

Navigating the depths: exploring seafarers' psychological well-being on board, anchored by the mediating role of resilience and loneliness

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ABSTRACT

Background: This study investigates seafarers' loneliness as a mediating variable between psychological well-being and resilience, and tests resilience as a mediating variable between psychological well-being and loneliness. It also examines the challenges faced by seafarers on different types of ships and evaluates the mediating roles of resilience and loneliness.

Materials and methods: The research uses descriptive data analysis, reliability analysis, correlation analysis, and mediation analysis with bootstrap-based regression models. An online survey was conducted with 471 active Turkish seafarers using a sociodemographic questionnaire and three standardized scales measuring psychological well-being (PW), loneliness at work (LAW), and psychological resilience (PR). Data were collected between 01/07/2023 and 01/09/2023.

Results: The findings indicate that ship type is a significant factor in the mediating roles of loneliness at work and psychological resilience. There is a partial mediating role of loneliness at work and resilience in psychological well-being across different ship types. Specifically, loneliness at work partially mediates the relationship between psychological resilience and psychological well-being among seafarers on tanker or bulk carrier vessels, but not on container vessels.

Conclusions: The study concludes with suggestions to address the mental health challenges faced by seafarers, emphasizing the importance of ship type in the mediating roles of loneliness and resilience. Regarding the mediating role of loneliness at work, it has been determined that there is partial mediation between psychological resilience and psychological well-being among seafarers working on tanker or bulk carrier vessels. However, on container vessels, loneliness at work does not mediate the relationship between psychological well-being and psychological resilience. Based on these findings, the authors conclude by offering a range of helpful solutions to address this problem.

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Keywords: loneliness at work, psychological well-being, resilience, seafarers, maritime industry, life on board, isolation, mental health

INTRODUCTION

Shipping is essential to the worldwide supply chain since it offers a very energy-efficient means of transporting goods like chemicals, oil, textiles, and other items [1].

Currently, more than 90% of shipping is essential to global trade [2]. When it is the case, seafarers are essential to the secure and effective operation of the world's maritime transportation sector, and the COVID19 pandemic has

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highlighted the crucial function of the seafarer workforce around the world [3]. Seafaring is a difficult profession on a daily basis, with demanding schedules, loneliness while imprisoned in small spaces, melancholy, and anxiety [4]. The world's 1.6 million seafarers have experienced anxiety during the pandemic due to closed cities and borders, transit ports forbidding shore leave and crew changes, welfare visits to ships being prohibited, and the lack of a predictable or clear end to these restrictions [5]. Seafarers often complain of social isolation, which was already a problem due to their typical way of life on board but has been made worse by the reduction in crew size, shortened ship turnaround times, and lack of shore leave [6]. Being a crew member on a cargo ship is a hazardous job. When compared to the general population, seafarers who work on commercial vessels are more likely to be at risk for illnesses, mental struggles and injuries since they spend weeks to months at sea, are far from home, and have access to few medical services [7]. The isolation and separation from loved ones can lead to feelings of loneliness, which can have significant consequences for their mental and physical health. Unlike most other professions, seafarers are occasionally on board during both working and non-working hours, 24 hours a day, and are thus frequently cut off from the outside world [8, 9].

The state of invisibility and abandonment at sea that seafarers are currently experiencing is merely an aggravation of the vulnerability that is perpetually present in seafarers' typical working conditions. Even harder, in accordance with the hierarchical organizational structure of the maritime industry, seafarers are required to obey the directives and instructions of their superiors, even if they disagree with them completely unless they're willing to lose their job. Consequently, seafarers have trouble using a venting approach to deal with pressure, venting approach — a method of psychotherapy wherein individuals receive support and are encouraged to express their negative emotions — thus preventing their accumulation and subsequent release at inappropriate moments, which would explain the nonsignificant effect of reassessment where the results indicate that there is no statistically significant impact. In the context of seafaring, a hierarchical organizational framework is observed, necessitating seafarers' adherence to directives and instructions issued by their superiors, even in instances where they may not fully concur with them [10]. Also, seafarers are always at risk for physical injuries and psychological stress, even when working on ships registered in nations that adhere to labour and environmental laws, health and safety requirements, and other legislations. Since contemporary cargo ports are frequently located distant from urban centres, and ship unloading and loading turnaround times are now so quick that seafarers rarely receive enough shore leave. These

concerns include their own well-being, the health of their families, their current and future employment opportunities, and their ability to make ends meet. After examining existing literature, the purpose of this paper is to shed light on the topic of loneliness at sea and its impact on the psychological well-being and resilience of seafarers on board and the mediating role of resilience in between loneliness and psychological well-being.

