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RESEARCH NOTE

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Resilience and mindfulness among radiological personnel in Norway, their relationship and their impact on quality and safety– a questionnaire study

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Abstract

Background Stress and burnout are widespread problems among radiological personnel Individual and organizational resilience and mindfulness offer protection against burnout.

Aim To investigate the level of resilience and mindfulness among radiological personnel, the associations between organizational resilience, individual resilience, and mindfulness, and how these factors impact the quality of care provided in radiological departments.

Methods An online questionnaire consisting of the Connor-Davidson Resilience Scale, the Mindful Attention Awareness Scale, the Benchmark Resilience Tool, and questions regarding burnout, and quality and safety was used. Data analysis consisted of descriptive statistics, bivariate correlation and standard multiple regression.

Results and Conclusion Few participants considered burnout a significant challenge. Individual and organizational resilience were low (30.40 ± 4.92 and 63.21 ± 13.63 respectively), and mindfulness was high (4.29 ± 0.88). There was a significant correlation between individual and organizational resilience (p = 0.004), between individual resilience and mindfulness (p = 0.03), and between organizational resilience and mindfulness (p = 0.02). Individual and organizational resilience affect each other. However; neither significantly affect quality and safety, nor mindfulness

Keywords Individual resilience, Organizational resilience, Mindfulness, Quality and safety

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Introduction

Stress and burnout are widespread problems among radiological personnel [1–11]. Different forms of mindfulness, ranging from formal meditation to more informal attention to day-to-day tasks, can prevent and reduce burnout among radiological personnel [3]. Another strategy for reducing stress and burnout among health professionals is promoting individual resilience [4, 9, 12]. Mindfulness and resilience could also affect the quality of care, due to their effectiveness in reducing stress and burnout [2, 5, 13].

Organizational resilience regards an organization's ability to manage change, bounce back from setbacks and maintain desirable functions and outcomes under pressure. This is influenced by for example leadership practices and human capital [14]. Some studies show a link between individual resilience and organizational resilience, and that these two types of resilience affect each other [15–17].

The objective of this study is to investigate the level of resilience and mindfulness among radiological personnel, the associations between organizational resilience, individual resilience, and mindfulness, and how these factors impact the quality of care provided in radiological departments.

Main text

Materials and methods

Design and setting

This study utilized a cross-sectional design to collect data on resilience, mindfulness, and the quality and safety of care among healthcare workers and their departments. The study is set within radiological departments in Norway, which encompasses both public hospitals and private institutions.

Population, study size and recruitment

The study population consisted of radiologists, registrars, radiographers, and radiation therapists. Participants were selected based on the following eligibility criteria; (a) they had a valid authorizations and (b) they currently worked in a clinical setting. According to an online sample size calculator (surveymonkey.com) the estimated sample size needed for this study, based on population size, 95% CI and 5% margin of error, was approximately 356 participants, which was not reached.

Participants were recruited in collaboration with the Norwegian Society of Radiographers and the Norwegian Radiological Association. These associations posted the link to a digital, online questionnaire on social media and their newsletter, resulting in probability sampling. Recruitment lasted from July 18th to October 5th 2022 and included a total of 4783 members.

Variables, data sources and measurement

The variables of interest in this study were individual resilience, mindfulness, organizational resilience, and quality and safety. Background variables that were used were public vs. private setting, and how leaders address burnout. All these variables were measured through a questionnaire consisting of six parts.

Not all parts had a Norwegian version available. The researcher, following the steps described by the Norwegian Directory of Health, translated this from English to Norwegian. Too see the interview guide used in the validation of the translated questionnaire, see supplementary file 2.

Part 1 was designed by the researcher to collect demographic data about the respondent. This included profession, workplace (public vs. private), department size and whether their position included personnel management.

Part 2 is the Norwegian Connor-Davidson Resilience Scale (CD-RISC-10), which is used to assess the ability to respond and adapt to life adversity, trauma, tragedy, threats or other major life stressors [18].

Part 3 is the five item Mindfulness Attention Awareness Scale (MAAS) translated to Norwegian by Smith et al. This scale measures the extent to which an individual can attend to, and remain aware of, experiences in the present moment [19]..

Part 4 is the short version of the Benhmark Resilience Tool (BRT 13), which assesses behavioral traits and perceptions linked to the organization's ability to plan for, respond to, and recover from emergencies and crises (organizational resilience) [20].

Parts 5 and 6 are aimed at specific groups. Part 5 was intended for respondents with personnel management roles and was only made available for the respondents who answered they had such roles. These questions were inspired by the questionnaire developed by Parikh et al. (2020) to evaluate a leader's effectiveness in detecting burnout among employees, and the tools used to measure burnout among employees [21].

Part 6 was intended for radiographers and radiotherapists and only made available for those listing these as their profession. The researcher designed the questions to evaluate the aspects of quality and safety in radiology that may be affected by stress and mindfulness. To see the questionnaire in its entirety, see supplementary file 1.

Statistical analysis

All analyses were performed using IBM SPSS version 26.0. Cronbach's α was measured to further validate the translated parts of the questionnaire. A low value could indicate poor translation.

