

# The psychosocial burden and stress coping strategies among seafarers

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## ABSTRACT

**Background:** The seafarers' professional group is one of the most numerous in the world. According to the statistics of the European Maritime Safety Agency (2020), there are approximately 280,000 people employed at sea in the European Union. The specific work environment on the ship (climatic, physical, chemical, psychological factors, etc.) is related to experiencing long-term stress. The World Health Organization considers work-related stressors to be very important determinants of health and disease. One of the basic psychological resources related to adaptation to demanding working conditions are strategies for coping with stress. The aim of the study is to assess the occurrence of harmful psychosocial factors in the work of seafarers and the stress coping strategies and their relationship with somatic diseases.

**Materials and methods:** One hundred and fifteen seafarers who received a maritime health certificate participated in the study at the Occupational Medicine Clinic. The study was part of a larger project looking at the prevalence of cardiovascular risk factors among seafarers. The study used the Coping Questionnaire in Stressful Situations (CISS) (Endler and Parker) and a general questionnaire created for the purposes of the study.

**Results:** Thirty six per cent respondents were exposed to traumatic event and to having nightmares, 13% had been discriminated at least once in the workplace. A positive correlation was found between discrimination and depression, nightmares and trauma. In addition, people who admitted having experienced trauma slept shorter (also while at home) and experienced nightmares more often. The most common style of coping was task oriented (29; 28.5%), and avoidance oriented (15%). The study also found a positive correlation between depression and the style of emotion-oriented coping and avoidance-oriented coping.

**Conclusions:** The specific working conditions and exposure to traumatic events have a negative impact on the health of seafarers by increasing the risk of depression and cardiovascular diseases. The coping styles with stress depend on the position in the ship hierarchy.

(Int Marit Health 2023; 74, 2: 122–128)

**Key words:** psychosocial risk factors, stress coping styles, work-related stress, work environment

## INTRODUCTION

According to the latest statistics of the European Maritime Safety Agency (EMSA), published in June 2020, there are approximately 280,000 professionally active seafarers in the European Union, from which around 36,000 are of Polish nationality [1]. Seafarers on sea-going ships are

exposed to multiple harmful factors related to changing climatic conditions, physical and chemical factors on board, specific work mode and high level of mental strain [2–4]. Seafarers are particularly exposed to the climatic conditions occurring onboard such as work both in low and very high temperatures, as well as exposure to wind, rainfall and other

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Received: 5.05.2023 Accepted: 27.06.2023

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atmospheric phenomena [3]. When it comes to physical factors, one should mention exposure to vibrations, electromagnetic field, high noise level, high temperatures and poor ventilation [2–5]. Accordingly chemical agents on ships include asbestos [6], polycyclic aromatic hydrocarbons, soot, as well as benzene and engine exhaust [2–4]. Moreover, harmful psychosocial factors such as long working hours, shift work, exposure to stress and traumatic events, as well as long separation from the family and constant stay in a closed environment are commonly found in the work environment of seafarers [4, 7, 8]. According to the research carried out by Oldenburg et al. [9], the high level of stress and the large number of night watches during the stay on board particularly concerned the officers employed on the bridge. In addition, most of the crews are made up of seafarers of different nationalities, speaking different languages, often from culturally distant countries. Those aspects may increase the level of stress, as well as induce a feeling of isolation and contribute to a greater risk of depression, especially at the beginning of a cruise [10].

In opposite to other professions, seafarers are exposed to the detrimental impact of harmful factors, also during their free time/during the entire stay on board.

In the context of work in the marine environment, the notion of mental stress as well as the participation and role of psychosocial factors as its source plays a particularly important role [11–13]. Exposure to harmful physical and psychosocial factors occurs simultaneously. In this approach, we deal with at least two processes – the direct mechanism of somatic disorders and the psychological effects of stress.

People vary greatly in their responses to stress. An event that triggers anxiety and flight responses in one person can be inspiring and energizing to another [14]. Resources related to coping may result from the actual external possibilities of coping with the problem (access to money, social support) or can be related to the personal internal predispositions [14].

Coping concerns the individual's efforts to regulate a stressful situation [15]. The coping styles are often used as mediators of prior stressful events and their consequences such as: anxiety, depression; mental discomfort and somatic complaints [16–18].

