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A quantitative study on the mental health of Turkish seafarers

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ABSTRACT
Physically and mentally healthy seafarers with professional knowledge and skills are needed for maritime transportation to be safe and sustainable. Mental problems experienced by seafarers can lead to negative consequences, such as bullying, substance dependency, assault, murder and suicide. Accordingly, this study examined the effects of differences between the socio-demographic characteristics of Turkish seafarers on their depression, which is an important criterion for determining mental disorders. Data collected from 403 participants through quantitative research methods were analyzed using SPSS version 25.0 and AMOS version 23.0. Although periodic physical and mental health checks are performed on seafarers, it was found from the analysis results that 33.2% of Turkish seafarers experience mental issues. Moreover, the study determined that the socio-demographic characteristics of seafarers made some differences in their depression levels.

KEYWORDS
seafarer; mental health; depression; seagoing life

1. Introduction

Individuals with mental problems tend to harm themselves, as well as their surroundings [1]. Maritime workers are among the occupational groups with the highest stress levels [2]; therefore, working in high-risk conditions can cause seafarers to experience mental problems [3,4]. In addition, maritime employment is among the most challenging occupations in terms of mental, psychosocial and physical stresses, and is not comparable with land occupations [5,6]. In a study examining suicide rates related to various occupations, the maritime occupation was included in the high-risk group, with the highest number of suicide cases [7]. Lefkowitz and Slade [8] found that 20% of the seafarers had thoughts of suicide or self-harm within the 2-week period prior to the study. Thus, many studies have been conducted on the factors that affect the mental health of seafarers. In previous studies, various problems, such as long-term contracts, social isolation, becoming distanced from home and family for long periods of time, limited shore leave [9–11], heavy workload and commercial pressures [12], were determined to be factors affecting the mental health of seafarers.

Seafarers should be suitably qualified in terms of professional knowledge, skills and technical competence, and should also be mentally and physically healthy [13]. Because seafarers tend not to deal with mental health problems, the increased number of incidents on ships, such as aggression, suicide and murder, is confirmed by news and posts in the press and social media. Unfortunately, although seafarers have been declared to be key employees in the maritime logistics and supply chain, many of their grievances have worsened considerably as a result of the coronavirus disease (COVID-19), which began in China at the end of 2019 [14]. The best example of that situation is the 'no-crew-change' condition required by freighters in their charters. The International Maritime Organization (IMO), in its circular published on this subject, stated that the 'no-crew-change' requirement would worsen the conditions of mentally and physically exhausted seafarers [15]. As of December 2020, it is estimated that 400,000 seafarers were marooned on ships after the expiration of their original contracts and could not be repatriated due to travel restrictions related to the COVID-19 pandemic. It is considered that the same number of seafarers were unable to join the ships and thus experienced economic difficulties [16].

It is important to protect the mental health of seafarers who are negatively affected by such factors so as to prevent suicides [17]. To eliminate mental health problems of seafarers, it is first necessary to examine the sources of those problems and then to take steps to solve and improve them. It is understood that the most common mental health problems in seafarers active in the maritime occupation are due to depression [18,19]. For that reason, in this study, the differences in socio-demographic characteristics of seafarers were determined by associating their mental health with their depression status, and then some solutions were proposed to reduce depression. Although these problems have been identified or implied in the Maritime Labor Convention (MLC) 2006 regulations, those related to the mental health, well-being and even fundamental employee rights of seafarers have yet to be effectively addressed [20]. In addition, the number of literature studies investigating depression and suicidal tendencies in seafarers is insufficient, and their findings are inconsistent [21]. It has also been observed that there are very limited studies on the mental health of Turkish seafarers in the literature. The maritime occupation has specific customs, traditions, and cultural and hierarchical structures. Maritime training and long-term professional experience are required to understand this working environment [22]. Therefore, the study is significant in terms of contributing to the literature.

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2. Conceptual framework

2.1. Depression

A lack or low level of mental disorder does not necessarily mean good mental health [23]. Depression is a common mental disorder manifested by loss of interest or emotion, decreased energy, feelings of guilt or low self-worth and inadequate concentration [24]. As a public health problem, depression has a high prevalence in both developed and developing countries [25]. It also causes death due to suicide [24], aggression [5], and cardiovascular and other diseases [26]. Due to isolated working conditions, seafarers live on ships for months at a time with no contact with anyone other than their colleagues. This isolated life can negatively affect their mental health [27]. Due to severe and dangerous working conditions, seafarers have a 1.3 times higher risk of death than those working on land [28]. Moreover, there are many studies in the literature indicating that the suicide rate in the maritime occupation is much higher than in land occupations [7,29,30]. Due to the combined negative factors, it is inevitable that common mental disorders such as stress and depression are observed. Mental disorders caused by depression and stress can lead to major consequences in seafarers, such as aggression, suicide and the tendency to murder [31,32]. As an example of such behaviors, an oiler stabbed the captain of a Turkish-flagged ship in his cabin in 2019, causing his death [33]. Depression causes behavioral disorders, such as aggression, insomnia and excessive smoking or alcohol consumption, in seafarers to compensate for their loneliness and also leads to additional physical health problems [5]. Similarly, the study conducted by Slišković and Penezić [34] indicated that seafarers increased the amount of smoking and alcohol consumption at sea compared to the amount on land as a way to deal with depression and stress. There are literature studies that analyze the mental disorders of seafarers in relation to their depression. Lefkowitz and Slade [8] determined the depression levels of seafarers by examining their mental health on the basis of data collected from 1572 seafarers. In that study, the majority of seafarers had symptoms of depression at different levels. A similar study conducted by Sau and Bhakta [35] determined that only a few seafarers had symptoms of depression. Unlike those, there are also studies in the literature on determining the mental health and depression levels of students enrolled in maritime education [36]. In the present study, it is considered that there is a significant difference between the depression of seafarers and socio-demographic factors. Accordingly, the main hypothesis proposal is as follows:

