

## **PHYSICAL ACTIVITY LEVELS AMONG OFFSHORE FLEET SEAFARERS**

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### **ABSTRACT**

Advanced technology has rationalized and simplified operations at sea; however, this development has resulted in higher demands being made of the operator. Good health has become an important safety factor: a good state of health is crucial both to preventing strain injuries and to ensuring alertness and optimal performance at work. Physical activity is a powerful preventive “medicine” for the maintenance of good health and the prevention of overweight and musculoskeletal disorders. The aim of this

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paper is to analyse the habits and preferences of seafarers with regard to physical activity.

Individual health factors, physical activity levels and work-related problems were surveyed on board vessels in a Norwegian shipping company. A questionnaire was completed by 577 seafarers.

The results demonstrated that 70% of the respondents exercised twice or more times per week when at home, whereas only 39% exercised on board. Twenty per cent never exercised on board, and 5% never exercised at home. Walking is preferred by 70% of seafarers at home, as well as cycling and doing manual work. On board, walking, cycling and manual work are the most common types of exercise. Strength training is more often preferred on board than at home. Preventing illness and injury, a pleasant and inviting gym on board, and keeping weight under control are the three most important motivational factors.

The results show that there is significant potential for improving and organising exercise-related activities on board as a means of maintaining good health and improving the performance of seafarers.

Keywords: Seafarers, offshore fleet, health, physical activity, survey

## INTRODUCTON

Offshore operations need to be performed around the clock under all weather conditions. Our performance and health are influenced by exposure to both physical and organizational work environment factors; e.g. work outdoors is performed in a wide range of weather conditions, as temperature, wind and rain vary geographically, seasonally and also in the course of the day. We can protect ourselves against exposure to negative aspects of the physical environment to a certain extent by wearing appropriate personal protective equipment (1, 2) and by modifying work routines (e.g. shorter work periods outdoors in cold weather). However, operations at sea involve shift work, and lack of sleep and fatigue have a substantial effect on performance (3). Musculoskeletal disorders are one of the most common causes for long-term sick leave and disability pension among individuals (4), as well as for loss of licence among offshore workers (5). Total psychosocial strain and coping with stress are also important factors in dealing with the challenges of working at sea (6).

New challenges in maritime operations are traditionally met by putting significant effort into developing new technology. There has been little focus on the seaman, despite the fact that many accidents and incidents are indirectly caused by poor human

performance due to severe working conditions, stress and ergonomically poor technical solutions. This effect is generally referred to as the “human factor”.

“Focus on health!” is a multiple year project with the aim to improve seafarers’ health and the work environment on board the offshore vessels of Farstad Shipping ASA. By initiating preventive measures, Farstad Shipping hopes to prevent work-related muscular pain and repetitive strain injuries among its employees. A good state of health in the individual is crucial to alertness and performance at work, as is the ability to tackle stress and to make correct decisions in a timely manner when undesirable situations arise. Good health is thus an important safety factor.

Exercise is recommended as a preventive measure against musculoskeletal disorders (7, 8), and it also improves the general state of health (9,10). Seafarers remain on board for four weeks or more at a time, so there is a major potential for enabling them to incorporate regular exercise in their daily routine on board. The premises for physical activity are very different at work and at home, with respect to both the time and the exercise facilities available. Furthermore, lack of motivation is a great challenge to raising exercise levels.

Our hypothesis is that seafarers suffer from musculoskeletal pain. Furthermore, there is a mismatch between the physical activity recommendations by public health authorities (4, 11) and seafarers’ exercise levels. It should be possible to identify factors that will motivate sailors to exercise more, thus improving their performance at work.

The aim of this paper is to analyse musculoskeletal problems among seafarers, and their habits and preferences with regard to physical activity on board offshore vessels.

## MATERIALS AND METHODS

The implementation of the project was based on a concept development method known as Concept Engineering® (12), which is a user-focused method of systematically gathering and processing data for the development of functional requirements, products and services (2). We conducted twenty personal interviews with seafarers, covering the different types of vessel operated by the company, operating waters and positions on board, as well as spouses and company management. The focus was on their subjective opinions regarding factors that have a negative impact on their health and the working environment on board, as well as personal preferences and needs as regards how to improve the situation. We also collected information about their preference as to physical exercise, lifestyle, work environment factors (physical and

psychosocial) and possible preventive measures in general. Observations were performed in the North Sea on board platform supply vessels.

All the interviews were carried out by two researchers, one asking questions and the other typing the responses. The most relevant statements were selected and developed into a questionnaire that aimed to detail the situation concerning physical activity levels, dietary conditions and work-related health problems, as well as to identify the causes of the most important health and work environment challenges on board. The questionnaire was developed from questions used in multi-national studies such as “HUNT 1” and “HUNT 2” (13) and the General Nordic Questionnaire for Psychological and Social Factors at Work (14). This enabled us to compare the seafarers with a large population. HUNT is a health survey of the population in the County of North-Trøndelag, Norway, in 1984-86 (HUNT 1) and in 1995-97 (HUNT 2). The questions regarding physical activity are based on HUNT 1, because these will be repeated in HUNT 3 in 2007-2008. The questions on self-reported physical activity have been validated (15, 16). We defined “exercise” as e.g. going for long walks, skiing, swimming, other kind of training or competitive sports.

