

## PROXIMITY TO COVID-19 ON MENTAL HEALTH SYMPTOMS AMONG HOSPITAL MEDICAL STAFF

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### SUMMARY

**Background:** Exposure to patients with COVID-19 can have a significant impact on mental health of hospital medical staff. The aim of this study was to examine the influence of proximity to patients with COVID-19 considering occupational position and gender on the mental health of hospital staff.

**Subjects and methods:** N=78 participants were included in the study, with n=40 of them with direct contact to patients with COVID-19 (51%); eight had contact with patients suspected of having COVID-19 (10%), and n=30 with no direct contact to people with COVID-19 (39%).

**Results:** Multinomial regression analyses showed that proximity had a negative (inverse) influence on avoidance behaviour as part of PTSD, physical symptoms, somatization, compulsiveness and anger expression-in as tendency to suppress anger. In addition, there was a significant impact of the female gender on increased physical symptoms, while age, work experience and occupation had no further influence.

**Conclusions:** These results that hospital medical staff is less psychologically stressed when closer to COVID-19 patients are inconsistent with previous studies. Self-efficacy and locus of control in these situations are relevant for processing the trauma. In summary, perception of personal risk is essential. Proximity is believed to be a proxy variable for personal risk perception. As a synopsis of these results, regular briefings of the hospital staff are recommended to prevent psychological impairment. They should contain specific information about conditions in the affected wards and the risk of infection, which could help reduce risk perception of medical personnel.

**Key words:** COVID-19 - medical staff - hospital - mental health

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### INTRODUCTION

Hospital medical staff are exposed to patients with COVID-19 at a varying extent. COVID-19 can be regarded as a severe stressor on mental health (Jakovljevic et al. 2020, Ćosić et al. 2020) especially for health care providers (Petzold et al. 2020). Proximity to the “epicentre” is well known as predictor of the mental health status. Direct exposure of emergency personnel to the terrorist attack in Paris or exposure to an unsecured crime scene was associated with higher psychological stress (Motreff et al. 2019). In addition, medical personnel who were directly exposed to patients with COVID-19 were more psychologically affected than their non-contact colleagues. In the same study, similar results were found in healthcare providers working close to regions with high infection rates (Lai et al. 2019). These results are supported by a meta-analysis which found an influence of direct contact with patients with acute respiratory infectious diseases and psychological symptoms of the medical staff (Koh et al. 2011). The occupational status (Wese-

mann et al. 2020b) and gender (Wesemann et al. 2020c) have been shown to be relevant for different mental health outcomes after terrorist attacks. Studies on war veterans (Braš et al. 2019) or active soldiers (Himmerich et al. 2016) with post-traumatic stress disorders (PTSD) support this. Shuja and colleagues (2020) highlight the influence of COVID-19 on anxiety and PTSD. Similar results were found among first-line medical staff fighting against COVID-19 (Zhu et al. 2020) but more specific research is needed (Zaka et al. 2020). Walton et al. (2020) provide an overview of acute stress reactions to COVID-19. In hospitalized high-risk patients with COVID19 and comorbid chronic lung diseases, severe cardiovascular diseases or oncological diseases the prevalence rate of severe posttraumatic stress is about 40% (Wesemann et al. 2020a). Relevant stress in the workplace was also noted among cardiac staff (Kozomara et al. 2019). The aim of the current study is to provide methods for protecting hospital staff tailored to the specific needs of the healthcare providers. These methods should strengthen resilience in short 3 term. In long term, it

would be desirable to include this knowledge in the training to prepare healthcare providers for future events. Therefore, the influence of individual proximity to patients with COVID-19 as a stressor must be assessed with special consideration of the professional group and gender as covariates.

