

Psychological stress in seafarers: a review

Anna Carotenuto¹, Ivana Molino¹, Angiola Maria Fasanaro², Francesco Amenta^{1, 3}

¹Centro Ricerche Cliniche, Scienze del Farmaco e dei Prodotti della Salute, Università di Camerino, Camerino, Italy

²Unità Valutativa Alzheimer e Malattie Involutive Cerebrali, Azienda Ospedaliera di Rilievo Nazionale A. Cardarelli, Napoli, Italy

³Fondazione Centro Internazionale Radio Medico (CIRM), Roma, Italy

ABSTRACT

Background: Seafaring is a particular profession, in which workers are usually exposed to several stressors that are related to the different duties on board ships. This paper has reviewed the main publications on different factors affecting seafarers with the purpose of identifying specific stress factors related to a particular duty on board.

Materials and methods: A literature search was conducted using the online databases PubMed and OvidSP. A survey on health, stress, and fatigue of Australian Seafarers published by the Australian Maritime Safety Authority (AMSA) fulfilling the selection criteria was also examined. This publication provided relevant data obtained from a large sample of seafarers.

Results: Our analysis confirmed that seafaring is associated with mental, psychosocial, and physical stressors. The most important factors were separation from family, loneliness on board, fatigue, multi-nationality, limited recreation activity, and sleep deprivation. The AMSA report gave a more detailed analysis on lifestyle and relevant factors inducing psychological distress. Stressors affecting seafarers working in the engine room were different from those involving the deck crew. Sleep quality and duration were reported to be poor mainly in pilots, whereas deck crew tended to be less adherent to physical exercise and healthy lifestyle recommendations.

Conclusions: Seafaring is still associated with relevant mental health risks. Information on known stress factors on board should be provided to seafarers to help them in lowering stress perception. Strategies for coping with “inevitable” stress conditions should also be investigated and developed. Strategies to decrease risks of stress should be directed to the different categories of seafarers, and the results of specific interventions should be evaluated.

(Int Marit Health 2012; 63, 4: 188–194)

Key words: seafarers, work-related stress at sea, psychological stress, fatigue

INTRODUCTION

Stress is the response to an event or situation. It is part of the normal process of adaptation to environment and consists of adaptive behavioural responses (coping). It is commonly considered as the result of a relationship with the environment that an individual appraises as significant for his/her wellbeing and in which the demands tax or exceed available coping resources. Exposure of subjects to a stressor of physical, social, or environmental

nature for a long time may make difficult to cope with it. When a stressor becomes dysfunctional a condition named distress is generated [1]. At work several factors such as job content and any inadequacy or deficiency in organisational communication may lead to the perception of an imbalance between work demands and needs and/or resources used. This creates distress [2, 3]. Work-related stress is a topic receiving increasing attention by research and political institutions. The European Union has

✉ Prof. Francesco Amenta, Centro Ricerche Cliniche, Telemedicina e Telefarmacia, Scienze del Farmaco e dei Prodotti della Salute, Università di Camerino, Via Madonna delle Carceri 9, 62032 Camerino (MC), Italy, tel: +39 0737 403311, fax: +39 0737 403325, e-mail: FAmenta@gmail.com

established the European Agency for Safety and Health at Work that has published an important Status Report on Stress at Work [3]. Recent Italian regulations on safety in the workplace (Decree No. 81 of 2008) prescribed to measure, besides physical fitting of workers, psychological stress in different working contexts [4].

Seafaring is a working activity with particular characteristics and is performed in specific contexts from a physical and psychosocial point of view. Work-related stress affecting seafarers has particular characteristics often different from stress that can be appreciated in other working activities. These include many possible dangers in the form of accidents, injuries, and diseases. Seafaring risks depend on the type of activity or work on board. This activity must be regarded as strenuous due to the multitude of factors within and without the ship that come to bear on it [5].

