Association between environment and psycho-emotional stress experienced at sea by Lithuanian and Latvian seamen

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Key words: *seamen; cross-national comparison; self-reported; psycho-emotional stress; risk factors.*

Summary. *This is the first scientific research in Lithuania and Latvia that involves a national cross-sectional study of the seamen of two different countries – Lithuania and Latvia – including the evaluation and comparison of seamen's working environment, lifestyle, health, the prevalence of health-damaging risk factors, as well as the causative relationships between the objective and subjective health evaluation and psycho-emotional stress experienced at sea. The aim of the study was to investigate the frequency and predictors of the psycho-emotional stress experienced at sea by Lithuanian and Latvian seamen.*

Beside the common statistical methods, the logistic stepwise regression analysis was used in order to find the risk factors of the self-rated stress and to correct the risk estimates for the confounding variables. Seamen of both countries indicated that they experienced psycho-emotional stress after, on the average, 2.7–2.8 months from the beginning of the voyage. More than one-half (57.5%) of Latvian seamen stated that they had experienced psycho-emotional stress, whereas the respective percentage of Lithuanian seamen was smaller (46.1%). The obtained findings showed that, having evaluated the influence of all the analyzed factors (industry-specific, health and lifestyle, medical and demographic), there was no significant difference between the seamen of the two countries concerning the experience of psycho-emotional stress on the ship. The following main prognostic factors related to the occurrence of psycho-emotional stress on the ship were determined: higher or specialized secondary education level ($p<0.001$), age of 35–44 or 45–54 years ($p<0.01$), 9–10 or 11–12 hours of work per day when being exposed to detrimental factors ($p<0.01$), the evaluation of one's health status as "average" ($p<0.05$), and evaluation of one's physical capacity as "quite good" or "average" ($p<0.01$). The occurrence of psycho-emotional stress was mostly influenced by work in the environment requiring increased visual strain ($p<0.001$) and vibration ($p<0.05$). We found that the following factors were associated with the occurrence of psycho-emotional stress on the ship: depression that occurred more frequently at sea than on shore ($p<0.001$), disturbed working and resting regimen due to time zone changes ($p<0.001$), and disturbed regular sexual life ($p<0.001$).

Many of the unique aspects of seafaring are unchangeable. However, it possible to modify, supplement, or develop new strategies to reduce the impact these factors have on the health of individual seafarers.

Introduction

The significance of maritime business for Lithuanian economics is indisputable. On January 1, 2005, the Lithuanian registry of mariners listed 11,823 seamen. More than 4000 of them work on Lithuanian ships and the rest – on foreign ship. At present Lithuania is modernizing its ship; the ships are supplied with newest technologies, the crews are becoming smaller, the duration of stays in foreign ports is decreasing, and the need for highly qualified seamen is rising. Important risk factors that affect seamen's health are arterial hypertension, immoderate use of alcoholic beverages, smoking, increased blood cholesterol levels, insufficient physical activity, and irrational nutrition. In addition to these factors, there are other industry-specific factors that affect seamen's health and lifestyle. Such factors include hard physical work accompanied by continuous tension, undefined work and rest regimen, long working hours, noise and vibration, changes in meteorological conditions, isolation from friends and the family, psycho-emotional stress (PS), irregular sexual life, a lack of normal nutri-

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tion, etc. In the analysis of the impact of risk factors on seamen's psychosocial stress, fatigue, and health, seamen are attributed to the high professional risk group and make a specific part of the population (1–6).

About 1.2 million seamen are engaged in the maritime business worldwide. The rapid globalization requires comparative studies on seamen's working environment, the aim of which would be the creation of common health and working environment safety standards (2, 3). In many sea countries, the aim of the studies and projects initiated on the national or international level is to investigate the psychosocial stress and professional health in the seamen's population, to reveal new regularities of the impact of the factors of the physical and the social environment, and to search for new effective methods of the control of these factors (4–7). The same objectives are raised in Lithuania as well.

The aim of the study was to investigate the frequency and predictors of the psycho-emotional stress experienced at sea by Lithuanian and Latvian seamen.

Materials and methods

Subjects. The inquiry embraced the respondents that made up the target population, *i.e.* seamen reporting for compulsory health check-up. A total of 2050 questionnaires were distributed; 1989 filled questionnaires (97.0%) were received, of them, 1984 (99.7%) were selected as suitable for the analysis. The data were accumulated in a database created using Microsoft Access computer software.

The case group consisted of 998 Lithuanian male seamen aged 20 to 64 years who underwent health examination at the Maritime Medicine Center of Klaipėda Seamen's Hospital. The comparison group consisted of 986 Latvian seamen aged 20 to 69 years who underwent health examination at Riga Maritime Medicine Center. Latvian seamen were investigated on the basis of the cooperation agreement between Latvian Maritime Medicine Center and Klaipėda Seamen's Hospital signed on May 12, 2002.

The cross-national study was performed during November–December 2003 in Lithuanian and Latvian seamen's population according to the international Lithuanian–Latvian concerted research technique. The mean age of Lithuanian and Latvian seamen was 40.4 (standard deviation (SD) 11.0) years: the mean age of Lithuanian seamen was 40.8 (SD 10.2) years, and the mean age of Latvian seamen – 40.0 (SD 11.7) years.

