

Correlates of mental health in occupations at risk for traumatization: A cross-sectional study

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Abstract

Background Hospitals, police stations, and fire departments are highly demanding work places. Staff members are regularly exposed to various stressors including traumatic events. Correspondingly, several studies report high rates of mental health issues among these occupations. Nevertheless, despite these challenging circumstances, some staff members manage to sustain their mental health. The current study is the first to investigate correlates of mental health among three different highly demanding occupations. Methods The present cross-sectional survey investigated health-benefitting factors (sense of coherence – SOC, trait resilience, locus of control – LOC) and psychopathological symptoms (general mental health problems, posttraumatic stress, burnout) in medical staff (n = 223), police officers (n = 257), and firefighters (n = 100). Results Among all occupations, SOC, trait resilience, and an internal LOC were negatively associated with general mental health problems, posttraumatic stress, and burnout symptoms. By contrast, all these outcome measures were positively correlated with an external LOC. Multiple regression models including all health-benefitting factors as predictors explained 56% of the variance in general mental health problems and 27% in posttraumatic stress symptoms. Among all occupations, SOC was the strongest predictor of both general mental health problems and posttraumatic stress symptoms. Multigroup path analyses revealed minor differences across occupations, mainly driven by a stronger influence of LOC in police officers. Conclusion Across all occupations, SOC was identified as the most important health-benefitting factor. Future longitudinal studies should further examine the causal link between health-benefitting factors and mental distress in different work places. Such studies will also allow for further development and evaluation of resilience promoting programs.

Background

Some professions are not only exposed to considerable levels of occupational stress but are also at a high risk for experiencing traumatic events. While approximately 70% of the global civilian population report the experience of a traumatic event during their lifetime [1, 2], this statistic increases to 84% for individuals working in high-risk occupations (e.g., police officers, firefighters and emergency dispatchers; [3]). Critically, individuals working in these occupations are repeatedly exposed to work-related traumatic events resulting in a cumulative burden which, in turn, increases their risk of developing mental health problems [4]. Three commonly identified high-risk occupations are medical staff [5], police officers [6, 7], and firefighters [8]. Accordingly, various studies report increased rates of burnout and depression in medical staff (e.g., [9, 10]), especially in intensive care medicine [11]. In case of police officers, symptom severity of mental health problems seem to depend on specific contextual factors: While a comparative study in the Netherlands did not find increased rates of mental health problems in police officers [12], studies conducted in Austria [13] and Sri Lanka [14] report higher rates of depression among police staff. However, the latter two lack a matched control group of other occupations with lower risks for traumatization and compare the prevalence rates to rates of the general population. Regarding firefighters, reported rates of posttraumatic stress disorder (PTSD) and other mental health problems differ considerably because of various applied cut-off scores and different (mostly self-report) instruments [15]. However, recent findings suggest high rates of mental health issues, including depression, PTSD, as well as substance abuse, and a linear relationship between the number of fatal incidents and the severity of mental health problems [16].

However, responses to occupational and operational stressors vary among employees. While some individuals experience the described mental health problems, others are able to maintain their mental health even when faced with persisting stressful circumstances [e.g., 17–19]. Based on these diverging responses to long-term stressors, it is crucial to identify factors and strategies that enable successful coping in highly demanding work places.

In this context, Aaron Antonovsky's theory of salutogenesis [20, 21] – with sense of coherence (SOC) as its key component – is closely linked to successful coping processes. SOC is defined as 'a global orientation that expresses the extent to which one has a pervasive and enduring, though dynamic, feeling of confidence that one's internal and external environments are predictable, and that there is a high probability that things will work out as well as can reasonably be expected' ([20], p. 10). In line with this definition, SOC as a resistance factor is assumed to uniquely combine behavioural, cognitive, and motivational aspects of coping and resistance [22]. With respect to work stressors, previous studies identify SOC as the most important correlate of mental health problems and posttraumatic stress in intensive care and anaesthesiology staff [23] and paramedics [24]. Moreover, recent meta-analyses underline SOC's role as a correlate of posttraumatic stress symptoms in various populations [25] and as a determinate of carer well-being in informal care-giving [26]. Consequently, higher levels of SOC are associated with lower levels of psychopathological symptoms [24] and enhanced posttraumatic growth [27] in medical staff. Similar associations of SOC and mental health problems have also been demonstrated for police officers [28] and firefighters [29].

Another concept considered to be important for maintaining mental health even under stressful circumstances is resilience [30]. However, specific conceptualizations of resilience differ: Firstly, resilience can be defined as a (rather stable) personality trait that inoculates individuals against the negative impact of stressful life events [31]. Secondly, resilience can be conceptualized as an outcome, i.e., as the absence of psychopathological symptoms after loss and potential trauma [32, 33]. Furthermore, a third conceptualisation of resilience as an active process of recovery following aversive life events has been increasingly employed in recent research [34]. Overall, resilience can be broadly defined as the ability to adapt successfully in the face of adversity, trauma, tragedy or significant threat [35].

When considering resilience as a personality trait, it is plausible to assume that it is involved in the process of coping by enabling an individual to adapt even in challenging situations, thereby contributing to a beneficial outcome in terms of fewer psychopathological symptoms. Considering related health-benefitting variables, trait resilience shows a substantial overlap with the concept of SOC: Both SOC and trait resilience are assumed to initiate, modulate, and support successful coping processes. However, both concepts have rarely been studied in a joint model with most studies focusing on either SOC or trait resilience. In this regard, various studies concentrating on trait resilience have identified associations with fewer psychopathological symptoms in medical staff [e.g., 35–37], police officers ([39, 40], but see a conflicting study by Balmer, Pooley and Cohen [41]) as well as in firefighters [42, 43].