Work of seafaring is characterised by subjective and objective stress factors [5]. Subjective factors rely on the self assessment of the person's own condition and on the degree of personal satisfaction that work produces. Subjective factors playing a role in the cause of accidents on board are very difficult to assess. They are probably the cause of more than 50% of accidents [6] and the most frequent reasons for absence from work at sea. Objective factors rely on the conditions in which the work is done (noise, vibration, temperature changes) leading to physical, chemical, mechanical, and structural risks. Other objective factors are represented by social and organisational aspects such as excessive responsibility, monotony, lack of career prospects, sleep difficulties, and long separations from families and home. These elements may have a negative influence on the physical and psychological efficiency of the crew [6].

Working under stress worsens the quality of life of the employees, their wellbeing, and can also negatively affect their health [7, 8]. More specific factors can be related to different activities in which seafarers are involved (pilots, masters/mates, engineers, and deck crew) [7].

This review has collected updated information on different stress factors affecting seafarers with the purpose of identifying those specifically related to a particular duty on board. Based on reviewed data, possible interventions for improving the psychological health of these workers and their wellbeing are suggested.

MATERIALS AND METHODS

Online databases PubMed and OvidSP were used to identify papers assessing the influence of psychological stress on seafarers. This study has examined publica-

tions from 1st January 2006 to 30th June 2012. Search terms included: psychological stress in seafarers/seafaring, fatigue in seafarers/seafaring, and work-related stress at sea. The review considered only "good quality" papers. For fulfilling "good quality" criteria, papers should be in English, with an abstract and including at least one of the above keywords in the title/abstract. For the query "psychological stress in seafarers/seafaring" 12 articles were identified, for the query "fatigue in seafarers/seafaring" 12 papers were identified, and for the query "work-related stress at sea" 33 articles were identified. A total of 57 papers were found and 18 of them were selected as they fulfilled the "good quality" criteria. A search on the Web search engine Google using the above indexing terms was also performed to find further materials. A survey of the health, stress, and fatigue of Australian Seafarers published by the Australian Maritime Safety Authority (AMSA) fulfilled the selection criteria and was therefore included in our analysis. This publication provided relevant data obtained from a large sample of seafarers [7].

Our literature survey allowed us to identify as stressors fatigue, loneliness, sleep disturbances, long separation from family, multi-cultural difficulties, and fatigue. These stressors were analysed according to different categories and ranks of seafarers.

RESULTS

The results of our literature analysis summarised below are divided into two parts: those obtained from the PubMed and OvidSP databases and those obtained from the AMSA survey.

PUBMED AND OVIDSP DATABASES DATA

Fatigue

International Maritime Organisation (IMO) guidelines define fatigue as: "A reduction of physical and/or mental condition, resulting from physical stress. It may impair almost all psycho-physical abilities including: power, speed, reaction time, coordination, decision making, and/or emotional balance" [8]. Fatigue is the consequence of long working days with work shifts, insufficient number of personnel [9], and inadequate qualification of the subordinate crewmembers [10]. Work shifts and unpredictability, which are typical features of life at sea, may lead to fatigue and therefore to a high risk of accidents, also of psycho-emotional nature [11].

Stress risk is higher in very long voyages, especially during the nighttime [12]. Risks related to fatigue are significantly higher in non-officers than in officers, and in

younger seafarers compared with the older ones (aged more than 35 years) [13, 14].

The International Transport Federation (ITF) study “Seafarer fatigue: Wake up to the dangers” [15] reports the results of a survey in which the global number of hours at work was very high. A quarter of the ITF sample stated that they worked on average more than 80 hours a week [1, 15].

Fatigue on waking was frequently reported by seafarers. It increases gradually from the start of the shift, and is more evident during the first week at sea. A wider perspective on the consequences of fatigue is required as our knowledge of the impact of it on health shows that it worsens life quality, causes environmental damage, and compromises the health and wellbeing of seafarers [1]. An isometric and dynamic effort associated with work under heat stress conditions may be regarded as a decisive causative factor for a sudden cardiac event [16]. It is important to apply measures referring to at least three different types of fatigue: objective demands, subjective stress, and health problems reported [17, 18]. The stress due to fatigue is also related to frustration [14] and has been associated with drug and alcohol abuse [1], and mental problems. These represent major risk factors for chronic disease and premature death [12].