LITERATURE REVIEW

MEDIATING ROLE OF LONELINESS AT WORK IN BETWEEN PSYCHOLOGICAL WELL-BEING AND RESILIENCE

It is crucial to understand that the term “mental health” refers to more than just the absence of mental illness; rather, it denotes a psychological state that enables the individual to live contentedly [11]. Long work shifts, long-term contracts, being away from home, having a poor social life on board, and worrying that they won't receive proper medical care in the event of illnesses or any psychological assistance on board in case of anxiety, stress, depression etc. are the main causes of seafarers' declining mental health [12]. Establishing social connections on board merchant ships can be challenging due to cultural diversity and linguistic obstacles, which worsen the sensation of loneliness [13]. When determining what elements contribute to mental problems in seafarers, doctors and psychologists frequently discussed the unique aspects of working at sea [14]. This decline may be exacerbated by several conditions, including social isolation and loneliness [15]. Social isolation, inadequate sleep/fatigue, a lack of recreational opportunities, and multicultural crews are all listed as potential stressors in recent studies examining seafaring [16]. Lefkowitz et al. [17] uncovered the significant issue of mental illness within a neglected, marginalized, and globally indispensable workforce. According to Mellbye and Carter, [18] loneliness at sea is a problem that is exacerbated by stress, particularly when navigating for extended periods of time (8–10 months), and it is related to being apart from one's family for a long time [19]. It has been stated that loneliness plays a key role in vulnerable individuals committing suicide, particularly those who work or live especially in isolated environments like the open sea. Seafarers may overindulge in drink or tobacco to make up for their isolation [14, 17, 20, 21]. One of the most important things that makes working at sea attractive for seafarers is income. It is particularly important to underline that the findings of Song et al. [22] suggest that there are other factors that influence seafarers' well-being besides income such as service time on board, fatigue, stress, isolation, family relations, communication facilities on board. Additionally, there is room for improvement in seafarers' working and personal conditions.

In literature, the mediating role of loneliness has been investigated in numerous studies. Vismara et al. [23] in the research held on 330 Italian individuals found that loneliness has a direct impact on mental health issues and mediates the connection between insecure patterns of attachment and symptoms of anxiety connected to the COVID-19, which in turn, positively predict mental health issues. On the other hand, Autry [24] conducted research on the impact of loneliness and resilience on the psychosocial health of cyberbullying victims in a college population. Findings have shown that loneliness acts as a mediator between cyberbullying and detrimental psychosocial effects. The depression, anxiety and stress scale revealed that those who supported engaging in cyberbullying and experiencing feelings of isolation also experienced higher levels of anxiety, depression, and stress. Asanjarani et al. [25] investigated the effects of parental involvement, resilience, and loneliness on pupils' subjective well-being during the COVID-19 pandemic in Iran. The results also showed that loneliness and resilience played a partial role in mediating the link between parental participation and students' subjective well-being. This paper aims to investigate deeply seafarers' loneliness as a mediating variable between psychological wellbeing and resilience, and to test seafarers' resilience as a mediating variable between psychological wellbeing and loneliness.

Therefore, in this research we hypothesize:

H1: Loneliness has a mediating effect in the relationship between psychological well-being and resilience.

MEDIATING ROLE OF RESILIENCE BETWEEN PSYCHOLOGICAL WELL-BEING AND LONELINESS

Resilience is a value that has drawn a lot of attention in the field of positive psychology. It is characterized as the capacity to “bounce back” after hardship [26, 27]. The propensity to see change and difficult situations as potential chances for personal development and learning rather than as a threat is the final sign of a strong sense of challenge [28]. Literature emphasizes understanding resilience as a learnable capacity that can be increased and nurtured through training interventions rather than seeing it as a particular individual feature [29, 30]. The resilience-testing tools were recently conducted by Ahern et al. [31]. They concentrated on six different constructs with the six measures they used, including “protective variables that promote resiliency”, “successful stress-coping ability”, “key protective resources of health adjustment”, “resilient coping behaviour”, and “resilience as a positive personality traits characteristic that enhances individual adjustment”. Research on the consequences of health crisis in Spain has revealed that life satisfaction and resilience are important mediators in the relationship between sadness, anxiety, and stress symptoms in adolescents and young

adults and COVID-19-related worries [32]. Calvo et al. [33] aimed to research how resilience, psychological inflexibility, and dispositional mindfulness mediate the association between attachment orientations and psychological well-being. Higher degrees of attachment anxiety and attachment avoidance were found to be correlated with worse levels of psychological well-being, according to correlation analyses. While investigating the impact of attachment styles on seafarers' well-being, the significance of factors such as attachment anxiety and avoidance has been underscored. Understanding how these factors influence seafarers' levels of well-being contributes crucial insights to the study's objective. Therefore, the investigation and control of these factors are highlighted as fundamental focal points of the research. Findings revealed that the association between attachment orientations and well-being was fully controlled by dispositional mindfulness, psychological rigidity, and resilience. Both attachment anxiety and attachment avoidance have been shown to dramatically lower one's well-being by lowering their resilience and mindfulness and raising their psychological rigidity. As an example, a study conducted by Mikulincer and Shaver [34] found that attachment anxiety and attachment avoidance significantly diminish individuals' mental resilience and mindfulness while increasing their psychological rigidity, thereby adversely affecting their well-being. On the other hand, Labrague [35] revealed that the pandemic-related stress 301 Filipino student nurses faced was at a high level, yet their resilience, life satisfaction, and psychological well-being were found to be moderate to high. Life satisfaction and psychological health were shown to be worse when pandemic-related stress levels were higher. Additionally, resilience was demonstrated to reduce the detrimental impacts of pandemic-related stress on the psychological health and life satisfaction of student nurses. According to research by Doyle et al. [28], longer sea service, more instrumental work support, and self-reported higher resilience levels were all substantially associated with lower levels of self-reported stress at sea. Gerino et al. [36] confirmed that resilience and mental health mediate the relationship between loneliness and both mental and physical well-being in older individuals. These findings show that loneliness affects both mental and physical quality of life, and that its effects are mediated by resilience and mental health. On the other hand, Ozbag [37] reported that psychological resilience completely mediates the association between job stress and subjective well-being in seafarers. Both the psychological well-being of the seafarers and the contributions of their spouses play a very important role in the psychological resilience of the seafarers. Another study proved that resilience, relationship satisfaction, perceived social support, and usage of stress coping mechanisms all have a significant role in explaining

