Journal of ETA Maritime Science 2023;11(3):148-158

Fear of COVID-19 in Seafarers: Association with Psychological Distress

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Abstract

Since its inception, the coronavirus pandemic has caused serious social, economic, and health problems around the world. Seafarers have been identified as key workers in mitigating the negative impact of the coronavirus on global trade and ensuring the delivery of medical and hygiene supplies to regions in need. However, the complete closure policies implemented by certain countries have led to prolonged periods on board for seafarers with expired contracts and economic hardship for those unable to join new assignments. Seafarers who spend long periods on board a ship must deal with issues that may affect their psychological state. Therefore, it is important to identify the factors that cause seafarers to experience psychological distress and to develop relevant strategies to address them. The aim of this study was to determine the association between seafarers' fear of coronavirus disease-2019 (COVID-19) and psychological distress including symptoms of anxiety, depression, and stress. The questionnaire used the fear of COVID-19 Scale and the expression, Anxiety and Stress Scale), which have strong psychometric properties. Data were collected from 425 qualified seafarers working on international merchant ships and analyzed by structural equation modeling using AMOS-24. The results indicate that seafarers' fear of COVID-19 is positively associated with symptoms of anxiety and stress but not with depression. Maritime companies, sectoral organizations, and policymakers should collaborate to reduce these associations among seafarers. A unified management approach improved access to health services, and regular mental health assessments can be effective solutions.

Keywords: DASS-21, FCV-19S, Stress, Anxiety, Depression

1. Introduction

From the past to the present, every crisis has tested the mechanisms of all systems, exposed their weaknesses, and forced those involved to develop and create new strategies [1]. In considering the major breaks and transformations in history, the most important underlying reasons for these can be said to be the great depressions and crises experienced by all humanity. Innovations concerning solutions for overcoming challenging times have affected all societies, albeit in different ways and have given them experiences of change and transformation. The coronavirus disease-2019 (COVID-19) pandemic, which has affected almost every country, both economically and sociologically, is one such crisis [2]. This epidemic disease has also affected the global economy and brought the activities of many sectors to a standstill due to the serious damages it has caused. After the coronavirus was declared an epidemic disease, widespread quarantine and restriction policies have been implemented all over the world and countries have subsequently adopted a complete closure approach [3]. This development has resulted in the deterioration of global-scale production, distribution, and consumption activities and has resulted in decreased international trade opportunities and volumes. Volumetric decreases in global trade due to the pandemic have also caused some problems with regard to maritime transport. Maritime transport is the most widely used transportation method in today's global trade structure, with more than 80% of volume-based trade being performed by this method [4,5]. Because of this high rate of trade, maritime transport creates employment for

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Received: 31.03.2023
Last Revision Received: 19.06.2023
Accepted: 20.06.2023

To cite this article: A. Toygar, and U. Yıldırım. "Fear of COVID-19 in Seafarers: Association with Psychological Distress." *Journal of ETA Maritime Science*, vol. 11(3), pp. 148-158, 2023.

many seafarers. In fact, about 1.9 million seafarers work on international trade ships [6].

Coronavirus pandemic negatively affects people's physical and psychological state [7,8]. One of the common reactions to epidemics is fear [9]. Fear related to coronavirus has caused several people around the world to experience mental health issues [10]. Additionally, because of this fear, individuals can make illogical decisions and have ambiguous thoughts [9]. Lee [11] has determined that individuals who have anxiety symptoms due to fear of COVID-19 are more anxious than those without such fears, and that these individuals are more likely to be suicidal. Coronavirus pandemic not only affects people's living standards on land but also directly affects the lives of seafarers. During the most intense periods of the COVID-19 pandemic, most countries did not allow seafarers to set foot on land to slow the spread of coronavirus. Some charter companies also added a "no crew change" clause to their charter parties [12]. In this process, over 400,000 seafarers could not leave their ships and had to live in a closed environment for prolonged periods [13]; some seafarers were even required to live on their ship for periods of up to 18 months [14]. Seafarers who were unable to return to their countries were required to stay on out-of-contract ships and were unable to sign new contracts; some of these individuals were not paid during their prolonged stay on board their respective vessels [12].

Several variables such as physical working conditions, natural environmental factors and health crises affect seafarers' health [15,16]. Although there have been several studies on the psychological state of seafarers, particularly during coronavirus pandemics [17-20], the association between coronavirus pandemics and the psychological state of seafarers remains unclear [21]. Further studies are needed to address this uncertainty [22]. Although there are studies using structural equation modeling (SEM) no study has been conducted using a measurement tool with a consistency and validity analysis of fear of coronavirus on seafarers' psychological state. Therefore, it will be necessary to investigate the issue comprehensively using different methodologies, and the issue should be evaluated within a scientific framework to develop scientifically based solutions. The novelty of this study is highlighted in three contexts, namely the measurement tools, the research method, and the sample group. First, seafarers' fear of COVID-19 was assessed using the Fear of COVID-19 Scale (FCV-19S), which has robust psychometric properties [7]. This scale has been used extensively in various studies of psychological aspects, including anxiety, stress, and depression, and has been successfully adapted to several languages [7,23]. Second, SEM, a rigorous statistical technique, was used to examine the relationship between seafarers' fear of COVID-19 and their levels of anxiety, stress, and depression. SEM allows simultaneous examination of both structural and measurement models, providing a robust framework for exploring the causal associations and directional effects among research variables. By employing SEM, this study takes advantage of its strong theoretical foundation, allowing for the exploration of unidirectional or bidirectional effects within the research framework [24]. Third, symptoms of depression, anxiety, and stress are common among people living in isolated environments [25]. During the process of working on ships, seafarers live an isolated life away from their social environment. In this context, the participants in this study are seafarers. They all have a certificate from the Standards of Training, Certification and Watchkeeping for Seafarers (STCW). Therefore, they can work on all merchant ships, including the largest and those on unlimited or international voyages. In other words, the participants constituting the sample group of this study are qualified seafarers who are actively working on merchant ships and whose qualifications and certificates meet the requirements of the flag state in accordance with the provisions of the STCW Convention. This study examined the association between seafarers' fear of COVID-19 and psychological distress, including symptoms of anxiety, depression, and stress. This is an original study, as no study has yet been conducted on the association between fear of coronavirus and psychological status in seafarers using a powerful measurement tool and statistical technique. The results of this study will contribute to the improvement of the maritime literature and the development of scientifically based solutions by maritime authorities.