One of the most popular concepts of stress coping strategies is the differentiation made by Endler and Parker [see 9]. Based on the research, three styles of coping with difficult situations were described (1) the task-oriented style, (2) the emotion-oriented style and (3) the avoidance-oriented style. Coping styles can be diagnosed with the Coping Inventory for Stressful Situations (CISS) [19]

The health consequences of stress and coping with it are diverse – they include both subjective and objective aspects. Indicators of health effects, as the likely effects

of occupational stress, can be divided into at least five groups, depending on the level of objectivity [20]:

1. “Objective” level indicators, such as the number and type of symptoms – i.e. body mass index and self-assessment health;
2. Declaration level – “subjective” indicators – i.e. assessment of mental and physical well-being, general perception of health;
3. Behavioural level – behaviour that may be stress-related (not necessarily conscious): smoking, eating habits (different at work than at home), absence from work;
4. Psychological well-being – an aspect of manifested mood, and generally perceived stress at work and at home;
5. Physiological consequences of stress, as well as based on behavioural indicators such as trouble falling asleep and waking up etc.

In the current research we analysed all five aspects of health indicators at the seafarers work. The aim of the presented study is to assess the occurrence of harmful psychosocial factors in the work of seafarers as well as the strategies of coping with stress and their possible relationship with somatic diseases.

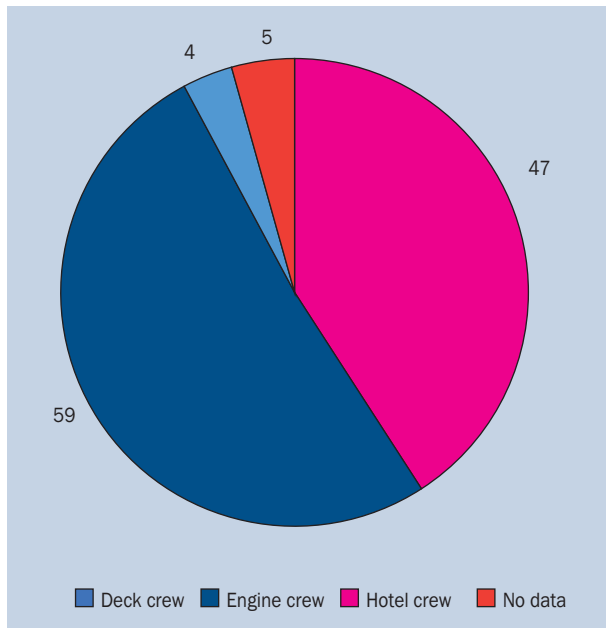
## MATERIALS AND METHODS

The study included a statistical analysis of the data obtained from the questionnaire created for the purpose of this project and the CISS [19]. The study was conducted in the period from February 2018 to February 2019 at the Outgoing Occupational Medicine Clinic after obtaining the consent of the Independent Bioethics Committee for Scientific Research. Inclusion criteria for the study were: age > 18 years and informed consent to participate in the study.

## CHARACTERISTICS OF THE STUDY GROUP

The study involved 115 seamen of Polish nationality who reported periodic examinations at the Clinic of Occupational Medicine. About 17% of seafarers refused to take part in the survey (20 out of 135). All people who agreed to participate in the study received a marine health certificate. Seafarers aged 21 to 68 (mean age 42.3, median 42) participated in the study; 97.19% of the respondents were male, which, according to data provided by EMSA [1], corresponds to the gender ratio of the European seafarers' population. In the study population, 60 seafarers were in the 20–40 age group, 45 in the 41–60 age group; and 10 respondents were over 60 years old

In the study group, three subgroups were distinguished depending on the workplace/department on the ship – deck crew, engine room crew and the so-called hotel crew (cooks, stewards), which can also be included in the deck crew. People who described their job as a fitter were included in the machinery department. The above division into three groups is con-



**Figure 1.** Division of the study group according to the place of work on the ship

sistent with the division introduced by the International Convention on Standards of Training, Certification and Watch-keeping for Seafarers [20], which regulates the organization of work on ships. Figure 1 shows the division of respondents according to the place of work. Another division, which was applied due to possible differences in exposure to harmful factors and partly different job characteristics, is the division into a group of officers and non-officers. In the studied group, about 51% were non-officers (58 people) and about 45% (52 people) were officers (no data for 5 people).

## METHODS

### General questionnaire created for the purpose of the study

The survey was a detailed interview including questions on following data.

#### Chronic diseases

The questionnaire asked about occurrence of such disease as: cardiovascular diseases (CVD), depression, schizophrenia, rheumatic diseases, as well as obstructive sleep apnoea and hypothyroidism.