Methods of the study. The data for the study were collected by means of a sociological questionnaire. Each Lithuanian and Latvian mariner applying for the compulsory health check-up received a questionnaire. The questionnaire evaluated the following: 1) general data; 2) medical service and health; 3) smoking habit; 4) food habits; 5) alcohol consumption; 6) weight, height, and physical activity on the ship; 7) unhealthy factors on sea; 8) other issues.

Subjective experienced PS was evaluated according to the answers to the question, "Did you experience PS on the ship during the last year (12 months)?" Possible answers were the following: no stress, some stress, and significant stress. The answers were dichotomized embracing both variants of the positive response: 1) no stress; 2) stress experienced. With respect to the experienced PS, the respondents had to evaluate their health status and physical capability (*good, quite good, average, quite bad,* and *bad*).

We assessed factors related to the subjective PS. The factors were the following: 1) psychological conditions: depressed mood, depression (*absent; not more than on the shore; somewhat more than on the shore; yes, very much*); the influence of industry-specific factors (time zone changes and disturbances in the regular sexual life) (*none; little; high*); and satisfaction with medical assistance on the ship (*fully satisfied, partially satisfied, dissatisfied, did not apply*); 2) present medical history of physical illnesses (hypertension, hypercholesterolemia, spine diseases, gastritis, ulcers, asthma, diabetes, rheumatoid arthritis, chronic bronchitis, myocardial infarction, angina pectoris, heart failure) by self-report (*yes* or *no*); disorders experienced on the ship (pain in the joints, the waist, the neck and the shoulder, and the head, toothache, foot swelling, varicose veins, rashes, constipation, etc.) by self-report (*yes* or *no*); medicines used; the frequency of consulting a physician on the ship and on the shore; 3) environmental, physical, and ergonomic factors: vibration, noise, electromagnetic field, heat, temperature, involuntary working posture, visual strain, working at high altitudes, and dust (*yes* or *no*); 4) lifestyle peculiarities: smoking on the ship and on the shore, alcohol consumption, and the frequency of physical exercises on the ship (*every day, 2–6 times per week, 2–4 per month, several times a year, cannot exercise*); 5) psychophysiological factors of the work: working hours per day and the type of work (*mostly sedentary; sedentary or standing; moving, involving lifting and carrying; hard physical work*).

Statistical analysis. Statistical analysis was performed with SPSS 10. The descriptive analysis of the

lifestyle determinants was performed using standard statistical indices: for the continuous variables – the arithmetic mean of the parameters, 95% confidence interval (CI), standard deviation, dispersion. In cases of non-parametric variables, statistical significance between the proportions was evaluated using the χ^2 criterion. The relationships of the analyzed determinants with the subjective PS experience (dependent variable) were determined in two stages: using a multiple univariate and a multivariate logistic regression analysis. Only the selected results of the bivariate analysis are presented here; other can be requested from the authors. The data on the seamen of each country were analyzed separately, followed by the analysis of the total contingent of subjects. During the first stage of the analysis, we investigated all separate determinants, taking into consideration the impact of the age, and included separate determinants and age into a logistic regression model. The quantitative evaluation of the impact of the studied determinants on the psycho-emotional stress was performed using the odds ratio (95% CI). After that, a stepwise (forward algorithm) procedure was used to include statistically significant variables into the model ($p<0.05$ – included, $p>0.10$ – excluded). Goodness of fit was assessed by the Hosmer-Lemeshow test.

Results

Socio-demographic characteristics of Lithuanian and Latvian seamen. The mean age of Lithuanian and Latvian seamen was 40.8 (95% CI 40.2–41.4) and 40.0 (95% CI 39.3–40.7) years, respectively. Socio-demographic data on seamen of both countries are presented in Table 1.

Lithuanian seamen's mean length of service was 11.9 (95% CI 11.3–12.5) years and that of Latvian

Table 1. **Socio-demographic characteristics of seamen**

Characteristic	Lithuania	Latvia	χ^2	p
	n (%)	n (%)		
Age, years			36.08	<0.001
20–24	77 (7.7)	132 (13.4)		
25–34	197 (19.7)	211 (21.4)		
35–44	329 (33.0)	262 (26.6)		
45–54	321 (32.2)	270 (27.4)		
55–64	74 (7.4)	104 (10.5)		
>64	–	7 (0.7)		
Education level			10.41	<0.05
Unfinished secondary	12 (1.2)	14 (1.4)		
Secondary	216 (21.6)	256 (26.0)		
Specialized secondary	538 (53.9)	536 (54.4)		
Higher	232 (23.3)	180 (18.2)		
Professional groups			7.54	>0.05
I. Management	180 (18.0)	171 (17.3)		
II. Management with combined specialties	5 (0.5)	0		
III. Mechanical ship service	404 (40.5)	400 (40.6)		
IV. Specialists of radionavigation equipment	2 (0.2)	3 (0.3)		
V. Deck crew	339 (34.0)	350 (35.5)		
VI. Specialists of non-self-propelled ship and ferries	2 (0.2)	1 (0.1)		
VII. Auxiliary ship segment	66 (6.6)	61 (6.2)		
Type of ship			3.43	>0.05
Sea transport	643 (64.4)	669 (67.8)		
Trawler	338 (34.0)	301 (30.6)		
Local water transport	17 (1.7)	16 (1.6)		
Length of service, years			30.84	<0.001
<1	15 (1.5)	11 (1.1)		
1–10	527 (52.8)	649 (65.8)		
11–20	275 (27.6)	201 (20.4)		
>20	181 (18.1)	125 (12.7)		

