Relationship between stress and alexithymia, emotional processing and negative/positive affect in medical staff working amid the COVID-19 pandemic

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ABSTRACT

The psychological burden of the COVID-19 pandemic may have a lasting effect on emotional well-being of healthcare workers. Medical personnel working at the time of the pandemic may experience elevated occupational stress due to the uncontrollability of the virus, high perceived risk of infection, poor understanding of the novel virus transmission routes and unavailability of effective antiviral agents. This study used path analysis to analyze the relationship between stress and alexithymia, emotional processing and negative/positive affect in healthcare workers. The sample included 167 nurses, 65 physicians and 53 paramedics. Sixty-two (21.75 %) respondents worked in COVID-19-designated hospitals. Respondents were administered the Toronto Alexithymia Scale-20, Cohen's Perceived Stress Scale, Emotional Processing Scale, and the Positive and Negative Affect Schedule. The model showed excellent fit indices (χ^2 (2)=2.642, p=0.267; CFI=0.999, RMSEA=0.034, SRMR=0.015). Multiple group path analysis demonstrated physicians differed from nurses and paramedics at the model level (X^2_{diff} (7)=14.155, p<0.05 and X^2_{diff} (7)=18.642, p<0.01, respectively). The relationship between alexithymia and emotional processing was stronger in nurses than in physicians (difference in beta=0.27; p<0.05). Individual path χ^2 tests also revealed significantly different paths across these groups. The results of the study may be used to develop evidence-based intervention programs promoting healthcare workers' mental health and well-being.

Significance of this study

What is already known about this subject?

- Medical personnel working at the time of the pandemic may experience elevated occupational distress which may adversely affect their occupational health and well-being.
- Work-related distress has been associated with compromised physical well-being, lowered efficiency and endurance, professional burnout, depression or anxiety.
- Significant differences in COVID-19-related stress can be observed between healthcare occupational categories.
- Emotional response to threats such as a pandemic can be affected by alexithymia and emotional processing, but the causal relationship is not well understood.

What are the new findings?

- The causal models of the relationship between stress and alexithymia, emotional processing and negative/positive affect in nurses, physicians and paramedics indicate emotional responses of physicians, nurses and paramedics to challenges of COVID-19 are determined by different factors.
- The results suggest inherent personality differences between individuals who take up various medical professions.

How might these results change the focus of research or clinical practice?

- The study may offer theoretical insights for future research and can be used in preparation of effective interventions to combat distress in healthcare workers.

INTRODUCTION

COVID-19 is an infectious disease caused by SARS-CoV-2. The current outbreak of the disease is often considered the most important global health challenge of the 21st century.[1] The effects of the present pandemic on occupational health and well-being of healthcare professionals have been analyzed in recent publications.[2–10] Healthcare professionals' work at the time of the pandemic is characterized by increasingly high demands related to job intensity, significantly higher number of working hours and low control.[11] The psychological impact of COVID-19 may also be associated

with the uncontrollability of the virus, high perceived risk of infection, poor understanding of the novel virus transmission routes and unavailability of effective antiviral agents. Additionally, the gap between the demand and the supply of critical care equipment such as ventilators and unclear guidelines for managing equipment shortage may evoke practice dilemmas and moral conflicts. Furthermore, caring for critically ill may cause feelings of helplessness and frustration.[11–13] Research consistently demonstrates increased levels of unrelenting work-related distress may adversely affect occupational health and well-being of medical staff. Work-related distress has been associated with compromised physical well-being, lowered efficiency and endurance, professional burnout, depression or anxiety.[14–18] Of note, nurses, paramedics and physicians play a fundamental role in caring for patients amid the pandemic, but they have their distinct functions and duties in the healthcare system. Studies indicate these occupational groups experience elevated occupational distress but they differ in the reported COVID-19-related strain, well-being and coping. According to some authors the differences in distress levels between various professional groups may be associated with personality variables.[9 10]