Demographic data, the score for individual and organizational resilience and mindfulness are described using frequencies and means. See Figs. 1, 2, 3, 4 and 5 for tests

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CDRS1 to CDRS10	,113	68	,030	,961	68	,031
MAAS1 to MAAS5	,097	68	,183	,975	68	,184
BRT1 to BRT 13	,113	68	,031	,944	68	,004
QS1 to QS8	,159	62	<,001	,942	62	,006

a. Lilliefors Significance Correction

Fig. 1 Tests of normality. Table produced by SPSS describing the tests of normality that were performed on all main variables: individual resilience (CDRS1 to CDRS10), mindfulness (MAAS1– MAAS5), organizational resilience (BRT1 to BRT13), and quality and safety (QS1 to QS8). This includes the Kolmogorov - Smirnov and Shapiro - Wilk tests. The significance value (Sig.) under 0.05 indicates that the variables individual resilience, organizational resilience and quality and safety are not normally distributed. This does not necessarily indicate a problem with the scale used, but rather reflects the underlying nature of the construct being measured. In the case of resilience previous studies have shown this to be low among radiological personnel, which can explain why this variable is somewhat skewed. Low organizational resilience can explain why this variable is skewed, and high quality and safety can explain why this variable is skewed even if there are no problems with the scales themselves. Further inspections of normality are shown in figures 2, 3, 4 and 5

of normality performed for all main variables. Bivariate correlation using Spearman's rho was used for correlation analysis, and standard multiple regression was used to further explore the relationships between the variables.

Three models for multiple linear regression were used. In the first model, individual resilience was used as the dependent variable (is individual resilience affected by organizational resilience and mindfulness?). In the second model, organizational resilience was used (is organizational resilience affected by individual resilience and mindfulness), and in the third, quality and safety were used as the dependent variable (is quality and safety affected by both types of resilience and mindfulness?)

The model building supports the use of these models. Even if mindfulness might be a confounding factor with individual resilience (see Fig. 6 and limitations for the discussion of its effect), there are no obvious interacting variables (see Fig. 7), and bivariate correlation shows some relationship between most of the variables (see Fig. 8), in addition to the literature indicating that these variables have some effect on each other.

The significance level was set at $P<0.05$ for all tests performed.

Results

The Cronbach's α scores ranged from 0.72 to 0.89, indicating internal consistency in all parts of the questionnaire. Thirty-one radiologists, 8 registrars, 24 radiographers and 5 radiotherapists completed the questionnaire (total=68). Most respondents worked in a public setting (88%), and 67% worked in moderate to large departments. Eleven respondents (16%) had a personnel management role. Of those 11 respondents, 12.9% considered burnout a significant challenge among their employees. Approximately 1.7% of the respondents considered themselves to be very effective at detecting burnout, and 81% reported using a tool to detect employee

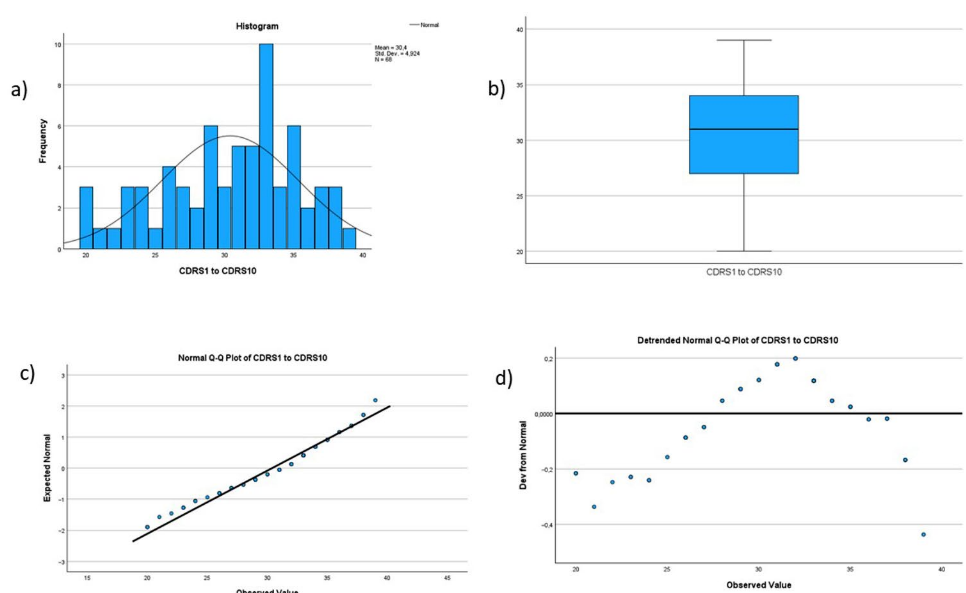


Fig. 2 Histogram, boxplot, and Q-Q Plots for the variable individual resilience. The histogram (labeled a in the figure) shows that the data are not entirely normally distributed but have a peak to the left. However, the data are not severely skewed. The boxplot (labeled b in the figure) shows no outliers. The Normal Q-Q Plot (labeled c in the figure) shows a reasonably straight line, indicating that the data are not entirely normally distributed, but are not severely skewed. Last, the Detrended Normal Q-Q Plot (labeled d in the figure) show no clustering of points, indicating that the data are not severely skewed for this variable