## SUBJECTS AND METHODS

Nursing staff and doctors were recruited from the Department of Cardiology and Vascular Medicine as well as from the Centre of Emergency Medicine, both University of Essen Medical School, during the COVID-19 pandemic 2020. Employees of the two departments were exposed to both COVID-19 positive and negative patients at a varying degree. The data acquisition took place between April 2<sup>nd</sup> and May 15<sup>th</sup>. We included N=78 participants with direct patient contact (n=40; 51%), contact with patients with suspect of COVID-19 infection (n=8; 10%) and contact with COVID-19 individuals as part of the work in the clinical routine (i.e. triage of patients), without direct contact to diseased individuals (n=30; 39%). All employees of the Department of Cardiology and Vascular Medicine and the Centre of Emergency Medicine had the opportunity to participate in the study. The sample included medical specialists in cardiology and anesthesia (n=11; 14%), residents (n=30; 39%) and nurses (n=37; 47%) with n=52 (67%) female and n=26 (33%) male study participants. Mean age was 32.7 years (y)  $\pm$  SD 9.38 y and a mean work experience 8.1 y  $\pm$  SD 9.25 y. The study was approved by the local Ethics Committee of the University of Essen Medical School (IRB number 20-9263-BO) and registered at Clinicaltrials.gov (NCT04368312). Participation in the study was voluntary, with all participants providing written informed consent. Data was collected using a questionnaire that included a biographical section, the posttraumatic stress disorder (PTSD) checklist for DSM-5 (PCL-5), the Patient Health Questionnaire (PHQ-D), the Brief Symptom Inventory (BSI) and the State-Trait 4 Anger Expression Inventory-2 (STAXI-2). The PCL-5 is a 20-item self-report questionnaire that contains scales for intrusion, avoidance, cognition and mood, hyperarousal and an overall scale. The PHQ-D is a reliable instrument for screening mental disorders. It consists of 78 items, some of which allow two to five answers to be given. The BSI contains 53 items on nine symptom dimensions. The STAXI-2 records the components anger temperament and anger reaction as well as forms of anger expression (inner or outer anger expression) and anger control. Data for the first wave was gathered four to 12 weeks after admission of the first patients with COVID-19 to the hospital. A Kruskal-Wallis one-way analysis of variance was performed to check

sample bias between the three groups "proximity to patients with COVID-19" and age and work experience. A chi-square test was carried out to check these differences for gender and occupational groups. Data analysis was done by a two-step process. First, mean differences were calculated by one-way ANOVA with the clinical scales as regressands and the proximity to patients as factor. In the second step, multinomial regression analyses were conducted to confirm these results and to check for covariates that were identified to be relevant in other studies such as occupational group, gender, age and work experience. Statistical analyses were conducted with SPSS (Version 21, IBM, Inc., Armond, NY, USA).

## RESULTS

Kruskal-Wallis one-way analyses of variance and chi-square tests showed no sample bias in the "proximity to patients" groups. One-way ANOVAs revealed that directly exposed personnel showed fewer PTSD symptoms in avoidance (PCL-5) as well as fewer physical symptoms (PHQ) or lower symptoms in the current mental state (BSI) concerning somatization, compulsiveness, social phobia, phobia and paranoid ideation. Regarding anger, directly exposed personnel had a lower physical anger impulse, a lower anger reaction and lower anger expression-in (tendency to 5 suppress anger or to direct it inwards; e.g. sample item: "I cook internally, but I don't show it"). Multinomial regression analyses confirmed the negative influence of proximity on avoidance as part of PTSD, physical symptoms, somatization, compulsiveness and anger expression-in. The only additional significant predictor was the influence of female gender on increased physical symptoms. Age, work experience, occupational group or gender had no further influence on the other outcomes as shown in table 1. The amount of explained variance varied between 14.5% (avoidance behavior) and 23.7% (physical symptoms).