2. Theoretical Basis and Research Hypotheses

2.1. Fear of Coronavirus Pandemic

Some studies have examined the impact of fear of coronavirus disease on the psychological state of individuals. Most of these suggest that fear of coronavirus disease is positively associated with symptoms of anxiety, stress and depression [10,26,27]. In addition, Şimşir et al. [23] found that fear of coronavirus was associated with symptoms of anxiety and stress. Similar to the experience of people working on land, coronavirus disease has caused physical and psychological problems for seafarers [16]. In fact, seafarers may experience much higher levels of mental health problems compared with other occupations [28]. Some of these problems can be explained by the difficult working conditions associated with seafaring. Seafarers work in two main areas of the ship, the deck and the engine, in harsh conditions where they are constantly moving and exposed to vibration and static electricity. Seafarers working in the engine room are exposed to a noisy, dirty, fuel-smelling,

high temperature and indoor environment, while those working on deck clean hatches, tanks and bilges in enclosed spaces or are exposed to the sun, dust and humidity for long periods of time [29-32]. There are studies in the literature examining seafarers' challenges during COVID-19. Zhao et al. [33] analyzed Chinese seafarers' fatigue during COVID-19. They found that seafarers were more fatigued during COVID-19 than before. The study identified several causes of fatigue, including seafarers' fear of infection, wearing of protective equipment, workload, denial of shore leave, and extension of contract duration. Kaptan and Olgun Kaptan's [34] qualitative research aimed at exploring the challenge mariners experienced during the COVID-19 outbreak and to identify possible solutions. These results show that COVID-19 has a negative impact on seafarers, with a higher incidence of infectious diseases because of their shared accommodation and quality of health services. Furthermore, Onakpojeruo et al. [35] investigated the effect of COVID-19 quarantine measures on seafarers' mental health and its influence on human error occurrence. The results indicate that with significant deviations of more than 55% in the mooring operation scenario, the quarantine measures had an unfavorable effect on seafarers' psychological well-being. The qualitative study by Timilsina and Baygi [36] identified seafarers' perceptions of the COVID-19 guidelines in relation to their health and well-being. The majority of participating seafarers reported that the guidelines could reduce stress and anxiety, while others expressed that they may not have a significant impact. Another result of the study was that seafarers who had completed their contracts were experiencing delays in returning to their home countries. Considering the aforementioned studies, the hypothesis proposed in the present study was to test the associations between fear of coronavirus and psychological distress including symptoms of anxiety, stress, and depression.

2.2. Anxiety

Pandemic diseases may cause some individuals to live with the fear of death under quarantine, and this can harm their mental health, leading to anxiety, depression, and stress [37]. Prolonged work periods experienced by seafarers on ships and the associated poor living conditions in limited, closed and/or isolated areas increase the pressure and mental fatigue on this population [38]. In addition, family pressure for seafarers to return home during the coronavirus disease, intense concern about the health status of relatives, and limited access to health services on board ships can be listed as other factors that increase mental fatigue among seafarers [39]. There are studies that found that the depression and anxiety levels of seafarers increased during coronavirus infection [19]. Lei et al. [40] determined that of those individuals who were exposed to quarantine restrictions and who had to lead a closed and isolated life during the coronavirus disease, 12.9% experienced anxiety symptoms and 22.4% experienced symptoms of depression. Baygi et al. [22] found that 12.4% of seafarers had anxiety, 14.1% had depression, and 37.3% were experiencing stress. Considering all these studies, the hypothesis proposed in this study to test the association between the fear of coronavirus and symptoms of anxiety in seafarers is as follows:

H_1: Fear of coronavirus among seafarers is positively associated with symptoms of anxiety.

2.3. Stress

It is normal for seafarers to experience more intense symptoms of stress than other individuals due to the harsh working conditions of maritime professions, the closed environments in which these individuals work, and the fact that they are required to work away from land for long periods. Having to work away from their families, not being able to stay away from their working area, even outside working hours, and the extra workloads can be cited as sources of stress in the maritime profession [41]. It is difficult for seafarers with mental health issues to be treated when at sea. Kınalı et al. [29] conducted a study with 403 seafarers and determined that 33.2% had mental health issues and were not aware of health centers from which they could benefit regarding possible mental problems they might experience. Mental health problems of seafarers, which have been the subject of several studies, are exacerbated by high levels of physical and mental stress during coronavirus disease [42]. Symptoms of stress and related psychological disorders have caused the suicide rates of seafarers to be higher than other occupational groups [43]. Ali et al. [44] conducted a study to determine the stress structure in seafarers' job roles and to measure work-related stress. The results reveal the emergence of six different themes that encompass the effects of the COVID-19 pandemic. Furthermore, the results indicate that COVID-19 has had a negative impact on seafarers' careers and has led to the occurrence of various stress-related problems. Therefore, the possibility that the fear of coronavirus disease triggers suicidal ideation in individuals necessitates the development of relevant reliable measurement tools for the detection of this problem and performing tests accordingly [45]. Taking all these studies into account, the present study proposes the following hypotheses to test the association between coronavirus anxiety and stress:

H_2: Fear of coronavirus among seafarers is positively associated with stress symptoms.