However, knowledge on the personality determinants of psychological response to COVID-19 is limited. In this context, studies point to the role of emotional processing, which is related to the ability to let go of emotionally distressing and aversive events or situations. Researchers also emphasize the role of alexithymia, which manifests in difficulty identifying, understanding and describing feelings, externally oriented thinking, and deficits in cognitive processing and regulation of emotions.[19–27] The assessment of alexithymia in medical staff is important for a number of reasons. First, findings imply alexithymia is prevalent in healthcare workers. Investigators believe healthcare workers may be characterized by increased vulnerability to alexithymia because this personality construct could be invoked by medical school learning environment.[22–27] Second, alexithymia may adversely influence healthcare workers' professional soft skills and the effectiveness of the patient–clinician communication because alexithymia has been linked to deficits in empathy and compromised ability to process and regulate emotions.[22] Third, alexithymia is negatively correlated with resilience and a sense of personal achievement and positively correlated with symptoms of professional burnout in medical staff. Consequently it may adversely affect healthcare workers' job satisfaction and self-efficacy.[23–27] Alexithymia has also been linked to increased levels of anxiety, depression and an above-average risk of suicide. According to some authors, alexithymia may determine emotional response to traumatic events such as a pandemic.[19–21] Consequently, this personal construct may have a profound negative effect on healthcare workers' occupational health and quality of life during the pandemic.[22–26]

In the current study we analyzed the data using path analysis. Data-driven methods such as path modeling have been used to build, evaluate and estimate models demonstrating causal mechanisms through which independent variables produce both direct and indirect effects on a dependent variable and to understand how these variables relate to one another.[28] Path analysis has been employed in occupational psychology research to explore the correlates and determinants of medical staff behavior or their psychological response to stressful job environment.[29–34] Path models depicting indirect causal relationships between psychological determinants could be used in formulating evidence-based models explaining psychological reactions to stressors such as COVID-19.[29–31] These models may also be useful in preparing tailored evidence-based interventions promoting occupational well-being for medical staff working at the time of the pandemic and in planning for future pandemics.

Given the critical importance of better understanding staff psychological reactions to the ongoing situation in healthcare, the current study used path analysis to examine the relationship between stress, alexithymia, emotional processing and negative/positive affect in healthcare staff working in Poland during the pandemic. Based on literature findings, doctors, physicians and nurses were suspected to differ in indirect relationships between stress, alexithymia, emotional processing and negative/positive affect. The authors also hypothesized the models for nurses, physicians and paramedics would differ in the magnitude and significance of causal relationships between stress, alexithymia, emotional processing and negative/positive affect.

MATERIALS AND METHODS

Subjects

This cross-sectional analysis was conducted between March and June 2020 during the national lockdown due to the first wave of COVID-19 pandemic. The sample included 285 hospital-employed medical staff workers with an average age of 39.60±12.32 years and an average job experience of 13.86±12.13 years. Two hundred and fourteen subjects (75%) were female. The sample included 167 (58.5%) nurses, 65 (22.8 %) physicians and 53 (18.59%) paramedics. Sixty-two (21.75 %) respondents worked on the first line in hospitals designated for COVID-19 treatments, while 223 (78.25%) worked on the second line and were not in an obvious contact with patients with COVID-19.

Measures

Respondents were administered self-administered, paper-and-pencil questionnaires to evaluate the following psychological parameters:

Alexithymia

Alexithymia was measured using the Toronto Alexithymia Scale-20 (TAS-20). The scale includes 20 items in three subscales assessing difficulty describing feelings (eg, 'It's difficult for me to find the right words for my feelings'), difficulty identifying feelings (eg, 'I am often confused about what emotion I am feeling'), and an operational, externally oriented style of thinking (eg, 'I prefer talking to people about their daily activities rather than their feelings'). Subjects responded to statements using a 5-point Likert scale ranging from 1 ('totally disagree') to 5 ('totally agree'). The internal consistency of the items of the Polish version of TAS-20 ranged from r=0.41to r=0.86. Reliability reached the following Cronbach's alpha values: 0.86 for all items; 0.81 for the difficulty identifying feelings subscale; 0.75 for the difficulty describing feelings subscale; and 0.64 for the externally oriented thinking subscale.