## DISCUSSION

The proximity to patients with COVID-19 had a significant reverse influence on avoidance behavior as a symptom of PTSD, on physical symptoms and on the current mental state in the form of somatization, compulsiveness and paranoid ideation as well as on anger expressionin. These results suggesting that the medical staff are less psychologically stressed when working closer to patients with COVID-19 are inconsistent with previous studies (Motreff et al. 2019). While direct exposure to threat is undoubtedly an indicator for the experience of a trauma, selfefficacy (Gallagher et al. 2020) and the locus of control (LOC) (Smith et al. 2020) in these situations are relevant for

**Table 1.** Influence of "proximity to patients with COVID-19" of medical hospital staff on their mental health

Regressand	R <sup>2</sup>	Predictors	USC		SC	t	Coefficients			ANOVA	
			B	SE	β		Sig.	df C	df D	F	Sig.
Avoidance (PCL-5)	0.145	Age	0.255	0.381	0.156	0.669	0.506	5	70	2.379	0.047
		WE	0.130	0.298	0.102	0.438	0.663				
		Gender	-0.059	0.380	-0.019	-0.156	0.877				
		Occ. Grp	0.091	0.264	0.043	0.346	0.730				
		Prox.	-0.485	0.186	-0.303	-2.601	0.011				
Physical Sympt. (PHQ)	0.237	Age	-1.434	0.896	-0.350	-1.601	0.114	5	70	4.358	0.002
		WE	1.236	0.706	0.381	1.752	0.084				
		Gender	-2.350	0.879	-0.307	-2.672	0.009				
		Occ. Grp	-0.907	0.602	-0.179	-1.508	0.136				
		Prox.	-1.133	0.428	-0.292	-2.646	0.010				
Somatization (BSI)	0.168	Age	-0.090	0.054	-0.385	-1.685	0.096	5	70	2.818	0.022
		WE	0.108	0.042	0.583	2.565	0.012				
		Gender	-0.039	0.053	-0.089	-0.742	0.461				
		Occ. Grp	-0.011	0.036	-0.037	-0.296	0.768				
		Prox.	-0.051	0.026	-0.228	-1.977	0.052				
Compulsive-ness (BSI)	0.181	Age	0.037	0.138	0.061	0.268	0.789	5	70	3.089	0.014
		WE	0.022	0.109	0.045	0.198	0.844				
		Gender	-0.128	0.136	-0.112	-0.940	0.351				
		Occ. Grp	-0.153	0.093	-0.202	-1.644	0.105				
		Prox.	-0.239	0.066	-0.415	-3.621	0.001				
Social Phobia (BSI)	0.113	Age	0.164	0.170	0.228	0.967	0.337	5	70	1.780	0.128
		WE	-0.078	0.134	-0.137	-0.584	0.561				
		Gender	-0.161	0.167	-0.120	-0.966	0.338				
		Occ. Grp	-0.068	0.114	-0.076	-0.594	0.555				
		Prox.	-0.210	0.081	-0.308	-2.584	0.012				
Phobia (BSI)	0.076	Age	0.170	0.148	0.276	1.147	0.255	5	70	1.159	0.338
		WE	-0.050	0.117	-0.102	-0.426	0.671				
		Gender	-0.125	0.146	-0.108	-0.855	0.395				
		Occ. Grp	0.128	0.100	0.168	1.288	0.202				
		Prox.	-0.045	0.071	-0.077	-0.633	0.529				
Paranoid Ideation (BSI)	0.177	Age	0.294	0.210	0.318	1.398	0.166	5	70	3.014	0.016
		WE	-0.079	0.166	-0.107	-0.474	0.637				
		Gender	-0.201	0.207	-0.116	-0.972	0.335				
		Occ. Grp	-0.164	0.141	-0.143	-1.159	0.250				
		Prox.	-0.323	0.101	-0.369	-3.211	0.002				
Physical Anger Impulse (STAXI-2)	0.121	Age	0.104	0.159	0.146	0.655	0.515	5	63	1.738	0.139
		WE	-0.125	0.125	-0.216	-1.000	0.321				
		Gender	-0.053	0.159	-0.043	-0.334	0.739				
		Occ. Grp	-0.117	0.110	-0.143	-1.063	0.292				
		Prox.	-0.195	0.077	-0.315	-2.549	0.013				
Anger Reaction (STAXI-2)	0.116	Age	0.467	0.783	0.142	0.597	0.552	5	68	1.783	0.128
		WE	-0.003	0.615	-0.001	-0.005	0.996				
		Gender	-1.487	0.775	-0.240	-1.920	0.059				
		Occ. Grp	-0.918	0.524	-0.226	-1.753	0.084				
		Prox.	-0.585	0.376	-0.187	-1.558	0.124				
Anger Expression-In (STAXI-2)	0.164	Age	2.667	1.447	0.462	1.843	0.070	5	65	2.543	0.037
		WE	-1.230	1.156	-0.269	-1.064	0.291				
		Gender	-1.983	1.402	-0.182	-1.415	0.162				
		Occ. Grp	-0.783	0.916	-0.109	-0.854	0.396				
		Prox.	-1.653	0.676	-0.297	-2.446	0.017				