2.4. Depression

Fears of COVID-19 may cause adjustment disorders and increase the levels of depression in individuals [46]. During

the coronavirus disease, seafarers are faced with adverse situations that cause psychological distress, such as being abandoned, living an isolated life, and having to stay on the ship for prolonged periods [47]. Baygi et al. [22] have determined that seafarers who have to work on a ship for a long time are more likely to experience depressive symptoms. Slišković [18] argues that coronavirus disease adversely affects the psychological and physical health of seafarers working in an isolated and confined environment. Qin et al. [20] examined the changes in seafarers' depression symptoms during the coronavirus disease, collecting data from 441 seafarers, and found that seafarers had high levels of depression associated with the coronavirus pandemic. Pesel et al. [48] analyzed the physical and psychological states of seafarers during coronavirus disease and revealed that 50% did not feel safe, 30% experienced insomnia, and 26% were unhappy and depressed. Jonglertmontree et al. [49] investigated depressive symptoms in seafarers during the COVID-19 period. The results showed that 19.5% of the participating seafarers had depressive symptoms. Based on these studies, this study hypothesizes the following association between the fear of coronavirus and depression among seafarers:

H_3: Fear of coronavirus among seafarers is positively associated with the symptoms of depression.

3. Methods

3.1. Sample Group of the Research

The research population comprises seafarers working on international trade ships. Two important methods were considered in determining the sample size of the present study, the sampling group table developed by Sekaran and Bougie [50] and power analysis. It is estimated that about 1.9 million seafarers work on more than 74,000 merchant ships in the global maritime transport sector. Sekaran and Bougie [50] argued that the sample size to represent a population over 1 million should comprise at least 384 participants. In addition, the researchers determined the research sample group size of the study using the "G.Power 3.1.9.2" tool before data collection process. To correct the sample size to be representative of the research population, a power analysis was performed using a confidence level of 99%. Accordingly, the minimum sample size for the goodness of fit analysis could be 287 (p: 0.01, 1-β err probe: 0.95, df: 5) [51]. Subsequently, the data collection process was started from the research population. The sample group of the study was interviewed between 10 July and 17 September 2022. The data were collected online because the seafarers who comprised the study sample were actively working on a ship. For the purpose of this study, a questionnaire was sent to 461 seafarers. However, thirty-six questionnaires were found to be missing or incorrectly completed and were not included in the study. After the final evaluation, this study was conducted with data collected from 425 seafarers. Table 1 shows the sociodemographic characteristics of seafarers.

3.2. Measures

The data were collected from seafarers using two different scales: the "FCV-19S" and the "Depression, Anxiety and Stress Scale (DASS-21)". FCV-19S was developed by Ahorsu et al. [9] to evaluate the fear of coronavirus pandemic using a valid and reliable measurement tool. The Scale was adapted to Turkish by Satici et al. [7], who found the reliability coefficient of the scale to be α=0.82. The authors also performed validity and reliability analyzes for the Scale and provided the structural validity of the scale [Goodness-of-fit index (GFI), NFI, Comparative fit index (CFI) ≥0.90, and Standardized Root Mean Square Residual (SRMR) ≤0.08]. DASS-21 was preferred to test the psychological state of seafarers. The original version of this scale comprises 42 items but was shortened by Henry and Crawford [52]; the revised version comprises 21 items. The scale has three subscales with each containing seven items: anxiety, stress, and depression. The scale was adapted to Turkish by Yılmaz et al. [53], who found

Table 1. *Sociodemographic characteristics of seafarers*

Variable	Sub-variable	Frequency (n)	%
The term of contract	1-3 months	144	33.9
	4-6 months	186	43.8
	7-9 months	62	14.6
	10-12 months	33	7.8
	Total	425	100.0
Voyage area	Port voyage	24	5.6
	Cabotage	68	16
	Coastal voyage	63	14.8
	Unlimited or international voyage	270	63.5
	Total	425	100.0
Duty on the ship	Master	59	13.9
	Officer (deck and engineer)	165	38.8
	Rating and catering	33	7.8
	Cadet (deck and engineer)	168	39.5
	Total	425	100.0
Ship type	Dry cargo ship/bulk carrier	137	32.2
	Tanker	147	34.6
	Container ship	50	11.8
	Ro-Ro	56	13.2
	Other	35	8.2
	Total	425	100.0

the reliability coefficient of the Scale and its subscales to be 0.755-0.822. The subscales also had structural validity [χ^2/df ≤3, GFI and Adjusted goodness-of-fit ≤1, and Root mean square error of approximation (RMSEA) ≤0.06].

4. Results

In this study, confirmatory factor analysis (CFA) was conducted as a precursor to SEM analysis. This step was taken for two crucial reasons. First, the sample group in this study differed from those in previous studies, which necessitated the selection of the most suitable scale for the research objectives. Second, it is important to verify the measurement model through CFA before assessing the suitability of the proposed SEM model [54]. SEM is an important analysis that has become increasingly common in recent studies. SEM focuses on analyzing the effects or associations between independent and dependent variables [7,55,56]. In this study, which included four variables, the AMOS-24 program was used to validate the research model. Data collected from 425 seafarers were entered into the program, and CFA was performed by establishing covariances between variables. The model fit values are χ^2/df: 2.927, RMSEA: 0.067, CFI: 0.921, GFI: 0.849, Incremental Fit Index: 0.921 and SRMR: 0.064, which are compatible with those accepted in the literature [57-60]. Table 2 presents the standardized regression weights of the items in the measurement model and regression weights, standard error, and significance