Locus of control (LOC, [44]) is another concept that is frequently discussed as a health-benefitting factor, which shows substantial conceptual overlap with both SOC and trait resilience. LOC assesses the degree to

which individuals have the impression that events are controllable by their own actions (internal LOC) or predominantly depend on factors beyond their personal influence (external LOC). Previous research has identified an external LOC as a risk factor of posttraumatic stress symptoms [45], as a mediating factor between socioeconomic adversity and later depression [46], and as a correlate of psychopathological symptoms [47]. On the other side, an internal LOC has been demonstrated to be a protective factor against the development of psychopathological symptoms in soldiers [48] and in adolescents after an earthquake [45]. In contrast to SOC and trait resilience, LOC has not been extensively studied in different occupations. However, some studies identified LOC as an important correlate of various aspects of mental health in medical staff [49–51], police officers [52], and firefighters [53, 54].

As illustrated by the presented evidence, there is a wealth of cross-sectional research on specific health-benefitting factors. However, few studies have investigated multiple health-benefitting factors simultaneously. Considering their high conceptual overlap, such research is needed in order to investigate their unique associations with psychopathological symptoms, and to identify the most important predictors and correlates of beneficial health outcomes. While some studies have already considered different concepts and their unique impact on mental health problems [e.g., 23, 24, 54], to our knowledge, none of these studies simultaneously assessed different high-risk occupations. One cross-sectional study that assessed social resources, including SOC, in multiple uniformed services (i.e., police officers, firefighters, prison officers, security guards, and city guards), focused their analyses around a general model of health and work stress rather than on group comparisons [56]. Given this lack of research, the current study simultaneously assessed multiple health-benefitting factors (SOC, trait resilience, and LOC), as well as psychopathological symptoms (general mental health problems, posttraumatic stress symptoms, and burnout) in three high-risk occupations. The aim of the current study was to investigate the associations between health-benefitting factors and psychopathological symptoms in different occupations in order to examine their unique contributions to psychopathological symptoms. Critically, we aimed to determine whether different patterns of associations emerge for different occupations by applying multigroup path analyses.

Method

Sample recruitment

Participants were recruited online by contacting different organisations and interest groups that represent specific high-risk occupations. Specifically, we contacted trade unions for medical professions, police staff, and firefighters. Moreover, study advertisements were posted on webpages addressing members of high-risk occupations (e.g., Facebook groups sharing information on emergency care). Respondents were additionally asked to distribute the survey link at their individual work places. Sample recruitment took place between February and November 2018. During this period, 750 individuals completed the 30-minute online survey. 170 respondents were excluded since they did not work in a field of interest. The final sample thus comprised 223 respondents who worked in the field of medicine, 257 police officers, and 100 firefighters. The study protocol was approved by the ethics committee of Saarland University (no. 16 – 2). All respondents gave written informed consent in accordance with the Declaration of Helsinki [57].

Sample Characteristics

Two hundred and thirty-five women (40.52%) and 345 men (59.48%) with a mean age of 38.19 years (SD = ± 11.55 years) participated in the survey. Across different occupations, the respondents reported 16.68 years (± 11.54 years) of work experience. Sixty percent of respondents worked in shifts, with 50.51% working night and 19.82% working standby shifts.

Measures

Socio-demographic and occupational information. The survey started with 18 questions on socio-demographic characteristics (i.e., gender, marital status, etc.) and occupational information (e.g., type of profession, work experience). This was followed by a set of standardized questionnaires on respondents' current psychopathological symptom burden and health-benefitting factors.

Health-Benefitting Factors.

Sense of coherence. SOC was measured using two questionnaires. SOC as defined by Antonovsky [20] was assessed using the German 13 item short version of the Antonovsky scales (SOC-13; [58]; English original scale: [59]). SOC-13 uses a bipolar seven-point scale with a verbal anchor on each side. Additionally, SOC-Revised (SOC-R) was assessed using a 13 item questionnaire developed by Bachem and Maercker [60]. In the current sample, SOC-13 showed good internal consistency reflected in a Cronbach's alpha (α) of .84. Results of analyses focusing on SOC-R will be reported elsewhere.

Trait resilience. The Resilience Scale 11 (RS-11; [61]; English original scale: [62]) assesses general psychological resilience as a trait that enables an individual to cope with stressful life events. RS-11 was developed as a short version of the 25 item resilience scale [61]. All items are rated on a bipolar seven-point scale. In the current study its reliability was good with $\alpha = .90$.

Locus of control. The concept of locus of control was assessed using the four item brief scale for the assessment of control beliefs (IE-4; [63]). This instrument consists of two subscales comprising two items each measuring perceived internal and external control. All items are rated on a five-point scale. As expected, items of each scale were correlated, $r_{\text{internal}} = .36$, $r_{\text{external}} = .37$, and both scales were negatively correlated, $r = -.44$.

Psychopathological symptom burden.

General psychopathological symptoms. General psychological symptom burden was assessed using the German version of the Brief Symptom Inventory (BSI; [64], English original: [65]). The BSI is a 53-item self-report instrument that measures symptomatic distress using nine subscales. For this study, the global severity index (GSI) which indicates general psychopathological symptom burden was used. In the current study the GSI showed a good reliability as reflected in $\alpha = .96$.