the mental health of seafarers' partners [38]. McVeigh et al. [20, 21] endeavoured to explore the perceptions and experiences of well-being, resilience, and stress among a cohort of merchant mariners and superintendents. Two important themes interconnected the findings. Participants highlighted recent changes in relation to fewer possibilities to release stress and to increase resilience due to decreased socialization and shore leave. Regarding the significance of a fair workplace, participants mentioned the second, organizational justice.

Thus, we hypothesize:

H2: Resilience mediates the association between psychological well-being and loneliness.

MATERIALS AND METHODS

MEDIATION ANALYSIS

The mediation analysis was conducted in several steps. First, we estimated the direct effect of X (independent variable) on Y (dependent variable) by regressing Y on X. This step provides an estimate of the total effect of X on Y. Second, we estimated the effect of X on M (mediator variable) by regressing M on X. This step provides an estimate of the relationship between X and M. Third, we estimated the effect of M on Y while controlling for X by regressing Y on both M and X. This step provides an estimate of the direct effect of M on Y while controlling for the effect of X. The indirect effect of X on Y through M was calculated as the product of the coefficients for the effect of X on M and the effect of M on Y while controlling for X. This indirect effect represents the portion of the total effect of X on Y that is mediated by M. The indirect effect was tested using a bootstrap confidence interval [39]. If the confidence interval does not include zero, it suggests that there is a significant indirect effect and thus evidence of mediation. If the direct effect of X on Y while controlling for M is not statistically significant, it suggests full mediation. If the direct effect is still statistically significant, it suggests partial mediation [40].

STATISTICAL ANALYSIS

This section of the study presents the results of descriptive data analysis, reliability analysis, correlation analysis, and mediation analysis using bootstrap-based regression models. Normality of the data was assessed using the Shapiro-Wilk test. Spearman correlation analysis was performed to examine relationships between non-normally distributed scale scores. The reliability of the three scales used in the study was evaluated using Cronbach's alpha coefficients. To evaluate the mediator role of loneliness at work among seafarers, we performed bootstrap-based mediation analysis using the regression-based approach proposed by Hayes [41], which estimates indirect, direct, and total effects through the use of bootstrap resampling

techniques. Mediation analysis results were obtained using regression models, with indirect, direct, and total effects estimated based on 5000 bootstrap samples. The 'psych' package [42] in R software was used for statistical analysis. The significance level was set at $p < 0.05$ for all analyses.

MEASURES

The online survey consisted of a sociodemographic questionnaire and three standardized scales measuring psychological well-being (PW), loneliness at work (LAW), and psychological resilience (PR) in Turkish seafarers. All measures were administered in Turkish.

Psychological resilience (PS)

The scale was developed by Smith et al. [43] to measure the psychological resilience of individuals. The short psychological resilience scale is a 5-point Likert-type, 6-item, self-report-style measurement tool. After the reverse-coded items in the scale were translated, higher scores indicated higher psychological resilience.

Psychological Well-Being (PW)

The "Psychological Well-Being" scale, which was developed by Diener et al. [44] to measure socio-psychological well-being and to complement existing measures of well-being, was used. The eight-item Psychological Well-Being Scale describes important elements of human function, from positive relationships to feelings of efficacy to having a meaningful and purposeful life.

Loneliness at work (LAW)

The Loneliness at Work Scale (LAWS) was developed by Wright, Burt, and Strongman [45] and uses an easy-to-use and short self-report style scale that subjectively assesses loneliness experienced at work. LAWS is a seven-point Likert-type scale consisting of 16 items. The original scale consists of two sub-dimensions, 'emotional deprivation' and 'social friendship'.

CHARACTERISTIC VARIABLES OF THE PARTICIPANTS

The survey was conducted anonymously and on a voluntary basis solely among Turkish seafarers (fluent in Turkish) working at sea. Approximately 600 survey links were sent out, out of which 471 fully completed the questionnaire. The response rate was 78.66%. Questionnaire links were sent out to seafarers both working at sea and on leave at home. We carried out a cross-sectional survey with $n = 471$ seafarers. The data for the survey was collected between 07/2023 and 09/2023 entirely in accordance with ethical guidelines. Our sample size is ten times greater than the scale items, so it is sufficient for

the statistical analyses. We selected the participants via random sampling. Seafarers' age, gender, income, ship type, civil status, seafaring time experience, position on board, and income were all questioned. Gender and sexual orientation were provided as open-ended questions and classified as a posteriori whereas age was recorded as a continuous variable. Measurements of gender and marital status used a dichotomous format (yes or no). Ordinal scales with various response possibilities were used to measure the remaining variables. The age groups were created with a deliberate emphasis on achieving a balanced distribution in sample sizes. Notably, these groupings encapsulate the diverse socio-economic contexts represented by the participants. Importantly, our samples exhibit a balanced distribution across age cohorts, with an ample sufficiency of observations therein.