#### Lifestyle

**Smoking cigarettes.** The respondents were asked whether they had ever smoked cigarettes (and if so, whether they still smoke), the duration of smoking (in years) and the average number of cigarettes smoked during the day.

**Diet.** The survey asked whether the respondents consumed at least 4–5 meals a day and how many portions

of vegetables/fruit, meat, dairy and sweets they consumed during the day.

**Exercise.** The questionnaire asked whether the respondents performed physical exercise (non-work-related effort) in an amount corresponding to at least 30 minutes a day for 5 days a week.

**Sleep.** Respondents had to determine how many hours they sleep on average per night while at work, and how many while at home. The respondents had to choose one of 4 intervals (1.9 h).

#### Characteristics of the work

The questionnaire included questions about type of work they perform, as well as the number of working hours during the week and night work. People who admitted to shift work were asked to clarify how many years they had been working at night. In the last question concerning the specificity of the work performed, the respondents were to estimate the average income per person in the family (the respondents could choose from 7 ranges, PLN 3,000).

#### Psychosocial factors

The surveyed seafarers also answered questions about whether they had ever experienced discrimination in the workplace on the basis of sex, age or race, and whether they had been exposed to a traumatic event, and whether they had nightmares or intrusive thoughts.

#### The Coping Inventory for Stressful Situations (CISS)

The CISS [17, 19] is a tool validated and adapted for use in Poland to assess the style of coping with stress. The CISS questionnaire contains 48 statements concerning different behaviours in stressful situations. The person's scale is to determine the frequency with which he/she takes a given action (or feels a given state or emotion) on a scale of 1–5, where 1 means never, and 5 – very often. The CISS questionnaire allows you to assess the levels of specific styles of coping with stress – task-oriented coping (TOC), emotion-oriented coping (EOC) and avoidance-oriented coping (AOC). In terms of the style focused on avoidance, two subscales can be distinguished: distractions (D) and seeking social diversion (SD).

## RESULTS

### GENERAL QUESTIONNAIRE

#### Psychosocial factors

One hundred and six seafarers answered questions about discrimination, trauma, nightmares and intrusive thoughts. 13% of respondents (15 people) stated that they felt discriminated at least once in the workplace due to age, gender or race. 42 (36%) seafarers admitted to having been exposed to a traumatic event in the past. Also 42 (36%) people from

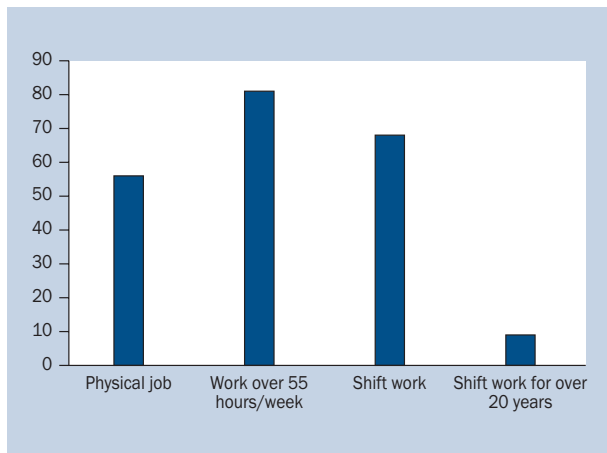


Figure 2. Work characteristics of the studied group

the study group admitted to having nightmares or intrusive thoughts. We found a weak positive correlation between an affirmative answer to the question about discrimination and depression in the interview ( $r = 0.240$ ;  $p = 0.013$ ) and a moderate positive correlation between discrimination and trauma ( $r = 0.309$ ;  $p = 0.001$ ); as well as between discrimination and nightmares ( $r = 0.312$ ;  $p = 0.001$ ). Additionally, a moderate positive correlation was found between the experience of trauma and nightmares ( $r = 0.431$ ;  $p = 0.043$ ).