H_1: The depression levels of seafarers significantly differ based on socio-demographic factors.

2.2. The length of working life (sea service)

Seafarers are in the same indoor spaces during working and resting hours throughout the length of their working life [20]. Therefore, they are isolated from the rest of the world for long periods, and stress factors become chronic [5]. The study by Oldenburg et al. [6] found that the main source of stress for seafarers was their long working hours. For that reason, seafarers who served on ships with difficult working conditions for long stretches were negatively affected in terms of both physical and mental health, thus jeopardizing the safety of their ships [37]. Smith et al. [38], in their study performed with 1856 seafarer participants, reported that one out of every four seafarers had fallen asleep during a shift and that approximately 50% of the seafarers had worked more than 85 h per week. There have been many studies on long working hours in the maritime occupation and the duration of length of working life of seafarers on ships due to the resulting negative effects. The study conducted by Ruggunan and Kanengoni [39] indicated that the high percentage of participants who received maritime training did not want to work on ships for many years. A similar situation has been observed for seafarers who have experienced shipboard life. It is seen that working for long periods under shipboard conditions negatively affects the mental health of seafarers [40]. In the study performed by Thomas et al. [41], seafarers who did not adapt to the isolated lifestyle of being distanced from the social environment for long periods decided to reduce their length of working life. The sub-hypothesis proposal is as follows:

$H_{1.1}$: The depression levels of seafarers significantly differ according to the length of their working life.

2.3. Duty on the ship

The working conditions on the ship and the difficulties associated with each duty can be determining factors for the depression levels of seafarers. For example, the captain, being the person in charge of a ship, performs more difficult and stressful tasks due to his responsibilities and authorities, which include long periods on duty when the ship is in channels, straits and heavy traffic regions or during inspections, such as the flag state and port state. Seafarers who work as ratings are also faced with various challenging working conditions, including dangerous jobs, such as cleaning of warehouses or tanks, and constant exposure to noise and heat for those who work on the engines. Studies have examined differences in the length of working life on a ship according to the job roles of officer, rating and catering staff. The study conducted by Oldenburg et al. [42], e.g., reported that seafarers working as ratings and as catering staff (8.3 months in a year) work on ships for longer periods of time than officers (4.8 months in a year). The different types of duties and working conditions associated with different seafarer positions have also been discussed in many studies investigating the factors affecting the mental health of seafarers. In the study carried out by Sampson and Ellis [9], the depression status of the seafarers was indicated to differ according to their specific duties. Oldenburg and Jensen [43], who investigated the sources of stress and strain for seafarers based on an analysis of the different duties they performed on container ships, reported that significant differences were found between the sources of stress for nautical officers and other seafarer positions. Likewise, the study by Carotenuto et al. [44] found that shift engineers had significantly higher anxiety than that of deck and engine personnel. In a study examining suicide attempts as a result of high stress and anxiety, it was observed that most suicidal seafarers were ancillary staff ($n = 22$) and ratings ($n = 19$) [31]. Based on these studies, the sub-hypothesis proposal is as follows:

$H_{1.2}$: The depression levels of seafarers significantly differ according to their respective duties on the ship.

2.4. Ship type

During their terms of contract, seafarers are on watch and/or work for 6–7 days a week, depending on the voyage area and

ship type. Thus, it is necessary to examine the differences in living and working conditions according to ship type [45]. For example, the terms of contract of seafarers working on tankers are shorter than those for other ship types. Considering that the length of time spent in the working environment at sea can increase the stress level of seafarers, it can be argued that shorter working times on the ship would provide significant advantages [46,47]. On the other hand, when comparing bulk carriers to other ship types, their salary averages are lower, their terms of contract and travel times are longer, and their internet access is more limited. For example, in a study examining changes in the working conditions of seafarers over time, it was determined that in 2011 most ships did not have internet access, regardless of ship type, but that in 2016 internet use became more widespread in other ship types, except bulk carriers [48,49]. When examining similar studies in the literature, a study on 55 suicide cases between 1976 and 2002 indicated that the mental disorders experienced by seafarers increased their suicidal tendencies, and that these tendencies differed according to ship type [31]. Carter [50] found in his study that mental problems were frequently experienced by seafarers working on ships other than passenger ships. Accordingly, the sub-hypothesis proposal is as follows:

$H_{1.3}$: The depression levels of seafarers significantly differ by ship type.

