

Creativity is Not Related to Higher Cognitive Functioning: An Exploration Among Healthcare Professionals and Students During the Covid-19 Omicron Wave

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Abstract

In the light of the public health crisis due to the coronavirus disease 2019 pandemic, it is important to acknowledge its impact on healthcare professionals and students during the Omicron wave. In this study, the aim was to compare the levels of depressive symptomatology, burnout, and creativity in Greek healthcare professionals and students while exploring associations with cognitive functioning. The sample consisted of 243 Greek individuals (104 healthcare professionals and 139 healthcare university students). Pearson correlation coefficient and independent t-test were used for data analysis. Both groups scored high in depression, however, no significant difference was found in the levels of creativity and cognitive functioning. Although health professionals scored higher in burnout, burnout levels were found to be low in both groups. No correlation was found among cognitive functioning, burnout, depression and creativity. Support should be provided to healthcare professionals and students. Further research should investigate cognitive functioning and possible associations with depression, burnout, and creativity.

Keywords: COVID-19, Depression, Burnout; Creativity, Cognitive function

Introduction

During the public health emergency of the coronavirus disease 2019 (COVID-19) pandemic, healthcare professionals were responsible for the treatment and general care of the infected patients (Tian et al., 2020). In many cases, they had to deal with the lack of proven treatments, the risk of becoming infected, and potential shortages of healthcare resources (Hu et al., 2020; Lai et al., 2020). As a result of the risk of contagion and the uncertainty of the situation, the levels of depression were exacerbated among healthcare professionals. Both in Italy and Portugal, studies found that frontline healthcare professionals, who are exposed to infected patients, are more likely to report high levels of depression (Trumello et al., 2020; Wańkiewicz et al., 2020). Lai et al (2020) found that among 1257 healthcare professionals in China, 50,4% of their sample reported symptoms of depression.

Given that healthcare professionals were exposed to multiple psychosocial stressors during the COVID-19 outbreak, burnout in response to the frequently changing protocols and the psychological distress has been claimed to constitute an epidemic (Restauri & Sheridan, 2020). Burnout is defined as the state of physical, emotional and mental exhaustion resulting from the excessive involvement in work settings that require sustained emotional effort (Schaufeli & Greenglass, 2001). Healthcare professionals have been suggested to be a high-risk group for burnout (Heath et al., 2020), with more than 62% of them displaying a moderate degree of burnout (Liu et al., 2020). In a cross-sectional study in China with more than 2000 participants working in Wuhan hospitals, half of the cohort reported suffering from moderate to high burnout (Hu et al., 2020). Additional studies in Italy, Switzerland, and Portugal confirmed high levels of burnout among healthcare professionals (Duarte et al., 2020; Fiabane et al., 2021; Weilenmann et al., 2021).

Aside from healthcare professionals, healthcare students were also affected. Healthcare students were charged with the responsibility of learning how to respond to unprecedented circumstances and provide care to patients (Sanghavi et al., 2020). Additionally, some students faced the disruption of their pre-clinical and clinical training which in combination with the exposure to high-risk environments constituted unique challenges (Halperin et al., 2021). Halperin et al (2021) reported that when compared to prior studies on healthcare students, the levels of depression were 70% higher during the COVID-19 period. Such scores highlight the impact of prolonged exposure to challenging environments. A longitudinal survey on healthcare students assessed their levels of burnout and depression during three phases: the early phase of the pandemic, later in May 2020 when cases were stabilized and finally in June 2020, when routine and telemedicine services had been restarted (Goss et al., 2022). Although burnout levels presented a decline throughout these phases, depression was the only factor that displayed an increase per additional phase (Goss et al., 2022). In Poland, healthcare students displayed low resilience which was significantly correlated with severe scores of burnout and depressions (Forycka et al., 2022). Especially students with diagnosed depressive disorders noticed a deterioration of their symptoms and an increase in the doses of their medication (Forycka et al., 2022).

The COVID-19 pandemic negatively affected healthcare students' and professionals' mental health, however, potential areas of improvement have been acknowledged. Xu et al (2021) explored depression and creativity among college students in China and reported that depression is positively associated with creativity. This finding indicates that depression may not only affect individuals' motivation and emotion negatively, but it may also impel individuals to generate novel ideas and increase their creativity. Creativity is typically defined as the process of conceiving novel ideas (Amabile, 1983) which, in organizations such as hospitals, can inspire an inventive and useful environment (Shalley & Gilson, 2004). In fact, in a sample of 754 Chinese and German employees, among who 120 were healthcare professionals, scholars found a significant increase in creativity during lockdown in all everyday activities (Hofreiter et al., 2021). In addition to that, Fox et al (2021) recounted the implementation of creative alternatives in hospitals as bereavement support and viewings for grieving family members were forbidden in line with public health restrictions. Creative alternatives in that time included communication through letters, photos, hand-drawn pictures and music (Fox et al., 2021). Hence, the uncertainty of the situation and the prevention measures urged people to discover their creative potentials and apply them to their professional environment.