In Table 1, the descriptive findings of the characteristic variables in the study can be found. In terms of age, the largest group was in the 26–35 age range (36.9%). In terms of gender, the majority of participants were men (91.3%), while women represented a small percentage (8.7%). Regarding marital status, most participants were single (56.5%). Concerning income, the largest group earned less than \$2000 (38.9%). Regarding ship type, the largest group was in the dry cargo category (45.0%). Concerning seafaring time, the largest group had less than 5 years of experience (49.3%). Regarding positions at sea, the most common were cadets (18.9%), followed by 2nd officer (15.9%), 3rd officer (10.8%), master mariner (11.5%), and chief engineer (5.1%). Other positions at sea were less common, with percentages ranging from 0.8% to 7.6%.

DESCRIPTIVE AND INFERENTIAL FINDINGS OF THE SCALES

Table 2 shows the descriptive statistics, correlation results and reliability coefficients for the scale scores utilized in the research. In Table 2, Cronbach's Alpha values were presented to demonstrate internal consistency. Notably, our approach, as elucidated by Hayes [41], does not presuppose adherence to specific assumptions such as normality. The utilization of bootstrapping methodology ensures robustness against non-normal distributions inherent in the data. Given the reliance solely on numerical data within this methodological framework, no particular assumptions are imposed. Based on the Cronbach's alpha coefficients, all scales, including psychological well-being, psychological resilience, and loneliness at work, were quite reliable. The correlation results indicate a significant and negative relationship between loneliness at work and both psychological well-being and psychological resilience ($p < 0.05$). In addition, a significant positive relationship was observed between psychological well-being and psychological resilience ($p < 0.05$).

Table 1. Sociodemographic characteristics distribution of the seafarers

Characteristics	Group	n	%
Age	< 26	132	28.10
	26–35	174	36.94
	36–45	107	22.72
	> 45	58	12.31
Gender	Man	430	91.30
	Woman	41	8.70
Marital status	Single	266	56.48
	Married	205	43.52
Income	< \$2000	183	38.85
	\$2001–4000	84	17.83
	\$4001–6000	98	20.81
	\$6001–8000	34	7.22
	\$8001–10000	30	6.37
	> \$10001	42	8.92
Ship type	Container	85	18.10
	Dry cargo	212	45.01
	Tanker	174	36.94
Seafaring time	< 5 years	232	49.26
	6–10 years	85	18.05
	11–15 years	61	12.95
	> 15 years	93	19.75
Position on board	1st officer	36	7.64
	2nd engineer	20	4.25
	2nd officer	75	15.92
	3rd engineer	13	2.76
	3rd officer	51	10.83
	4th engineer	4	0.85
	Cook	6	1.27
	Chief engineer	24	5.10
	Electrotechnical officer	8	1.70
	Fitter	4	0.85
	Seaman	7	1.49
	Steward	5	1.06
	Master Mariner	54	11.46
	Donkeyman	11	2.34
	Bosun	15	3.18
Cadets	89	18.90	
Able seaman	24	5.10	
Oiler	25	5.31	

Table 2. Descriptive findings and correlation results of the scales

	LAW	PW	PR	M (SD)	Min	Max	Sk	K	α
LAW	1			38.308 (12.793)	16	80	0.355	-0.238	0.913
PW	-0.523***	1		43.297 (8.693)	8	56	-1.022	1.325	0.871
PR	-0.395**	0.450***	1	21.363 (4.847)	6	30	-0.324	-0.12	0.776

M – mean; SD – standard deviation; Min – minimum, Max – maximum, Sk – skewness; K – kurtosis, α – Cronbach’s Alpha reliability coefficient; PW – psychological well-being; PR – psychological resilience; LAW – loneliness at work; ***p < 0.001

MEDIATION ANALYSIS

In this part, we present the result of two mediation models. In the first model, we considered loneliness at work as the mediator. In the second model, we used psychological resilience as the mediator variable. Information about the models and regarding variables is given in Table 3.

In the application part, we conducted the mediation analyses for all participants and the ship types as well. The effects of the mediator variables are investigated in dry cargo, container, and tanker type ships. We denote the hypotheses that are being tested using mediation models as follows:

H1: Loneliness at work mediates the relationship between psychological well-being and psychological resilience.

H1a: Loneliness at work mediates the relationship between psychological well-being and psychological resilience in dry cargo ships.

H1b: Loneliness at work mediates the relationship between psychological well-being and psychological resilience in container ships.

H1c: Loneliness at work mediates the relationship between psychological well-being and psychological resilience in tanker ships.