2.5. Age

Insufficient work experience and age are important variables that affect the occurrence of work accidents and injuries [51]. Accordingly, inexperienced young seafarers who work on the deck or in the engine room have a higher risk of injury. In a study on the safety culture and the safety attitudes of seafarers in tankers, it was observed that young seafarers felt higher work pressure than that of others [52]. Moreover, Lefkowitz et al. [53] found that the majority of seafarers who applied for health insurance due to mental health problems between 2007 and 2015 were 30 years of age or younger (defined as the young age category in the study). The study by Qin et al. [54] indicated that high work stress was among the factors responsible for causing severe depression symptoms. There are other studies in the literature indicating that the stress factor increases with increasing age. Hystad and Eid [55] emphasized that the higher the age, the greater the experience and sense of responsibility, which means, in turn, that older workers may have higher stress levels in work life. Similarly, the study conducted by Griffiths et al. [56] found that the stress level in work life increases with age, with the age group of 50–55 years having the highest stress levels. The hypothesis proposal for eliminating this ambiguity in the literature is as follows:

$H_{1.4}$: The depression levels of seafarers significantly differ according to age.

2.6. Terms of contract

There are also differences in the terms of the contracts of seafarers according to their duties on the ship. It is seen, based on the study by Smith et al. [38], that some seafarers work for 2–4 weeks on a contract, while others work for 3 months to 2 years. Seafarers working on long-term contracts are more exposed to social isolation than are those working for short periods [21]. Long-term factors such as social isolation and separation from the family cause mental, psychosocial and physical stresses in seafarers [5]. In fact, seafarers can show various depressive behaviors because they spend their work and rest times in the same indoor spaces during the long contract terms [55]. For example, Zamora et al. [57] found that seafarers with contract terms of longer than 6 months had higher depression levels than those with contract terms of 5 months or less. Similarly, the study conducted by Alderton et al. [58] determined that seafarers who had been out of the port for more than 4 months and had no social contact had a tendency to consider very small things to be 'a matter of life and death'. To test those negative developments, this sub-hypothesis is proposed:

$H_{1.5}$: The depression levels of seafarers significantly differ according to their terms of contract.

2.7. Voyage area

Although seafarers spend months on ships, shore leave durations may be limited to only a few hours, and, in some voyage areas, it is not even possible to leave the ship [59]. Restrictions imposed by differences in voyage areas lead to more social isolation and psychosocial pressure on seafarers [60]. In addition, seafarers can be exposed to diseases caused by infectious agents in their voyage areas, and the effects of those diseases may be further increased by the lack of direct access to medical assistance on the ships [61]. Roberts and Marlow [31], examining this problem on the basis of previous suicide cases, concluded that seafarers working on long voyages are more likely to commit suicide than those working on short voyages. The sub-hypothesis proposal is as follows:

$H_{1.6}$: The depression levels of seafarers significantly differ according to voyage region.

2.8. Marital status

Working on a ship involves social isolation and, thus, affects the stress and depression status of seafarers negatively, causing them to feel a sense of emotional emptiness throughout the length of their working life [62]. When the difficulty due to the work structure on the ship is combined with the lack of social communication, it can lead to extremely dangerous results. Carotenuto et al. [5] found that being away from family and social isolation were the main factors affecting the mental health of seafarers. Therefore, marital status is an important variable in the relationship between perceived stress and induced anxiety [63]. Peplinska et al. [64] highlighted the importance of marital status on the mental health of seafarers, stating that marital status is related to the levels of stress and anxiety, and that it is a stress inhibitor. In a study by Sau and Bhakta [35], the differences in marital status of seafarers were investigated according to their depression levels. The study found that there were significant differences between the depression levels of single and married seafarers. Similarly, Zamora et al. [57] also examined the depression states of seafarers according to their marital status. The sub-hypothesis constructed on the basis of these studies is as follows:

$H_{1.7}$: The depression levels of seafarers significantly differ on the basis of marital status.

3. Methodology

3.1. Research population and sampling

The quantitative method was used in this study, and the research population comprised Turkish seafarers. As of August 2019, the total number of active Turkish seafarers was 101,277, with 29,543 being active officers and 71,734 active crewmembers [65]. According to the table developed by Sekaran and Bougie [66], 384 participants sufficiently represent a research population when the research population is higher than one million or when it cannot be determined. Accordingly, the sample group of this study consisted of 403 Turkish seafarers. Following the data collection phase of this study, the sample size was analyzed using G. Power version 3.1.9.2 to determine whether it was sufficient at an 80% confidence level. Accordingly, the lowest value of the effect size of the study was calculated to be 0.175, with a minimum power of 0.81. According to Cohen [67], the minimum value required for post-hoc power analysis is 0.67. It was determined that the study attained a sufficient number of samples, as the statistical power for tests was between 0.81 and 0.98.