A national cross-sectional study on seamen of two different countries, Lithuania and Latvia, demonstrated that factors associated with psycho-emotional stress are essentially depression and disorders of sexual life [19]. Other studies showed an impairment of cognitive abilities [20], emotional eating disorders, and uncontrolled/compulsive eating – binge eating disorders and night eating disorders [21].

Seafarers’ fatigue should be tackled using standard approaches (e.g. regulations, appropriate training, and audits) with any increased risk dealt with in a similar way to other breaches of health and safety. It is important to treat fatigue in seafarers as a serious safety problem, rather than considering it as a simple health and safety issue. A proper approach to it could bring benefits to the whole maritime industry/activities [1].

Loneliness

Seafarers are one of the most isolated groups in the world as they have little contact with others, being at sea for days or weeks before they can reach a port. Social isolation is a major cause of psychological problems and has caused a decrease in the number of seafarers in Western countries. Isolation can lead to despair and depression. In particular situations and in vulnerable individuals it has been reported to be a cause of suicide.

Seafarers may compensate the feeling of loneliness with excessive smoking and/or alcohol consumption [9]. Loneliness is also associated with distance from family for long periods of time. Being away from home is one of the main demotivating factors identified by seafarers [22]. Although trade associations and shipping companies are sensitive to this problem it is still largely unresolved [10]. An interview conducted on 134 seafarers showed that 59.7% of them consider “long separation from family” as the main stress factor on board. Stress levels increase considerably when some family members are not well or when contacts with family (phone calls) are difficult.

Sleeping disturbances

Sleep of enough duration and quality is necessary for psychological wellbeing. Sleep is based on circadian rhythms according to an approximately 24-hour cycle. If this rhythm is impaired it is possible to feel sleepy when it is necessary to be awake or to feel awake at the sleeping time. A large proportion of seafarers refer to not sleeping well and to having rest continuously interrupted [13]. This phenomenon, similar to the so-called “jet lag”, is experienced primarily by seafarers sailing on board of ships rapidly crossing several time zones. Seafarers working on transoceanic ships complain of having 2/3 episodes of awakening during sleep [23] and they show a circadian predicted dip in alertness in the nighttime. A pronounced dip of alertness is also noticeable in the afternoon with an increase of accident risk.

Seafarers’ work requires a shift system, which has a negative impact on circadian rhythms. Working on 24-hour shift patterns on a moving vessel poses a number of obstacles to gain sufficient restorative sleep. Crew may have to work additional hours, sleep when their bodies feel naturally awake, and face disturbances from vessel activity.

In a recent interview, fatigue effects were investigated in a sample of seafarers. Participants worked on a 6-on, 6-off watch system or on 4-on, 8-off watch system. Sleepiness was higher in those working with the 6-on, 6-off system, and also fatigue increased during the watch. The effect in the 4-on, 8-off system was, inversely, less evident. A trend was also found toward short sleep episodes in the 6-on, 6-off system where sleep was more often split in two episodes [24].

Environmental factors of the ship such as noise, vibration, and adverse weather conditions can impair sleep quality [9]. Sleep disturbances related to noise may vary depending on the place in which the seafarers sleep and on their age. Younger people are more sensitive to noise and therefore more prone to sleep complaints. Sleep dis-

turbances can also lead to mood, cognitive, and perceptive abilities disorders [25]. These situations increase the risk of accidents.

Multinationality

The increased vulnerability to stress in the workplace is linked to various factors, such as social relationships, physical heaviness, and lack of monitoring and support [26]. These factors could aggravate problems that may arise from the presence of people of different nationalities and speaking various languages on board. This can increase communication problems and lead to isolation [14]. In general, crews consist of people of different nationalities, religions, and cultural backgrounds. These factors could cause conflict [12].