### Work-related factors

The work characteristics are presented in Figure 2. As many as 70% of the surveyed seafarers work more than 55 hours a week, and over 60% work in shifts (9 people have worked in shifts for more than 20 years). Shift work is more often performed by people working on board ( $M = 0.77$ ;  $SD = 0.42$ ;  $t = 2.13$ ;  $p = 0.36$ ) in comparison with people employed in the engine room ( $M = 0.57$ ;  $SD = 0.49$ ;  $p = 0.61$ ). At the same time, officers ( $M = 0.79$ ;  $SD = 0.41$ ) performed

shift work more often ( $t = 2.861$ ;  $p = 0.005$ ) compared to non-officers ( $M = 0.53$ ;  $SD = 0.5$ ). On the other hand, manual labour is the domain of employees in the engine room ( $M = 0.69$ ;  $SD = 0.47$ ); who work significantly more physically –  $t(96) = 3.32$ ;  $p = 0.001$  from deck workers ( $M = 0.36$ ,  $SD = 0.49$ ). At the same time, there were significant differences between officers and non-officers – officers ( $M = 0.32$ ;  $SD = 0.47$ ) performed physical work less frequently ( $t = 4.228$ ;  $p = 0.013$ ).

### Chronic diseases

There were no people in the study group who had experienced a heart attack or arterial revascularization coronary heart disease, stroke or transient ischaemic attack.

Two (1.7%) respondents admitted to being depressed in the study group. Both respondents who admitted depression were cooks, and therefore members of the hotel staff. There was a weak positive correlation between the exposure to discrimination in the history and the occurrence of depression. Weakly/moderately positive correlation occurred simultaneously between depression and the AOC styles of coping ( $r = 0.249$ ;  $p = 0.012$ ) and EOC ( $r = 0.397$ ;  $p = 0.000$ ). In response to the question about schizophrenia, none of the respondents chose an affirmative answer.

In the study group, 3 (2.6%) suffered from obstructive sleep apnoea, and 4 (3.5%) suffered from hypothyroidism.

### STRESS COPING STYLES

Among the respondents, 102 completed the CISS questionnaire assessing the styles of coping with stress. The most common style of coping with stress was TOC (29; 28.5%). AOC, which is associated with an increased risk of CVD, was presented by 14 (13.7%) respondents. Figure 3 presents the division of the respondents according to the dominant

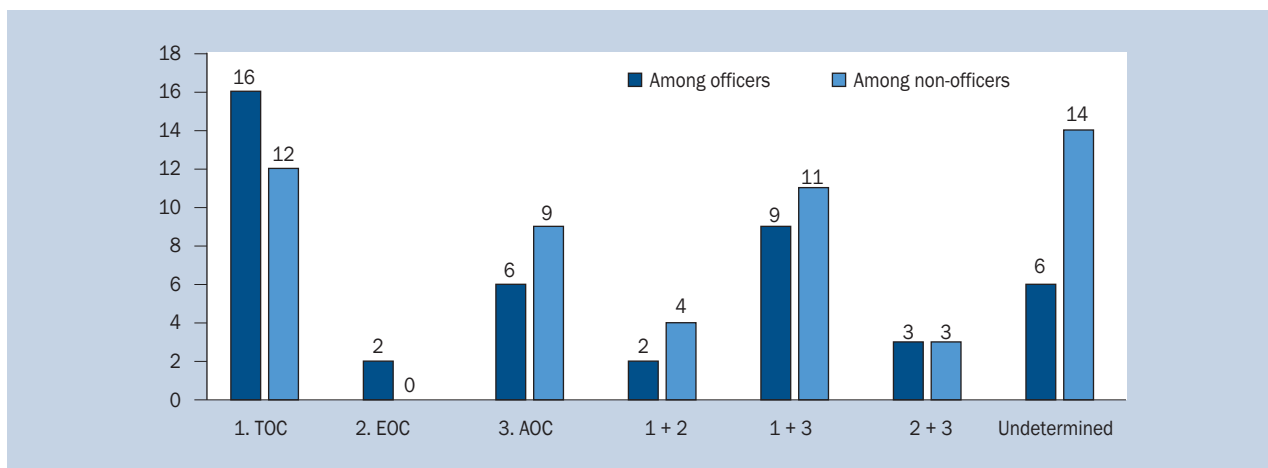


Figure 3. The comparison of the dominant coping styles among seafarers with division into officers and non-officers; TOC – task-oriented style; EOC – emotions-oriented style; AOC – avoidance-oriented style

CISS style. In some respondents, two styles were dominant or it was impossible to define the dominant style in accordance with the applicable norms. There is a significant difference in the TOC between officers ( $M = 6.4$ ;  $SD = 1.9$ ) and non-officers ( $M = 95.5$ ;  $SD = 91.6$ ). Officers have a significantly higher TOC index ( $TOC = 2.564$ ;  $p = 0.012$ ).