H2: Psychological resilience mediates the relationship between loneliness at work and psychological well-being.

H2a: Psychological resilience mediates the relationship between loneliness at work and psychological well-being in dry cargo ships.

H2b: Psychological resilience mediates the relationship between loneliness at work and psychological well-being in container ships.

H2c: Psychological resilience mediates the relationship between loneliness at work and psychological well-being in tanker ships.

Figure 1 displays the graphs, while Table 4 presents the statistical results of the first model. The findings indicate

a significant decrease in loneliness at work as psychological well-being increases among all types of ships and participants. However, except for container ships, an increase in loneliness at work is significantly associated with a decrease in psychological resilience among all other types of ships and participants. Additionally, for all types of ships and participants, the total effect sizes for the models, in which loneliness at work acts as a mediator, are statistically significant. According to the results of the indirect effect, loneliness at work plays a statistically significant partial mediating role between psychological well-being and psychological resilience for the seafarers in dry cargo, tanker ships and the participants. However, for seafarers in container ships, the indirect effect is not significant, indicating that loneliness at work does not act as a significant mediator.

Figure 2 shows the plots and Table 5 denotes the statistical findings of the second model. The results reveal a significant negative relationship between loneliness at work and psychological resilience for all three types of ships and participants. However, there is a significant positive association between psychological resilience and psychological well-being among all types of ships and participants. The total effect sizes are statistically significant for the mediation models in which psychological resilience serves as a mediator. Specifically, according to the results of the indirect effect, psychological resilience significantly and partially mediates the relationship between loneliness at work and psychological well-being for seafarers in all three types of ships and the participants.

Table 6 shows the results for the research hypotheses. While hypothesis H1b is rejected, all other alternative hypotheses cannot be rejected. Except for the H1b, there are significant partial mediation roles for all the hypotheses (H1, H1a, H1c, H2, H2a, H2b, H2c).

Table 3. Description of the mediation models and variables

Type of mediation models	X (Independent variable)	M (Mediator variable)	Y (Dependent variable)
Model-1	PW	LAW	PR
Model-2	LAW	PR	PW

PW – psychological well-being; PR – psychological resilience; LAW – loneliness at work

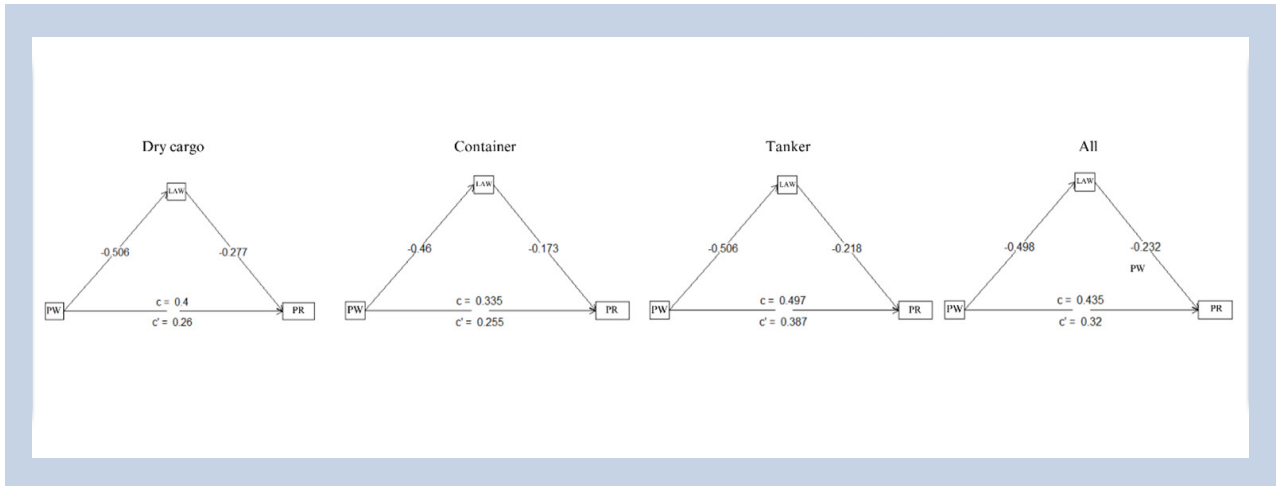


Figure 1. Mediation plots for the first model

Table 4. Statistical results of the first mediation model

Ship type	X on M (a)		M on Y (b)		Indirect effect (ab)		Total effect (c)	
	Coef	p	Coef	p	Boot-Coef	95% CI Boot-Coef	Coef	p
Dry cargo	-0.506	< 0.001	-0.277	< 0.001	0.113	[0.051, 0.181]	0.400	< 0.001
Container	-0.460	< 0.001	-0.173	0.138	0.087	[-0.030, 0.222]	0.335	0.002
Tanker	-0.507	< 0.001	-0.217	0.004	0.135	[0.075, 0.208]	0.497	< 0.001
All	-0.498	< 0.001	-0.232	< 0.001	0.094	[0.042, 0.148]	0.435	< 0.001

Coef – regression coefficient; Boot-Coef – bootstrapped regression coefficient; CI – confidence interval; X – psychological well-being; Y – psychological resilience; M – loneliness at work