USC: unstandardized coefficients; SC: standardized coefficients; Sig: significance (p); dfC: degrees of freedom counter; dfD: degrees of freedom denominator; WE: work experience; Occ Grp: occupational group; Prox: proximity to patients with COVID-19 (factor)

the processing of a trauma. Thereby, self-efficacy is defined as the subjective conviction that one can cope with new or difficult requirements based on one's own competencies while LOC is the perception of subjective control over situations. This could explain why emergency personnel who were closely exposed to a terrorist attack (Motreff et al. 2019) were more affected than the more distant personnel were. The same applies to medical hospital staff during the COVID-19 pandemic (Lai et al. 2020) if the individuals are worried about their own health. This difference could be explained by the different loci of control. While health care providers who are not directly exposed to the patient may fear a higher infection rate of their own and their families' lives and less personal control, directly exposed personnel may have a more realistic view. This is especially relevant considering that the objective risk of an infection can be limited when following the standard safety procedures. Proximity to critical incidents could therefore be seen as a good proxy variable for personal risk perception, as both variables are expected to be highly correlated. There is no information available on the infection rates of participants. Nevertheless, a representative sample antibody test at the University Hospital Essen confirmed an infection rate below one percent with no difference between the three "proximity groups". There is no information on the infection rate of the staff in the previous study (Lai et al. 2020). The assessment of personal risk perception of an infection should be included in future studies as a predictor of mental health outcomes. The more frequent physical symptoms in women workers are attributed to the more frequent double burden of women with family and work. Schools, crèches and kindergartens were closed at the time of data collection due to COVID-19. The study is limited by the small sample size of N=78 study participants. Due to the pilot character of the study, no alpha correction was carried out. A confirmation study is required to validate the results.

## CONCLUSIONS

Aside from the limitations, the symptoms suggest that, alongside physical symptoms, avoidance and paranoid thinking are paramount. Education and specific information for all hospital employees could therefore help to alleviate these fears. These instructions should include information about the conditions in the affected wards and the individual risk to health care providers. Regular updates of this information are recommended to maintain the effect. This 7 short and quick intervention could reduce symptoms in hospital staff who are not working directly on patients with COVID-19.

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## Contribution of individual authors:

Ulrich Wesemann & Johannes Siebermair: Conception of the work, analysis and interpretation of data for the work, drafting the work, approval of the final version and agreement to be accountable for all aspects of the work.

Julia Vogel: Acquisition of data for the work, revising the work, approval of the final version and agreement to be accountable for all aspects of the work.