Posttraumatic stress symptoms. Posttraumatic stress was measured using the German version of the Impact of Event Scale-Revised (IES-R; [66]; English original scale: [67]). The IES-R assesses symptoms of intrusive re-experiencing, hyperarousal, and avoidance. The questionnaire consists of 22 items each rated on a four-point scale. Item scores are transformed into a non-equidistant format (0, 1, 3, 5) resulting in a minimum total score of 0 and a maximum total score of 110. In line with previous findings [66], the IES-R showed good internal consistencies in the current sample for the total score ($\alpha = .93$).

Burnout symptoms. The German version of the Maslach Burnout Inventory – General Survey (MBI; [68]; English original scale: [69]) was used to assess burnout symptoms in different occupations. The MBI consists of 22 items assessing three domains of burnout: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). All items are rated on a seven-point scale. Psychometric properties of the scale have been shown to be sufficient [70] and were also satisfactory in the current sample reflected in high internal consistencies for all subscales ($\alpha_{EE} = .90$, $\alpha_{DP} = .75$, $\alpha_{PA} = .75$).

Data Collection And Analyses

All measures were collected using the online survey platform SoSci Survey [71]. Analyses were conducted using SPSS version 25 [72], RStudio [73] and the lavaan package [74].

Descriptive statistics were computed to illustrate sample characteristics in the terms of frequencies, means (M), and standard deviations (SD) of the variables. To assess differences between different occupations, MANOVAs and t-tests for independent samples were conducted. Bonferroni-Holm's correction [75] was applied to control for the effects of multiple testing. Pearson's bivariate correlation coefficients were used to assess the relationship between SOC, trait resilience, LOC, and health outcomes. Multiple regressions were conducted to determine the unique variance explained by each predictor variable that showed a significant bivariate correlation with the respective outcome variable. To assess the specific relevance of each predictor, multiple hierarchical regressions were conducted including each variable in the last step. The change in R^2 (ΔR^2) represents the unique amount of variance accounted for by each predictor. ΔF was used to assess the significance of ΔR^2 . Due to missing data, degrees of freedom vary between analyses. Path analyses were conducted to compare multiple regression models among different occupations. Regression models were calculated as saturated models ($df = 0$) allowing for varying path coefficients across occupations and were compared with a model constraining all regression coefficients across occupations to be equal. Differences in model fit were assessed using $\Delta\chi^2$ -tests. A significant $\Delta\chi^2$ -test indicates significant group differences concerning the regression model. In this case, further model tests were conducted to identify paths that varied significantly across occupations. Significant differences between regression coefficients were tested using z-tests as previous done by Arble, Daugherty and Arnetz [76].

Results

Demographic group differences

Sample characteristics of each occupation are presented in Table 1. Occupations differed regarding the proportion of women, $\chi^2(2) = 129.88$, $p < .001$. Police officers and firefighters included predominately male participants whereas the medical staff group comprised more women. Occupational groups also differed in mean age, $F(2, 574) = 6.37$, $p = .002$, $\eta^2 = .02$. After applying Bonferroni-Holm's correction, post-hoc tests revealed that police officers were significantly older than medical staff, $t(457) = -2.84$, $p_{\text{adjusted}} = .010$, $d = 0.27$, and firefighters, $t(345) = 3.06$, $p_{\text{adjusted}} = .006$, $d = 0.33$. There was no difference between medical staff and firefighters, $t(319) = 0.79$, $p = .431$, $d = 0.09$. Moreover, occupations differed significantly regarding their years of work experience, $F(2, 574) = 25.42$, $p < .001$, $\eta^2 = .09$. Post-hoc tests revealed that medical staff reported significantly fewer years of work experience than police officers and firefighters, $t(543) = -6.06$, $p_{\text{adjusted}} < .001$, $d = 0.52$. However, there was no difference between police officers and firefighters, $t(543) = 1.93$, $p = .054$, $d = 0.17$. Shift work was more common in medical staff and police officers than in firefighters, $\chi^2(2) = 60.11$, $p < .001$. Of those working shifts, especially police officers reported an increased number of night shifts, $\chi^2(2) = 23.26$, $p < .001$. Standby shifts were most frequent in medical staff compared to lower rates in police officers and firefighters, $\chi^2(2) = 38.94$, $p < .001$.

Table 1
Sample characteristics per occupational group

	Medical staff	Police officers	Firefighters		p
Sex (% women)	68.61	28.40	9.00	$\chi^2(2) = 129.88$	< .001
Age (in years)	37.05 (11.64)	40.05 (11.35)	35.96 (11.26)	$F(2, 574) = 6.37$.002
Job experience (in years)	12.34 (9.69)	19.82 (11.98)	17.29 (11.16)	$F(2, 574) = 25.42$	< .001
Shift work (%)	74.00	64.20	26.00	$\chi^2(2) = 60.11$	< .001
Night shifts (% of those working shifts)	76.43	93.93	69.20	$\chi^2(2) = 23.26$	< .001
Standby duty (%)	49.68	16.70	34.62	$\chi^2(2) = 38.94$	< .001

Group Differences: Psychopathological Symptoms

General psychopathological symptoms. An ANOVA with occupation as between-subject factor and GSI scores as dependent variable showed no significant group differences regarding psychopathological symptom burden, $F(2, 568) = 0.79$, $p = .455$, $\eta^2 = .00$.

Posttraumatic-stress symptoms. An ANOVA with occupation as between-subject factor and IES-R total scores as dependent variable revealed no significant group differences, $F(2, 495) = 2.31$, $p = .101$, $\eta^2 = .01$.