seamen – 9.9 (95% CI 9.4–10.4) years. Most seamen of both countries worked for 1 to 10 years at sea. Every fourth Lithuanian seaman and every fifth Latvian seaman worked for 11–20 years (27.6% and 20.4%, respectively). Almost one-fifth (18.1%) of Lithuanian seamen and 12.4% of Latvian seamen worked for more than 20 years at sea.

Self-report of duration of the latest tour of duty was the following: in Lithuanian seamen – 6.4 (95% CI 6.3–6.5) months and in Latvian seamen – 6.5 (95% CI 6.4–6.6) months. More than half (51.2%) of Latvian seamen and 45.4% of Lithuanian seamen spent more than 6 months at sea. We did not find any significant differences when analyzing these data according to different types of ship. Lithuanian and Latvian seamen's length of service according to positions occupied was similar, and no significant differences were found between Lithuanian and Latvian seamen working in the same positions.

Unhealthy factors at sea. Seamen of both countries unanimously agreed on the factors that are detrimental to health while being at sea (Fig. 1). The first factor was vibration and then acoustic noise, the effect of the electromagnetic field, thermal environment inside the ship, the effect of temperature when being on the deck, increased visual strain, increased dust levels, forced working posture, and work at high altitudes followed.

Lithuanian seamen indicated that the mean duration of work being exposed to unhealthy factors while at sea was 9.4 (95% CI 9.2–9.7) hours per day, and Latvians – 9.1 (95% CI 8.8–9.2) hours per day (ANOVA $F=9.048$, $p<0.01$). Lithuanian seamen significantly more frequently, compared to Latvians, indicated that they worked in a vibrating environment (9.9 (95% CI 9.7–10.2) hours and 9.4 (95% CI 9.1–9.5) hours, respectively) and under the effect of temperature when working on the deck (9.9 (95% CI 9.6–10.4) hours and 9.3 (95% CI 9.1–9.6) hours per day, respectively).

More than one-third of all seamen experienced discomfort due to disturbed work and resting regime under the influence of time zone changes; 2.4–2.8% of all seamen stated that they experienced severe discomfort caused by time zone changes. One-third (33.0%) of Lithuanians and significantly more (47.1%) Latvians stated that they experienced some discomfort due to disturbed work and resting regime under the influence of time zone changes ($p<0.05$).

The percentages of seamen who experience discomfort caused by disturbance in the regular sexual