The current study also examined differences in stress, emotional processing and positive/negative affect between low-scoring respondents without alexithymia and high-scoring respondents with elevated alexithymia. The sample was dichotomized into two groups of low-scoring and high-scoring respondents using a commonly accepted cut-off point of 60 points, indicating elevated alexithymia.[35 36]

Stress

Stress levels in the past month were measured using Cohen's Perceived Stress Scale (PSS-10). PSS-10 comprises 10 test items in two subscales that measure perceived helplessness and self-efficacy. The internal consistency of the Polish version of PSS-10 ranged from r=0.41 to r=0.66. The Cronbach's alpha values were calculated to measure internal consistency (0.86), absolute stability (0.90) and test–retest reliability at 4 weeks (0.72).[37–39]

Emotional processing

Emotional processing was measured using the Emotional Processing Scale (EPS). This scale consists of 25 items in five subscales: (1) suppression, (2) signs of unprocessed emotion, (3) controllability of emotion, (4) avoidance and (5) emotional experience. Subjects rated their agreement/disagreement with the statements on a 9-point scale ranging from 0 (totally disagree) to 9 (totally agree) (eg, 'My emotions felt blunt/dull'). The internal consistency of all the items of the Polish version of EPS ranged from r=0.51 to r=0.90, whereas the Cronbach's alpha reliability for the scale was 0.91. The Cronbach's alpha coefficients for the EPS subscales reached the following values: 0.86 for suppression subscale; 0.84 for signs of unprocessed emotion subscale; 0.69 for controllability of emotion subscale; 0.63 for avoidance subscale; and 0.70 for emotional experience subscale.[40–43]

Positive and negative affect

The propensity to experience the world in a more positive or a more negative way was assessed using the Positive and Negative Affect Schedule (PANAS). The questionnaire contains 20 adjectives in two 10-item domains measuring positive and negative affect (eg, interested, excited and strong, guilty and hostile). Subjects rated each item on a 5-point scale from 1 (not at all) to 5 (very much). The psychometric properties of the Polish version of PANAS reached the following values: the internal consistency (Cronbach's alpha) of the positive affect subscale was 0.80; the internal consistency (Cronbach's alpha) of the negative affect subscale was 0.88; the absolute stability of the positive affect subscale was r=0.62; and the absolute stability of the negative affect subscale was r=0.73. The discriminating power indices ranged from r_{it}=0.51 to r_{it}=0.72 and from r_{it}=0.47 to r_{it}=0.69 for the positive and for the negative subscale, respectively.[44–46]

On conducting power analyses with G*Power V.3.1 with up to four predictors in a linear multiple regression model, a sample size of 285 was considered appropriate to detect effects of size of 0.05 or higher, with an alpha of 0.05 and power of 0.90. Additional subjects were recruited to account for missing data.[47]

Verbal informed consent was obtained from all subjects involved in the study. Subjects were informed about the purpose and importance of the study and assured of their anonymity and confidentiality. They were also informed they could leave the study at any moment without providing reasons. Subjects were not provided financial compensation for participating in the study.

Model construction and evaluation

Before the main analysis, data were screened for normality, multicollinearity, influential outliers and linearity. Since all variables had skewness and kurtosis of less than 0.6, they were treated as normal.[48]

When testing for multicollinearity all tolerances were above 0.4 and all variance inflation factors were below 2.5, indicating multicollinearity did not distort the analysis. Additionally, no value exceeded 0.04 when tested with Cook's distance test (values <1 are treated as acceptable).[48–50]

Visual inspection of all scatter plots revealed linear relationships between every pair of variables. To test the significance of a mediation effects, we applied the bootstrapping procedures with 2000 samples, which established CI. The analyses were carried out using James and Lim's plug-in for AMOS.[51–53]

RESULTS

The model for the sample is shown in figure 1.

The model fit indices reached the following values: χ^2 (2)=2.642, p=0.267, comparative fit index (CFI)=0.999, root mean square of approximation (RMSEA)=0.034 and standardized root mean squared residual (SRMR)=0.015. According to established criteria, the model had excellent fit indices.[54] A large proportion of negative emotions variance (R^2=0.63) was explained by all exogenous variables, but a much smaller proportion of positive emotions variance was explained (R^2=0.20). The results for the final model are presented in table 1.