3.2. Scaling used in the study

The survey method, one of the primary data collection tools, was used in this study. In this study, the patient health questionnaire-9 (PHQ-9) scale developed by Kroenke et al. [68], and adapted to Turkish by Sari et al. [69], was used. The PHQ-9 is a depression scale module developed to identify mental disorders [68]. A total score of 1–4 obtained from the scale is minimal depression, 5–9 is mild depression, 10–14 is moderate depression, 15–19 is moderately severe depression and 20–27 is severe depression. It was based on *Diagnostic and Statistical Manual of Mental Disorders-IV* (DSM-IV) criteria and then adapted to Turkish by performing validity and reliability analyses [69]. In the study conducted by Sari et al. [69], Cronbach's α values were calculated to determine the internal consistency of the scale. According to the test results, Cronbach's α value for the nine items was 0.842, and when each item was calculated separately, the values varied between 0.813 and 0.838.

3.3. Data collection method and socio-demographic characteristics of participants

Due to the widespread use of the internet on ships, data were collected from participants through an online e-survey application between February 1, 2020 and April 30, 2020. There are important advantages of online data collection methods, especially in studies conducted with quantitative methods. Survey studies conducted with online applications attract the attention of well-informed participants who have an understanding of the topic [70]. During data collection, 408 participants responded to the questionnaire forms. The forms of five participants were not evaluated because they were incomplete, inaccurate or inconsistent.

Table 1 presents the distribution of participants in the sample group according to their socio-demographic characteristics. It is seen that 33.5% of seafarers had 10 years or more of sector experience, 29.9% were cadets and 41.5% were working on dry cargo ships or bulk carriers. Moreover, 56.3% of seafarers were working with a term of contract of 6 months or more, 65.8% were working on long-distance voyages and, lastly, 59.3% were single.

Table 1. Socio-demographic characteristic distribution of participants.

Variable	Subtitle	*n*	%
Length of working life (years)	0–1	107	26.6
	2–3	72	17.9
	4–6	53	13.2
	7–9	36	8.9
	10 and more	135	33.5
Duty on the ship	Captain	48	11.9
	Deck officer	113	28.0
	Engine officer (including chief engineer)	61	15.1
	Cadet (deck and engineer)	120	29.9
	Rating and catering	61	15.1
Ship type	Dry cargo ship/bulk carrier	167	41.5
	Tanker	113	28.0
	Container ship	59	14.6
	Other	64	15.9
Age (years)	16–23	103	25.6
	24–29	115	28.5
	30–35	72	17.9
	36 and older	113	28.1
Term of contract (months)	0–5	176	43.7
	6 and more	227	56.3
Voyage area	Short distance	138	34.2
	Long distance	265	65.8
Marital status	Married	164	40.7
	Single	239	59.3
Total		403	100.0

3.4. Validity–reliability analyses

Exploratory factor analysis (EFA) was performed to test the sufficiency of statistical values of the scale used in this study and to determine the structural validity of the factor. In addition, the Kaiser–Meyer–Olkin (KMO) test, Bartlett's test of sphericity and Cronbach's α were performed to achieve the prerequisites of EFA, while lower and upper 27% group tests were performed to determine the item-total correlation and the distinctiveness of items in the factor.

The correlation between all of the items on the scale should be no lower than 0.30 [71]. When the correlations between items are examined, it is seen that all correlation relationships are significant. Due to the fit of all items within the specified criterion, no item was excluded from the scale. The KMO value and Bartlett's test of sphericity were examined to determine the prerequisites of EFA, i.e., the sufficiency of the relationship between the items and factor structure [72]. As a result of the analysis, the KMO value was determined to be 0.910. Because the KMO value was higher than 0.60, it was deemed 'sufficient' for factor analysis, which stemmed from a multivariate normal distribution [73]. When Bartlett's test of sphericity was examined, the obtained χ^2 value ($\chi^2(36) = 1589.733; p < 0.05$) was found to be acceptable. The varimax vertical rotation technique, one of the principal component analyses, was used for the factor structure of the scale. With this analysis, the variance

Table 2. Consistency and validity analysis results of the PHQ-9 scale.

Factor	Item number	Total item correlation	Factor weight	Factor exponent	Factor weight	Test value (upper 27% – lower 27%)	*p*	Eigen value	Factor reliability
Factor	Item 1	0.571	0.665	52.844	0.665	−5.278	0.000*	4.80	0.886
	Item 2	0.742	0.816		0.816	−19.241	0.000*		
	Item 3	0.655	0.737		0.737	−21.668	0.000*		
	Item 4	0.730	0.800		0.800	−23.107	0.000*		
	Item 5	0.660	0.739		0.739	−19.930	0.000*		
	Item 6	0.660	0.748		0.748	−15.421	0.000*		
	Item 7	0.631	0.720		0.720	−16.101	0.000*		
	Item 8	0.646	0.733		0.733	−14.807	0.000*		
	Item 9	0.457	0.550		0.550	−7.339	0.000*		
	Total			52.844					0.886
	KMO scale validity							0.910	
	Bartlett's test of sphericity $\chi^2(36)$							1589.7	
	p							0.000*	

*$p < 0.05$.
Note: Cronbach's $\alpha = 0.886$. KMO = Kaiser–Meyer–Olkin; PHQ-9 = patient health questionnaire-9.