Burnout symptoms. A MANOVA with occupation as between-subject factor and MBI-subscale scores as dependent variables revealed significant group differences, $F(6, 1134) = 9.89, p < .001, \eta^2 = .05$. Univariate comparisons, yielded significant differences for each subscale; emotional exhaustion: $F(2, 568) = 15.27, p_{\text{adjusted}} < .001, \eta^2 = .05$; depersonalization: $F(2, 568) = 13.97, p_{\text{adjusted}} < .001, \eta^2 = .05$; personal accomplishment: $F(2, 568) = 4.98, p = .007, \eta^2 = .02$. Post-hoc tests revealed that police officers reported higher levels of emotional exhaustion than medical staff, $t(573) = 5.06, p_{\text{adjusted}} < .001, d = 0.42$, and that emotional exhaustion was higher in medical staff than in firefighters, $t(573) = -3.50, p_{\text{adjusted}} < .001, d = -0.29$. Moreover, police officers showed significantly higher rates of depersonalization compared to both other groups, $t(574) = 5.10, p_{\text{adjusted}} < .001, d = 0.43$, while medical staff and firefighters did not differ, $t(574) = -.14, p = .887, d = -0.01$. Concerning personal accomplishment, medical staff showed higher rates than both other groups, $t(569) = 3.14, p_{\text{adjusted}} = .004, d = 0.26$, while police officers and firefighters reported comparable levels, $t(569) = 0.30, p = .765, d = 0.03$.

Table 2

Means, standard deviations and group differences of health outcomes and health-benefitting factors

	Medical staff (MS)	Police officers (PO)	Fire- fighters (FF)		p	Significant post-hoc tests
Health outcomes						
General mental health problems	15.37 (5.41)	15.91 (5.29)	15.24 (6.38)	F(2, 568) = 0.79	.455	
Posttraumatic stress symptoms	29.67 (22.49)	30.31 (23.36)	24.58 (19.29)	F(2, 495) = 2.31	.101	
Burnout						
Emotional exhaustion	16.54 (10.35)	18.99 (11.17)	12.01 (10.10)	F(2, 573) = 15.26,	< .001	PO > MS > FF
Depersonalization	6.68 (5.95)	9.36 (6.44)	6.57 (5.88)	F(2, 574) = 13.80	< .001	PO > (MS = FF)
Personal accomplishment	30.21 (7.69)	28.06 (8.51)	27.77 (7.93)	F(2, 569) = 5.15	.006	MS > (PO = FF)
Health-benefitting factors						
Sense of coherence	46.58 (7.59)	45.11 (7.52)	46.84 (7.84)	F(2, 577) = 3.02	.050	PO < (MS = FF)
Trait resilience	60.94 (10.14)	60.98 (10.18)	60.02 (9.69)	F(2, 575) = 0.36	.700	
Internal LOC	4.14 (0.62)	3.94 (0.72)	4.18 (0.61)	F(2, 577) = 7.05	.001	PO < (MS = FF)
External LOC	2.40 (0.77)	2.61 (0.82)	2.34 (0.82)	F(2, 577) = 5.61	.004	PO > (MS = FF)
Note. Significant group differences are bold.						
FF = firefighters; LOC = Locus of control; MS = Medical staff; PO = police officers						

Group Differences: Health-benefitting Factors

General psychopathological symptoms. Comparing two models predicting general mental health problems based on SOC, trait resilience, internal, and external LOC allowing the regression coefficients to vary across groups or not, had no impact on the model fit, $\Delta\chi^2(8) = 12.91$, $p = .115$, indicating no differences between the occupations regarding the prediction of general mental health problems.

Posttraumatic-stress symptoms. Applying the same model comparison to posttraumatic stress, the test revealed a significant difference between models, $\Delta\chi^2(8) = 22.15$, $p < .001$. Model comparisons between models fixing regression coefficients across all groups and models allowing one path to vary across groups, revealed significant fit differences for external LOC, $\Delta\chi^2(2) = 9.25$, $p = .001$ (see Table 4 for all paths). Regarding regression coefficients, SOC descriptively remained the strongest predictor of posttraumatic stress for all occupations (see Table 5). However, external control beliefs explained a larger amount of variance in posttraumatic stress symptoms in police officers compared to firefighters, $\text{diff} = .31$, $p_{\text{adjusted}} < .001$, and medical staff, $\text{diff} = .21$, $p_{\text{adjusted}} < .001$, but there was no difference between medical staff and firefighters, $\text{diff} = .10$, $p = .111$, where external control beliefs were no longer a significant predictor of posttraumatic stress symptoms.

Burnout symptoms. Concerning burnout symptoms, the model comparison indicated significant differences across the different occupations regarding emotional exhaustion, $\Delta\chi^2(8) = 17.40$, $p = .026$, and personal accomplishment, $\Delta\chi^2(8) = 28.92$, $p < .001$, but no differences for depersonalization, $\Delta\chi^2(8) = 7.31$, $p = .504$. Concerning emotional exhaustion, model comparisons did not reveal significant fit differences for models allowing one path to vary across groups (see Table 4). Regarding personal accomplishment, model comparisons presented in Table 3 showed significant fit differences between a model fixing all regression coefficients and a model allowing one path to differ across groups for each predictor variable. However, comparing the regression coefficients between the occupations, there was only one significant difference reflected in a larger association of SOC and personal accomplishment in medical staff than in firefighters, $\text{diff} = .05$, $p_{\text{adjusted}} = .021$.