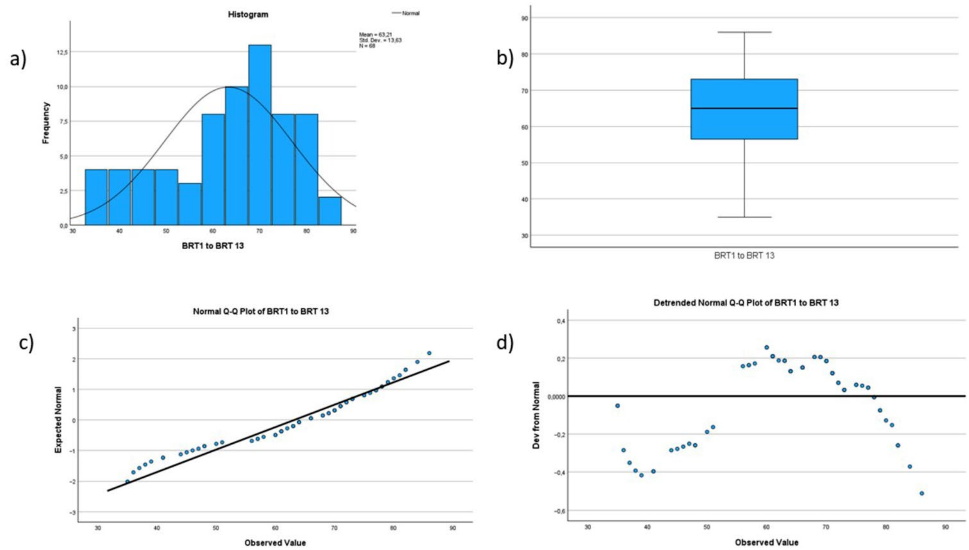


Fig. 3 Histogram, boxplot and Q-Q Plots for the variable organizational resilience. The histogram (labeled a in the figure) shows that the data are not entirely normally distributed but are somewhat skewed to the left. However, the data are not severely skewed. The boxplot (labeled b in the figure) shows no outliers. The Normal Q-Q Plot (labeled c in the figure) shows a reasonably straight line, indicating that the data are not entirely normally distributed, but are not severely skewed. Last, the Detrended Normal Q-Q Plot (labeled d in the figure) show no clustering of points, indicating that the data are not severely skewed for this variable

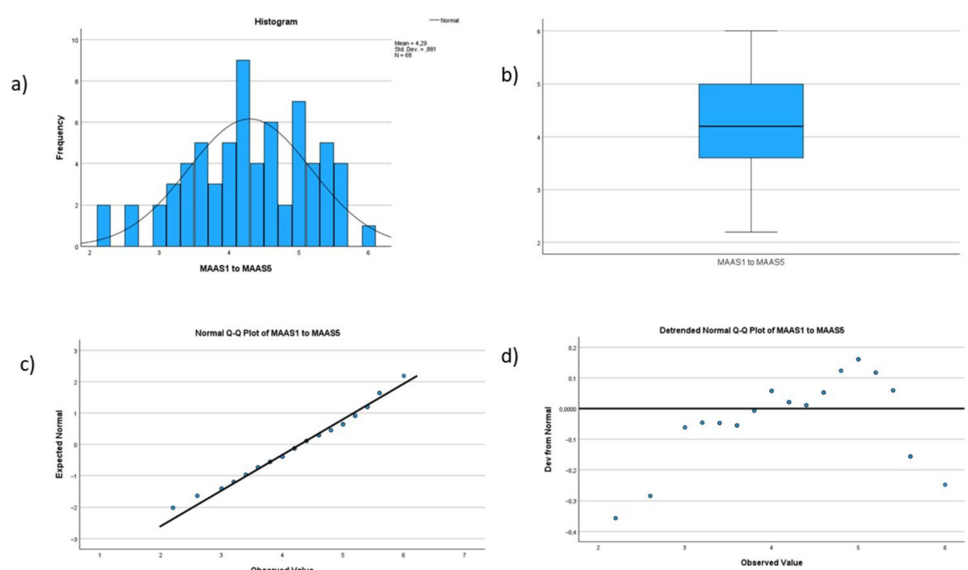


Fig. 4 Histogram, boxplot and Q-Q Plots for the variable mindfulness. The histogram (labeled a in the figure) shows that the data are reasonably normally distributed. The boxplot (labeled b in the figure) shows no outliers. The Normal Q-Q Plot (labeled c in the figure) is showing a reasonably straight line, indicating that the data is normally distributed. Last, the Detrended Normal Q-Q Plot (labeled d in the figure) shows no clustering of points, indicating that the data are not skewed for this variable.

burnout. The tools used were personal development interviews (55%), questionnaires (33%) and work environment surveys (11%).

The CD-RISC-10 total score was 30.40±4.92, BRT 13 was 63.21±13.63, and MAAS was 4.29±0.88. The highest scores were for those working in the private sector. The total score for quality and safety was 17.79±3.31. The public sector scored slightly lower than the private sector (17.83 vs. 18.20), and departments with the fewest labs (>5) had the lowest score (16.00±0.44), indicating higher quality.