Limited recreation activity

Seafarers often have little free time and this may increase stress. Sport, for example, may contribute to improve physical and psychological wellbeing and therefore could represent an opportunity to facilitate social interactions, encourage team building, and increase cooperation. Other factors that positively influence the wellbeing are social skills, good self-esteem, problem solving, and the appropriate expression of emotions. With sport activities, seafarers may improve their social competence and health. Hence, a fitness room and some social events may be useful to improve the wellbeing onboard ship [9].

AUSTRALIAN MARITIME SAFETY SURVEY

The Australian Maritime Organisation has published an accurate survey on stress in a large sample of seafarers inclusive of pilots, masters/mates, engineers, and deck crew [7]. This study has explored which factors might be more relevant as causes of psychological distress. Differences depending on the rank and activity on board were observed. For instance, engineers are exposed to stressors (sleep disturbances, missing home and recreation, isolation, multi-nationality, and fatigue) that are different from those of the deck crew, and pilots.

Sleep disturbances

A structured interview concerning sleep showed that in more than half of them, sleep quality was perceived either as fair or poor-very poor. Both pilots and engineers had a slightly higher incidence of poor sleep quality compared to deck crew and masters/mates. This may be attributable to the fact that both pilots and engine crew are involved in on-call duties while at sea. Apprehension associated with being on call has been reported as a factor reducing perceived sleep quality. In terms of duration of sleep, the majority of the entire sample (about 95%) re-

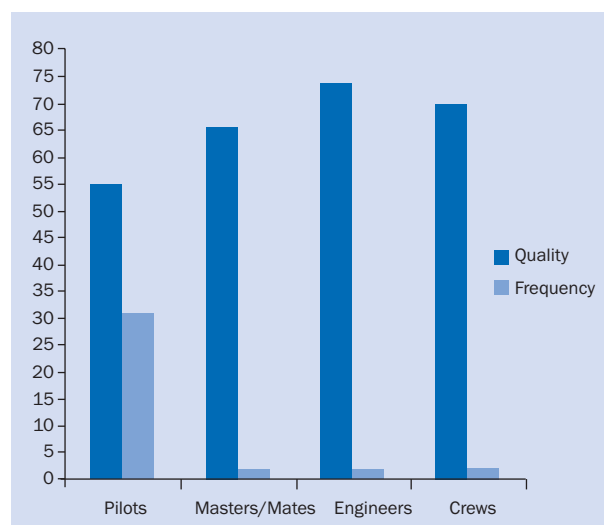


Figure 1. Quality and duration of sleep in different categories of seafarers. Impaired sleep quality was found mostly in engineers. Pilots reported the lowest duration of sleep. Elaborated from the data of Parker et al. [7]

ported 4–6 or 7–8 hours sleep per day, but there were significant differences between the groups. Approximately 30% of pilots reported less than 4 hours sleep per day. A further 65% of them reported between 4 and 6 hours sleeping time per day. As pilots may be on call at any time while at sea, and the hours of sleep depend upon weather conditions, the traffic density, the reliability of the bridge team, and the ship's equipment, these results are not unexpected (Fig. 1). Moreover, seafarers indicated that the short duration of sleep (4–6 hours) was fragmented, often being broken into two periods of about 3 hours each. As poor sleep may affect safety and mood, the duration and quality of sleep should be preserved as much as possible.

Home missing and isolation

All groups considered showed a similar level of home missing, without significant differences. This is the most significant factor contributing to stress at sea. Another element leading to stress is the transition between ship and shore and vice-versa, which represents a pressure source for all workers. Pilots generally report a lower level of pressure from work than the other groups. This may be due to the shorter time spent on each ship, and therefore to the lower degree of involvement in organisation and personal issues in the workplace.

