emotional experiences in relation to vaccination. Preliminarily, all the answers to the open questions of the questionnaire were combined to form a single script that was "cleaned" by removing meaningless words, such as articles or prepositions, to condense meanings (Angioi et al., 2008) into a "corpus". Words with different meanings or full of meanings (compound words, phrasal verbs, idioms) have been disambiguated and assigned to a lemma. A lemma is a designated word referring to the same semantics. During the exclusion and disambiguation processes, a focus group was carried out with five non-independent referees who reached an agreement of at least 75%. Correspondence Analysis and Co-Word Analysis were performed on the lemmas detected. Initially, the analyzes were carried out on the lemma in the original language (Italian) and subsequently on the lemma translated into English and revised.

Results

Quantitative analysis

In relation to the research objective, analysis of the results obtained in the PSS-10 test scores, which evaluates the perception of perceived stress, showed that 14.8% of the sample reported low stress, 56.7% had moderate stress levels and 28.5% perceived high levels of stress.

Table 2 shows the differences between the mean values obtained in the PSS-10 according to the variables of gender and degree course attended. Physiotherapy students had a higher average (23.20±8.07) than other courses (medicine and surgery: 22.35±7.65; nursing sciences: 21.10±6.77; obstetrics: 22.38±8.20). Females students had a higher mean score (22.86±7.29) compared to males (20.44±7.78).

Tab. 2. Differences of PSS-10 scores between variables

Variables		Mean±Standard Deviation	*p* value
Gender	Male	22.86±7.29	<0.05
	Female	20.44±7.78	
Degree course	Medicine and Surgery	22.35±7.65	<0.05
	Nursing sciences	21.10±6.77	
	Obstetrics	22.38±8.20	
	Phisiotherapy	23.20±8.07	

Regarding the coping strategies implemented by the students, both the male and female groups and those in different degree courses preferred emotion-focused coping (see Table 3) Alternatively, there was a slight gender difference with females using avoidant coping (14.02±3.14) to a greater extent than males (13.31±2.69). Furthermore, again in relation to avoidance, obstetrics students had a higher average score (14.21±3.34) compared to other degree courses.

Tab. 3. Differences of coping strategies (BRIEF-COPE) scores between variables

Variables		Mean ± Standard Deviation			*p* value
		Problem-Focused Coping	Emotion-Focused Coping	Avoidant Coping	
Gender	Male	21.58±4.48	27.36±4.77	13.31±2.69	<0.05
	Female	23.12±4.37	29.32±5.24	14.04±3.14	
Degree course	Medicine and Surgery	22.69±4.58	29.46±5.28	13.89±2.70	<0.05
	Nursing sciences	22.04±5.19	27.39±5.21	13.55±3.24	
	Obstetrics	23.36±3.50	29.62±4.97	14.21±3.34	
	Phisiotherapy	22.61±4.46	28.68±5.17	13.79±3.01	

Significant correlations (*p*= 0.05) emerged between age and problem-focused coping strategies (*p*= 0.108), and between the PSS-10 score and the emotion-focused coping *p*= 0.213) and avoidant coping (*p*= 0.366). On the other hand, significant negative correlations emerged between gender and the three types of coping strategies (problem-focused coping, *p*= -.162; emotion-focused coping, *p*= -.178; avoidant coping, *p*= -.111) and the PSS-10 score (*p*= -.151).

Qualitative analysis

A cluster analysis was performed to explore the semantic relationships between the one-to-one-type words that take into account the positions of the various lexical units within the sentences produced by the participants in the open-ended questions of the questionnaire (in relation to their emotions and moods before and after the administration of the COVID-19 vaccine). The elements closest to the keywords are those that have the highest probability of coming before (predecessors) or

after (successors) them. Figures 1 and 2 show the analysis of the sequences of the words "fear" and "vaccination" that appeared more frequently in the pre-vaccination period and were related to the lemmas in the text, with which they have created relational nodes. For the "fear" emotion, the most relevant nodes are with the following words: worry, time, study, situation, pandemic, others, my, hope, future, feel, anxiety and anguish; while for the word "vaccine", the nodes are related to a positive pole correlated to hope, free, happy/happiness, normal, reaction and time.