Table 3. PHQ-9 test frequency and percent distribution.

None		Mild		Moderate		Partially severe		Moderately severe	
Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
139	34.5	130	32.3	82	20.3	34	8.4	18	4.5

Note: PHQ-9 = patient health questionnaire-9.

values of the factors with eigenvalues above one should be taken into account [73]. In this study, as in the original scale, it was determined that a single-factor structure with eigenvalues greater than one formed after varimax vertical rotation. The single-factor structure satisfying the condition with an eigenvalue above one (eigenvalue = 4.8) explains 52.844% of the total variance. The factor weights constituting the factor as a result of EFA are higher than 0.40, which indicates that the load value of the factor is high [74]. The variance between 40 and 60% seems to be sufficient [75]. Examination of the factor weights presented in Table 2 indicates that all items are at the desired level, between 0.550 and 0.816. The reliability is found to be 0.886 for the scale, which is considered to be a good reliability. This indicates that the internal consistency of the scale used in the study is good. To determine the distinctiveness of the items in the scale, the raw scores obtained from the scale were ranked in descending order, and the mean scores of the groups in the lower 27% and upper 27% were compared with the independent-samples *t* test. As a result of the comparison, there was a significant difference at the $p < 0.05$ level between the means of the lower and upper group item scores in terms of all items. Based on this, it is seen that the scale is distinctive in terms of measuring the desired quality.

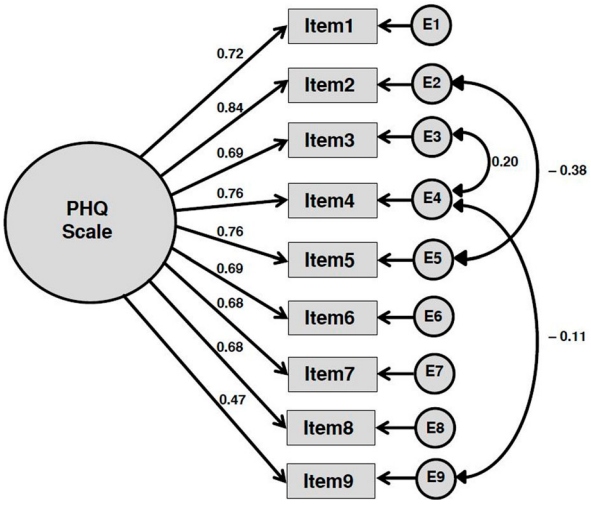


Figure 1. Model for single-factor CFA of the PHQ-9 scale. Note: CFA = confirmatory factor analysis; E = residual-error variance; PHQ-9 = patient health questionnaire-9.

4. Findings

4.1. Describing the depression states of seafarers

Table 3 presents the PHQ-9 test frequency and percentage distribution. Answers given to the items included are labeled 0 for the lowest and 3 for the highest (1–4 = *minimal*, 5–9 = *mild*, 10–14 = *moderate*, 15–19 = *partially severe* and 20–27 = *moderately severe*). According to Table 3, 34.5% of the participants did not show any symptoms of depression, 32.3% showed mild symptoms, 20.3% showed moderate depression, 8.4% showed partially severe depression and 4.5% showed moderately severe depression symptoms.

4.2. PHQ-9 confirmatory factor analysis

The research population of the study is different from that determined during the development of the scale. Furthermore, it is necessary to test the compatibility of the original structure and the structural validity of the scale with this study. Confirmatory factor analysis (CFA) was performed to fulfill these conditions [76]. The model for the single-factor CFA of the PHQ-9 scale is shown in Figure 1, and the results for the measurement model are presented in Table 4.

Table 4. Results of the PHQ scale model.

Factor		Item	Factor load	*SE*	Test value	*p*	AVE	CR
PHQ-9 scale	Item 1	Little interest or pleasure in doing things	0.723	–	–	–	0.49	0.89
	Item 2	Feeling down, depressed or hopeless	0.841	0.065	17.021	***		
	Item 3	Trouble falling or staying asleep, or sleeping too much	0.691	0.088	13.140	***		
	Item 4	Feeling tired or having little energy	0.759	0.072	16.150	***		
	Item 5	Poor appetite or overeating	0.763	0.085	13.705	***		
	Item 6	Feeling bad about yourself – or that you are a failure or have let yourself or your family down	0.694	0.076	12.118	***		
	Item 7	Trouble concentrating on things, such as reading the newspaper or watching television	0.677	0.072	12.818	***		
	Item 8	Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0.680	0.083	10.464	***		
	Item 9	Thoughts that you would be better off dead or of hurting yourself in some way.	0.406	0.064	4.984	***		

***$p < 0.05$.
Note: AVE = average variance extracted; CR = composite reliability; PHQ-9 = patient health questionnaire-9.