Multigroup comparisons

Models for the three groups of healthcare providers were compared. The individual path coefficients for each group are shown in figure 2. We ran χ^2 difference tests to examine differences in model fit between groups and in the fit across individual paths (the results were calculated by plug-in for AMOS).[52–54] At the model level nurses did not differ from paramedics (X^2_{diff} (7)=10.874, p>0.1); however, they differed from physicians (X^2_{diff} (7)=14.155, p<0.05). Additionally, physicians differed from paramedics (X^2_{diff} (7)=18.642, p<0.01) at the model level. Individual path coefficients for nurses, paramedics and physicians are presented in figure 2.

Individual path χ^2 tests revealed five significantly different paths across the analyzed professional groups. Specifically, the relationship between alexithymia and emotional processing was stronger in nurses than in physicians (difference in beta=0.27; p<0.05). As for the nurses, there was a weaker relationship between emotional processing and negative emotions (difference in beta=−0.30; p<0.01). The relationship between stress and negative emotions was also weaker in nurses, but the effect was marginally insignificant (difference in beta=−0.17; p<0.1).

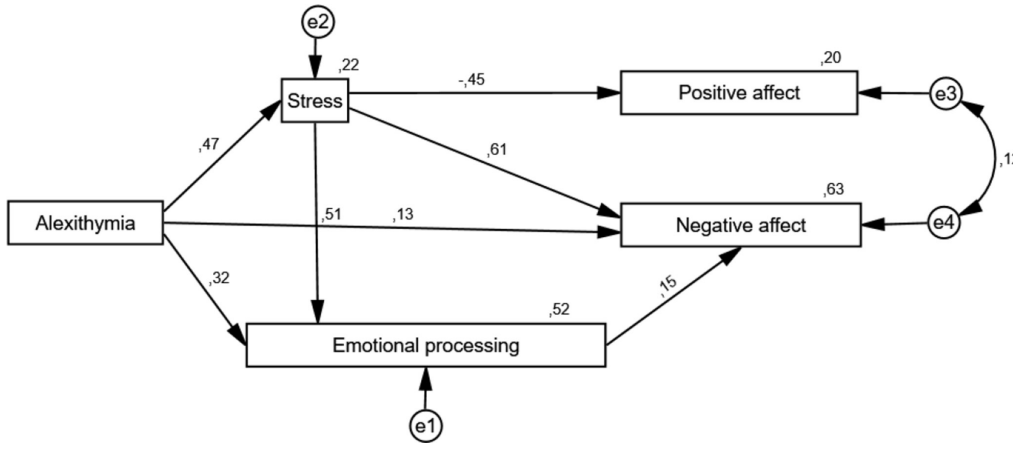

Figure 1 The model for the sample.

The comparison between physicians and paramedics indicated two significant differences. In physicians, emotional processing predicted negative emotions more strongly than in paramedics (difference in beta=0.54; $p<0.1$). Paramedics, in turn, were characterized by a stronger relationship between stress and negative emotions (difference in beta=−0.52; $p<0.1$). The latter relationship was also stronger in paramedics than in nurses (difference in beta=−0.35; $p<0.1$).

The investigation also involved the analysis of the differences in stress, emotional processing and positive/negative affect outcomes between low-scoring respondents without alexithymia and high-scoring respondents with elevated alexithymia. A commonly accepted cut-off value of 60 points indicating elevated alexithymia was applied.[35] Then subjects with TAS-20 scores below and above the cut-off value were dichotomized as low-scoring respondents without alexithymia (<60 points) and high-scoring respondents with elevated alexithymia (≥61 points), respectively. The sample comprised 55 subjects with alexithymia and 230 individuals without alexithymia. The analysis revealed those with alexithymia obtained significantly higher scores than those without alexithymia in all the other scales, except for the subscale of positive affect ($p>0.05$). The results of the comparison between the two subgroups are presented in table 2.