Table 2. *Standardized item loadings, AVE, CR, Alpha values*

Dimension	Factor	β	S.E.	p	Cronbach's α	CR	AVE
Anxiety	Anx1	0.654	-	***	0.889	0.89	0.54
	Anx2	0.752	0.076	***			
	Anx3	0.754	0.075	***			
	Anx4	0.775	0.071	***			
	Anx5	0.742	0.077	***			
	Anx6	0.751	0.079	***			
	Anx7	0.709	0.077	***			
Depression	Dep1	0.808	-	***	0.913	0.91	0.60
	Dep2	0.798	0.054	***			
	Dep3	0.782	0.053	***			
	Dep4	0.735	0.055	***			
	Dep5	0.830	0.052	***			
	Dep6	0.772	0.061	***			
	Dep7	0.671	0.06	***			
Stress	Str1	0.773	-	***	0.905	0.91	0.58
	Str2	0.814	0.06	***			
	Str3	0.844	0.057	***			
	Str4	0.715	0.056	***			
	Str5	0.781	0.059	***			
	Str6	0.704	0.067	***			
	Str7	0.701	0.058	***			
FCV-19S	Fcv1	0.787	-	***	0.926	0.92	0.63
	Fcv2	0.839	0.048	***			
	Fcv3	0.714	0.057	***			
	Fcv4	0.866	0.06	***			
	Fcv5	0.855	0.057	***			
	Fcv6	0.701	0.053	***			
	Fcv7	0.761	0.058	***			

***p<0.001.

AVE: Average variance extracted, CR: Composite reliability, S.E.: Standard error, α: Cronbach alfa coefficient, β: Standardized regression weight, p: Probability value

level of the composite reliability (CR) and average variance extracted (AVE) values.

The standardized regression item weights of the latent variables ranged between 0.654-0.754 for anxiety, 0.671-0.830 for depression, 0.701-0.844 for stress, and 0.701-0.866 for FCV-19S, and all path coefficients were found to be significant ($p<0.01$). The fact that standardized factor loadings are greater than 0.60 and less than 0.90 indicates the absence of correlation problem. Convergent validity, divergent validity, and Cronbach's α were emphasized for the reliability values of the measurement model. In this context, the AVE and CR values were examined after the first order CFA. The generally accepted values in the literature for ensuring scale validity are >0.70 for CR and >0.50 for AVE [58,61]. These values were determined using the "Stats Tools Package" developed by Gaskin [62]. The results of this study indicate that both AVE and CR values of all dimensions are greater than the determined values, providing convergent and divergent validity for the measurement model (AVE: 0.54-0.63; CR: 0.89-0.92). In addition, the Cronbach's α value of the dimensions should be greater than 0.70 to ensure scale reliability [63]. The results of the analysis show that the Cronbach's α values of all dimensions in the study are well above the value accepted in the literature (FCV-19S: 0.926; Anxiety: 0.889; Depression: 0.913; Stress: 0.905). These values suggest that the measurement structure comprising four latent variables and 28 items were confirmed and the data collected from the seafarers were compatible with the scales.

Table 3 presents information on the path coefficients of the structural model and the regression coefficients of the latent variables on the observed variables. It also presents the results of standardized regression weights and hypothesis tests, which are indicator values generated as a result of SEM. Considering the model fit values in the structural model, all values are within the limitations accepted in the literature and comply with the data collected from the study participants. Considering the path coefficients among the latent variables, the independent variable fear of coronavirus has a significant and positive association with the dependent variables' symptoms of anxiety (β: 0.475; $p<0.001$) and stress (β: 0.392; $p<0.001$). However, there is no significant association between the fear of coronavirus and depression. In line with these results, two path coefficients have positive and significant values and one path coefficient does not.

5. Discussion

Coronavirus disease is an important contemporary development that threatens the mental and physical health of individuals and can cause them to be highly stressed. It is important to understand the changes in individuals' behaviors during coronavirus disease and to create a roadmap in this direction. The coronavirus pandemic has caused serious social, economic and health issues across the world since its beginning. Seafarers who provide the transportation of important human goods such as food, fuel, equipment and medical supplies come to the fore as key workers within this process [64,65]. There is a need to investigate the problems of seafarers through a powerful measurement tools and evaluate the results. This study investigated the association between the fear of coronavirus and the psychological states of seafarers. In this study, the psychological states of seafarers were tested in terms of symptoms of anxiety, depression, and stress. Validity and reliability analyses of the scales used in this study were performed and strong psychometric properties were proven by authors who developed and adapted the scales [7,9,52,53]. The results indicate that fear of coronavirus has a significant positive association with psychological distress, including symptoms of anxiety and stress, and suggest that fear of coronavirus disease has an aggravating effect in seafarers' psychological distress. The results of the study comply with those in the literature, suggesting that fear of coronavirus disease positive association with stress [7] and anxiety [9]. These also indicate compatibility with those of studies on the psychological health of seafarers during coronavirus [18,19]. In this process, several countries have imposed disembarkation bans on seafarers or crew when changing ports, causing severe pressure on seafarers [20]. Therefore, the results of this study coincide with those of one study in which mental problems of seafarers during the pandemic to be associated with pandemic precautions preventing them from setting foot in ports [22].

Table 3. *Hypothesis test results*

Structural Path			Hypothesis	β	S.E.	t	p	Supported or not
The fear of coronavirus	➔	Anxiety	H_1	0.366	0.033	6.454	<0.001	Yes
The fear of coronavirus	➔	Stress	H_2	0.139	0.039	2.608	0.009	Yes
The fear of coronavirus	➔	Depression	H_3	0.083	0.037	1.562	0.118	No
χ^2= 995.147; sd = 340, χ^2/sd: 2.927; RMSEA: 0.067, SRMR: 0.064, IFI: 0.921, CFI: 0.921. β: Standardized regression weights, S.E.: Standard error, p: Probability value, t: Critic ratio								

The results of the first hypothesis test indicate that fear of coronavirus has a significant positive association with symptoms of anxiety in seafarers, so H_1 is accepted. In addition, these also indicate that the fear of coronavirus causes psychological distress and is most associated with symptoms of anxiety. This result explains the limited access of seafarers to land. The implementation of various restrictions on seafarers during the pandemic, including the prohibition on leaving their ships, has resulted in their confinement in confined spaces without access to necessary physical and mental health care, exacerbating their existing health problems. In addition, the restriction of seafarers' access to shore has resulted in prolonged periods of isolation and loneliness, cutting them off from their social environment. During this process, increased psychological stress and anxiety about their future can be identified as factors contributing to this outcome. These results are consistent with the study indicating that seafarers experience increased levels of anxiety related to COVID-19 and that this contributes to an increased perception of COVID-19 burnout [66]. It is also consistent with the literature [22,40].