Table 5. Fit criteria findings of recommended and actual values.

Fit criterion	χ^2 / *df*	rmsea	GFI	AGFI	NFI	SRMR
Recommended value	≤ 5[a]	< 0.08[b]	≤ 1[b]	≤ 1[b]	≤ 0.80[c]	≤ 0.05[d]
Actual value (PHQ-9)	2.374	0.058	0.937	0.881	0.805	0.059

[a]From Bentler and Bonet [80].
[b]From Schermelleh et al. [82].
[c]From Hair et al. [81].
[d]From Hu and Bentler [83].
Note: $\chi^2 = 56.986$, $df = 24$, $p = 0.000$. AGFI = adjusted goodness-of-fit index; GFI = goodness of fit; NFI = normed fit index; PHQ-9 = patient health questionnaire-9; rmsea = root mean square error of approximation; SRMR = standardized root mean squared residual.

When the data in Figure 1 and Table 4 are examined on the basis of the CFA results of the PHQ-9 scale, the factor load values of the items are between 0.406 and 0.841, which is an acceptable range. The *t* values, which indicate the statistical significance level of relationships between items and implicit variables, were determined to be significant at the $p < 0.05$ level, and all values were found to be higher than 2.58 [77]. The reliability of the measurement model was tested by average variance extracted (AVE) and composite reliability (CR) values. The CR value of implicit variables in the measurement model must be higher than 0.70 [78], and the AVE value must be higher than 0.40 to achieve convergent validity [79]. As presented in Table 4, the results of the AVE test indicate that the items of the scale achieves the prerequisite for convergent validity (AVE = 0.49) and that the CR value is higher than the threshold value determined to be the lower limit (CR = 0.89). The accepted values for the fit indices of the PHQ-9 scale are presented in Table 5.

The fit criteria of PHQ-9 must be compatible with the recommended values presented in Table 5. The findings indicate that the ratio of the χ^2 value to the *df* value, one of the primary fit values, is sufficient (2.374) and the root mean square error of approximation (rmsea) value (0.058) satisfies the fit criteria. When it comes to the values of other fit criteria, all values are in accordance with the recommended values. According to the CFA, as a result of structural equation modeling, the scale is significant at the $p = 0.000$ level and the scale with nine items is associated with a single sub-dimension scale structure. Based on those findings, the factor structure for PHQ-9 was validated.

4.3. Hypothesis tests

After testing the scale in terms of structural validity and reliability, the normality of the data collected from the participants was evaluated to test the hypotheses and to determine the applicable method. Whether the data provided normal distribution was examined by using skewness and kurtosis values, which are important criteria for testing the normal distribution of the data. In addition, the standard deviation of both values should be ± 1 to achieve a normal distribution [84]. Outliers increase the error variance, and also affect the strength of statistical tests. Therefore, the analyzed data sets were checked for outliers prior to the statistical tests. Because no outliers were found, no data were excluded. As a result of the tests, both the skewness (0.796) and kurtosis (0.166) values satisfied the normal distribution condition; thus, the analyses of hypotheses were appropriate for parametric tests. The hypotheses proposed in the study were tested using

two parametric tests, the independent-samples *t* test and one-way analysis of variance (ANOVA).

To compare the socio-demographic characteristics of the participants with their PHQ-9 scores, the independent-samples *t* test and ANOVA were used. As a result, it is seen that there was a statistically significant difference between the length of working life of participants and their PHQ-9 scores ($f(398) = 5.261$, $p < 0.05$). Bonferroni correction was applied to determine the distinctive group. Participants with 2–3 years of working life (arithmetic mean [$\overline{X}$] = 1.08, *SD* 0.70) had higher depression levels than those with 10 years or more of working life ($\overline{X} = 0.69$, *SD* 0.58). There was a statistically significant difference between the sufficiency levels of participants on ships and their PHQ-9 scores ($f(398) = 2.603$, $p < 0.05$). Rating and catering participants ($\overline{X} = 1.03$, *SD* 0.71) had higher depression levels when compared with those of captains ($\overline{X} = 0.67$, *SD* 0.51). There was a statistically significant difference between ship types and PHQ-9 scores of participants ($f(399) = 2.856$, $p < 0.05$). The depression levels of the participants working on dry cargo ship/bulk carriers ($\overline{X} = 0.89$, *SD* 0.64), container ships ($\overline{X} = 80.97$, *SD* 0.64) and other ships ($\overline{X} = 0.94$, *SD* 0.62) were found to be higher than the depression levels of participants working on tankers ($\overline{X} = 0.72$, *SD* 0.62). There was a statistically significant difference between the ages of participants and their PHQ-9 scores ($f(399) = 9.390$, $p < 0.05$). It was determined that the seafarers who were between the ages of 24 and 29 years ($\overline{X} = 1.09$, *SD* 0.70) had higher depression levels than those who were between the ages of 30 and 35 years ($\overline{X} = 0.70$, *SD* 0.54) and over age 36 years ($\overline{X} = 0.70$, *SD* 0.60). There was a statistically significant difference between the terms of contract of the participants and their PHQ-9 scores ($t(401) = -3.660$, $p < 0.05$). The participants with terms of contract of 6 months or more ($\overline{X} = 0.96$, *SD* 0.63) had higher depression levels than those with terms of contract of 0–5 months ($\overline{X} = 0.73$, *SD* 0.62). Lastly, there was a statistically significant difference between marital status and the PHQ-9 scores of the participants ($t(401) = -2.681$, $p < 0.05$). Single participants ($\overline{X} = 0.93$, *SD* 0.63) were found to have higher depression levels than married participants ($\overline{X} = 0.76$, *SD* 0.63).