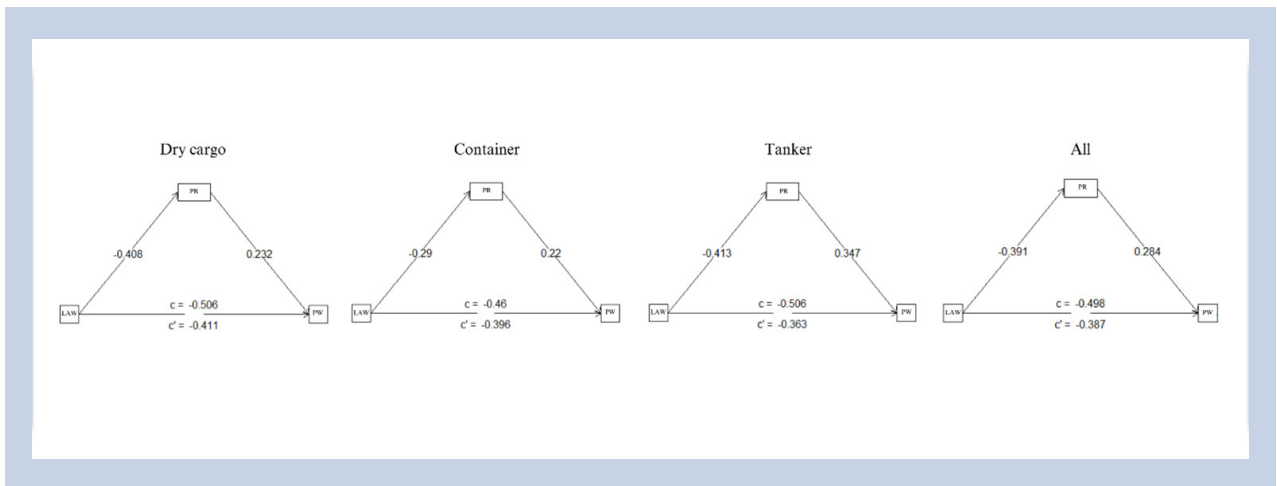


Figure 2. Mediation plots for the second model

RESULTS

The results of the study revealed several important findings regarding the relationships between seafarers' psychological well-being, resilience, and loneliness on board ships of various types. Firstly, the study found a significant negative correlation between loneliness at work

and both psychological well-being and psychological resilience among seafarers. Additionally, a significant positive relationship was observed between psychological well-being and psychological resilience. Type of vessel was identified as a distinguishing factor in the mediating roles of loneliness at work and psychological resilience. Secondly, the study

Table 5. Statistical results of the second mediation model

Ship type	X on M (a)		M on Y (b)		Indirect effect (ab)		Total effect (c)	
	Coef	p	Coef	p	Boot-Coef	95% CI Boot Coef	Coef	p
Dry cargo	-0.408	< 0.001	0.232	< 0.001	-0.062	[-0.114, -0.020]	-0.506	< 0.001
Container	-0.290	0.007	0.219	0.030	-0.115	[-0.225, -0.007]	-0.460	< 0.001
Tanker	-0.413	< 0.001	0.347	< 0.001	-0.153	[-0.230, -0.082]	-0.506	< 0.001
All	-0.391	< 0.001	0.284	< 0.001	-0.063	[-0.097, -0.033]	-0.498	< 0.001

Coef – regression coefficient; Boot-Coef – bootstrapped regression coefficient; CI – confidence interval; X – loneliness at work; Y – psychological well-being; M – psychological resilience

Table 6. Decision table for research hypotheses

Mediator	Hypothesis	Decision
LAW	H1	Accepted – Partial mediation
	H1a	Accepted – Partial mediation
	H1b	Rejected
	H1c	Accepted – Partial mediation
PR	H2	Accepted – Partial mediation
	H2a	Accepted – Partial mediation
	H2b	Accepted – Partial mediation
	H2c	Accepted – Partial mediation

uncovered the partial mediating role of loneliness at work and resilience in psychological well-being across different ship types. Specifically, it was found that loneliness at work partially mediated the relationship between psychological resilience and psychological well-being in tanker and bulk carrier vessels. However, on container vessels characterized by intense work pace, loneliness at work did not mediate the relationship between psychological well-being and psychological resilience. Thirdly, the study revealed that psychological resilience mediated the relationship between loneliness at work and psychological well-being in container, tanker, and dry bulk carrier vessels irrespective of ship types. Based on these findings, the study suggests several recommendations for improving the mental health and well-being of seafarers. These include providing mental health and psychological resilience education and training, promoting positive psychology and physical activity, facilitating social interactions through group activities, offering psychological support from occupational therapists, and ensuring that seafarers are psychologically prepared for life on board before joining the ship. Moreover, enhancing seafarers' circumstances in terms of mental support, connectivity, socialization, and social events on board is proposed as a solution to reduce their sense of isolation and bolster their mental resilience. Overall, the study advocates for a systems approach involving stakeholders

across the maritime industry to address the challenges faced by seafarers and improve their overall well-being. The authors aim to underline the inherent dangers associated with resilience training solely focused on individual and team levels within the maritime sector. It is essential to acknowledge that each vessel operates within its own unique environment, characterized by distinct operational approaches and varying levels of demanding and unequal working conditions. Considering these complex dynamics, resilience training that fails to address broader systemic changes within organizations and the maritime industry may inadvertently worsen feelings of frustration and disengagement among seafaring crew. The importance of addressing structural factors to enhance workforce well-being is being highlighted in maritime settings. Therefore, fostering a comprehensive work environment perceived as supportive, fair, and equitable becomes crucial for effective psychosocial interventions onboard. Such interventions not only promote the mental and emotional resilience of seafarers but also contribute to overall organizational productivity and performance.