The results of the second hypothesis demonstrate that the fear of coronavirus disease has a significant positive association with symptoms of stress among seafarers; therefore, H_2 is accepted. This can be explained by the harsh working conditions and inadequate health services on ships. Although the fear of coronavirus disease has a negative impact on several occupational groups, workers in most occupations have access to health services for their health problems. This difference between seafaring and other professions may lead to symptoms of stress among seafarers. The results of the study are consistent with those in the literature suggesting that the physical and mental stress of seafarers increased during the coronavirus outbreak [42], and accordingly, it can be argued that long periods of quarantine would be stressful for individuals [67]. They are also consistent with the results of a study indicating that seafarers' concerns about the risk of contracting the novel coronavirus had a positive effect on their perceptions of work-related stress [66]. Another notable result of the study was that symptoms of stress were second only to symptoms of anxiety associated with the fear of coronavirus. These problems can also be reduced by ensuring compliance with working hours and rest periods on board ships (despite commercial pressures), joint decisions by maritime companies and authorities, improving health services, and creating social areas for activities on board. Furthermore, four-month contracts and action plans to facilitate the departure of seafarers whose contracts have expired can provide important solutions to mental health problems.

The results of the final hypothesis indicate that fear of coronavirus does not have a significant positive association with symptoms of depression in seafarers, leading to the rejection of hypothesis H_3. These results differ from previous studies that suggested an association between fear of coronavirus disease and high levels of depression symptoms among seafarers [20] and that argued that half of the participating seafarers did not feel safe in their work environment during the pandemic and that a quarter of them experienced unhappiness and depression during their last contracts [48]. The restriction of seafarers from ships during the coronavirus outbreak provides important insights into the visibility of their mental health problems, including depression. The lack of communication with their social environment may also contribute to uncontrollable sadness. However, seafarers have the opportunity to alleviate their depression by going ashore in ports of call, where they can learn about different cultural values and meet their personal needs, thereby reducing their depression levels [29]. During the COVID-19 pandemic, the increased time spent in port or at anchor has facilitated seafarers' increased use of telecommunications to maintain communication with their families and social circles. In addition, factors such as the provision of agency support, addressing seafarers' nutritional needs, and allowing limited shore leave to mitigate the effects of COVID-19 may have hindered the establishment of a significant and positive association between seafarers' depression symptoms and their fear of COVID-19. In other words, the relaxation of COVID-19-related restrictions during the study period may explain the lack of a significant and positive association between fear of the pandemic and symptoms of depression among seafarers.

6. Study Limitations

There is a significant limitation in the data collection process of this study. Strict quarantine measures are still in place in different regions, and seafarers are not allowed access to land in these regions. Due to strict quarantine measures at the time of data collection from the sample group, ships could not be visited, and seafarers had to be contacted online via email or social media accounts. An examination of the mobile phone and internet habits of Turkish seafarers showed that rating seafarers were less likely to use smartphones, had lower internet access rates, and were less interested in academic studies compared with officer seafarers. As a result, it is much more difficult to reach rating seafarers and get them to respond to questionnaires than it is for officer seafarers. This limitation in the data collection process also affected the sampling method of the research. In this study, convenience sampling, which is a non-probability sampling method, was preferred.

In the contemporary world, where various challenges such as pandemics and conflicts occur simultaneously, safeguarding the mental and physical health of seafarers holds paramount importance. Although several factors may contribute to psychological distress among seafarers, this study focuses specifically on the fear of COVID-19. To further explore this association, it is recommended that future studies investigate the effects of seafarers' fear of COVID-19 and psychological distress on their levels of occupational burnout. Understanding the potential implications of this fear on seafarers' occupational deformation, emotional exhaustion, depersonalization, and occupational commitment will provide valuable insights for intervention strategies and support systems. By expanding the existing knowledge in this field, policymakers and maritime organizations can develop targeted initiatives to protect seafarers' well-being and enhance their overall occupational experience.

7. Conclusion

Seafarers spend most of their time on board during working and rest periods. Time spent ashore is limited and is only possible at loading and discharging ports. Quarantine and restriction policies have been reduced in many countries. However, in some countries in the Asia-Pacific region, these policies remain in place and seafarers are not allowed access to land. In other words, access to land is restricted for seafarers working on ships bound for ports in these countries. The implementation of COVID-19 policies in a region with a high volume of maritime transport is the main indicator that the problem is not only regional but also global. Therefore, the present study aimed to investigate the association between fear of coronavirus and symptoms of anxiety, depression, and stress in a sample of seafarers. The study results demonstrate a positive association between seafarers' fear of COVID-19 and psychological distress including symptoms of anxiety and stress. To mitigate the impact of this association, collaboration among maritime companies, sectoral organizations, and policymakers are crucial. The following suggestions reduce the existing symptoms of stress and anxiety among seafarers related to their fear of COVID-19:

1. Establish collaborative initiatives: Encourage maritime companies, sectoral organizations, and policymakers to collaborate on initiatives focused on seafarers' mental health and well-being, specifically addressing symptoms of stress and anxiety. Comprehensive strategies and programs can be developed through such a collaboration.

2. Adopt a consistent management approach: To ensure consistent access to the limited health services and resources available to seafarers, particularly in association with stress and anxiety management, a standardized management approach should be implemented across the maritime industry. This may include the establishment of protocols and guidelines for the provision of health care and mental health support.