Table 4

Fit differences between models fixing all regression coefficients across groups and models allowing one path to vary across groups

Outcome	Model comparisons
Posttraumatic stress	
Sense of coherence	$\Delta \chi^2(2) = 5.67, p = .059$
Trait resilience	$\Delta \chi^2(2) = 4.55, p = .103$
Internal LOC	$\Delta \chi^2(2) = 2.18, p = .337$
External LOC	$\Delta \chi^2(2) = 9.25, p = .001$
Burnout	
Emotional exhaustion	
Sense of coherence	$\Delta \chi^2(2) = 1.20, p = .548$
Trait resilience	$\Delta \chi^2(2) = 4.41, p = .111$
Internal LOC	$\Delta \chi^2(2) = 2.84, p = .242$
External LOC	$\Delta \chi^2(2) = 0.95, p = .620$
Personal accomplishment	
Sense of coherence	$\Delta \chi^2(2) = 6.34, p = .042$
Trait resilience	$\Delta \chi^2(2) = 17.72, p < .001$
Internal LOC	$\Delta \chi^2(2) = 10.53, p = .005$
External LOC	$\Delta \chi^2(2) = 10.05, p = .007$
Note. Significant group differences are bold. LOC = Locus of control	

Table 5
Differences of path analyses between occupations

	Medical staff	Police officers	Fire- fighters	 diff 1 	P_{adjusted}	 diff 2 	P_{adjusted}	 diff 3 	p
General mental health									
Sense of coherence	<i>-.68</i>	<i>-.49</i>	<i>-.68</i>						
Trait resilience	<i>-.12</i>	<i>-.25</i>	<i>-.26</i>						
Internal LOC	.08	.04	.02						
External LOC	.02	.05	.05						
Posttraumatic stress									
Sense of coherence	<i>-.24</i>	<i>-.36</i>	<i>-.44</i>	.20	.174				
Trait resilience	.01	<i>-.15</i>	.06	.21					
Internal LOC	<i>-.14</i>	.06	<i>-.25</i>	.31					
External LOC	.07	.28	<i>-.03</i>	.31	<.001	.21	<.001	.10	.111
Burnout									
Emotional exhaustion									
Sense of coherence	<i>-.57</i>	<i>-.28</i>	<i>-.36</i>	.29					
Trait resilience	<i>-.02</i>	<i>-.25</i>	<i>-.04</i>	.23					
Internal LOC	<i>-.04</i>	<i>-.10</i>	<i>-.27</i>	.23					
External LOC	.02	.15	.11	.09					
Depersonalization									
Sense of coherence	<i>-.43</i>	<i>-.43</i>	<i>-.39</i>						
Trait resilience	<i>-.04</i>	<i>-.03</i>	.13						
Internal LOC	.09	<i>-.06</i>	<i>-.10</i>						

Note. Unstandardized coefficients are reported as estimated in the grouped path analysis. Significant regression coefficients in each group model are bolded ($p < .05$). Differences between medical staff, police officers and firefighters are italicized for emphasis. p-values are adjusted using Bonferroni-Holm's correction. Regression coefficients are grey if the model comparison in Table 4 did not indicate significant group differences.

	Medical staff	Police officers	Fire- fighters	 diff 1 	p_{adjusted}	 diff 2 	p_{adjusted}	 diff 3 	p
External LOC	- .06	- .04	.10						
Personal accomplishment									
Sense of coherence	- .44	- .43	- .39	.05	.021	.04	.082		
Trait resilience	- .04	- .03	.13	.17	.100				
Internal LOC	.09	- .06	- .10	.19	.099				
External LOC	- .06	- .04	.09	.15	.840				
<p>Note. Unstandardized coefficients are reported as estimated in the grouped path analysis. Significant regression coefficients in each group model are bolded ($p < .05$). Differences between medical staff, police officers and firefighters are italicized for emphasis. p-values are adjusted using Bonferroni-Holm's correction. Regression coefficients are grey if the model comparison in Table 4 did not indicate significant group differences.</p>									

diff 1 = Largest difference between regression coefficients that could be calculated. diff 2 = Second largest difference. diff 3 = Remaining comparison. LOC = Locus of control.

Bivariate Correlations

Table 2 shows the bivariate correlations between health-benefitting factors and different measures of psychopathological symptom burden. All health-benefitting factors were significantly correlated with mental health outcomes (all $ps < .001$). The strongest association was found between SOC and general psychopathological symptom burden, $r = -.73$, $p < .001$, indicating that a stronger SOC was related to lower symptom levels. As hypothesized, higher levels of SOC, resilience, and a stronger internal LOC were related to less severe general mental health problems, lower levels of posttraumatic stress, and fewer burnout symptoms. Conversely, stronger external control beliefs were linked to more severe general mental health problems, higher levels of posttraumatic stress, and more burnout symptoms.

Table 3

Bivariate Pearson correlations of health-benefitting factors and psychopathological symptoms

	1	2	3	4	5	6	7	8	9
SOC (1)	.84	.54**	.50**	-.53**	-.73**	-.49**	-.59**	-.44**	.42**
Resilience (2)		.90	.45**	-.31**	-.52**	-.34**	-.40**	-.23**	.48**
LOC _{internal} (3)			.36	-.44**	-.38**	-.35**	-.42**	-.24**	.33**
LOC _{external} (4)				.37	.43**	.38**	.41**	.24**	-.18**
GSI (5)					.96	.53**	.59**	.37**	-.32**
IES-R _{total} (6)						.93	.45**	.27**	-.30**
MBI _{EE} (7)							.90	.58**	-.25**
MBI _{DP} (8)								.75	-.20**
MBI _{PA} (9)									.75
Note. The diagonal shows the reliabilities (Cronbach's α).									
** $p < .001$									
SOC = Sense of coherence; LOC = Locus of control; GSI = Global Severity Index as measured by the Brief Symptom Inventory; IES-R = Impact of Event Scale-Revised; MBI = Maslach Burnout Inventory; MBI _{EE} = MBI Emotional exhaustion; MBI _{DP} = MBI Depersonalization; MBI _{PA} = MBI Personal accomplishment									

Regression Models

General psychopathological symptoms. A multiple regression showed that 56% of general mental health problems were explained by SOC, trait resilience, and internal and external control beliefs, $F(4, 566) = 179.30$, $p < .001$. All predictors except for internal control beliefs, $\beta = .05$, $t(566) = 1.33$, $\Delta R^2 = .00$, accounted for a unique amount of variance in symptom severity [SOC, $\beta = -.61$, $t(566) = -16.10$, $\Delta R^2 = .20$, $p < .001$, trait resilience, $\beta = -.19$, $t(565) = -5.57$, $\Delta R^2 = .02$, $p < .001$, external control beliefs, $\beta = .07$, $t(565) = 2.16$, $\Delta R^2 = .00$, $p = .031$].