DISCUSSION

This study investigated the association among psychological well-being, resilience, and loneliness on board in Turkish seafarers and examined the mediating role of resilience between loneliness and psychological well-being, and the mediating role of loneliness at work between resilience and psychological well-being via a moderated mediation model. The first model's findings indicated that all types of ships and participants' psychological well-being increases as loneliness at work significantly declines. All other types of ships and participants' psychological resilience declines dramatically when loneliness at work increases, except for container ships. We can explain this accordingly. Seafarers working on container ships, compared to other types of vessels, experience higher levels of workload due to frequent port calls and operations associated with short sea shipping. This intense workload often leaves them with limited time, making it difficult even to find time for sleep. Consequently,

they may not perceive feelings of loneliness on board as acutely due to the busyness of their duties. Therefore, as feelings of loneliness at work increase, their psychological well-being and resilience do not decrease; rather, given the demanding nature of their operations, they may have a need for solitude amidst the intense operational, berthing, and manoeuvring rhythm on board. In addition, the total impact sizes for the models in which loneliness at work serves as a mediator are statistically significant for all types of ships and participants. The results of the second model in this study revealed that resilience partially mediated the relationship between the psychological well-being of seafarers working on container, bulk and tanker ships and their loneliness on board. Moreover, according to the results of the indirect effect, loneliness at work plays a statistically significant partial mediating role between psychological well-being and psychological resilience for the seafarers on dry cargo, tanker ships and for the participants. However, for seafarers on container ships, the indirect effect is not significant, indicating that loneliness at work does not act as a significant mediator.

On the other hand, Linz et al. [46] indicated that resilience is dynamic and trainable, which increases its potential for potential therapies for mental health in seniors, especially in the most marginalized and humiliated individuals meaning a person who has feeling of shame, embarrassment, or loss of dignity typically resulting from a disrespectful or demeaning treatment or experience. As a result of the research conducted by Tamarit et al. [32] people who expressed high levels of COVID-19 fears but also showed high levels of resilience and life pleasure had fewer signs of anxiety and stress than people who expressed low levels of COVID-19 worries but high levels of resilience and life satisfaction. In another research, it has been observed that seniors with high resilience levels may be significantly less likely to experience the negative consequences of loneliness on their mental health, yet this was insufficient to counteract the direct detrimental effects of loneliness [47]. This result of resilience's partial mediation has already been supported by research on the effects of isolation on particular aspects of mental health, like symptoms of depression [47] or quality of life [36]. Another study revealed that the pandemic considerably increased the level of fatigue among Chinese seafarers. According to the interview data, a variety of variables, such as increased workload, concern of contracting an infection, wearing four pieces of personal protective equipment (PPE), missing shore leave, and longer duty times, may be contributing to the greater levels of fatigue [48]. Another study's findings conducted on seafarers' mental health during the COVID-19 pandemic by Tang et al. [49] highlighted the significance of family, friends, coworkers, shipping organizations, and government bodies because

they are linked to the most efficient support measures, such as timely crew changes, family communication, being given priority for vaccination, getting vaccinated, and having a friendly and supportive environment on board. The study discovered a total of 22 mental health support strategies, all of which were thought to have improved the mental health of seafarers. Not all of them, though, were readily accessible to or used by seafarers. In the study of Ribeiro-Gonçalves et al. [50], findings revealed that there were modest to high levels of resilience, ageism, loneliness, and psychological distress. Ageism's impact on psychological distress was totally moderated by resilience, but loneliness's impact was only partially moderated. According to another study's findings, seafarers' well-being may be improved by boosting their resilience and their perception of instrumental support at work [29] Keeping a sense of agency can assist a person's ability to maintain a positive outlook on life, moderate the emotional impact of loneliness and anxiety, and support a higher level of life satisfaction [51]. Also, Nitara et al. [15] stated that the most effective strategy of action is to treat psychological well-being with the same seriousness as physical safety, taking into mind the effect that mental health might have on general health of seafarers. A modification of the rules already in effect, stricter control over shifts on board, longer breaks, and more opportunities for recreation and family time could be the starting point. The emotions of seafarers on board are influenced by a variety of circumstances, but the main ones are worry about family health (81%), bad weather (63%), physical health (61%), psychological health (32%), receiving salary on time (22%) and the possibility of coming across pirates (20%) [21]. Parallel to other research, Ozbag [37] discovered that the association between the job stress experienced by seafarers and their subjective well-being is mediated by psychological resilience. Also, seafarers' subjective well-being is favourably impacted by their psychological resilience level according to the same research.