The relationship between individual resilience, organizational resilience, mindfulness and quality and safety was investigated using bivariate correlation (Spearman's rho is reported). This was chosen when preliminary analysis indicated some violations of normality (see Figs. 1,

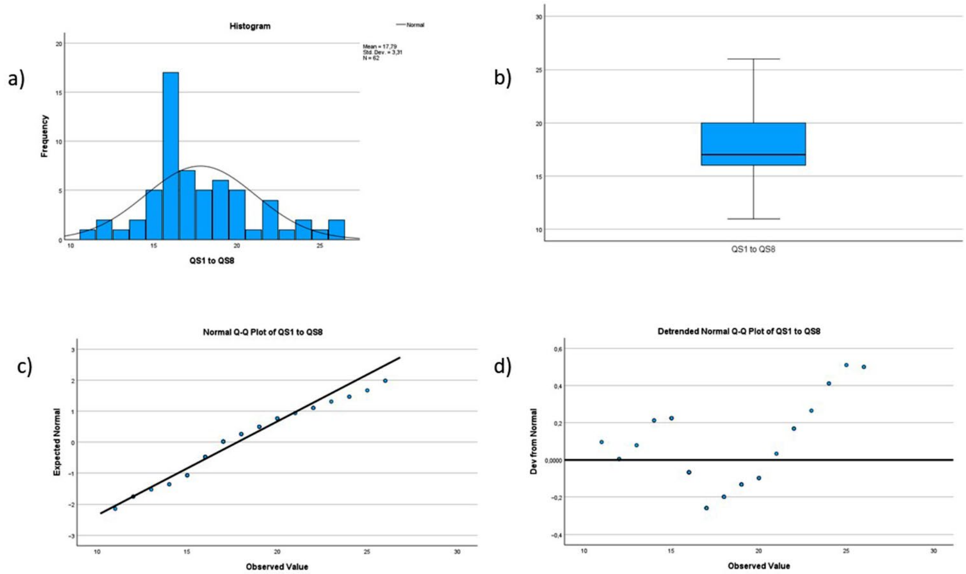


Fig. 5 Histogram, boxplot and Q-Q Plots for the variable quality and safety. The histogram (labeled a in the figure) shows that the data are not entirely normally distributed but have a peak to the right. However, the data are not severely skewed. The boxplot (labeled b in the figure) shows no outliers. The Normal Q-Q Plot (labeled c in the figure) shows a reasonably straight line, indicating that the data are not entirely normally distributed, but are not severely skewed. Last, the Detrended Normal Q-Q Plot (labeled d in the figure) show no clustering of points, indicating that the data are not severely skewed for this variable.

2, 3, 4 and 5). There was a small, positive correlation between mindfulness and individual resilience ($\rho=0.27$, $n=62$, $p=0.03$), and between mindfulness and organizational resilience ($\rho=0.28$, $n=62$, $p=0.02$). There was also a moderate, positive correlation between individual and organizational resilience ($\rho=0.35$, $n=62$, $p=0.004$). See Fig. 8 for more information obtained from the bivariate correlation.

Standard multiple regression was performed to further explore the relationship between these variables, as described in the statistical analysis. The models revealed no strong violations of normality, linearity, or multicollinearity (Figs. 9, 10 and 11), and residual analysis showed model fit (Fig. 12). Model 1 showed that 13.8% of the variance in individual resilience could be explained by organizational resilience and mindfulness (adjusted R squared 0.138, intercept=18.79, F=6.37, $p=0.003$, VIF=1.08), with organizational resilience providing the largest unique contribution ($\beta=0.31$, $p=0.01$) (see Fig. 9 for more information).

Similar results were seen for model 2, where 13.9% of the variance in organizational resilience could be explained by individual resilience and mindfulness (adjusted R squared 0.139, intercept=24.49, F=6.39, $p=0.003$, VIF=1.08). Individual resilience provided the largest unique contribution ($\beta=0.31$, $p=0.01$) (see Fig. 10) Model 3 showed no statistically significant findings (adjusted R squared 0.03, intercept=19.62, F=0.63, $p=0.59$, VIF=1.12) (see Fig. 11).

Discussion

Only a minority of respondents (12.9%) considered burnout a significant challenge among their employees, and a majority (81%) reported having a tool in place for detecting burnout. This contradicts a previous study indicating that most leaders in the radiological field consider burnout a significant challenge among their employees, with only a minority having tools available to detect burnout [21]. This difference in results could be explained by differences in what is considered a tool for detecting burnout. In this questionnaire, the respondents consider development interviews, questionnaires, and work environment surveys as tools for detecting burnout, whereas respondents in previous studies might utilize these tools, but not consider them tools for detecting burnout.

The total CD-RISC-10 and BRT 13 scores indicate relatively low individual and organizational resilience among the respondents, which is consistent with previous studies [22, 23]. This has been attributed to stress, frustration, lack of stress buffers, increased complexity of tasks, less resources, time constraints and worrying about the effect of diagnostic error on patient care [22, 23]. At the same time, these studies demonstrated a high degree of optimism, indicating confidence in respondents' ability to overcome the difficulties at hand [22, 23].