DISCUSSION

COVID-19 is a highly contagious viral disease with high associated mortality. The global outbreak of the disease has become a major public health challenge of 2020 and 2021. Ever since COVID-19 was declared a pandemic, majority of countries with significant outbreaks have restricted social activities and implemented social distancing or 'lockdown' measures as a strategy to attenuate the spread of the pandemic.[1] With recommended or enforced stay-at-home policies, the COVID-19 pandemic has caused sudden social, political, economic, cultural, civilizational and economic consequences, bringing change to individual lifestyle or family life. The sequence of stressful events related to COVID-19, including the escalating number of confirmed COVID-19 cases and reported deaths, has been accompanied by increased stress and generalized fear. Studies indicated symptoms of COVID-19-related anxiety were triggered by a number of factors, such as internet information search, perceived possibility of contracting the virus, perceived risks of loved ones, awareness of clinical outcomes or the absence of effective treatment for COVID-19 health complications.[55–57 58 59 60] Authors emphasize that abnormally elevated anxiety, panic or pervasive feelings of helplessness, which are widespread during outbreaks of contagious diseases, are associated with negative outcomes including suicide.[61–63]

Observations consistently demonstrate COVID-19 is presenting new challenges for healthcare workers worldwide. Healthcare staff caring for patients amid this large-scale public health event are working in a new context. They are vulnerable to the emotional impact of COVID-19 themselves and simultaneously care for and support patients' and patients' families. Consequently, they may experience enormous psychological burden which may have profound and permanent effects on their physical and psychological

Table 1 Unstandardized and standardized estimates of indirect effects for alexithymia to negative and positive emotions

Indirect path	Unstandardized estimate	Lower bounds	Upper bounds	P value	Standardized estimate
Alexithymia → stress → emotional processing → negative mood	0.026	0.012	0.045	0.002	0.240**
Alexithymia → stress → negative mood	0.199	0.150	0.251	0.001	0.285***
Alexithymia → stress → positive mood	–0.118	–0.160	–0.083	0.001	–0.209***
Alexithymia → emotional processing → negative mood	0.035	0.013	0.061	0.002	0.050**
Stress → emotional processing → negative mood	0.099	0.035	0.177	0.003	0.079**

Lower and upper boundaries 95% CI.
***P<0.001, **P<0.010.