Fig. 1. Pre-Vaccine Sequence Analysis - "FEAR"
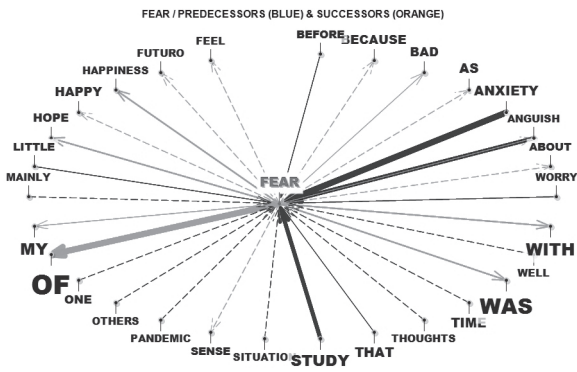
Fig. 2. Pre-Vaccine Sequence Analysis - "VACCINE"
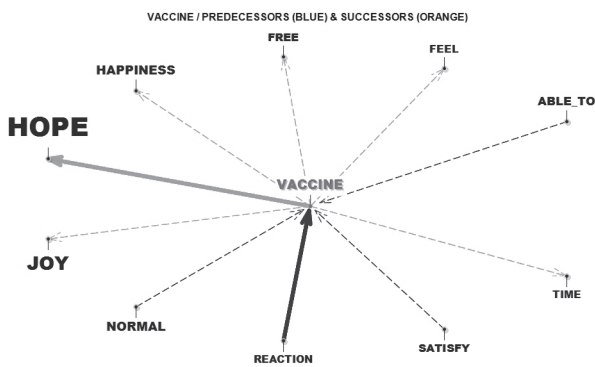
Similarly, the words "hope" and "vaccination" are clustered in the post-vaccination phase. Figure 3 shows a very important association between the lemma "hope" and the words satisfaction, happy/happiness, future, normal, mind, safe, tranquility and change. Furthermore, for the word "vaccination", the corresponding headwords are on the positive side, especially for the words detected (see Figure 4), such as: colleague, start, day, result, emotion and able to.
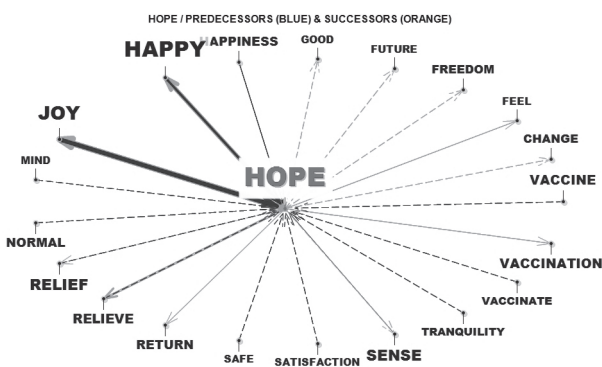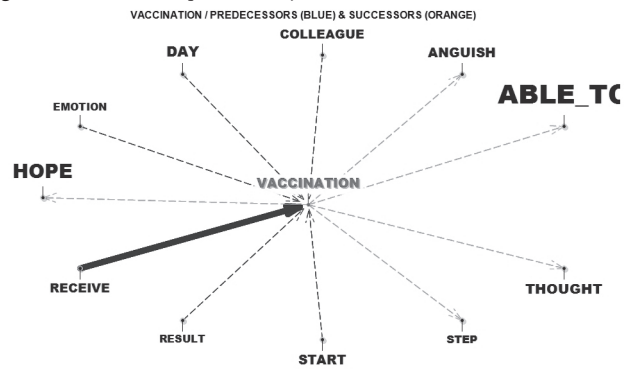
Fig. 3. Post-Vaccine Sequence Analysis - "HOPE"

Fig. 4. Post-Vaccine Sequence Analysis - "VACCINATION"

Discussion and conclusions

The results of this study highlight the impact of anti-COVID-19 vaccination in relation to the cognitive, emotional and psychophysical structures of university healthcare students. Unlike other studies, in the present work, the participants did not have post-traumatic stress disorder (PTSD), but had all been exposed to the traumatic event that is the COVID-19 pandemic. In relation to the time of vaccination, 56.7% of the sample showed a moderate level of stress. Physiotherapy students had a higher average than those in other courses and, in general, in accordance with the findings of the Patelarou study (2021), females had a higher mean than males (Abdulghani et al., 2020). Moreover, what emerges from our data is that every student uses more emotion-focused and avoidant coping. Emotion-focused coping is characterized by venting, the use of emotional support, humor, acceptance, self-blame and religion. A high score indicates coping strategies that aim to regulate the emotions associated with the stressful situation. Avoidant coping is characterized by self-distraction, denial, substance use and behavioral disengagement. A high score indicates physical or cognitive efforts to disengage from the stressor. Low scores are typically indicative of adaptive coping.