5. Results and discussion

The depression status of individuals is an important criterion for determining mental disorders [68]. With depression being such a common mental problem experienced by seafarers [19], this study examined the mental health status of Turkish seafarers actively working on ships to determine differences in their levels of depression based on socio-demographic factors. Although seafarers receive a Medical Examination Certificate for Seafarers after undergoing periodic physical and mental health checks, according to the initial results of this study 33.2% of the seafarers were found to have depression symptoms. This finding is consistent with those found by other studies, which report that 25% of seafarers show moderate-to-high level symptoms of depression [8] and 48.7% experience various mental health problems [35].

In this study, which examined the effects of socio-demographic factors on the depression levels of seafarers, it was observed that all of the factors (length of working life, duty, ship type, age, term of contract and marital status), except 'voyage area', had a significant effect on the depression levels of the seafarers. Table 6 indicates that the depression levels of the seafarers differed to a partially significant degree based on socio-demographic factors, and thus partially confirmed H_1; the differences due to socio-demographic factors were examined one by one to understand the reasons for this significant difference.

Table 6. Hypothesis results.

Hypothesis	Test variable	Test value	*p*	Supported
H_1	Socio-demographic			Partially yes
$H_{1\cdot1}$	Working life	5.261	0.000*	Yes
$H_{1\cdot2}$	Duty	2.603	0.036*	Yes
$H_{1\cdot3}$	Ship type	2.856	0.037*	Yes
$H_{1\cdot4}$	Age	9.390	0.000*	Yes
$H_{1\cdot5}$	Term of contract	−3.660	0.000*	Yes
$H_{1\cdot6}$	Voyage area	1.930	0.054	No
$H_{1\cdot7}$	Marital status	−2.681	0.008*	Yes

*$p < 0.05$.

The study results revealed that the depression levels of the seafarers did, in fact, significantly differ based on the length of time working on the ship, and thus confirmed $H_{1.1}$ more specifically; it was found that the seafarers who had been working on commercial ships for 2–3 years or less had higher depression levels than those of the seafarers who had been working for 10 years or more. This result is in agreement with those reported by other studies indicating that seafarers who have worked on a ship for 2–3 years tend to experience higher levels of depression due to not yet being accustomed to the work structure of the ship [48] and that young seafarers just starting the job are at the highest risk for mental health problems [12]. Furthermore, this result also supports the idea that the experience gained with years of service can serve to decrease the effects of work-related stress [85].

The depression levels of seafarers differed significantly according to their duties, which confirms $H_{1.2}$; as understood from the data presented in Table 7, it was determined that the depression levels of ratings and catering staff were higher than those of officers and captains. These results support studies indicating that ratings and auxiliary service staff have higher depression levels compared to those of other seafarers [9,44], as well as studies reporting that rating seafarers have higher suicide rates [31,76].

The research results indicated that depression levels differed significantly based on ship types, confirming $H_{1.3}$; more specifically, the depression levels of seafarers working on bulk cargo, general cargo, container and roll-on/roll-off passenger cruise ships were higher than those of the seafarers working on tanker ships. These results support the idea that suicidal tendencies of seafarers vary according to ship type [31].

The depression levels of the seafarers also differed by age group, which confirms $H_{1.4}$; it was determined that the depression levels of the seafarers who were between 20 and 29 years of age were higher than those of the 30 years and over group. Accordingly, the results of the present study are in agreement with the study by Lefkowitz et al. [53].

The depression levels of the seafarers differed significantly according to the terms of contract, confirming $H_{1.5}$; it was found that the seafarers with a term of contract of 6 months or more had higher depression levels than those whose term of contract was 5 months or less. This finding supports studies from the literature indicating that the feelings of loneliness experienced by seafarers working under a long-term contract

Table 7. Comparison of PHQ-9 scores of participants based on socio-demographic characteristics.