Posttraumatic-stress symptoms. Regarding posttraumatic stress, 27% of variance in symptom severity could be collectively explained by the set of health-benefitting factors, $F(4, 493) = 45.18$, $p < .001$. However, only SOC, $\beta = -.33$, $t(493) = -6.13$, $\Delta R^2 = .06$, $p < .001$, and an external LOC, $\beta = .15$, $t(493) = 3.20$, $p = .001$, $\Delta R^2 = .02$, accounted for unique amounts of variance.

Burnout symptoms. Together, SOC, trait resilience, and LOC explained 38% of the variance of symptoms of emotional exhaustion, $F(4, 571) = 88.19$, $p < .001$. On a single predictor level, all variables were significant

predictors of emotional exhaustion, with SOC being the strongest, $\beta = -.43$, $t(571) = -9.63$, $\Delta R^2 = .10$, $p < .001$, followed by internal LOC, $\beta = -.12$, $t(571) = -2.98$, $\Delta R^2 = .01$, $p = .003$, external LOC, $\beta = .10$, $t(571) = 2.58$, $\Delta R^2 = .01$, $p = .005$, and trait resilience, $\beta = -.09$, $t(571) = -2.16$, $\Delta R^2 = .01$, $p = .003$. Regarding depersonalization, only 19% of the variance were explained by all predictors, $F(4, 572) = 33.70$, $p < .001$, whilst only SOC accounted for an unique amount of variance, $\beta = -.42$, $t(572) = -8.31$, $\Delta R^2 = .10$, $p < .001$. Concerning personal accomplishment, the set of predictors accounted for 28% of the variance, $F(4, 567) = 53.79$, $p < .001$. Trait resilience was the strongest predictor, $\beta = .43$, $t(567) = 7.84$, $\Delta R^2 = .08$, $p < .001$, followed by SOC, $\beta = .23$, $t(567) = 4.70$, $\Delta R^2 = .03$, $p < .001$, an internal LOC, $\beta = .10$, $t(567) = 2.27$, $\Delta R^2 = .01$, $p = .024$, and an external LOC, $\beta = .09$, $t(567) = 2.02$, $\Delta R^2 = .01$, $p = .045$. See Appendix A for a table presenting all regression results.

Discussion

For the first time, the current study assessed multiple health-benefitting factors and their associations with psychopathological outcomes across different high-risk occupations, that is, medical staff, police officers, and firefighters. SOC was identified as the most important correlate of mental health problems across different occupations. While all health-benefitting factors were found to collectively explain 56% of the variance in general mental health problems and 27% of the differences in posttraumatic-stress, SOC emerged as the strongest predictor for both outcome variables, accounting for 20% of variance in general mental health problems and 6% in posttraumatic stress symptoms. SOC was also the strongest predictor of the burnout subscales of emotional exhaustion and depersonalization symptoms and explained an equal amount of variance as trait resilience in personal accomplishment scores. Moreover, path analyses investigating group differences in the regression models, did not reveal differences for general mental health problems, but found significant differences between occupations for posttraumatic stress and burnout symptoms (except for depersonalization).

The current findings are in line with previous research that identified SOC as an important correlate of mental health problems across different occupations [e.g., 24, 25, 54, 55]. Comparing different health-benefitting factors, SOC's particularly strong association with several mental health outcomes may result from its conceptualization as the most comprehensive resistance factor, uniquely combining cognitive, motivational, and behavioral aspects that are essential in dealing with various stressors [22]. However, other aspects might also be of interest: In contrast to previous findings from our group [23, 24], trait resilience as well as internal and external control beliefs also accounted for significant amounts of variance in general mental health problems and posttraumatic stress. Nonetheless, in terms of effect sizes, SOC remained the strongest correlate of health outcomes. The significant associations with trait resilience and control beliefs might thus be driven by the large sample in our study (but see Streb et al. [24] with $N = 668$ paramedics), which also allowed for the identification of smaller predictors. However, despite SOC's role as an important correlate of mental health, its vague conceptual boundaries have been debated [60]. SOC's strong correlations with other constructs, including depression, anxiety, and neuroticism, challenge its role as an independent concept [77, 78] as they suggest that SOC might constitute an inverse measure of psychopathology. However, there is no substantial overlap in item content between the SOC scales [59] and

standard measures of depression or anxiety. Furthermore, SOC increases over time and is found to be particularly strong in older adults [22, 79], whereas the exact inverse course was not observed for measures of mental health issues [80]. Thus, reducing SOC to an inverse measure of psychopathology seems inappropriate. Irrespective of their overlap with other measures, the SOC scales developed by Antonovsky [59] seem to provide an efficient way of assessing different health-benefitting aspects that show a substantial and robust association with various aspects of mental health.