In relation to the avoidance strategy, high and frequent averages emerged in the group of females and during the degree course in Obstretrics (mostly attended by females). This data reports what is already present in the literature, i.e., the greater vulnerability of women in the development of post-traumatic symptoms (Bangasser et al., 2006; Tollin et al., 2006).

Our findings underscore that coping strategies, being strongly linked to a dynamic adaptation process, should be evaluated at different stages and at different temporal distances from the activating event. In the acute phase, the presence of some coping strategies can provide fundamental clues to the possibility of developing psychic distress and, in the subsequent phase, they allow us to monitor the ability to cope in the long term, as well as warning if the strategies for coping are established non-functional coping. In this regard, the relevant findings that emerged from our qualitative analysis justify the probable resistance and fears relating to the vaccine based on the moods and emotions of the negative pole reported by the students. In the pre-vaccination analysis, it is interesting that "fear" was the emotion most experienced by the students interviewed and that the words associated with it were worry, time, study, situation, pandemic, others, my, hope, future, feel, anxiety and anguish.

All these words are connected to a concern about the traumatic event experienced and the impact it had on the perception of one's life, as well as that of those people closest. Fear, a primary emotion, is fundamental for our defense and survival: if we did not feel it, we would not be able to save ourselves from risks. It also has an adaptive function, but the line between a functional alert (positive stress or eustress) and an excess of activation, with unclear and counterproductive behaviors (negative stress or distress), is, however, very subtle.

In a previous study (Shekhar et al., 2021) evaluating the attitudes of health care workers in relation to COVID-19 vaccination before and during the pandemic, it was found that 36% of respondents were willing to take the vaccine as soon as it was available, 56% were unsure or they preferred to know more accurate data and only 8% of health workers did not provide for vaccination. Similar results, also in a study conducted in Jordan (El-Elimat et al., 2021), in which it was found that subjects over 35 and employed, participants who believed there was a conspiracy behind COVID-19 and those who do not trust any source of information on vaccines, they were less likely to accept the COVID-19 vaccine.

The behavioral consequence of fear is avoidance, a reaction that occurs when you decide you do not want to experience certain internal or external feelings such as body sensations, emotions, thoughts, places or people (Carpinelli et al., 2022). In fact, females are the ones who use avoidance strategies the most as a consequence of a greater perception of reported stress (Abdulghani et al., 2020). The words "hope" and "vaccination" were grouped together in the post-vaccination phase, and from our qualitative analysis, an important association emerged between the lemma "hope" and the words satisfaction, happy/happy, future, normal, mind, safe, tranquility, and change. According to Snyder (1995), hope is a type of behavioral spring and identifies two components: agentivity (the belief that one can achieve one's goals) and pathways (the belief that one can make plans to achieve one's goals). These two elements constitute the "power to move forward." Having hope has positive consequences for the individual, such as experiencing positive emotions, training thoughts to develop different strategies while gaining flexibility, and gaining more sympathy and social support, as a positive attitude is more welcoming. In addition, for the word "vaccination," the corresponding lemmas were on the positive side, especially for words such as: colleague, beginning, day, result, emotion, and able to. This association determines students' ability to resiliently adapt to change and shows self-perception as effective.

Our study notes the importance to investigate the levels of perceived stress and the emotional states at the entrance to events and which underlie the activation of and more or less adaptive behaviors. Ledda et al. (2021) suggest the importance of identifying the factors associated with vaccination intentions that could direct and most impact vaccination promotion campaigns and that the most reliable sources of information on COVID-19 vaccines are healthcare professionals. Carrying out this type of assessment especially in people such as university students of the health professions would also support the inclusion of specific actions aimed at strengthening and empowering skills that can be useful to future professionals of these disciplines, improving the quality of personal and professional life.

Limitations and future prospects

This study shows several methodological limitations. In the first place, the failure to collect further variables characterizing the sample, such as nationality and socio-economic status (SES), did not allow to further investigate the correlation of the factors with perceived stress levels. Furthermore, no further gender differences could be detected as sampling could not be controlled equally between males and females. According to a primary prevention perspective and in continuity with further future developments in this area of investigation, it would be useful to hypothesize a protocol for assessing the emotional-cognitive states of students in the healthcare professions, in order to monitor any influence of environmental and context variables that may undermine adaptive coping strategies. Moreover, it would be useful to broaden the study in a multicenter perspective so as to have, on a statistical level, the possibility of comparison between groups. Furthermore, the usefulness of this monitoring would allow the creation of an intervention action also through focus groups of sharing, empowerment, and personal well-being.

Author Contributions

Compliance with Ethical Standards

Conflict of interest

Funding

Ethical approval

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