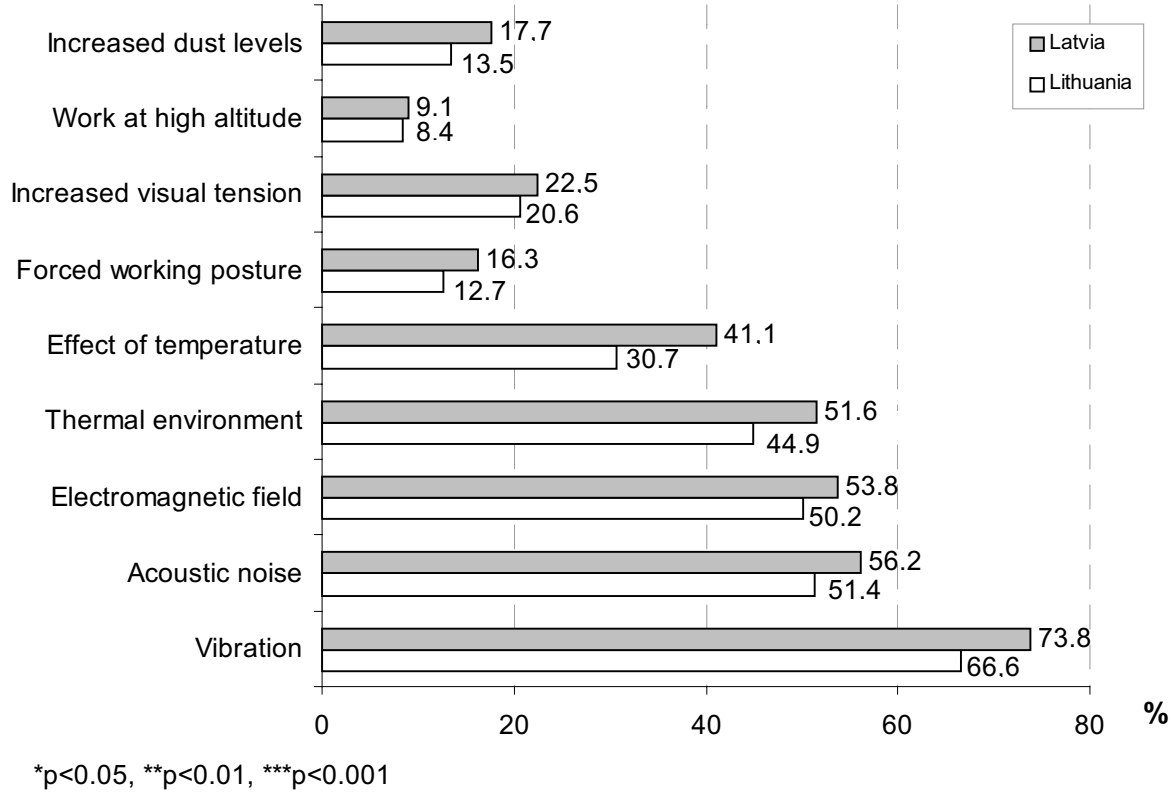

Fig. **The distribution of Lithuanian and Latvian seamen according to the frequency of unhealthy factors at work**

life when on the ship were 74.1% and 81.5%, respectively, in Lithuania and Latvia. Moreover, 10% of Lithuanians and 14.9% of Latvians stated that the experienced discomfort was severe (χ^2=22.45, p<0.001).

About 80% of Lithuanian and Latvian seamen did not complain of depression (depressed mood) when on the ship or indicated that episodes of depressed mood occurred not more frequently than on the shore (20.6% of Lithuanian and 34.5% of Latvian seamen). Every sixth Lithuanian (15.6%) than Latvian (18.8%) seaman complained of slightly more frequent depression when on the ship, compared to being on the shore. More Lithuanian seamen (3.4%) than Latvian (2.6%) stated that they felt significantly more depressed when being on the ship compared to being on the shore. The analysis of these findings (after adjusting for age differences) showed a significant association between the frequency of depression when on the ship among Lithuanian and Latvian seamen (χ^2=64.51, p<0.001).

Every second Lithuanian and Latvian seaman indicated health-damaging factors at sea as the main cause of morbidity among seamen. Other most common causes were unanimously stated to be stress, difficult living conditions, and stressful work at sea (around 30% of cases). Irrational nutrition, deficiency of vitamins and microelements, and alcohol consumption were mentioned by 2 to 5% of seamen, and up to 2% of seamen mentioned smoking, insufficient physical activity, overweight, genetic factors, and others. Having controlled for the influence of age, we did not find any significant differences in the frequencies of the causes of morbidity indicated by Lithuanian and Latvian seamen.

We found that Lithuanian seamen experience PS more frequently than Latvian seamen (age adjusted OR= 1.66; 1.39–2.00). More than one-half (57.5%) of Latvian seamen stated that they had experienced PS, whereas the respective percentage of Lithuanian seamen was smaller (46.1%). About 5% of all seamen (6.3% of Lithuanian and 4.7% of Latvian seamen) stated that they had experienced severe PS.

Seamen from both countries indicated that they experienced PS on the average after 2.7–2.8 months. Lithuanians stated that they experienced severe PS after 2.0±1.4 months, and Latvians – after 2.5±1.8 months (p< 0.01) from the beginning of the voyage.

The relationships of psycho-emotional stress with risk factors

The univariate analysis. During the first stage of the multiple univariate logistic analysis (the dependent variable – PS), we performed the analysis of each

Table 2. **Socio-demographic factors (education level, professional groups, and the type of ship were analyzed when adjusted for age) related to psycho-emotional stress**

Factors	Lithuanian seamen			Latvian seamen		
	n+	OR (95% CI)*	p for trend	n+	OR (95% CI)*	p for trend
Age, years			<0.001			<0.05
20–24#	77	1		132	1	
25–34	197	1.52 (0.85–2.72)		211	1.48 (0.95–2.29)	
35–44	329	2.78 (1.61–4.80)		262	1.74 (1.14–2.65)	
45–54	321	2.72 (1.57–4.70)		270	2.00 (1.31–3.05)	
55–64	74	2.81 (1.43–5.54)		104	1.28 (0.76–2.14)	
>64	0			7	2.9 (0.54–15.54)	
Education level			<0.001			<0.001
Unfinished secondary#	12	1		14	1	
Secondary	216	3.55 (0.44–28.4)		256	6.36 (1.39–29.09)	
Special secondary	538	7.59 (0.96–59.93)		536	7.76 (1.70–35.29)	
Higher	232	16.21 (2.03–129.1)		180	18.2 (3.85–86.05)	
Professional groups			<0.001			<0.001
Management	185	2.93 (1.62–5.30)		171	2.74 (1.47–5.10)	
Mechanical ship service	406	2.09 (1.21–3.59)		403	1.27 (0.73–2.19)	
Deck crew	341	0.89 (0.51–1.55)		351	0.93 (0.54–1.63)	
Auxiliary sector#	66	1		61	1	

+ – the number of subjects; * – odds ratio was statistically significant when 1 was not included into its 95% confidence interval, p>0.05; # – reference category.

individual factor including age into logistic regression. Candidates to major PS-related factors and age-adjusted odds ratios allowing for the quantitative evaluation of the relationship of socio-demographic data and psychophysiological factors with PS experienced on the ship are presented in Tables 2–4.