Given that healthcare professionals played a key role in the treatment of COVID-19 cases and healthcare students contributed to the healthcare workforce as part of their clinical placements (McFadden et al., 2022; Whitfield et al., 2020), it is imperative to examine the effects of the COVID-19 Omicron wave on them. Further, burnout has been associated with deficits in three main cognitive functions (executive functions, attention, and memory) (Deligkaris et al., 2014), while depressive symptomatology is considered to be linked to deficits in different aspects of cognition (Goodall et al., 2018). These associations have clear implications for professions that are characterized by high levels of both work pressure and cognitive demands, such as healthcare professions. Therefore, the aim of this study was to compare the levels of depressive symptomatology, burnout, and creativity during the challenging COVID-19 Omicron wave, while examining cognitive functioning with the intention to understand how these factors relate to each other.

Methods

Participants

The sample consisted of 243 Greek participants. Out of the 243 participants, 104 were healthcare professionals (non-students) (67 female; $M_{age} = 35.63$, $SD = 8.75$) working at state hospitals in Northern Greece during the COVID-19 pandemic, and the rest ($n = 139$) were healthcare university students (78 female; $M_{age} = 19.45$, $SD = 2.72$) in the fields of nursing, psychology, medicine, and physiotherapy. Based on the inclusion criteria, participants were selected only if they: 1) were native speakers living and/or studying in Greece, 2) were over 18 years old, and 3) were working or studying in the area of healthcare. Study inclusion criteria were similar to other studies (Fradelos et al., 2014). Participants were contacted during the first months of 2022, and were asked to complete a detailed demographics questionnaire along with three questionnaires. For the abovementioned sample, there was an additional invitation for a brief cognitive assessment, thus a subgroup of 25 healthcare students ($n = 14$ women; $M_{age} = 22.40$, $SD = 4.41$) and 25 healthcare professionals ($n = 14$ women; $M_{age} = 35.20$, $SD = 9.85$; with a limited work experience $M = 1.90$, $SD = 1.18$) went through a brief cognitive assessment. The gender characteristics of the second group were selected on purpose, so the demographics regarding gender were the same for the two groups, as sex has been found to influence a plethora of cognitive functions. The study was approved by the relevant institutional review board and all the participants provided their written informed consent before participating in both phases of this study.

Measures

Burnout was assessed with the Greek version of Maslach Burnout Inventory (MBI) - 22 items/questions ($\alpha = 0.88$), which consists of three dimensions, namely emotional exhaustion, personal accomplishment, and depersonalization (Anagnostopoulos & Papadatou, 1992). Further, depressive symptomatology was assessed with the Center for Epidemiologic Studies-Depression (CES-D) scale. Higher scores on the CES-D indicate more depressive symptoms (Zhang et al., 2011).

For measuring creativity, the Creative Attitudes and Values section was used, which consists of 25 items and is part of the Runco Creativity Assessment Battery (rCAB). Each item is scored on a 5-point Likert scale. Out of these 25 items, 15 were indicative and 10 were contraindicative items that were reverse coded and used along with the indicative ones (Runco & Acar, 2012). The Cronbach's alpha for this sample was acceptable ($\alpha = 0.705$). The purpose of the Creative Attitudes and Values questions was to try and assess individuals' attitudes and values about creativity, their tendency to act creatively, and their affinity for creativity (Acar & Runco, 2014), as attitudes can greatly influence the probability of thinking and feeling in a creative fashion.

During the cognitive assessment, the three cognitive domains (i.e. executive functions, attention and memory) that have been found to be affected by burnout were examined. Executive functioning was examined with the use of the Stroop Colour-Word condition, as overall successful performance on the Stroop test requires active selection, and, therefore, in some instances, inhibition of the features requires attention in order to produce the appropriate response. Auditory attention was measured with the Digit Span forward, and verbal memory was assessed with the Digit Span backward, which are subtests of the Wechsler Adult Intelligence Scale (WAIS) (see Table 1 for Means and SDs of the total sample).