With respect to group differences, path analyses did not identify differences between the occupations for general mental health problems, which in turn showed the strongest association with the investigated health-benefitting factors. In contrast, the predictors accounted for differential amounts of variance per group for posttraumatic stress. Across all occupations SOC remained the strongest predictor of posttraumatic stress. Interestingly, within the police group as opposed to medical staff and firefighters, an external LOC was found to be a significant and strong predictor for posttraumatic stress. Coincidentally, police officers reported significantly higher levels of an external LOC and significantly lower levels of internal control beliefs and SOC, suggesting an important role of control beliefs in police officers. In line with these findings, prior studies investigating LOC in police staff reported an association of external control beliefs and perceived levels of stress [e.g., 80, 81]. Moreover, a recent cross-sectional study by Arble, Daugherty and Arnetz [76] investigated approach- and avoidance-based coping strategies in Swedish police officers and other non-military first responders. In accordance with the current findings, they mainly report similarities in coping processes and well-being across different first responders. However, avoidant coping, which describes strategies to avoid direct considerations of emotions and thoughts as well as triggering stimuli related to stressful events, was particularly relevant in police officers. Such coping strategies showed a stronger association with poor well-being and less posttraumatic growth in police officers than in other first responders. In line, a recent study reported a positive association of passive coping strategies and PTSD symptoms [83]. The current study identified control beliefs as an important correlate of PTSD symptoms, particularly in police officers. Thus, further studies in different occupations should investigate the relationship between control beliefs and avoidant coping, which may be caused by stronger external and weaker internal control beliefs, and might act as a mediator between control beliefs and psychopathological symptoms as shown previously in firefighters [53]. However, given the cross-sectional nature of both studies, these findings do not address if individuals with low levels of internal and high levels of external control beliefs and avoidant coping strategies tend to choose a career in the police or if specific occupational and operational stressors during police work impact on control beliefs. Furthermore, differences in personality between high-risk occupations, as they have been shown between police officers and firefighters [84], may impact both the choice of occupation and responses to stressors. As the directionality of this association is of critical relevance for potential interventions targeted at the promotion of health-benefitting factors in occupations at risk for mental distress, longitudinal studies are urgently required. Further, these studies should also focus on stressors that are specifically relevant to individual occupations, which might influence the differential relevance of health-benefitting factors between these occupations.

While general mental health problems and posttraumatic stress clearly showed the strongest association with SOC, burnout symptoms, which have not been addressed in prior studies [23, 24, 56], demonstrated a more diverse pattern of associations across different burnout symptom clusters. Depersonalization and

emotional exhaustion, which showed the strongest correlations with psychopathological symptoms, were mainly predicted by SOC. However, trait resilience was the strongest predictor of personal accomplishment. Our findings are in line with prior studies that have already identified strong associations between SOC and burnout especially in medical staff [85–87], between trait resilience and burnout [36, 88, 89], as well as between control beliefs and burnout [50, 51]. Moreover, as opposed to general mental health problems and posttraumatic stress, occupations differed regarding burnout symptoms. In line with previous studies that described a distinct pattern of results for police staff [76], this study found medical staff and firefighters to report lower levels of burnout symptoms. Together these findings indicate the presence of particular strain within the police [90–92], but see: [12]. However, given that the current data constitute the first investigation of burnout symptoms within the context of multiple health-benefitting factors across different occupations in a large sample, results should be interpreted with caution. Particularly considering that some studies identified problems with the factorial validity of the MBI scales specifically in heavily burdened populations [93, 94].

Limitations

The present study has several limitations: Firstly, our findings show that SOC, trait resilience, and LOC are correlates of psychopathological symptoms. However, no causal conclusions can be drawn from the current study: On the one hand, it is plausible to assume that these factors might play an important role in the development and course of mental health problems. On the other hand, the results might equally reflect that SOC, trait resilience, and an internal LOC are impaired by current mental health problems and posttraumatic stress. Also, a third variable might underlie the relationship between health-benefitting factors and psychopathological symptoms. Thus, only longitudinal studies in large samples will give insight into the causal influence of health-benefitting factors on psychopathological symptoms and their development. Such studies may also assess a wider range of health-benefitting factors (e.g., openness, optimism, self-efficacy, and sense of mastery) and include a broader assessment of health including physical aspects.

Secondly, the present study did not assess occupational stressors. As these stressors are assumed to influence both health-benefitting factors and levels of psychopathological symptoms, future studies should include respective measures. In order to assess a large sample size across different occupations, we limited the number of measures to ensure that survey participation was not too time consuming. However, future research should consider assessing both occupational and operational stressors.

Future Research

The majority of studies on mental health problems in different occupations is cross-sectional in design, limited to specific aspects of health and investigates only a small set of health-benefitting factors [95]. Future research should address these shortcomings by including multiple health-benefitting factors in order to further identify, both their unique association with several health outcomes and their overlapping aspects. Consequently, some of the discussed factors may become subordinate as they might only explain minor proportions of redundant variance. Furthermore, such studies should also include posttraumatic growth as

an outcome measure as it has been shown to be associated with both health-benefitting factors [27] and psychopathological symptoms [96]. Moreover, there is a strong need for longitudinal studies addressing the predictive value of several health-benefitting factors across longer periods of time. A further shortcoming of current research is that some of the very rare longitudinal studies only assess health-benefitting factors after prior exposure to several stressors. This may have already impaired health-benefitting factors which might influence their assessment [97, 98]. Future large-scale studies should assess health-benefitting factors as early as possible and more than twice to identify their causal influence on emerging psychopathological symptom burden. Such studies may also allow for further development and evaluation of resilience promoting programs, which have shown to be effective also in non-clinical samples [99].