According to the findings of the univariate analysis, seamen over 35 years of age more frequently experienced PS, compared to younger seamen aged 20–24 years. Seamen of the managing sector and mechanical ship services as well as those with higher education level independently of the type of ship, the length of service on the ship (among Latvians, the length of service of 1–10 years significantly increased the risk for stress), and the duration of the voyage significantly frequently experienced PS.

PS was most frequently experienced by seamen whose work was sedentary, compared to those involved in hard physical work and experiencing PS by 0.3–0.7 times less frequently. The duration of work being exposed to unhealthy factors exceeding 8 hours per day increased the risk for PS by 1.9–4.5 times, compared to 1–6 hours of work per day in such conditions (Table 3).

We detected a statistically significant difference in the subjective evaluation of the health status between the seamen of the two neighboring countries (χ^2=39.59, p<0.01). More Lithuanian seamen than Latvians evaluated their health as "good" – 65.7% and 55.6%, respectively. Seamen who evaluated their health status as "quite good" or "average" indicated that they experienced PS by 1.7–3.7 times more frequently, compared to those who evaluated their health as "good." The number of seamen who experienced PS among those who evaluated their physical capacity as "quite good" and "average" was by 1.8–4 times greater, as compared to seamen who evaluated their physical capacity as "good."

Table 3. **Psychophysiological factors related to psycho-emotional stress (age adjusted OR)**

Factors	Lithuanian seamen			Latvian seamen		
	n+	OR (95% CI)*	p for trend	n+	OR (95% CI)*	p for trend
Length of service, years			NS**			<0.01
<1#	15	1		11	1	
1–10	527	2.35 (0.64–8.68)		649	10.55 (1.32–84.20)	
10–20	275	2.42 (0.64–9.15)		201	7.87 (0.96–64.47)	
>20	181	2.06 (0.53–8.01)		125	5.07 (0.60–42.43)	
The duration of work at sea during the last year, months			NS**			<0.05
<1#	39	1		42	1	
1–3	19	0.39 (0.09–1.60)		16	0.52 (0.15–1.78)	
4–6	488	1.80 (0.90–3.63)		427	1.31 (0.68–2.50)	
7–12	454	1.66 (0.82–3.35)		501	1.65 (0.86–3.15)	
The duration of work being exposed to detrimental factors while at sea, hours per day			<0.001			<0.001
1–6#	137	1		163	1	
7–8	405	1.43 (0.94–2.18)		342	1.07 (0.73–1.56)	
9–10	126	4.54 (2.67–7.73)		168	1.89 (1.21–2.95)	
11–12	284	2.30 (1.49–3.57)		307	1.98 (1.33–2.94)	
>12	46	3.36 (1.66–6.79)		6	5.90 (0.66–52.65)	
Type of work at sea			<0.001			<0.01
Mostly sedentary#	54	1		50	1	
Sedentary and/or standing	312	0.73 (0.40–1.33)		231	0.56 (0.28–1.14)	
Mobile, involving frequent lifting, etc.	556	0.42 (0.24–0.76)		652	0.39 (0.20–0.78)	
Hard, physical	76	0.61 (0.29–1.27)		53	0.33 (0.14–0.79)	

+ – the number of subjects; * – odds ratio was statistically significant when 1 was not included into its 95% confidence interval; **NS – statistically insignificant, p>0.05; # – reference category.

Seamen who tried to exercise on the ship at least once a week more frequently indicated that they experienced PS, compared to those who exercised every day. More seamen who experienced PS were found among those who consulted a physician because of different disorders while at sea. Among Lithuanians, a greater number of those who experienced PS were also detected among those who consulted a physician while being on the shore.

The reasons for consulting a physician were quite similar among seamen of both countries. The logistic regression analysis, including all the aforementioned disorders and age into the model, revealed health disorders statistically significantly related to PS (Table 4). These were the following: insomnia (by 9.5 times more frequent among Lithuanian seamen who experienced PS; no such relationship was detected among Latvian seamen), headaches (by 2.1–2.6 times), waist pain (by 1.9–2.4 times), toothaches (by 1.7 times more frequent, only among Lithuanian seamen), and other disorders (by 2 times more frequent among those who experienced PS).

Use of medicines associated with health disorders was also related to PS: medicines for headache were

Table 4. **Specific maritime industry and other factors related to experienced psycho-emotional stress (age adjusted OR, only statistically significant OR are given)**