Based on the correlation analysis there is a small, but positive relationship between the two types of resilience. This relationship is further validated through the standard multiple regression. The similar effects of individual and organizational resilience contradict a previous study

a)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	23,857	2,900		8,228	<,001	18,067	29,646					
	MAAS1 to MAAS5	1,523	,662	,273	2,302	,025	,202	2,844	,273	,273	,273	1,000	1,000
2	(Constant)	18,791	3,375		5,568	<,001	12,050	25,531					
	MAAS1 to MAAS5	1,047	,659	,187	1,590	,117	-,268	2,363	,273	,194	,180	,925	1,081
	BRT1 to BRT 13	,112	,043	,311	2,641	,010	,027	,198	,363	,311	,299	,925	1,081

a. Dependent Variable: CDRS1 to CDRS10

b)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	45,045	8,025		5,613	<,001	29,023	61,067					
	MAAS1 to MAAS5	4,229	1,831	,273	2,310	,024	,573	7,885	,273	,273	,273	1,000	1,000
2	(Constant)	24,494	10,937		2,240	,029	2,651	46,336					
	MAAS1 to MAAS5	2,917	1,823	,189	1,601	,114	-,723	6,557	,273	,195	,181	,926	1,080
	CDRS1 to CDRS10	,861	,326	,311	2,641	,010	,210	1,513	,363	,311	,299	,926	1,080

a. Dependent Variable: BRT1 to BRT 13

c)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	16,680	2,120		7,869	<,001	12,440	20,920					
	MAAS1 to MAAS5	,259	,484	,069	,535	,595	-,709	1,226	,069	,069	,069	1,000	1,000
2	(Constant)	19,169	3,008		6,372	<,001	13,150	25,188					
	MAAS1 to MAAS5	,417	,501	,111	,833	,408	-,586	1,421	,069	,108	,107	,926	1,080
	CDRS1 to CDRS10	-,104	,090	-,155	-1,163	,250	-,284	,075	-,125	-,150	-,149	,926	1,080
3	(Constant)	19,621	3,141		6,247	<,001	13,334	25,909					
	MAAS1 to MAAS5	,471	,514	,126	,917	,363	-,558	1,501	,069	,120	,118	,891	1,123
	CDRS1 to CDRS10	-,088	,095	-,132	-,931	,356	-,279	,102	-,125	-,121	-,120	,836	1,196
	BRT1 to BRT 13	-,018	,034	-,076	-,538	,592	-,087	,050	-,089	-,071	-,070	,836	1,197

a. Dependent Variable: QS1 to QS8

Fig. 6 Tests for confounding factors in the models. To check for confounding factors the models were built by adding in one independent variable at a time. In model 1 (labeled a in the figure), where individual resilience is the dependent variable and mindfulness and organizational resilience are the independent variables, mindfulness might be a confounding variable. This is indicated by a change in the β-value (and standardized β-value) that is rather large. However, the large CI makes this change less worrisome. In model 2 (labeled b in the figure), where organizational resilience is the dependent variable and individual resilience and mindfulness are the independent variables a similar challenge occurred. This can indicate that the confounding might be between mindfulness and individual resilience. However, the CI is still large enough that the change in value in mindfulness is not worrisome. In the third and last model (labeled c in the figure), mindfulness still might be a confounding variable with individual resilience based on the change in its β-value when individual resilience is introduced which is not seen when organizational resilience is introduced to the model. The change in beta-value is the largest in this model, and the smaller CI makes this change more worrisome than in the other two models. The change in β-values and large CI can also, in part, be explained by the correlation between these factors and the relationship between them that has been established in previous studies. Since the evidence for confounding is not that strong and the indication of confounding is between two factors with a known correlation the choice was made to perform the statistical analysis as planned.

showing that organizational resilience enables the resilient behavior of employees, and the capability to cope and learn at the individual level [24].

The correlation analysis further supports the claim that these are closely linked, and that it is important to take both in consideration when applying interventions to improve occupational health among healthcare workers. The need for not only individual, but also systematic, change has been demonstrated in previous studies [3–5, 8].

Although this study shows indications of relatively high mindfulness, the results regarding quality and safety demonstrate that small mistakes that can be made under stress and time constraints are still somewhat frequent. This contradicts previous studies indicating that higher mindfulness and resilience increase the quality and safety of care [3, 13]. The discrepancy may be attributable to variations in how different studies measure the quality of care. It is also possible that different studies measured mindfulness with different tools.

In conclusion: both individual and organizational resilience are somewhat low in Norwegian radiological departments, and mindfulness is somewhat high. There is a positive relationship between both types of resilience and mindfulness; however, resilience affects each other more than mindfulness. Quality and safety do not seem to be affected by either resilience or mindfulness.

Limitations

Variables such as gender, age, and seniority (which were not included in this study) could have an effect that is not demonstrated in this study and could account for some of the differences between this and previous studies.

Another limitation of this study is the small sample size, which did not reach the suggested number of participants needed. Small sample sizes can have a negative

a)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	,011	,117		,090	,929
	Zscore: MAAS1 to MAAS5	,178	,122	,178	1,457	,150
	Zscore: BRT1 to BRT 13	,312	,119	,312	2,625	,011
	moderator_BRT_MAAS	-,039	,107	-,043	-,363	,718

a. Dependent Variable: Zscore: CDRS1 to CDRS10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,407[a]	,166	,127	,93454736

a. Predictors: (Constant), moderator_BRT_MAAS, Zscore: BRT1 to BRT 13, Zscore: MAAS1 to MAAS5

b)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	,036	,118		,306	,761
	moderator_CDRS_MAAS	-,134	,129	-,118	-1,036	,304
	Zscore: CDRS1 to CDRS10	,303	,118	,303	2,571	,012
	Zscore: MAAS1 to MAAS5	,195	,118	,195	1,652	,104

a. Dependent Variable: Zscore: BRT1 to BRT 13

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,422[a]	,178	,140	,92753092

a. Predictors: (Constant), Zscore: MAAS1 to MAAS5, moderator_CDRS_MAAS, Zscore: CDRS1 to CDRS10