3. Conduct regular mental health assessments: Introduce periodic mental health assessments for seafarers at specified intervals, including assessments specifically aimed at identifying and addressing symptoms of stress and anxiety. Utilize therapy methods and screening tools to promptly detect and address mental health problems at an early stage. This proactive approach can help identify symptoms of stress and anxiety issues early and provide appropriate support and intervention.

4. Include mental health discussions in safety meetings: Incorporate discussions on mental health, including symptoms of stress and anxiety, in shipboard safety meetings. Provide a platform for seafarers to share their experiences, challenges, and concerns related to symptoms of stress and anxiety. This can foster a supportive environment, reduce stigma, and promote collective problem-solving in addressing these issues.

5. Provide training and awareness programs: Implement training programs to educate seafarers, coping strategies specifically tailored to address symptoms of stress and anxiety. Raising awareness can contribute to a more empathetic and supportive environment in which seafarers feel empowered to manage their symptoms of stress and anxiety effectively.

6. Establish onshore support networks: Develop shore-based support networks consisting of mental health professionals, counselors and peer support groups specifically focused on addressing seafarers' symptoms of stress and anxiety. These networks can provide accessible resources, counseling services, and a platform for seafarers to connect with others who understand the unique stressors and anxieties they face.

By implementing these suggestions, maritime companies, sectoral organizations, and policymakers can work collaboratively to address seafarers' symptoms of stress and anxiety and promote a healthier and more resilient workforce in the face of COVID-19 and beyond.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept design: A. Toygar, U. Yıldırım, Data Collection or Processing: A. Toygar, U. Yıldırım, Analysis or Interpretation: A. Toygar, U. Yıldırım, Literature Review: A. Toygar, Writing, Reviewing and Editing: A. Toygar, U. Yıldırım.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

[1] T. E. Notteboom, T. Pallis, and J. P. Rodrigue, "Disruptions and resilience in global container shipping and ports: the COVID-19 pandemic versus the 2008–2009 financial crisis.," *Maritime Economics & Logistics*, vol. 23, pp. 1–32, Jan 2021.

[2] A. Toygar, and U. Yıldırım, "The changing structure of international trade: an evaluation of the liner shipping industry," in *New Normal and New Rules about International Trade, Economics and Marketing*, Peter Lang GmbH, pp. 103–112, 2021.

[3] A. Toygar, U. Yildirim, and G. M. İnegöl, "Investigation of empty container shortage based on swara-aras methods in the COVID-19 era," *European Transport Research Review*, vol. 14, pp. 1–17, Mar 2022,

[4] UNCTAD, "The review of maritime transport 2021," 2021. https://unctad.org/system/files/official-document/rmt2021_en_0.pdf

[5] R. Yan, H. Mo, X. Guo, Y. Yang, and S. Wang, "Is port state control influenced by the COVID-19? evidence from inspection data," *Transport Policy*, vol. 123, pp. 82–103, Jul 2022.

[6] ICS, "New bimco/ics seafarer workforce report warns of serious potential officer shortage," 2021. https://www.ics-shipping.org/press-release/new-bimco-ics-seafarer-workforce-report-warns-of-serious-potential-officer-shortage/

[7] B. Satici, E. Gocet-Tekin, M. Deniz, and S. A. Satici, "Adaptation of the fear of COVID-19 scale: its association with psychological distress and life satisfaction in turkey," *International Journal of Mental Health and Addiction*, vol. 19, pp. 1980–1988, Dec 2021.

[8] A. Luqman, and Q. Zhang, "Explore the mechanism for seafarers to reconnect with work after post-pandemic psychological distress (papist19): the moderating role of health-supporting climate," *Ocean & Coastal Management*, vol. 223, pp. 106153, 2022.

[9] D. K. Ahorsu, C. Y. Lin, V. Imani, M. Saffari, M. D. Griffiths, and A. H. Pakpour, "The fear of COVID-19 scale: development and initial validation," *International Journal of Mental Health and Addiction*, vol. 20, pp. 1537–1545, Mar 2020.

[10] M. S. Mahmud, M. U. Talukder, and S. M. Rahman, "Does 'fear of COVID-19'trigger future career anxiety? an empirical investigation considering depression from COVID-19 as a mediator," *International Journal of Social Psychiatry*, vol. 67, pp. 35–45, July 2020.

[11] S. A. Lee, "Coronavirus anxiety scale: a brief mental health screener for COVID-19 related anxiety," *Death Studies*, vol. 44, pp. 393–401, 2020.

[12] IMO, "Coronavirus (covid 19) "no crew change" clauses in charterparties," 2020. https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/COVID CL 4204 adds/CL.4204-Add.36 no crew change clause.pdf

[13] S. Cotton, and B. Ahmed, "ITF and jng joint statement: on seafarers' rights and the present crew change crisis," 2020. https://www.itfglobal.org/en/news/itf-and-jng-joint-statement-seafarers-rights-and-present-crew-change-crisis

[14] J. Hines, and J. Burt, "Seafarers forced to spend up to 18 months on ships, international transport workers' federation says," 2020. https://www.abc.net.au/news/2020-10-20/seafarers-spend-18-months-without-leaving-cargo-ships/12780960

[15] C. Hetherington, R. Flin, and K. Mearns, "Safety in shipping: The human element," *Journal of Safety Research* vol. 37, pp. 401–411, Oct 2006.

[16] X. Li, Y. Zhou, and K. F. Yuen, "A systematic review on seafarer health: conditions, antecedents and interventions," *Transport Policy*, vol. 122, pp. 11–25, June 2022.

[17] M. Mittal, G. Battineni, L. M. Goyal, B. Chhetri, N. Oberoi, S. V. Chintalapudi, and F. Amenta, "Cloud-based framework to mitigate the impact of COVID-19 on seafarers' mental health," *International Maritime Health*, vol. 71, no. 3, pp. 213–214, Sep 2020.