Conclusions

The current study is the first to address the association of psychopathological symptoms and various health-benefitting factors across different high-risk occupations (medical staff, police officers, and firefighters). Across all occupations, sense of coherence was the strongest correlate of general mental health problems, posttraumatic stress and burnout symptoms. Furthermore, burnout symptoms were strongly correlated with trait resilience. Overall, predictors of mental health problems were similar across occupations. However, in contrast to medical staff and firefighters, external control beliefs explained a unique amount of variance in police officers in both general mental health problems and posttraumatic stress suggesting an important role of control beliefs in police officers.

Abbreviations

BSI: Brief Symptom Inventory; FF: firefighters; GSI: Global Severity Index as measured by the Brief Symptom Inventory; IES-R: Impact of Event Scale-Revised; IE-4: A 4-item brief scale for the assessment of control beliefs; LOC: locus of control; MBI: Maslach Burnout Inventory; MBI_{DP}: MBI Depersonalization; MBI_{EE}: MBI Emotional exhaustion; MBI_{PA}: Personal accomplishment; MS: medical staff; PO: police officers; PTSD: posttraumatic stress disorder; SOC: sense of coherence; SOC-R: SOC-Revised; RS-11: Resilience Scale 11

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

SKS designed the study, organized sample recruitment, analyzed and interpreted the data, drafted the article and prepared the final manuscript. MRS, JLH and TM contributed to conception and design of the study, supported the interpretation of the data and commented on manuscript drafts. MS contributed to data analysis and interpretation, and commented on the manuscript drafts. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The study protocol was approved by the ethics committee of Saarland University (no. 16-2). All respondents gave written informed consent before they participated in the study in accordance with the Declaration of Helsinki [57].

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

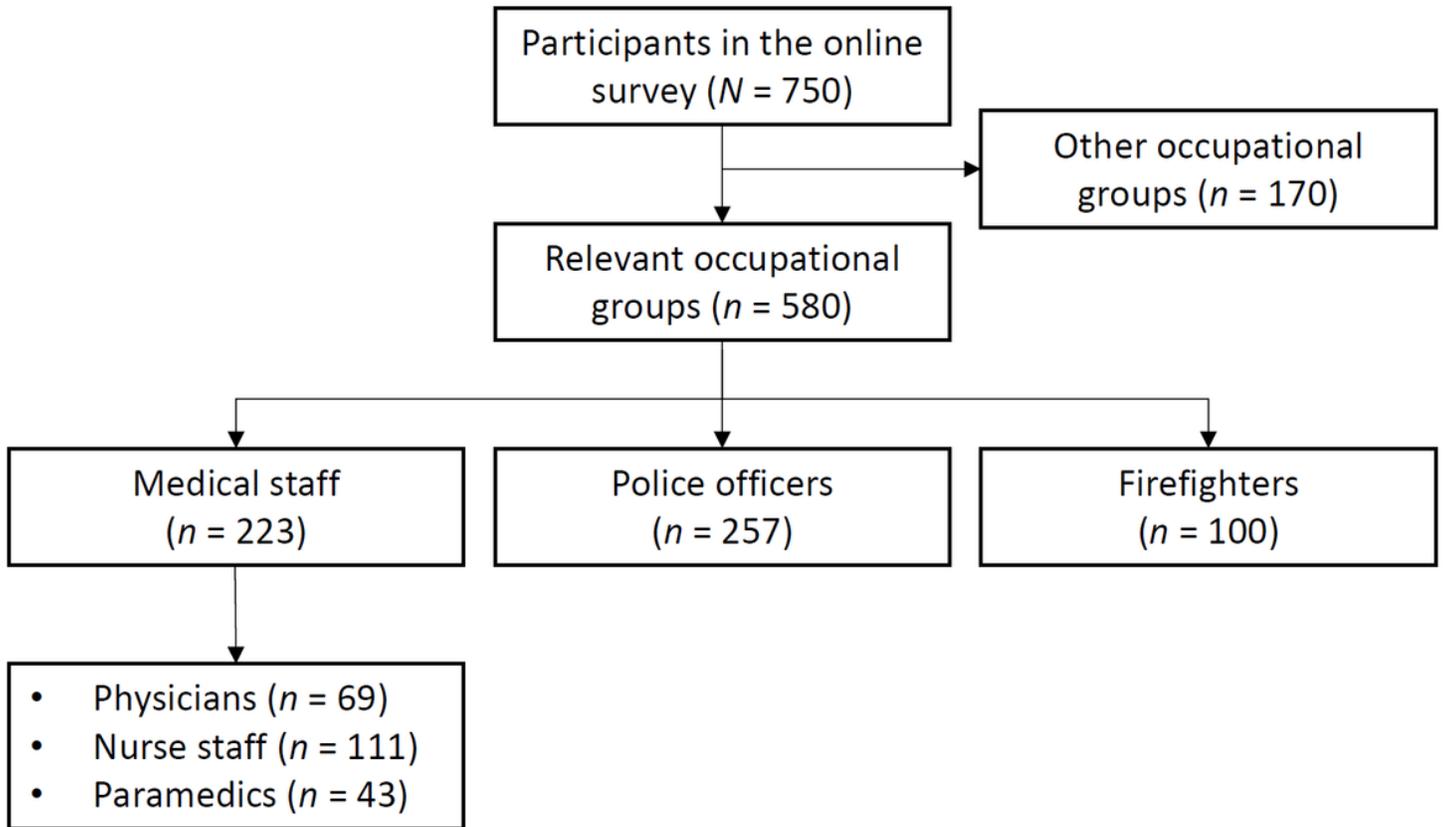


Figure 1

Flow chart of the study sample

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