Factors	Lithuanian seamen			Latvian seamen		
	n+	OR (95% CI)*	p for trend	n+	OR (95% CI)*	p for trend
Time zone changes			<0.001			<0.001***
Did not experience#	646	1		501	1	
Experienced to some extent	330	4.60 (3.44–6.15)		461	2.79 (2.14–3.64)	
Experienced significantly	22	12.1 (5.11–28.65)		24	5.51 (2.05–14.77)	
Sexual life disturbances			<0.001			<0.001***
Did not experience#	257	1		185	1	
Experienced to some extent	641	3.13 (2.25–4.35)		652	2.41 (1.71–3.38)	
Experienced significantly	100	8.79 (5.14–15.04)		149	6.84 (4.14–11.29)	
Depression			<0.001			<0.001***
Did not experience #	602	1		431	1	
Not more than on the shore	206	7.24 (5.06–10.38)		341	3.26 (2.41–4.38)	
Somewhat more than on the shore	156	13.17 (8.37–20.72)		188	7.25 (4.76–11.02)	
Significantly more than on the shore	34	13.84 (5.55–34.52)		26	23.19 (5.3–100.6)	
Unhealthy factors on sea						
Vibration	664	2.14 (1.60–2.87)	<0.001	738	1.68 (1.24–2.29)	<0.01
Increased visual strain	206	1.94 (1.38–2.72)	<0.001	226	2.40 (1.70–3.40)	<0.001
Forced working posture	127	1.63 (1.07–2.47)	<0.05			
Acoustic noise	514	1.40 (1.07–1.83)	<0.05	562	1.61 (1.23–2.12)	<0.01
Increased dust levels				177	1.75 (1.20–2.54)	<0.01
Detected health disorders						
Spinal diseases				27	3.02 (1.12–8.13)	<0.05
Health disorders on the ship						
Waist pain	35	2.43 (1.15–5.30)	<0.05	23	1.97 (0.76–5.11)	NS**
Headache	48	2.55 (1.32–4.94)	<0.01	55	2.06 (1.11–3.79)	<0.05
Insomnia	12	9.52 (1.20–75.6)	<0.05	22	1.58 (0.59–4.22)	NS**
Toothache	82	1.71 (1.07–2.74)	<0.05			
Other	53	1.97 (1.11–3.52)	<0.05	46	2.12 (1.08–4.13)	<0.05

+ – the number of subjects; * – odds ratio was statistically significant when 1 was not included into its 95% confidence interval; **NS – statistically insignificant, p>0.05; *** – p for trend; # – reference category.

used 1.9–3.5 times, tranquilizers 2.2–3.5 times, and vitamins and microelements 1.3–2.3 times more frequently by those who experienced PS.

More frequent dissatisfaction with medical assistance on the ship among those who experienced PS also seems to be regular. In the univariate analysis, only spinal disorders remained statistically significantly related to PS; among Latvian seamen such disorders are detected at least by 3 times more frequently among seamen who experienced PS, compared to those who did not.

A significant relationship has been found between experienced PS and industry-specific factors at sea: disturbed working and resting regimen due to time zone changes and irregular sexual life. PS experienced on the ship significantly increased the risk for depression and depressed mood.

According to the data of the inquiry, seamen had quite unequivocal opinion about detrimental factors at sea. After the analysis of the relationship of the unhealthy factors with PS, the first statistically significant factor that increased the risk for PS in the univariate analysis remained increased visual stress, followed by vibration, forced working posture, acoustic noise, and increased dust levels.

We performed a multivariate analysis of factors related to the occurrence of PS on the ship for the whole contingent of Lithuanian and Latvian seamen, including citizenship as an independent factor (Table 5). The model also included diseases that in the univariate analysis of the whole contingent were found to be statistically significantly related to experienced PS: arterial hypertension (age adjusted OR=2.03; 1,08–3,80) and spinal diseases (OR=2.48; 1.27–4.85); health disturbances on the ship – waist pain (OR=2.45; 1.36–4.42), headache (OR=2.41; 1.55–3.77), insomnia (OR=3.31; 1.42–7.69), and other disorders (OR=1.92; 1.25–2.96); with respect to medicines used at sea – medicines for headache (OR=2.45; 1.91–3.14), tranquilizers (OR= 3.52; 2.05–6.05), and antitussives (OR=1.38; 1.01–1.89). However, all relationships of health disorders detected on the ship and peculiarities of lifestyle with PS "disappeared" from the multivariate logistic regression models in cases of both Latvian and Lithuanian seamen.

The obtained findings showed that, having evaluated the influence of all the analyzed factors (industry-specific, health and lifestyle, medical and demographic), there was no significant difference between the seamen of the two countries concerning the experience of PS on the ship (OR=1.13; 0.91–1.42). The following prognostic factors related to the occurrence of PS on the ship were determined: higher or specialized secondary education level ($p<0.001$), age of 35–44 or 45–54 years ($p<0.01$), 9–10 or 11–12 hours of work per day when being exposed to detrimental factors ($p<0.01$), the evaluation of one's health status as "average" ($p<0.05$), and evaluation of one's physical capacity as "quite good" or "average" ($p<0.01$). The occurrence of PS was mostly influenced by work in the environment requiring increased visual strain ($p<0.001$) and vibration ($p<0.05$). We found that the following factors were associated with the occurrence of PS on the ship: depression or depressed mood ($p<0.001$), disturbed working and resting regimen due to time zone changes ($p<0.001$), and disturbed regular sexual life ($p<0.001$). In this study, 40% of the variance of perceived stress could be explained.