[18] A. Slišković, "Seafarers' well-being in the context of the COVID-19 pandemic: a qualitative study," *Work*, vol. 67, pp. 799–809, Dec 2020.

[19] F. Baygi, A. Mohammadian Khonsari, N. Agoushi, A. Hassani Gelsefid, S. Mahdavi Gorabi, and M. Qorbani, "Prevalence and associated factors of psychosocial distress among seafarers during COVID-19 pandemic," *BMC Psychiatry*, vol. 21, pp. 1–8, Apr 2021.

[20] W. Qin, L. Li, D. Zhu, C. Ju, P. Bi, and S. Li, "Prevalence and risk factors of depression symptoms among Chinese seafarers during the COVID-19 pandemic: a cross-sectional study," *BMJ Open*, vol. 11, pp. e048660, June 2021.

[21] B. Pauksztat, M. R. Grech, and M. Kitada, "The impact of the COVID-19 pandemic on seafarers' mental health and chronic fatigue: beneficial effects of onboard peer support, external support and internet access," *Marine Policy*, vol. 137, pp. 104942, 2022.

[22] F. Baygi, et al. "Post-traumatic stress disorder and mental health assessment of seafarers working on ocean-going vessels during the COVID-19 pandemic," *BMC Public Health*, vol. 22, pp. 242, Feb 2022.

[23] Z. Şimşir, H. Koç, T. Seki, and M. D. Griffiths, "The relationship between fear of COVID-19 and mental health problems: a meta-analysis," *Death Studies*, vol. 46, pp. 515–523, 2022.

[24] S. L. Hoe, "Issues and procedures in adopting structural equation modelling technique," *Journal of Applied Quantitative Methods*, vol. 3, pp. 76–83, July 2008.

[25] M. M. Hossain, A. Sultana, and N. Purohit, "Mental health outcomes of quarantine and isolation for infection prevention: a systematic umbrella review of the global evidence," *Epidemiology and Health*, vol. 42, pp. 1-11, June 2020.

[26] C. A. Harper, L. P. Satchell, D. Fido, and R. D. Latzman, "Functional fear predicts public health compliance in the COVID-19 pandemic," *International Journal of Mental Health and Addiction*, vol. 19, pp. 1875–1888, Apr 2021.

[27] A. J. Rodríguez-Hidalgo, Y. Pantaleón, I. Dios, and D. Falla, "Fear of COVID-19, stress, and anxiety in university undergraduate students: a predictive model for depression," *Frontiers in Psychology*, vol. 11, pp. 591797, Nov 2020.

[28] Z. Zhen, R. Wang, and W. Zhu, "A deep learning based method for intelligent detection of seafarers' mental health condition," *Scientific Reports*, vol. 12, pp. 1–11, 2022.

[29] H. Kınalı, U. Yıldırım, and A. Toygar, "A quantitative study on the mental health of Turkish seafarers," *International Journal of Occupational Safety and Ergonomics*, pp. 1–26, Feb 2022.

[30] U. Yildirim, A. Toygar, and C. Çolakoğlu, "Compensation effect of wages on decent work: A study on seafarers attitudes," *Marine Policy*, vol. 143, pp. 105155, Sep 2022.

[31] M. Danacı and U. Yıldırım, "comprehensive analysis of lifeboat accidents using the fuzzy delphi method," *Ocean Engineering*, vol. 278, pp. 114371, June 2023.

[32] R. Cui, Z. Liu, X. Wang, Z. Yang, S. Fan and Y. Shu, "The impact of marine engine noise exposure on seafarer fatigue: a china case," *Ocean Engineering*, vol. 266, pp. 112943, Sep 2022.

[33] Z. Zhao, L. Tang, and Y. Wu, "Fatigue during the COVID-19 pandemic: the experiences of chinese seafarers," *Marine Policy*, vol. 153, pp. 105643, July 2023.

[34] M. Kaptan, and B. Olgun Kaptan, "The investigation of the effects of COVID-19 restrictions on seafarers," *Australian Journal of Maritime & Ocean Affairs*, vol. 15, pp. 25–37, Aug 2023.

[35] D. Onakpojeruo, B. Jeong, and C. Park, "Mental wellbeing; human reliability assessment of seafarers during the COVID-19 era," *Journal of International Maritime Safety, Environmental Affairs, and Shipping*, vol. 7, pp. 2184604, Feb 2023.

[36] A. Timilsina, and F. Baygi, "COVID-19 guidelines and its perceived effect on seafarers' health and wellbeing: a qualitative study," *PLoS One*, vol. 18, pp. e0284155, Apr 2023.

[37] F. Khademi, S. Moayedi, and M. Golitaleb, "The COVID-19 pandemic and death anxiety in the elderly," *International Journal of Mental Health Nursing*, vol. 30, pp. 346-349, Feb 2020.

[38] D. Shan, "Occupational health and safety challenges for maritime key workers in the global COVID-19 pandemic," *International Labour Review*, vol. 161, pp. 267–287, 2021.

[39] S. Stannard, "COVID-19 in the maritime setting: the challenges, regulations and the international response," *The International Labour Review*, vol. 71, pp. 85–90, 2020.

[40] L. Lei, X. Huang, S. Zhang, J. Yang, L. Yang, and M. Xu, "Comparison of prevalence and associated factors of anxiety and depression among people affected by versus people unaffected by quarantine during the COVID-19 epidemic in southwestern china," *Medical Science Monitor International Scientific Information*, vol. 26, pp. e924609- e924601, 2020.

[41] A. Slišković, "Occupational stress in seafaring," in *Maritime Psychology: Research in Organizational and Health Behavior at Sea*, M. MacLachlan, Ed., New York: Springer International Publishing, 2017, pp. 99–126.