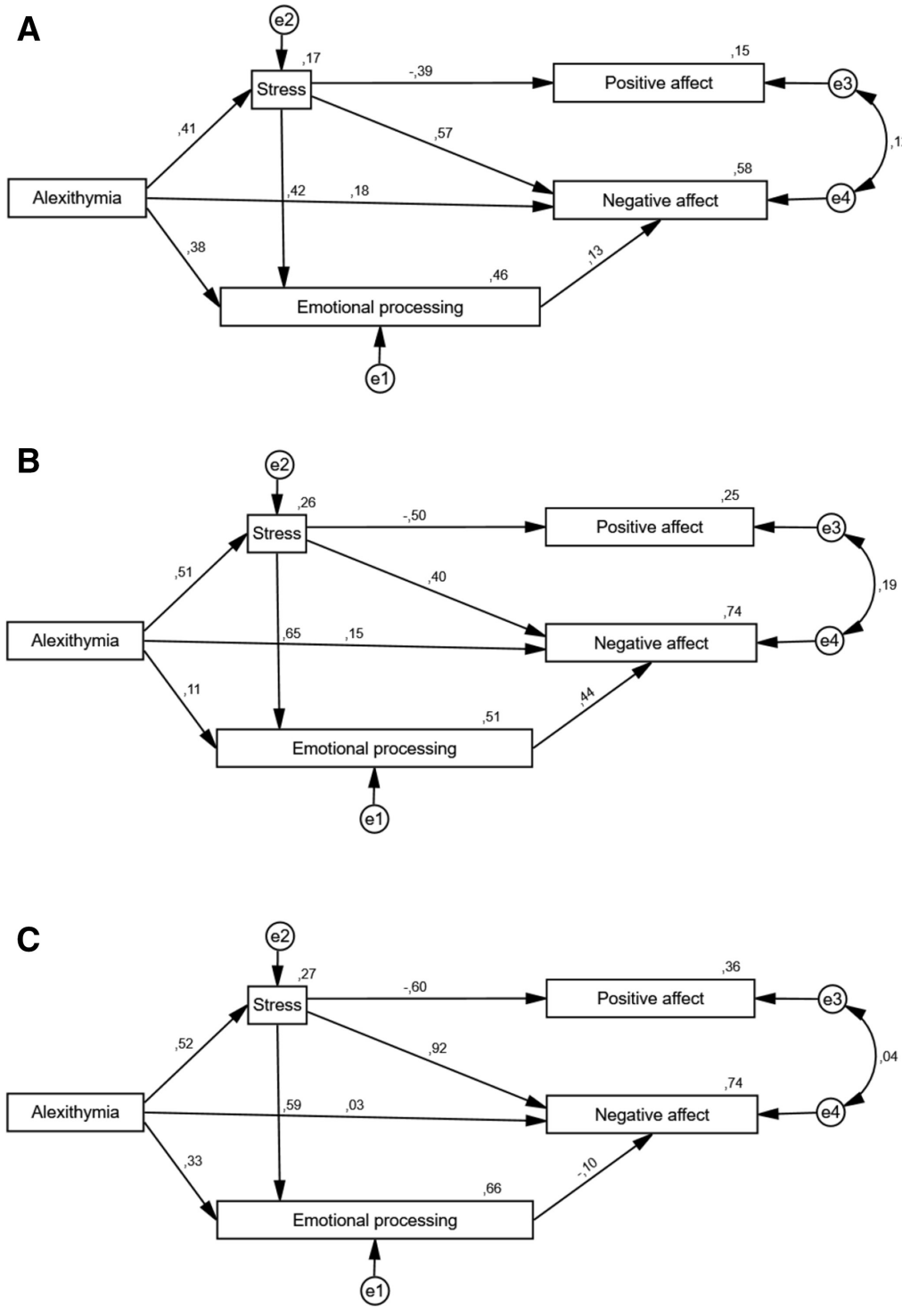

Figure 2 Individual path coefficients for (A) nurses, (B) paramedics and (C) physicians.

well-being. Maintaining staff well-being is essential to assure optimal quality of care and to maximize patients' potential for recovery.[2–10 14 15 64–66]

Research demonstrates emotional response to threat can be determined by personality traits.[67] Therefore, it is essential to identify and describe personality constructs that may determine healthcare workers' emotional and behavioral response to the pandemic.[68] In this context, researchers pay attention to alexithymia, which manifests in difficulty identifying, understanding and describing feelings, externally oriented thinking, and deficits in cognitive processing and regulation of emotions. Alexithymia has also been linked to deficits in empathy, that is, the ability to take the perspective of others and to understand others' feelings and intentions. Since individuals with alexithymia find it difficult to process and regulate their emotions, they are at an increased risk of developing symptoms of depression and suicide. Studies also point to the role of

Table 2 Differences between low-scoring respondents without alexithymia and high-scoring respondents with elevated alexithymia

	Alexithymia score	Mean	SD	t-test for difference	Effect size (d)
Emotional processing	Low scores (<60)	79.33	39.89	t=9.11; df=283; p<0.001	1.36
	High scores (≥61)	132.91	36.05		
Stress	Low scores (<60)	18.77	6.35	t=5.55; df=283; p<0.001	0.83
	High scores (≥61)	24.25	7.48		
Positive affect	Low scores (<60)	32.46	6.84	ns	−0.29
	High scores (≥61)	30.45	7.35		
Negative affect	Low scores (<60)	23.49	7.65	t=6.89; df=283; p<0.001	1.03
	High scores (≥61)	31.75	9.30		

n=235 and n=55 for the respective subgroups of low-scoring and high-scoring respondents.

emotional processing, which is related to the ability to let go of emotionally distressing and aversive events or situations.[19–26 41–43 65–70]