Variable	Subtitle	$\overline{X}$	*SD*	Test value		*p*	Bonferroni
				Ratio of variance[a]	Test statistic[b]		
Length of working life (years)	0–1 (1)	0.87	0.59	5.261	–	0.000*	2 > 5
	2–3 (2)	1.08	0.70				
	4–6 (3)	0.91	0.70				
	7–9 (4)	0.98	0.57				
	10 and more (5)	0.69	0.58				
Duty on the ship	Captain (1)	0.67	0.51	2.603	–	0.036*	5 > 1
	Deck officer (2)	0.90	0.67				
	Engine officer (3)	0.78	0.65				
	Cadet (4)	0.87	0.58				
	Rating and catering (5)	1.03	0.71				
Ship type	Dry cargo ship/bulk carrier (1)	0.89	0.64	2.856	–	0.037*	1 > 2, 3 > 2, 4 > 2
	Tanker (2)	0.72	0.62				
	Container ship (3)	0.97	0.64				
	Other (4)	0.94	0.62				
Age (years)	16–23 (1)	0.90	0.58	9.390	–	0.000*	2 > 3, 2 > 4
	24–29 (2)	1.09	0.70				
	30–35 (3)	0.70	0.54				
	36 and older (4)	0.70	0.60				
Term of contract (months)	0–5	0.73	0.62	–	−3.660	0.000*	
	6 and more	0.96	0.63				
Voyage area	Short distance	0.95	0.62	–	1.930	0.054	
	Long distance	0.82	0.64				
Marital status	Married	0.76	0.63	–	−2.681	0.008*	
	Single	0.93	0.63				

[a]One-way analysis of variance.
[b]Independent-samples *t* test.
*$p < 0.05$.
Note: $\overline{X}$ = arithmetic mean.

on a ship out at sea were higher, and that these seafarers experienced emotional problems in their relationships [41].

The final result of the study was that the depression levels of the seafarers differed significantly according to marital status, confirming $H_{1.7}$; in particular, the study found that the depression levels of single seafarers were higher compared to those of married seafarers. These results are consistent with one study that reported 46.4% of married seafarers showed symptoms of depression, while this rate increased to 74.1% in single seafarers [35].

6. Conclusion

The maritime occupational group is among the most isolated occupational groups in the world. Seafarers live on the ship for months without social contact with people other than their colleagues and suffer mental health problems due to the difficult working conditions of the profession. As a group, they tend to be hesitant to share their feelings with other people. The carelessness, panic, fear and aggression caused by the mental disorders seafarers experience can lead to loss of life and property, and even serious environmental disasters. Therefore, it is important to determine and analyze the factors that cause the mental disorders of seafarers. The hypotheses proposed within the scope of this study served to direct attention on identifying the effect of certain socio-demographic factors on the depression levels of seafarers. The results of the study support previous studies in showing that the factors of length of working life, duty, ship type, age, term of contract and marital status are significant determining factors for the depression levels of seafarers. The present study is important insofar as it filled a gap in the literature with the analysis performed on the mental health status of Turkish seafarers. The results of the study will contribute to creating awareness for the stakeholder institutions and companies in the maritime industry and to facilitating coordination among them.

7. Limitations and future research

This study had two limitations that are important to point out. First, the study was restricted to using convenience sampling, a non-probability sampling method, due to the severe quarantine practices in Turkey and the challenges these posed to accessing the sample group during data collection periods. Second, although there are many factors that can cause mental deterioration in individuals, in this study only depression levels were measured in determining the mental health of the seafarers. While the mental health of seafarers is certainly an important topic frequently addressed in the literature, the working conditions and social problems responsible for the mental health issues they experience have not been studied in detail. Examining the working conditions on the ship and the personal and social behaviors of seafarers and associating these with concepts that cause mental disorders, such as depression, anxiety and stress, would provide important contributions to the literature.

8. Recommendations for the seafaring industry

Today, mental health checks of seafarers are performed according to specific standards. It is very important that the tests used to determine the mental status of seafarers are performed in a detailed manner during health inspections, and that the seafarers who cannot meet the qualifications are referred to health centers. In addition, maritime companies can provide psychological evaluations and psychiatric support with online methods during the voyage as a safe method for preventing the mental disorders experienced by seafarers. The same care shown to physical health problems should also be shown to mental illnesses. Encouraging seafarers to talk about their mental health as much as possible and routinely evaluating mental health issues in ship safety meetings will contribute to reducing the problems caused by mental illnesses.

While the minimum number of seafarers that must be on board a ship has decreased in recent years, the workload of seafarers has increased due to the many national and international rules now governing ships. It is believed that the increase in the workload and working hours and fatigue of the seafarers and the decrease in their sleep and rest periods will negatively affect their depression status and lead to negative consequences. Maritime companies should implement programs to increase mental health support, especially for trainees and newcomers. They furthermore should develop policies on bullying, harassment and mental health, balance work and leave periods in employment contracts, and ensure that terms of contract are less than 4–6 months, depending on the type of ship, without possibility of extension except in obligatory circumstances. Lastly, seafarers should be encouraged to socialize and be allowed to go out at the ports of call to meet their cultural and personal needs, as these would contribute to reducing depression problems.

Disclosure statement

No potential conflict of interest was reported by the authors.

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