Table 1: Descriptive statistics for the whole sample regarding the Center for Epidemiologic Studies-Depression (CES-D), Maslach Burnout Inventory (MBI), Creative Attitudes and Values, Digit Span forward-backward and Stroop Test.

Tests					
	N	Minimum	Maximum	Mean	SD
CES-D	243	6.00	48.00	22.3621	12.56
MBI	243	0.00	42.00	17.7603	12.07
Creative Attitudes and Values	243	68.00	111.00	90.1422	8.23
Digit span forward	50	5.00	14.00	7.4600	1.60
Digit span backward	50	3.00	14.00	6.7200	1.75
Stroop (Colour-Word condition)	50	20.00	52.00	34.1200	9.46

Statistical Analysis

All statistical analyses were performed with the Statistical Package for Social Sciences (SPSS) version 24. Pearson correlations were generated to explore the associations among variables under study. Thereafter, independent samples t-tests were performed to measure and compare the variables of interest in both cohorts. Only raw scores were used for all questionnaires and cognitive tests.

Results

No statistically significant differences were found between healthcare professionals and healthcare students when independent samples t-tests were performed, regarding the CES-D ($t(241) = 1.797$, $p = .074$), Creative Attitudes and Values ($t(223) = .314$, $p = .754$), Digit Span forward ($t(48) = .612$, $p = .543$), Digit span backward ($t(48) = 1.998$, $p = .051$), and Stroop Test performance ($t(48) = .118$, $p = .906$). Only a statistically significant difference was found for the MBI ($t(240) = 10.157$, $p = .000$), with the healthcare professionals scoring higher than the healthcare students group (Table 2).

Table 2: Group differences for the Center for Epidemiologic Studies-Depression (CES-D), Maslach Burnout Inventory (MBI), Creative Attitudes and Values, Digit Span forward-backward and Stroop Test.

Tests	Group	N	Mean	SD
CES-D	Students	139	21.11	12.32
	Professionals	104	24.02	12.73
MBI	Students	138	12.02	11.88
	Professionals	104	25.36	7.12
Creative Attitudes and Values	Students	133	90.28	8.10
	Professionals	92	89.93	8.47
Digit span forward	Students	25	7.60	1.91
	Professionals	25	7.32	1.24
Digit span backward	Students	25	7.20	2.02
	Professionals	25	6.24	1.30
Stroop	Students	25	34.28	10.26
	Professionals	25	33.96	8.79

In addition to the above, Pearson correlations between the total score of MBI and CES-D revealed that there is a statistically significant positive correlation as expected ($r = 0.206$, $p = 0.001$) and a negative correlation between CES-D and Creative Attitudes and Values ($r = -0.142$, $p = 0.033$).

No correlation was found among the three main cognitive functions (executive functioning, attention and verbal memory) and MBI, CES-D, and Creative Attitudes and Values. Only an expected correlation between Digit Span forward and Digit Span backward was found (Table 3).

Table 3: Pearson correlations for the Center for Epidemiologic Studies-Depression (CES-D), Maslach Burnout Inventory (MBI), Creative Attitudes and Values, Digit Span forward-backward and Stroop Test ($n = 50$).

		Digit span forward	Digit span backward	Stroop	CES-D	MBI	Creative Attitudes and Values
Digit span forward		1	.845**	-.099	-.058	.117	.009
	Sig. (2-tailed)		.000	.494	.690	.420	.953
Digit span backward		.845**	1	-.069	-.127	.074	-.109
	Sig. (2-tailed)	.000		.632	.381	.609	.453
Stroop		-.099	-.069	1	.035	.268	.131
	Sig. (2-tailed)	.494	.632		.809	.060	.365
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Discussion

The objective of the present study was to compare the levels of depressive symptomatology, burnout, and creativity in Greek, healthcare professionals and students during the COVID-19 Omicron wave, and also to examine whether correlations with cognitive functioning are present. Results demonstrated that depressive symptomatology, as measured by the CES-D scale, was high in both healthcare professionals and students, given that a total score of 16 or greater is considered an indicative of subthreshold depression (Radloff, 1977). These results corroborate previous studies which were conducted during the first wave of the COVID-19 pandemic and found high depression levels in both healthcare professionals and students (Forycka et al., 2022; Goss et al., 2022; Lai et al., 2020; Trumello et al., 2020).