It has been shown that stress levels increase when additional factors intervene such as illness of a family member or difficulty in having telephone contact. The high cost of telephone calls to the family and the diffi-

culties in sending mail from ships do not help in keeping constant contact between crewmembers and their families. These difficulties might be reduced by: (a) Occasionally wives and families at sea; (b) The possibility to arrange family visits to ships; (c) A video showing them working and living at sea; (d) A supporting officer in the shipping company or other organisation qualified to assist in case of family problems in the absence of the seafarer. Another possibility due to the increased diffusion of the Internet on board ships is to allow crewmembers to have regular e-mail contact with their families. These possibilities should be considered to minimise the impact of loneliness.

Fatigue

Long work hours associated with a poor quality of sleep can cause chronic fatigue and can affect mental health. Mental ill health measurement concerns the degree to which feelings and behaviour are affected by perceived job pressure over the previous 3 months. A higher score on mental ill health for a particular group indicates that there is a lower sense of emotional well-being. The number of hours worked and the amount of extra work is a major source of stress and chronic fatigue. Fatigue was more pronounced when asked to work extra hours. Similar problems were experienced in all occupational groups, being more pronounced in the order in, mates/masters, engineers and deck crews. Working long hours had an impact on all groups. As a consequence, poor decisions are made and safety is compromised, particularly when handling and manoeuvring vessels in bad weather close to fixed structures. Seafaring work will always contain an element of fatigue, varying according to workload [1]. Masters/mates and engineers had similar scores for most measures of job satisfaction. This reflects satisfaction with on board roles associated with levels of responsibility, opportunities for decision-making, and involvement in organisation tasks. Overall, crewmembers reported less satisfaction than other groups in all aspects of job satisfaction. Conflicts often arise because of the lack of safety in the workplace and because most seafarers were unhappy due to the poor career prospects.

Another aspect affecting fatigue is represented by inappropriate nutrition. Excess consumption of sugars, fibres, and fat are quite common in the alimentary behaviour of seafarers. Pilots and crewmembers rated as less relevant to correct nutrition compared to engineers and masters/mates. Pilots consume less sugar and less fat than other categories. Over half of the seafarers reported drinking alcohol at sea and at least 50% of pilots and masters/mates said that they consumed alcohol during

a trip. A relatively high proportion of both deck crew and, to a lesser extent, engineers exceeded limits of food intake recommended as healthy. The low frequency of drinking among pilots is consistent with the short time they spend relaxing at sea and with the particular nature of a pilot's work while on ship.

Health problems other than fatigue were only rarely the cause of maritime accidents. The main approach to risk reduction is by the application of fitness criteria to seafarers [27]. Appropriate steps must be taken to minimize the impact of all these factors.

DISCUSSION

“Call me Ishmael. Some years ago... having nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world” [28]. The universally known incipit from Moby Dick reminds us of the romantic figure and the extraordinary difficulties of sailing in the past, obviously different from those of today. Still now, however, in spite of the radical changes and improvements of sailing conditions, seafarers may face particular situations potentially acting on their psychological wellbeing. Most of them have been accurately investigated, defined and measured.

Loneliness is the most frequently reported condition by all seafarers, and leisure scarcity and fatigue have also a relevant impact on all. Short stays by vessels in port and the large number of ports visited in a limited amount of time have exacerbated the problem of fatigue over the past few years [29]. Beyond these aspects, which represent the first source of stress, some specific features differentiate groups of seafarers based on their rank. This is the case with sleep disturbances, which are reported by pilots and engineers with a higher incidence than by deck crew and masters/mates. On the other hand, work pressure is felt by pilots less than by others. Pilots have great responsibility, must be able to make fast decisions, and should often afford hard and physical work. Masters/mates and engineers report similar scores in most measures of job satisfaction. This probably reflects the psychological advantage of having responsibilities, taking decisions, and being involved in organisational tasks. Deck crewmembers report the lowest satisfaction levels. The risks for stress on board can be regarded as a virtually endless list of human tragedies. It has been reported that stress can represent a cause of fatal accidents in merchant marine [30], and the IMO estimates that 80% of accidents on board cargo ships are caused by human factors [31].