c)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-,005	,129		-,041	,968
	Zscore: CDRS1 to CDRS10	-,134	,142	-,132	-,938	,352
	Zscore: MAAS1 to MAAS5	,129	,138	,127	,934	,354
	Zscore: BRT1 to BRT 13	-,029	,152	-,028	-,192	,848
	moderator_BRT_CDRS_MAAS	-,120	,149	-,112	-,804	,425

a. Dependent Variable: Zscore: QS1 to QS8

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,201[a]	,041	-,027	1,01329976

a. Predictors: (Constant), moderator_BRT_CDRS_MAAS, Zscore: CDRS1 to CDRS10, Zscore: MAAS1 to MAAS5, Zscore: BRT1 to BRT 13

Fig. 7 Tests for interacting variables. To check for interaction between variables the Z-scores for the variables were used, as well as moderator-variables. The Z-scores are a variable standardized to have a standard deviation of 1 and a mean of 0. The moderation-variable is the product of the independent variables in the planned regression model, which is then added to the regression model. To confirm if a variable has a moderation effect on the relationship between an independent variable and a dependent variable, the nature of this relationship must change once the moderator variable changes. In this case there does not seem to be any interacting factors, since the moderator variable is not statistically significant in either model 1 (labeled a in the figure), model 2 (labeled b in the figure) or model 3 (labeled c in the figure). This is further supported by the fact that the R Squared or adjusted R squared did not significantly change between this model and the model run with the actual variables, indicating that the relationship between the variables has not changed

Correlations

			CDRS1 to CDRS10	MAAS1 to MAAS5	BRT1 to BRT 13	QS1 to QS8
Spearman's rho	CDRS1 to CDRS10	Correlation Coefficient	1,000	,269*	,348**	-,162
		Sig. (2-tailed)	.	,027	,004	,208
		N	68	68	68	62
	MAAS1 to MAAS5	Correlation Coefficient	,269*	1,000	,284*	,050
		Sig. (2-tailed)	,027	.	,019	,700
		N	68	68	68	62
	BRT1 to BRT 13	Correlation Coefficient	,348**	,284*	1,000	-,037
		Sig. (2-tailed)	,004	,019	.	,773
		N	68	68	68	62
	QS1 to QS8	Correlation Coefficient	-,162	,050	-,037	1,000
		Sig. (2-tailed)	,208	,700	,773	.
		N	62	62	62	62

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Fig. 8 Bivariate correlation using Spearman's Rho. The correlation analysis revealed that there are statistically significant relationships between mindfulness and individual resilience (ρ = 0.27, n=62, p= 0.03), between mindfulness and organizational resilience (ρ = 0.28, n=62, p= 0.02), and between individual and organizational resilience (ρ = 0.35, n=62, p= 0.004). There are no variables that are significantly correlated with quality and safety, however. Even if it is not statistically significant, there seems to be a small, negative relationship between quality and safety and individual resilience (ρ = -0.16, n=62, p=0.21). This could indicate that there is a relationship between these variables that could be worth exploring even if their relationship is not statistically significant in this test.

effect on linear regression analysis, mainly affecting the validity of the results, and to some extent, the transferability of the results to other contexts.

However, both the correlation and the linear regression showed the same relationship between individual and organizational resilience, indicating that the results regrading that correlation are valid. The findings are also still transferable for quality improvement projects and future research.

Last, there were some indications of multicollinearity in model 2 (dependent variable=organizational resilience), and mindfulness might be a confounding factor with individual resilience. However, there were no strong indications for this, so the analysis was performed as planned. Due to the indications of multicollinearity and confounding being very weak, any effects of this were also expected to be minimal.

a)

Coefficients model 1[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95,0% Confidence Interval for B Lower Bound	95,0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	18,791	3,375		5,568	<,001	12,050	25,531					
	MAAS1 to MAAS5	1,047	,659	,187	1,590	,117	-,268	2,363	,273	,194	,180	,925	1,081
	BRT1 to BRT 13	,112	,043	,311	2,641	,010	,027	,198	,363	,311	,299	,925	1,081

a. Dependent Variable: CDRS1 to CDRS10

b)

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions MAAS1 to MAAS5	Variance Proportions BRT1 to BRT 13
1	1	2,952	1,000	,00	,00	,00
	2	,031	9,835	,01	,54	,73
	3	,018	12,829	,99	,46	,26

a. Dependent Variable: CDRS1 to CDRS10

c)

Correlations

		CDRS1 to CDRS10	MAAS1 to MAAS5	BRT1 to BRT 13
Pearson Correlation	CDRS1 to CDRS10	1,000	,273	,363
	MAAS1 to MAAS5	,273	1,000	,273
	BRT1 to BRT 13	,363	,273	1,000
Sig. (1-tailed)	CDRS1 to CDRS10	.	,012	,001
	MAAS1 to MAAS5	,012	.	,012
	BRT1 to BRT 13	,001	,012	.
N	CDRS1 to CDRS10	68	68	68
	MAAS1 to MAAS5	68	68	68
	BRT1 to BRT 13	68	68	68

d)