Our results, however, suggested that although high depressive symptomatology was reported in both samples, no statistically significant difference between the samples was found. This could be explained as both healthcare professionals and students have endured a prolonged exposure to infected patients and treatment uncertainty due to the novel Omicron variant which may have perpetuated their depressive symptoms.

Contrary to previous research showing extremely high levels of burnout in Greek doctors and nurses during COVID-19 (Bogiatzaki et al., 2019; Giannouli, 2021; Giannouli & Syrmos, 2021; Ilias et al., 2021), burnout levels were low at this phase of the COVID-19 pandemic in both healthcare professionals and students. Although the scores differed, such that healthcare professionals scored higher in burnout compared to healthcare students, both scores were extremely low when compared with previous studies. This inconsistency apart from the time that the measurements were completed, may also be explained by the diminished workload and the fewer reported hospitalizations of COVID-19 patients in the state hospitals. The number of COVID-19 cases in Greece did not explode to the extent that was observed in other countries such as China or Italy, hence hospitalization in wards or intensive unit care were manageable (Zimeras et al., 2020).

Drawing on prior research, the relationship of depression, burnout and cognitive functioning has started to attract interest, with some scholars claiming to have found cognitive impairments in executive functions, attention and memory related to the experienced burnout and depression (Beaujean et al., 2013; Deligkaris et al., 2014; Jonsdottir et al., 2017). Surprisingly, for the whole sample, no correlation was found among burnout, depressive symptomatology and the three cognitive tests. This finding may be due the fact that this was a very brief cognitive assessment, not examining in detail the full neuropsychological profile of the selected participants. Nonetheless, this study provides a reasonable indication that cognitive functioning, and more particularly executive functions, attention and memory, may not be correlated to burnout and depressive symptomatology. Further, no differences were found in cognitive performance between these two groups, a finding that may be explained by the fact that both groups of professionals and students (apart from the difference of completion of university studies) fall into the category of young adults.

A novel finding of our study concerns that of the correlation between creativity and cognitive functioning. Intelligence and higher cognitive functioning have been suggested to be internal factors that have a great effect on creativity (Benedek et al., 2012), thus scholars have been assuming a substantial correlation between cognitive functioning and creativity. In a recent study, Akhtar and Kartika (2019) found a strong correlation coefficient between creativity and intelligence, indicating that creative people are commonly characterized by high levels of intelligence. Relevant findings in the field of neuroscience suggest that the ability to be creative requires a synthesis of neurocognitive processes involving executive functions, memory processes, internally-focused attention, or spontaneous modes of thought (Beaty et al., 2019; Boccia et al., 2015). Our results, however, are inconsistent with previous studies and indicate that the multifaceted construct of creativity is not associated with higher cognitive functioning. This inconsistency may be dependent on the characteristics of our sample, but more importantly on the brief cognitive assessment. However, this study suggests that more factors, other than cognitive functioning, may be involved or may be responsible for high creativity levels in some individuals.

Although this is the first study to compare burnout, depressive symptomatology, and creativity levels as well as examine possible correlations with cognitive functions in Greek healthcare students and professionals during the COVID-19 Omicron wave, there are some limitations to consider. One limitation is the small number of participants, both healthcare professionals and students, that completed the neuropsychological assessment. Future studies should further investigate these factors in larger sample sizes. Further, cognitive functions measured in this study did not cover the whole neuropsychological profile as participants underwent a brief cognitive assessment. Hence, we must be cautious about generalizing these findings to the healthcare or other populations. This would benefit from thorough follow-up assessments of the neuropsychological profile. In addition to that, researchers should take into consideration apart from the intraindividual variables, the group variables that describe the workplace or the school-teaching environment as well (Varytis & Giannouli, 2023). Finally, it should be mentioned that data were collected during the first months of 2022 when the Omicron variant was prevailing, and the number of the infected people was decreased compared to the first COVID-19 wave. Therefore, different pandemic phases may cause distinct psychological reactions. Hence, the timing of the study must be taken into consideration when interpreting the findings (Stoyanova & Giannouli, 2023).

Despite the limitations, this study provides evidence with regards to the levels of depressive symptomatology, burnout, and creativity during the COVID-19 Omicron wave in Greece and the possible correlations with cognitive functioning. With regards to policy making, it also highlights the significance of implementing preventive interventions and mental health support for healthcare professionals and healthcare students. Future research exploring the possible long-term influences on mental health and the correlations among these factors with cognitive functioning in larger sample sizes is strongly recommended, considering that the COVID-19 pandemic is an ongoing, public health concern.

Conflict of Interest

None.

Source of funding

None.

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