Discussion

Lithuanian and Latvian seamen spend about half of each year working and living away from home in a unique environment. Seamen had prolonged hours of continuous work. Work on board is stressful and risky. About one-half of all the studied seamen stated that they had experienced psycho-emotional stress at sea on the average after 2.7–2.8 months. Studies in Australia had shown that periods of duty over 3 months were associated with increased stress (5). The factors which characterize work at sea present a unique and complex array of potential stressors, which compounds the occupational and lifestyle issues found in other industries. Many of the unique aspects of seafaring are unchangeable. Seafaring also provides a number of unique working environments which by themselves may be the source of health problems. Noise and vibration as well as the continual rolling and pitching of the ship are constant problems, in addition to thermal stress and pollutants. A recent review of maritime studies indicated that environmental problems together with negative lifestyle practices such as smoking, poor nutrition, and excessive consumption of alcohol might be associated with health problems such as depression, cardiovascular disease, and cancer among seafarers. Exposure to ongoing elevated stress levels and to excess levels of environmental hardships (noise, vibration, humidity, pollutants) has a negative impact on physical and mental health as well as on work performance (1–6, 8, 9).

In our study, we identified a relatively small number of mainly industry-specific factors as the main contributors to occupational stress. The industry-specific factors were the following: long working hours,

Table 5. **The main prognostic factors related to psycho-emotional stress on the ship**

Factors	n+	OR (95% CI)*	p for trend
Age, years			<0.01
20–24#	209	1	
35–44	591	1.54 (1.04–2.30)	
45–54	591	1.64 (1.09–2.48)	
Country			NS**
Lithuania	998	1	
Latvia	986	1.13 (0.91–1.42)	
Education level			<0.001
Unfinished secondary	28	1	
Special secondary	1074	4.40 (1.16–16.69)	
Higher	412	7.94 (2.05–30.7)	
The duration of work when being exposed to detrimental factors, hours per day			<0.01
1–6#	299	1	
9–10	292	1.74 (1.05–1.17)	
11–12	583	1.54 (1.09–2.17)	
Subjective evaluation of health status			<0.05
Good#	1206	1	
Average	138	1.69 (1.01–2.84)	
Subjective evaluation of physical capacity			<0.01
Good#	865	1	
Quite good	680	1.69 (1.30–2.20)	
Average	435	1.98 (1.40–2.72)	
Time zone changes			<0.001
Did not experience#	1143	1	
Experienced to some extent	798	2.06 (1.63–2.59)	
Experienced significantly	52	3.04 (1.18–7.85)	
Sexual life disturbances			<0.001
Did not experience#	442	1	
Experienced to some extent	1293	1.47 (1.11–1.95)	
Experienced significantly	249	2.24 (1.44–3.47)	
Depression			
Did not experience#	1033	1	<0.001
Not more than on the shore	547	3.51 (2.73–4.51)	
Somewhat more than on the shore	344	6.15 (4.40–8.59)	
Significantly more than on the shore	60	8.43 (3.58–18.87)	
Health-damaging factors			
Increased visual strain	431	1.46 (1.10–1.93)	<0.001
Vibration	1400	1.37 (1.07–1.75)	<0.05

+ – the number of subjects; * – odds ratio was statistically significant when 1 was not included into its 95% confidence interval; **NS – statistically insignificant, p>0.05; # – reference category.

environmental hardships, disturbed working and resting regimen due to time zone changes, and disturbed regular sexual life. Similar associations have also been found in other studies that analyzed experienced stress on ships of other countries (5, 6). In a study performed in Finnish commercial fleet, seamen's health and experienced stress were analyzed in association with work-related stressors and personal characteristics. The study identified the factors associated with work at sea (noise, climate conditions, position occupied, recognition at work, and greater stress levels) as well as the main personal characteristics (pessimism, optimism, and the strength of the ego). The quality of seamen's interrelationships influenced neither their

experienced stress levels nor their health status (4, 9, 10). Other studies investigated individual relationships, psychosocial factors, and the whole of the working conditions and found that all of them influenced experienced stress, fear, and sleep problems. Numerous studies indicate a strong association between experienced stress and poor sleep. The fact that poor sleep probably contributes to fatigue and stress represents a primary problem with the at-sea environment that should be addressed. According to one recent report (6), seafaring work will always contain an element of fatigue which will vary according to workload (as defined by a combination of long working hours and poor sleep). However, appropriate steps must be taken to minimize the impact of this factor across the industry (5). Several studies have shown that health problems in the maritime industry especially include occupational diseases as well as attrition, hearing-handicap, musculoskeletal system diseases, joint pain from the constant pitching and rolling of the ship (bad weather), and cardiovascular diseases. Furthermore, there are stress-related illnesses as the result of the special psychosocial conditions with increased occurrence of tiredness, stress, and psychic symptoms. In case of stress-related illness, recovery is more complicated (5, 11–13). In our study, PS experienced on the ship significantly increased the risk for depression and depressed mood. When answering questions on the reasons for consulting a physician on the ship, seamen did not mention depression or depressed mood. It is alarming that many seamen who experience depression or anxiety do not consult their physicians.