The current study used path analysis to determine the paths between stress, alexithymia, emotional processing and negative/positive affect in physicians, nurses and paramedics working during the COVID-19 pandemic in Poland. Path analysis is an extension of multiple regression that aims to provide estimates of the magnitude and significance of hypothesized causal connections between sets of variables. We found significant differences at the model levels and in individual paths. At the model level, the differences between nurses and paramedics could not be found, but there were differences between nurses and physicians and between paramedics and physicians, respectively. The analysis demonstrated significantly different paths across these occupational groups. Specifically, the relationship between alexithymia and emotional processing was stronger in nurses than in physicians. The analysis also revealed that emotional processing was a stronger predictor of negative emotions in physicians, while paramedics were characterized by a stronger relationship between stress and negative emotions. Moreover, the relationship between stress and negative emotions was stronger in paramedics than in nurses and physicians. As for the nurses, there was a weaker relationship between emotional processing and negative emotions and between stress and negative emotions, respectively, but the effect was marginally insignificant. The analyses provided a preliminary picture of the relationship between stress, alexithymia, emotional processing and negative/positive affect in healthcare staff working in Poland during the pandemic. The causal models of the relationship between stress and alexithymia, emotional processing and negative/positive affect for nurses, physicians and paramedics indicate emotional responses of physicians, nurses and paramedics to challenges of COVID-19 are determined by different factors.

The study demonstrated a statistically significant relationship between alexithymia and emotional processing in nurses. This finding should be viewed in the context of the general requirement to wear personal protective equipment such as masks. Face masks reduce the risk of viral transmission but also impair the ability to adequately read emotions from human faces, thus creating a barrier to effective patient–clinician communication and relationship, which are at the cornerstone of good quality care. Of note, communicating with patients wearing masks can be an additional adversity for individuals with alexithymia due to the association between alexithymia, emotional processing and the ability to adequately recognize emotions from human faces.[71 72]

The results are somewhat consistent with the literature on emotional outcomes of the coronavirus pandemic in healthcare workers. For example, Salopek-Žiha *et al*[10] demonstrated nurses and physicians working during the COVID-19 pandemic used different coping strategies in stressful situations. They found nursing staff were more likely to use emotional coping strategies, while physicians were inclined to use problem-solving strategy. Similarly, Harrison and the coworkers indicated emotional response and coping strategy in a medical setting differed by professional group.[73] These variations may stem from inherent personality differences between individuals who take up various medical professions or could be associated with varied roles these professional groups play in the healthcare system. However, they may reflect the impact of the so-called hidden curriculum.[74] The implicit values, attitudes, knowledge, behaviors and norms that are transmitted to students in the implicit curriculum may lead to differences in the way physicians, nurses or paramedics view their professional autonomy, assess their ability to control the stressful situations or perceive their status in professional hierarchy.[74]

The analysis also revealed individuals with and without alexithymia participating in our study significantly differed in their scores in negative affect, but could not find any differences associated with positive affect. These results confirm the outcomes of previous studies on the association between alexithymia and negative or positive affect. For example, Suslow and Donges[75] could not indicate any marked correlations between various components of alexithymia and implicit or explicit (state and trait) positive affect. They also observed significant positive correlations between the alexithymia facet difficulties describing feelings and the negative trait affect as measured by PANAS.

The results of this study have to be seen in light of some limitations. First, the sample is characterized by uneven female to male ratio. It should be noted, however, that the high proportion of women in the sample is based on sound evidence. The 75% female outcome remains a true representation of the current male to female distribution in the population of healthcare workers in Poland. The increasing women's participation in medical professions has been well described in literature. In Poland, for instance, women constitute the majority of students pursuing degrees and ultimately careers in all medical professions. [59 75–77] It is

also worth mentioning that the statistical analysis could not demonstrate any significant differences in test results associated with gender ($p>0.05$) (citation anonymized, unpublished data). Another shortcoming of the investigation is related to a relatively small sample size of the subgroups of physicians and paramedics. In addition, the study could have been affected by the use of self-rated scales and the cross-sectional design. However, the outcomes may offer some theoretical insights for future research and can be used in the preparation of effective interventions to combat distress in healthcare workers. To add, the design and methodology of the study can make important contributions to our understanding of factors affecting healthcare workers' psychological response to COVID-19.

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