How can the stress factors be reduced? Different measures may be taken according to the data reported in

literature and synthesised in this review. These measures should act on general and specific stress factors, and include the availability of some leisure activities, the encouragement of physical engagement, cultural projects, and the installation of shipboard telecommunication systems to contact families and friends. Better organisation of working hours and work shifts should also be included. This would allow a longer and continuous period of sleep. Besides considering chronobiological aspects, the watch system should be organised according to the requirements of the three operating situations: sea voyage, canal/river navigation, and port stays [29].

Appropriate psychoeducation approaches could prepare seafarers to recognise job-specific stressors and implement suitable coping strategies. Relaxation and privacy in suitable areas could offer the opportunity to relax with specific techniques previously learned through psychoeducation. Recreation areas should be designated and located to reduce vibration and noise and should contain facilities such as access to the Internet to allow seafarers a real break from standard activities.

All the above aspects are probably relevant. We also suggest encouraging the creation of a team climate that could motivate seafarers to work as a group. Learning groups might be established for this purpose and more in general group activities, as they are known to encourage adaption to the environment [32]. Management often has the opinion that work stress problems are caused by individuals, particularly by their incapacity to cope with the work demands, but it is in the interests of the ship owners to provide coping strategies, lower the stress levels, and improve the quality of life [32].

It would be useful to obtain a psychological profile of the workers to significantly modify the impact of stress factors. The availability of a personality profile for workers might allow measures to be planned to prevent psychological stress and to direct specific interventions towards workers with clinical signs of distress. These workers would benefit from a more accurate psychological follow up. Such an approach, which should be included in the medical assessment of these workers, would be of great importance as seafaring is almost inevitably associated with some stressful conditions.

CONCLUSIONS

Besides these aspects, as the stressful conditions lead to unhealthy lifestyles, information should be collected about these aspects too. Specific strategies should also be directed to the different categories of seafarers and the results of these interventions should be evaluated at

a distance. European rules including the Italian ones, if properly applied, might guarantee a true improvement in the psychological health of workers and their safer activity. Future perspectives might include a system of counselling and support at a distance, through the web, which would be an opportunity to expose feelings and emotions in a context far from job activities, then in a safer condition. Seafarers could make use of web counselling with a psychologist to reduce factors previously indicated, such as eating disorders and loneliness, to improve social skills, life quality, self-esteem, problem solving, and appropriate expression of emotions. If applied with a good quality methodology, such interventions might also be extrapolated to similar contexts to improve, as much as possible, the difficulties related to particular jobs and activities.

REFERENCES

1. Allen PH, Wadsworth EJ, Smith A. Seafarers' fatigue: a review of the recent literature. *Int Marit Health* 2008; 59: 81–92.
2. Cox T, Griffiths A, Rial-Gonzalez E. Work-related stress. European Agency for Safety and Health at Work, Luxembourg 2000.
3. Legislative Decree 9 April 2008, No. 81. Actions consequent to article 1 of the Law 3 August 2007, No. 123, on health protection and safety in working places (in Italian). *Official Journal of Italian Republic* 101 of 30 April 2008.
4. Jezewska MJ, Leszczynska I, Jaremin B. Work-related stress at sea self estimation by maritime students and officers. *Int Marit Health* 2006; 57: 1–4.
5. Shultz DP, Shultz S. Psychology and challenges of the present-day work. PWN, Warszawa 2002.
6. Kahn RL, Byosiere P. Stress in organization. In: Dunette WM, Hough L eds. *Handbook of industrial and organizational psychology*. Consulting Psychologist Press (Paolo Alto, California) 1992; 3: 571–650.
7. Parker AW, Hubinger LM, Green S et al. A survey of the health, stress and fatigue of Australian seafarers. Australian Maritime Safety Authority, Canberra 1997.
8. International Maritime Organization (IMO). Guidance on fatigue mitigation and management. MSC/Circ.1014 12 June 2001. International Maritime Organization, London 2001.
9. Oldenburg M, Jensen HJ, Latza U et al. Seafaring stressors aboard merchant and passenger ships. *Int J Public Health* 2009; 54: 96–105.
10. Oldenburg M, Baur X, Schlaich C. Occupational risks and challenges of seafaring. *J Occup Health* 2010; 52: 249–256.
11. Salyga J, Kusleikaite M. Factors influencing psychoemotional strain and fatigue, and relationship of these factors with health complaints at sea among Lithuanian seafarers. *Medicina (Kaunas)* 2011; 47: 675–681.
12. Wadsworth EJ, Allen PH, Wellens BT et al. Patterns of fatigue among seafarers during a tour of duty. *Am J Ind Med* 2006; 49: 836–844.
13. Allen PH, Wadsworth EJ, Smith A. The prevention and management of seafarers' fatigue: a review. *Int Marit Health* 2007; 58: 167–177.