Stress is a significant occupational health problem resulting in high expenditures not only of individuals, but also organizations and the society. Occupational stress occurs when people are confronted with the environment that poses a threat or demand, and they perceive they do not have the capability or resources to match or exceed the source of stress. The resulting imbalance can lead to reduced work performance and reduced employees' health and well-being. Although on the international level studies on seamen's health in different sectors of the business have been performed for a number of years, there is still a lack of knowledge about the working environment, injuries, and diseases on the ships, and thus the majority of maritime studies emphasize the necessity of the renewal of knowledge in this area (14, 15). According to the recommendations of the World Health Organization (WHO), studies on the working environment of different professional groups of coast workers have been performed for over 30 years; the recommendations are being implemented, while similar research in maritime business is only in its initial stage. As a result of the cooperation between the WHO and the International Labor Organization (ILO), a new strategy of maritime studies has been adopted in Geneva in 1997 (2, 3). The strategy recommended that physicians would learn about the seamen's living and working conditions on the ship during the compulsory health check-ups. One of the main tasks was research on the relationship between seamen's health and working environment. Detailed information about the seamen's working and resting conditions is necessary, since only sufficient knowledge may allow for early detection of health disorders and diseases and for timely application of effective preventive measures. In our study, 56.0% of Lithuanian and Latvian seamen indicated that the main cause of morbidity was the work at sea when being exposed to unhealthy factors.

Such study that evaluates and compares the impact of lifestyle and psychosocial factors on health in Lithuanian and Latvian seamen's population according to the international Lithuanian-Latvian concerted research technique has been performed for the first time in Lithuania. We hope that the results of the study will become significant for a more detailed study on the priority sectors of the national maritime shipping and the improvement of the lifestyle and health of all or separate professional groups of seamen. Future studies should therefore pay special attention to the estimation of the associations or the cause-and-effect relationship between the occurrence of a disease, poor environmental conditions, and critical traffic conditions.

Conclusions

1. About one-half of seamen of both countries indicated that they experienced psycho-emotional stress after, on the average, 2.7–2.8 months from the beginning of the voyage.

2. The main prognostic factors that conditioned the occurrence of psycho-emotional stress among Lithuanian and Latvian seamen were as follows: age (35–54 years), higher or specialized secondary education level, the duration of work exceeding 60 hours per week, work associated with increased visual strain and vibration, evaluation of one's health as "average," evaluation of one's physical capacity as worse than "good," depression that at sea occurs more frequently than on the shore, experienced discomfort due to disturbed work and resting regime under the influence of time zone changes, and disturbances in regular sexual life.

Lietuvos ir Latvijos jūrininkų aplinkos ir patiriamos psichoemocinės įtampos sąsajos

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Raktažodžiai: jūrininkai, psichoemocinė įtampa, stresas, rizikos veiksniai.

Santrauka. Jūrininkų darbo aplinka, traumų ir ligų priežastys nepakankamai ištirtos. Pagrindinės šiuolaikinės jūrų pramonės tyrimų sritys: stresas, sveikata ir gyvensena. Nepaisant problemos aktualumo, išsamių mokslinių tyrinėjimų populiacijos lygmenyje šia tema yra labai nedaug. Vienmomentis nacionalinis jūrininkų gyvensenos ir sveikatos tyrimas atliktas 2003 metų lapkričio–gruodžio mėn. pagal tarptautinę Lietuvos ir Latvijos šalių suderintą metodiką: vertinant ir lyginant jūrininkų darbo aplinką, gyvenseną, sveikatą, sveikatą žalojančių rizikos veiksnių paplitimą, objektyvios ir subjektyvios sveikatos vertinimo ir patiriamos psichoemocinės įtampos priežastinius ryšius. Šio darbo tikslas – nustatyti Lietuvos ir Latvijos jūrininkų patiriamos psichoemocinės įtampos paplitimą bei įvertinti veiksnius, susijusius su psichoemocine įtampa.

Tyrimo duomenimis, kas antras jūrininkas patyrė psichoemocinę įtampą. Abiejų šalių jūrininkai nurodė patiriantys psichoemocinę įtampą vidutiniškai po 2,7–2,8 mėn. nuo reiso pradžios. Įvertinus visų nagrinėtų veiksnių įtaką (taikant logistinės regresijos analizės metodus), nenustatyta reikšmingo skirtumo tarp abiejų šalių jūrininkų, patiriančių psichoemocinę įtampą laive. Patiriant psichoemocinę įtampą laive, nustatyti šie nepriklausomi prognostiniai veiksniai: aukštasis ar specialusis vidurinis išsilavinimas ($p<0,001$), amžius – 35–44 ar 45–54 metų ($p<0,01$), darbas, veikiant sveikatai žalingiems veiksniams 9–10 arba 11–12 valandų per parą ($p<0,01$) ir sveikatos vertinimas „vidutiniška“ ($p<0,05$), fizinio pajėgumo vertinimas „gana geras“ arba „vidutiniškas“ ($p<0,01$). Didžiausią įtaką patirti psichoemocinę įtampą turėjo darbas padidėjusios regėjimo įtampos aplinkoje ($p<0,001$) ir vibracija ($p<0,05$). Nustatyta, kad su patiriama psichoemocine įtampa buvo susijusi depresija, prislėgta nuotaika ($p<0,001$) ir sutrikęs darbo ir poilsio režimas dėl laiko juostų kaitos ($p<0,001$), taip pat reguliaraus lytinio gyvenimo sutrikimas ($p<0,001$).

Daugelis specifinių jūrinių rizikos veiksnių yra neišvengiami ir nepakeičiami, tačiau juos įmanoma modifikuoti papildant ar kuriant naujas strategijas, siekiant sumažinti tų veiksnių poveikį jūrininkų sveikatai.

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