A positive correlation was found between EOC and a positive history of CVD in men in a family ( $r = 0.199$ ;  $p = 0.056$ ) and the frequency of consuming sweets during the week ( $r = 0.272$ ;  $p = 0.01$ ). There was also a weak positive correlation between avoidant style (the avoidant style has two dimensions: distraction and social diversion) and eating at least 5 meals a day ( $r = 0.245$ ;  $p = 0.05$ ) and consumption of red meat ( $r = 0.220$ ;  $p = 0.029$ ). The study also found a positive correlation between depression and EOC ( $r = 0.399$ ;  $p = 0.000$ ) and AOC ( $r = 0.249$ ;  $p = 0.01$ ).

## Lifestyle

**Smoking cigarettes.** In the study group, 58 (50.5%) sailors have ever smoked cigarettes in their lives, of whom 41 (35% of respondents) were still smoking at the time of the study. The average number of cigarettes smoked by smokers in the study group was 8.80/day ( $SD = 15.10$ ), and 5 people smoked more than 20 cigarettes a day. The average length of cigarette smoking was 8.9 years ( $SD = 11.68$ ); and most of the respondents smoked for a maximum of 5 years – only 15 seafarers (13% of the respondents) smoked for over 5 years. There is a significant difference in the number of cigarettes smoked during the day between officers ( $M = 6.1$ ;  $SD = 7.3$ ) and not officers ( $M = 9.3$ ;  $SD = 9.3$ ) – officers smoke significantly less cigarettes during the day ( $t = 1.964$ ;  $p = 0.05$ ) than non-officers. A positive correlation was found between the duration of cigarette smoking and body mass index ( $r = 0.222$ ;  $p = 0.025$ ).

**Diet and exercise.** One hundred and eight of the respondents answered questions about physical exercise and diet (no data for 7, i.e. 6% of the study group). Among 108 respondents, less than half (48 respondents) perform physical exercises in the amount recommended by the European Society of Cardiology guidelines [21], i.e. on average 5 times a week for a minimum of 30 minutes. A moderate positive correlation was found between the recommended amount of physical exercise and shift work ( $r = 0.337$ ;  $p = 0.000$ ). Moreover, people who exercised smoked less cigarettes during the day ( $r = -0.240$ ;  $p = 0.012$ ) and were more satisfied with their health condition ( $r = 0.256$ ;  $p = 0.008$ ). In the case of diet 49.5% (57) and 52% (62) of the respondents, respectively, do not consume the recommended portion of fish and dairy products during the week; and 48.7% or 56 of respondents eat less than the recommended 5 meals a day. Moreover, 54% of the surveyed people (62 people) eat more than 300 g of red meat a week, and as many as

69% (75 respondents) eat sweets more than twice a week. Officers ( $M = 0.75$ ;  $SD = 0.44$ ) ate vegetables significantly more often ( $t = 2.133$ ;  $p = 0.035$ ) than non-officers ( $M = 0.55$ ;  $SD = 0.5$ ). There was a positive relationship between the level of income and the consumption of the recommended portion of vegetables ( $r = 0.20$ ;  $p = 0.035$ ) and between the consumption of the recommended portion of vegetables and the consumption of the recommended amount of dairy ( $r = 0.243$ ;  $p = 0.011$ ) and fish ( $r = 0.304$ ;  $p = 0.05$ ).

**Sleep.** The optimal length of sleep (7–9 hours) per day while staying at home was declared by 76% of the respondents. While on board, this percentage drops to 55%. Almost half of the respondents (45%) sleep less than 7 hours while working at sea (only 1/5 of the respondents (20%) sleep at home for less than 7 hours a day. Ten respondents sleep less than 6 hours at work and at home. On the other hand, the study found a weak negative correlation between the duration of sleep at home and the exposure to a traumatic event in the history of non-officers ( $r = -0.240$ ;  $p = 0.015$ ).

## DISCUSSION

Working at sea is associated with a heavy physical and mental burden, and work on ships is one of the most dangerous jobs in the world. All harmful and hazardous factors onboard affect seafarers both during their work and in their spare time throughout the voyage.

Also the presence of harmful psychosocial factors such as stress and fatigue is inherent in working on a ship [22]. The reflection of a significant psychological burden among seafarers may be indirect due to the fact that, according to some reports available in the literature, suicides are one of the most frequent causes of death in this professional group (especially considering the underestimation of the number of suicides, for example in the case of disappearances at sea) [10, 22–24].