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## References

1. Braš M, Brajković L, Đorđević V, Pjevač N, Braš B: *The Role of PTSD in Perception of Health-Related Quality of Life and Social Support among Croatian War Veterans. Psychiatr Danub* 2019; 31:761-768
2. Ćosić K, Popović S, Šarlija M, Kesedžić I: *Impact of Human Disasters and COVID19 Pandemic on Mental Health: Potential of Digital Psychiatry. Psychiatr Danub* 2020; 32:25-31
3. Gallagher MW, Long LJ, Phillips CA: *Hope, optimism, self-efficacy, and posttraumatic stress disorder: A meta-analytic review of the protective effects of positive expectancies. J Clin Psychol* 2020; 76:329-355
4. Himmerich H, Willmund GD, Zimmermann P et al.: *Serum concentrations of TNF $\alpha$  and its soluble receptors during psychotherapy in German soldiers suffering from combat-related PTSD. Psychiatr Danub* 2016; 28:293-298
5. Jakovljević M, Bjedov S, Jaksic N, Jakovljević I: *COVID-19 Pandemia and Public and Global Mental Health from the Perspective of Global Health Securit. Psychiatr Danub* 2020; 32:6-14
6. Koh Y, Hegney DG, Drury V: *Comprehensive systematic review of healthcare workers' perceptions of risk and use of coping strategies towards emerging respiratory infectious diseases. Int J Evid Based Healthc* 2011; 9:403-419
7. Kozomara D, Babić D, Marijanović I, Kraljević M, Buhovac T: *Workplace Stress in the University Clinical Settings: Comparison between the Cardiac Unit and Emergency Center Medical Staff. Psychiatr Danub* 2019; 31:796-804
8. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Du H, Chen T, Li R, Tan H, Kang L, Yao L, Huang M, Wang H, Wang G, Liu Z, Hu S: *Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open* 2020; 3: e203976

9. Motreff Y, Baubet T, Pirard P, Rabet G, Petitclerc M, Stene LE, Vuillermoz C, Chauvin P, Vandentorren S. Factors associated with PTSD and partial PTSD among first responders following the Paris terror attacks in November 2015. *J Psychiatr Res* 2019; 121: 143-50
10. Petzold MB, Plag J, Ströhle A. Umgang mit psychischer Belastung bei Gesundheitsfachkräften im Rahmen der Covid-19-Pandemie [Dealing with psychological distress by healthcare professionals during the COVID-19 pandemic]. *Nervenarzt* 2020; 91:417-421
11. Shuja KH, Aqeel M, Jaffar A, Ahmed A. COVID-19 Pandemic and Impending Global Mental Health Implications. *Psychiatr Danub* 2020; 32:32-35
12. Smith NB, Sippel LM, Presseau C, Rozek D, Mota N, Gordon C, Horvath M, Harpaz Rotem I: Locus of control in US combat veterans: Unique associations with post-traumatic stress disorder 5-factor model symptom clusters. *Psychiatry Res* 2020; 268:152-156
13. Walton M, Murray E, Christian MD: Mental health care for medical staff and affiliated healthcare workers during the COVID-19 pandemic. *Eur Heart J Acute Cardiovasc Care* 2020; Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7189614/> Accessed May 18, 2020
14. Wesemann U, Hadjamu N, Willmund G et al. Influence of COVID-19 on General Stress and Posttraumatic Stress Symptoms Among Hospitalized high-risk Patients. *Psychol Med* 2020a; 1-8
15. Wesemann U, Mahnke M, Polk S, Bühler A, Willmund G. Longitudinal Mental Health Effects of the 2016 Terrorist Attack in Berlin on Various Occupational Groups of Emergency Service Personnel. *Health Secur* 2020b; 18:403-408
16. Wesemann U, Polk S, Mahnke M, Willmund G. Long-term Effects of the Terror Attack in Berlin in 2016 on Paranoid Ideation in Female Emergency Personnel. *BJPsych Open* 2020c ; 6: e79
17. Zaka A, Shamloo SE, Fiorente P, Tafuri A. COVID-19 pandemic as a watershed moment: A call for systematic psychological health care for frontline medical staff. *J Health Psychol* 2020; 25: 883-887
18. Zhu J, Sun L, Zhang L, et al. Prevalence and Influencing Factors of Anxiety and Depression Symptoms in the First-Line Medical Staff Fighting Against COVID-19 in Gansu. *Front Psychiatry* 2020; 11:386

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