14. Bridger R, Kilminster S, Slaven G. Occupational stress and strain in the naval service: 1999 and 2004. *Occup Med (Lond)* 2007; 57: 92–97.
15. International Transport Workers' Federation. *Seafarer fatigue: Wake up to the dangers*. ITF, London, 1998.
16. Wojcik-Stasiak M, Jaremin B, Roberts SE et al. Sudden cardiac event on a sea-going ship and recognition of a work-related accident. *Int Marit Health* 2011; 62: 110–115.
17. Leszczynska I, Jezewska MJ. Psychosocial burden among offshore drilling platform employees. *Int Marit Health* 2010; 62: 159–167.
18. Leszczynska I, Jezewska MJ, Jaremin B. Work-related stress at sea. Possibilities of research and measures of stress. *Int Marit Health* 2008; 59: 93–102.
19. Salyga JA. Association between Juozulynas environment and psycho-emotional stress experienced at sea by Lithuanian and Latvian seamen. *Medicina* 2006; 42: 759–769.
20. Wadsworth EJ, Allen PH, McNamara RL et al. Fatigue and health in a seafaring population. *Occup Med (Lond)* 2008; 58: 198–204.
21. Jezewska MJ, Babicz-Zielinska E, Leszczynska I et al. Promotion of healthy nutrition of seafarers. *Int Marit Health* 2009; 60: 48–55.
22. Haka M, Borch DF, Jensen C et al. Should I stay or should I go? Motivational profiles of Danish seafaring officers and non-officers. *Int Marit Health* 2011; 62: 20–30.
23. Tirilli G. The impact of fragmented schedules at sea on sleep, alertness and security of seafarers. *Medicina Maritima* 2004; 4: 96–105.
24. Lutzhoft M, Dahlgren A, Kircher A et al. Fatigue at sea in Swedish shipping: a field study. *Am J Ind Med* 2010; 53: 733–740.
25. Foo SC, How J, Siew MG et al. Effects of sleep deprivation on naval seamen: II. Short recovery sleep on performance. *Ann Acad Med Singapore* 1994; 23: 676–679.
26. Jezewska MJ, Leszczynska I, Jaremin B. Work-related stress at sea self estimation by maritime students and officers. *Int Marit Health* 2006; 57: 66–75.
27. Carter T. Mapping the knowledge base for maritime health: safety and performance at sea. *Int Marit Health* 2011; 62: 236–244.
28. Melville H. *Moby-Dick*. Harper & Brothers Publishers, New York, 1851.
29. Oldenburg M, Jensen HJ. Merchant seafaring: a changing and hazardous occupation. *Occup Environ Med* 2012; 69: 685–688.
30. Jaremin B, Kotulak E, Starnawska M et al. Causes and circumstances of deaths of Polish seafarers during sea voyages. *J Travel Med* 1996; 3: 91–95.
31. Maritime Knowledge Center. *International Shipping Facts and Figures*. Information Resources on Trade, Safety, Security. Maritime Knowledge Center, London, 2012.
32. Semmer NK. Job stress interventions and organisation of work. In: Quick JC, Tetrick LE eds. *Handbook of occupational health psychology*. American Psychological Association, Washington, DC, 2003.