Moreover, significant fatigue related to working at sea may pose a direct threat to the health and life of the seafarer himself or other crew members, increasing the risk of an accident. According to the literature, especially long working hours and night work are associated with a higher risk of an accident [25]. In the presented study, as many as 70% of seafarers admitted to work over 55 hours a week, and as many as 60% of seafarers to working at night – shift work was more often performed by deck workers and officers. Similarly, a significant shift workload among officers was found in a Danish study on occupational burnout among seafarers [9]. Psychosocial burdens found in seagoing work include discrimination, sleep disturbances, depression, and post-traumatic stress disorder (PTSD) [22, 24]. Currently, most of the crews of seagoing ships are composed of representatives of different nationalities and religions, which may generate conflicts, increase the level of stress

and be a source of discrimination [26]. In the survey, approximately 13% of respondents stated that they felt discriminated against in the workplace at least once. Exposure to a traumatic event (36%) and nightmares (36%) were reported much more often, as many as 1/3 of the respondents. Moreover, a positive relationship was found between exposure to a traumatic event and nightmares and intrusive thoughts, as well as between shorter sleep at home and exposure to a traumatic event in the history. Both nightmares, intrusive thoughts and sleep disturbances are symptoms of PTSD [27]. Post-traumatic stress disorder was also diagnosed in 5 out of 15 Polish survivors of the Nefryt ship after group poisoning with phosphate (PH<sub>3</sub>), which resulted in the death of 2 young officers [28, 29]. Similar statistics on exposure to traumatic incidents among seafarers can be found in a survey of German seafarers – out of 323 surveyed seafarers, 116 (35.9%) experienced ship damage/serious accidents and 55 (17.0%) piracy on board [30]. Moreover, in the case of such dramatic events as kidnapping of crew members by pirates, PTSD may affect up to 1/4 of seafarers who have experienced kidnapping [31], and the detrimental effect of trauma often affects family members of kidnapping victims [32].

However, the sleep at work of seafarers is mainly influenced by the shift work system. In the current study, about half of the respondents admitted that sleeps less than 7 hours while at sea; and only one in 5 seafarers admitted sleeping for less than 7 hours while at home. The frequent sleep deficit among seafarers is confirmed by earlier studies – in a German study conducted in 2019 on a group of over 300 seafarers working on the deck of a container ship [33] it was found that the average length of sleep for a sailor was 5 hours a day, and the sleep deficit was common, especially among officers (67%). Among the respondents, the task-oriented style (TOC) was dominant, which is associated with a lower CVD risk, and the prevalence of the TOC style was higher among officers. The style of emotions-oriented (EOC) and avoidance-oriented (AOC) and mixed EOC + AOC that are associated with a higher level of stress and a higher risk of CVD [34, 35] occurred in a total of 20% of respondents. The study shows a correlation between the occurrence of EOC and a positive family history of CVD. There are reports in the literature that the tendency to use specific stress coping strategies may be hereditary [36]. More frequent occurrence of EOC in people with a positive family history may indirectly confirm this relationship.

## CONCLUSIONS

In the analysed study the significant burden of psychosocial factors resulting from the specificity of work at sea was confirmed, as reflected in previous studies [10, 19–24]. The psychosocial burdens commonly found in the studied group in-

clude long working hours, shift work, insufficient sleep per day, as well as exposure to traumatic events or discrimination.

We believe that some interventions could be used to reduce the risk of negative health and psychological effects, for example increasing the pressure on shipowners to plan transports and unloading in such a way as to minimise the number of night watches and work over 55 hours a week. It would also be beneficial to organize the work in such a way that the shifts lasted 12 instead of 6 hours where possible – for example during often multi-day stopovers in the roadstead. Furthermore we need to increase commitment of shipowners to provide free Internet connectivity – currently, in accordance with the 2006 International Labour Office convention, the shipowner “should consider” providing the crew with Internet access. Providing free access to a good and stable connection would help all crew members, especially seafarers from developing countries, to stay in constant contact with loved ones, which would somehow improve the quality of life at sea and reduce the feeling of isolation. Due to the frequency of occurrences that may cause PTSD [30], it seems reasonable to introduce an obligation for the shipowner to provide psychological or religious assistance to the crew (depending on the crew’s needs and the cultural context) after a trauma, sudden death or a serious accident on board, in order to reduce the risk of psychological or psychiatric complications. Alternatively, we can consider training for the crew about coping mechanisms and strategies for stressful situations and training in interpersonal communication to reduce the stress level.

**Conflict of interest:** None declared

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