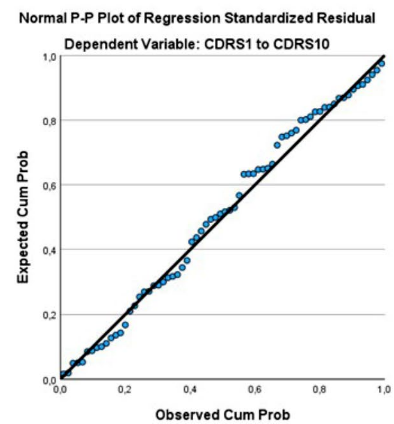


Fig. 9 Summary of model 1. There do not appear to be any problems with multicollinearity in this model (tolerance <0.10, VIF-values >10 in the table labeled a in the figure, only one dimension with a variance proportion <0.90 in the table labeled b in the figure, and small correlation between the independent variables, the Pearson Correlation being 0.27, as seen in the table labeled c in the figure). There do not seem to be any outliers in the model, and the reasonably straight line in the Normal P-P Plot (labeled d in the figure) indicates normality of the data. The Adjusted R Square of the model is 0.138 (13.8% of the variance in individual resilience can be explained by the independent variables), which is statistically significant (F=6.38, p= 0.003). Organizational resilience contributed the largest, and statistically significant, unique contribution to the equation (Beta=0.31, p=0.01, as seen in the table labeled a in the figure)

a)

Coefficients model 2[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95,0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	24,494	10,937		2,240	,029	2,651	46,336					
	CDRS1 to CDRS10	,861	,326	,311	2,641	,010	,210	1,513	,363	,311	,299	,926	1,080
	MAAS1 to MAAS5	2,917	1,823	,189	1,601	,114	-,723	6,557	,273	,195	,181	,926	1,080

a. Dependent Variable: BRT1 to BRT 13

b)

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	CDRS1 to CDRS10	MAAS1 to MAAS5
1	1	2,962	1,000	,00	,00	,00
	2	,025	10,778	,06	,25	,94
	3	,012	15,515	,94	,75	,06

a. Dependent Variable: BRT1 to BRT 13

c)

Correlations

		BRT1 to BRT 13	CDRS1 to CDRS10	MAAS1 to MAAS5
Pearson Correlation	BRT1 to BRT 13	1,000	,363	,273
	CDRS1 to CDRS10	,363	1,000	,273
	MAAS1 to MAAS5	,273	,273	1,000
Sig. (1-tailed)	BRT1 to BRT 13	.	,001	,012
	CDRS1 to CDRS10	,001	.	,012
	MAAS1 to MAAS5	,012	,012	.
N	BRT1 to BRT 13	68	68	68
	CDRS1 to CDRS10	68	68	68
	MAAS1 to MAAS5	68	68	68

d)

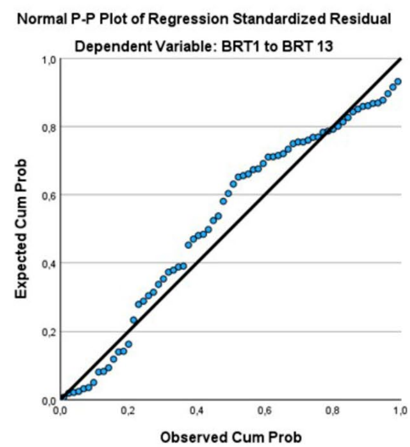


Fig. 10 Summary of model 2There could be a small challenge with multicollinearity in this model. Tolerance <0.10, and VIF-values >10 in the table labeled a in the figure, does not indicate any problems, but there are two dimensions with a variance proportion <0.90 in the table labeled b in the figure, which can indicate some problems with multicollinearity. However, the correlation between the independent variables is low enough (Pearson Correlation =0.27) that it is not worrisome. There do not seem to be any outliers in the model, and the reasonably straight line in the Normal P-P Plot (labeled d in the figure) indicates normality of the data. The models Adjusted R Square is 0.139 (13.9% of the variance in organizational resilience can be explained by the independent variables), which is statistically significant (F=6.39, p= 0.003). Individual resilience contributed the largest, and statistically significant, unique contribution to the equation (Standardized β=0.31, p=0.01, as seen in the table labeled a in the figure)

Coefficients model 3[a]

a)

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95,0% Confidence Interval for B Lower Bound	95,0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	19,621	3,141		6,247	<,001	13,334	25,909					
	MAAS1 to MAAS5	,471	,514	,126	,917	,363	-,558	1,501	,069	,120	,118	,891	1,123
	BRT1 to BRT 13	-,018	,034	-,076	-,538	,592	-,087	,050	-,089	-,071	-,070	,836	1,197
	CDRS1 to CDRS10	-,088	,095	-,132	-,931	,356	-,279	,102	-,125	-,121	-,120	,836	1,196

a. Dependent Variable: QS1 to QS8

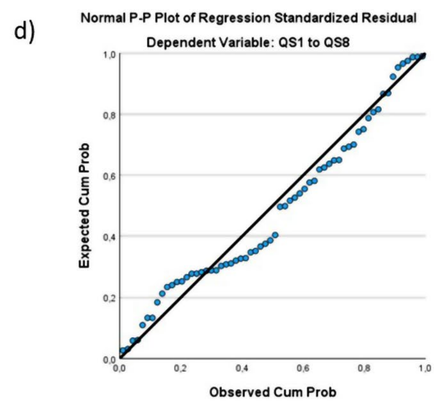
Collinearity Diagnostics[a]

b)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions MAAS1 to MAAS5	Variance Proportions BRT1 to BRT 13	Variance Proportions CDRS1 to CDRS10
1	1	3,934	1,000	,00	,00	,00	,00
	2	,031	11,352	,00	,57	,60	,00
	3	,023	13,090	,12	,38	,40	,32
	4	,012	17,893	,87	,05	,00	,67

a. Dependent Variable: QS1 to QS8

d)