[42] Y. Guo, R. Yan, Y. Wu, and H. Wang, "Ports opening for seafarer change during the COVID-19: Models and applications," *Sustainability*, vol. 14, pp. 2908, March 2022.

[43] R. T. Iversen, "The mental health of seafarers," *International Maritime Health*, vol. 63, pp. 78–89, 2012.

[44] S. N. M. Ali, et al. "A study of psychometric instruments and constructs of work-related stress among seafarers: a qualitative approach," *International Journal of Environmental Research and Public Health*, vol. 20, pp. 2866, 2023.

[45] M. A. Mamun, and M. D. Griffiths, "First COVID-19 suicide case in bangladesh due to fear of COVID-19 and xenophobia: possible suicide prevention strategies," *Asian Journal of Psychiatry*, vol. 51, pp. 102073, 2020.

[46] J. Zhang, W. Wu, X. Zhao, and W. Zhang, "Recommended psychological crisis intervention response to the 2019 novel coronavirus pneumonia outbreak in China: a model of West China Hospital," *Precision Clinical Medicine*, vol. 3, pp. 3–8, 2020.

[47] U. J. Okeleke, "A study of the results of coronavirus (COVID-19) on the nigerian maritime workers," *AIJR Preprint Server*, vol. 176, pp. 1–8, 2020.

[48] G. Pesel, M. L. Canals, M. Sandrin, and O. Jensen, "Wellbeing of a selection of seafarers in eastern adriatic sea during the COVID-19 pandemic 2020," *International Maritime Health*, vol. 71, pp. 184–190, Sep 2020.

[49] I. Jonglertmontree, W. Kaewboonchoo, O. Morioka, and P. Boonyamalik, "Depressive symptoms among thai male seafarers during the COVID-19 pandemic: a cross-sectional study," *BMC Public Health*, vol. 23, pp. 475, Mar 2023.

[50] U. Sekaran and R. Bougie, *Research Methods for Business: A Skill-Building Approach*, 7th Edition. West Sussex: Wiley & Sons, 2016. https://www.wiley.com/en-us/Research+Methods+ For+Business%3A+A+Skill+Building+Approach%2C+7th+Edition-p-9781119266846

[51] J. Cohen, *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed. New York, 1988. https://www.taylorfrancis.com/books/mono/10.4324/9780203771587/statistical-power-analysis-behavioral-sciences-jacob-cohen.

[52] J. D. Henry, and J. R. Crawford, "The short-form version of the depression anxiety stress scales (dass-21): construct validity and normative data in a large non-clinical sample," *British Psychological Society*, vol. 44, pp. 227–239, Jun 2005.

[53] Ö. Yılmaz, H. Boz, and A. Arslan, "The validity and reliability of depression stress and anxiety scale (DASS21) Turkish short form" *Research of Financial Economic and Social Studies*, vol. 2, pp. 78–91, 2017.

[54] T. A. Brown, "Confirmatory factor analysis for applied research". New York: Guilford Press, 2006. https://psycnet.apa.org/record/2006-07729-000

[55] K. Kara, and S. Edinsel, "The mediating role of green product innovation (gpi) between green human resources management (ghrm) and green supply chain management (gscm): evidence from automotive industry companies in turkey," *Supply Chain Forum: An International Journal*, pp. 1–22, Mar 2022.

[56] U. Yıldırım, A. Toygar, and A. L. Tunçel, "Effects of power distance on organizational commitment: a study on maritime faculty students," *Journal of ETA Maritime Science*, vol. 9, pp. 256–265, 2021.

[57] P. M. Bentler, and D. G. Bonett, "Significance tests and goodness of fit in the analysis of covariance structures," *Psychological Bulletin*, vol. 88, pp. 588–606, 1980.

[58] C. Fornell, and D. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *Journal of Marketing Research*, vol. 18, pp. 39–50, 1981.

[59] H. Schermelleh-Engel, K. Moosbrugger, and H. Müller, "Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures," *Methods of Psychological Research,* vol. 8, pp. 23–74, May 2003.

[60] R. B. Kline, *Principles and practice of structural equation modeling*, Third. New York: Guilford Publications, 2011. https://www.researchgate.net/profile/Cahyono-St/publication/361910413_Principles_and_Practice_of_Structural_Equation_Modeling/links/62cc4f0ed7bd92231faa4db1/Principles-and-Practice-of-Structural-Equation-Modeling.pdf

[61] D. Gefen, D. Straub, and M. C. Boudreau, "Structural equation modeling and regression: guidelines for research practice," *Communications of the Association for Information Systems*, vol. 4, 2000.

[62] J. Gaskin, "Multi-group effects gaskination's statwiki," 2012. http://statwiki.gaskination.com/index.php?title=Main_Page

[63] J. C. Nunnally, *Psychometric Theory*, 2nd ed. New York: McGraw-Hill Book Company, 1978. https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/ReferencesPapers.aspx?ReferenceID=1867797

[64] C. Doumbia-Henry, "Shipping and COVID-19: protecting seafarers as frontline workers," *WMU Journal of Maritime Affairs*, vol. 19, pp. 279–293, Sep 2020.

[65] IMO, "Coronavirus (COVID-19)-designation of seafarers as key workers," 2021. https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/COVID CL 4204 adds/Circular Letter No.4204-Add.35 - Coronavirus %28Covid-19%29 - Designation Of Seafarers As Key Workers.pdf (accessed June 21, 2022).

[66] A.T. Erdem and H. Tutar, "Impact of COVID-19 anxiety on work stress in seafarers: the mediating role of COVID-19 burnout and intention to quit," *International Maritime Health*, vol. 73, pp. 133-142, 2022.

[67] S. K. Brooks, et al. "The psychological impact of quarantine and how to reduce it: rapid review of the evidence," Lancet, vol. 395, pp. 912–920, Mar 2020.