In the present study, resilience was discovered to play a partial mediating function between loneliness and well-being, which may have revealed the underlying mechanism by which loneliness may indirectly affect well-being. The Resilience Framework, which describes resilience as a dynamic process with a mediating function [52], was also consistent with our findings. According to our findings, there is a significant reverse link between loneliness and resilience-related depressive symptoms as previous studies reports [53, 54]. Similar to former study, resilience serves as a defence against psychiatric disorders, with high resilience lowering the prevalence of such disorders or loneliness [55]. The findings of our study indicate the importance of ensuring uniform working conditions for seafarers across various ship operators, irrespective of the types of vessels they oversee.

Furthermore, it is recommended that resilience training for seafarers commence during their cadetship programs. However, resilience training, without corresponding reforms at the organizational and maritime industry levels, has the potential to exacerbate feelings of frustration and disengagement. Moreover, to mitigate feelings of isolation and loneliness among seafarers while at sea, it is imperative for ship operators to establish conducive conditions. This includes ensuring access to internet connectivity, facilitating regular communication with families, reassuring seafarers regarding the support available for their families during potential onshore crises, and fostering social interaction opportunities onboard. While several of these actions, like providing free Internet access, promoting good social relationships, and shortening workdays, have been consistently suggested in the literature [56–58]. The seafarers in Tang et al.'s study [49] similarly believed that offering assistance to immediate family when necessary was very useful. By helping seafarers improve resilience and psychological well-being, there is potential to reduce loneliness at work, as shown in the models of this study.

CONCLUSIONS

This study examined the relationships between seafarers' psychological well-being, resilience, and loneliness on board while serving on various types of ships and performing various tasks. Firstly, the correlation results indicate a significant and negative relationship between loneliness at work and both psychological well-being and psychological resilience. In addition, a significant positive relationship was observed between psychological well-being and psychological resilience. Vessel type was found to be a distinctive feature in the mediating roles of loneliness at work and psychological resilience. Secondly, the results revealed the partial mediating role of loneliness at work and resilience in psychological well-being in different ship types. In terms of mediating role of loneliness at work, it has been determined that there has been partial mediation between psychological resilience and psychological well-being whether they work in tanker or bulk carrier vessels. Thus, H1, H1a and H1c are accepted (Fig. 1 and Table 4). On the other hand, on container vessels, which have an intense working pace, it has been revealed that loneliness at work does not mediate the relationship between psychological well-being and psychological resilience. Therefore, H1b is rejected. Thirdly, it has been observed that psychological resilience mediates the relationship between loneliness at work and psychological well-being in container, tanker, and dry bulk carrier vessels regardless of ship types (Fig. 2 and Table 5).

As a result of the findings, it may also be beneficial to look at providing cadets and seafarers with mental health and psychological resilience education and training. Positive

psychology and physical activity are important for both the psychological well-being of seafarers and the population when it comes to preventative measures against the development of mental disorders. This needs to be encouraged through encouraging group activities that can improve their mood by triggering the release of hormones like serotonin and endorphins. Feeding the seafarers with positive emotions will both increase their psychological resilience and ensure their psychological well-being. By preserving mental resilience, physical wellness can support mental well-being by fostering social interactions. To overcome loneliness on board, seafarers can get the assistance of psychological experts like occupational therapists. Before joining the ship, seafarers need to be psychologically prepared for life on board. Furthermore, improving seafarers' circumstances in terms of mental support, connectivity, socialization, and social events on board can be viewed as a solution proposal to reduce their sense of isolation and boost their mental resilience. For the amelioration of the seafarers' current situation, from ship operators to seafarers, a systems approach is needed in the maritime industry.

LIMITATIONS & FUTURE PERSPECTIVES

It could be intriguing to analyse the findings of the current study critically and take the study's constraints into account. The first set of tools utilized were self-reporting tools, which are not immune from flaws including false reporting and bias based on social desirability. Secondly, since participation in the study was voluntary, the sample makeup might not accurately reflect the characteristics of the overall population of seafarers. The absence of female seafarers is the third drawback of this study. The gender link of seafarers' professional loneliness could not be investigated due to a lack of data. In the future, it is recommended to examine whether any gender-related differences exist across loneliness, resilience and psychological well-being using a homogeneous data set. One of the limitations of the study is that it was conducted solely on Turkish seafarers. Future studies should look longitudinally at the association between resilience, burnout, anxiety, uncertainty intolerance, self-consciousness, depression, well-being, and other aspects of mental health. Research might examine the working circumstances of seafarers in various nations and track changes over time in the linkages between these aspects of professional life at sea. Additionally, they could compare the resilience and loneliness of seafarers before and after they finished a particular intervention program.

ARTICLE INFORMATION AND DECLARATIONS

Data availability statement: Data is available upon request.

Ethics statement: This study has been conducted according to ethical rules.

Author contributions: NS participated in the research design, data collection, material & methods, manuscript elaboration and revision. ED participated in the data analysis and manuscript revision. All authors contributed to the article and approved the submitted version.

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