Correlations

c)

		QS1 to QS8	MAAS1 to MAAS5	BRT1 to BRT 13	CDRS1 to CDRS10
Pearson Correlation	QS1 to QS8	1,000	,069	-,089	-,125
	MAAS1 to MAAS5	,069	1,000	,273	,273
	BRT1 to BRT 13	-,089	,273	1,000	,363
	CDRS1 to CDRS10	-,125	,273	,363	1,000
Sig. (1-tailed)	QS1 to QS8	.	,297	,245	,167
	MAAS1 to MAAS5	,297	.	,012	,012
	BRT1 to BRT 13	,245	,012	.	,001
	CDRS1 to CDRS10	,167	,012	,001	.
N	QS1 to QS8	62	62	62	62
	MAAS1 to MAAS5	62	68	68	68
	BRT1 to BRT 13	62	68	68	68
	CDRS1 to CDRS10	62	68	68	68

Fig. 11 Summary of model 3There do not appear to be any problems with multicollinearity in this model (tolerance <0.10, VIF-values >10 in the table labeled a in the figure, no dimension with a variance proportion <0.90 in the table labeled b in the figure, and small correlation between the independent variables, the Pearson Correlation ranging from -0.12 to 0.07, as seen in the table labeled c in the figure). There do not seem to be any outliers in the model, and the reasonably straight line in the Normal P-P Plot (labeled d in the figure) indicates normality of the data. The models Adjusted R Square is -0.018 indicating that the independent variables do not have enough predictive value. The model is not statistically significant (F=0.64, p= 0.59).

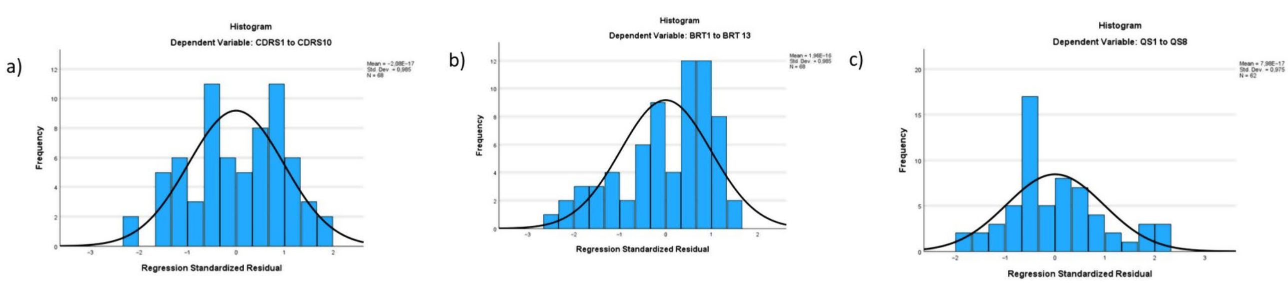


Fig. 12 Residual analysis for model fit. Based on the residual analysis all three models have a reasonably good fit. All residuals are somewhere between -3 and 3 in all models (model 1 is labeled a in the figure, model 2 is labeled b, and model 3 is labeled c in the figure), indicating a reasonably good fit. In model 3 (labeled c), all residuals are somewhere between -2 and 2, indicating that this model might have the best fit out of the three. The residuals are also reasonably normally distributed for models 1 and 3 (labeled a and c), further supporting that the models have a good fit. For model 2 (labeled b in the figure) the residuals seem to be somewhat skewed to the left; however, they are not skewed enough that they indicate a problem with the fit of the model.

Abbreviations

BRT	Benchmark Resilience Tool
CDRS	Connor-Davidson Resilience Scale
MAAS	Mindfulness Attention Awareness Scale
NSD	Norwegian Social Science Data Services
SPSS	Statistical Package for Social Sciences

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13104-024-06748-1.

Supplementary Material 1

Supplementary Material 2

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Not applicable.

Author contributions

AMG was responsible for the conception and design of the study and this paper, collection and analysis of data, and the writing of the manuscript.

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Data availability

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

Declarations

Ethics approval and consent to participate

The study was submitted to, and approved by, the Norwegian Social Science Data Services (NSD) (Ref. 616162, 28 March 2022). Ethical approval was given based on how data were going to be archived and processed in regard to privacy / data protection. NSD does not have an ethics committee / IRB but is a national data protection agency. However, NSD did confirm that no further ethical approval from a Norwegian Regional Ethical Committee (REK) was necessary based on the type of study being conducted and the data being collected. All participation was voluntary and consented. Participants were informed about the study during recruitment, as well as when the link to the questionnaire was opened. Here more detailed information regarding what the study entailed for participants was provided. Consent was given when participants chose to proceed and answer the survey. Informed consent was obtained from all subjects participating in the study. The questionnaire and all other methods used in this project were carried out in accordance with relevant guidelines and regulations, as provided by the Norwegian Social Science Data Services (NSD) (Ref. 616162, 28 March 2022).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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