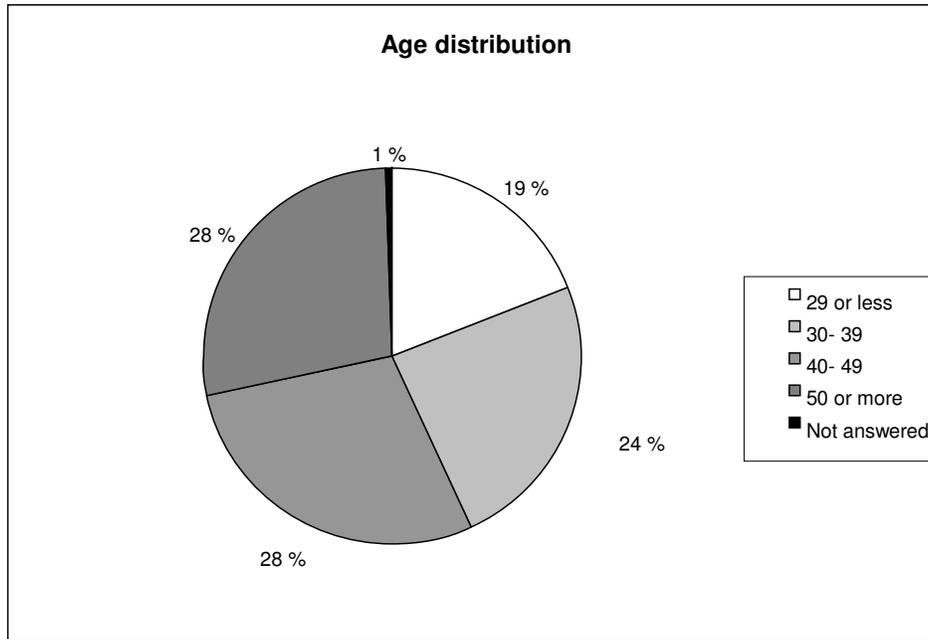
Background information was also recorded, i.e. age, nationality, position on board, type of vessel. The questionnaire was available in English and Norwegian versions and treated as confidential, as no names were recorded. The survey was carried out according to the Personal Data Registers Act in Norway, and was reported to the Privacy Issues Unit operated by the Norwegian Social Science Data Service.

The questionnaire was distributed to both crews on the vessels reporting to Farstad Shipping’s offices in Ålesund, Norway and Aberdeen, Scotland (summer of 2006); and Melbourne, Australia (fall of 2007). The respondents were asked to return the completed form in a sealed envelope to a named person on board, so that they could be returned in bulk from each vessel and identified by the vessel’s name. As a motivation, the management of Farstad had promised a prize to the crew with the highest response rate. Several crews had a 100% response rate.

## RESULTS AND DISCUSSION

A total of 577 forms were completed and returned to SINTEF. Many of the respondents had written comments at the end, which indicates a high degree of involvement with the topics of the survey. Of the participants, 3% were female and 91% male, while 6% did not answer this question. The age distribution is shown in Figure 1. Fifty-six per cent were on board a vessel operating in the North Sea, 24% offshore

South America, 11% in Australian waters, 6% off the west coast of Africa and 2% in the Far East. 66% of the respondents were working six-hour shifts; 33% 12 hour shifts, 2% other shifts and 4% did not answer this question.



**Figure 1. Age distribution of the respondents expressed as a percentage of total (n =577). Age intervals in years.**

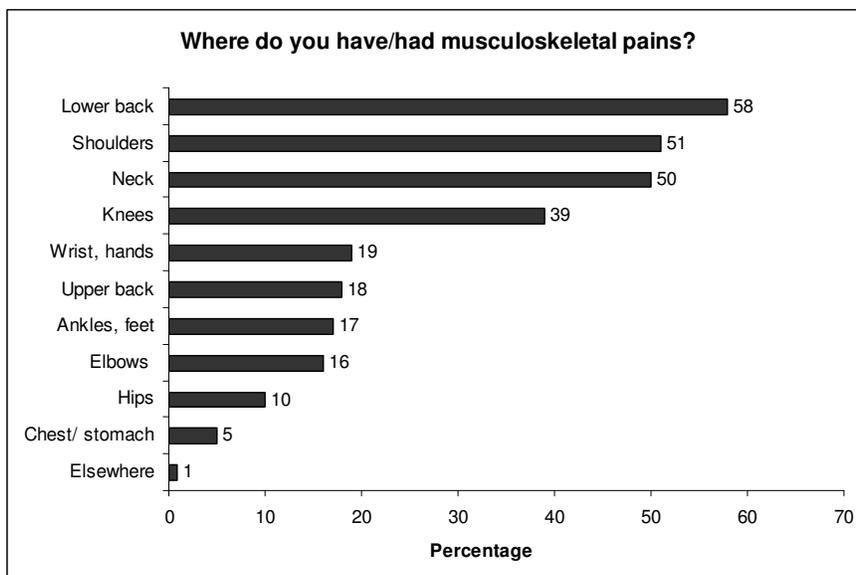
The respondents represented 18 different countries (Table 1). Forty-eight per cent of the respondents were working on Platform Supply Vessels (PSV) and 39% on Anchor-handling Tug Supply Vessels (AHTS), the remaining 13% were on other offshore vessels.

**Table 1. Home countries of the participants in the survey are shown as a percentage of total (n=577).**

Country	Number	% of total (n=577)
Norway	212	36.7
Great Britain	90	15.6
Brazil	55	9.5
Australia	54	9.4
Portugal	42	7.3
Poland	31	5.4
Indonesia	15	2.6
New Zealand	7	1.2
Ireland	3	0.5
Nigeria	3	0.5
Sweden	3	0.5
Pakistan	2	0.3
Chile	1	0.2
East Timor	1	0.2
Philippines	1	0.2
Italia	1	0.2
Spain	1	0.2
Hungary	1	0.2
Not answered	54	9.4

**Figure 2. The results from the question: Identify where you had pain and/or stiffness in muscles and joints. Results are presented as percentages of those who had pain/stiffness in muscles and joints (n=282).**

Fifty-one per cent of the respondents have been or are troubled by musculoskeletal

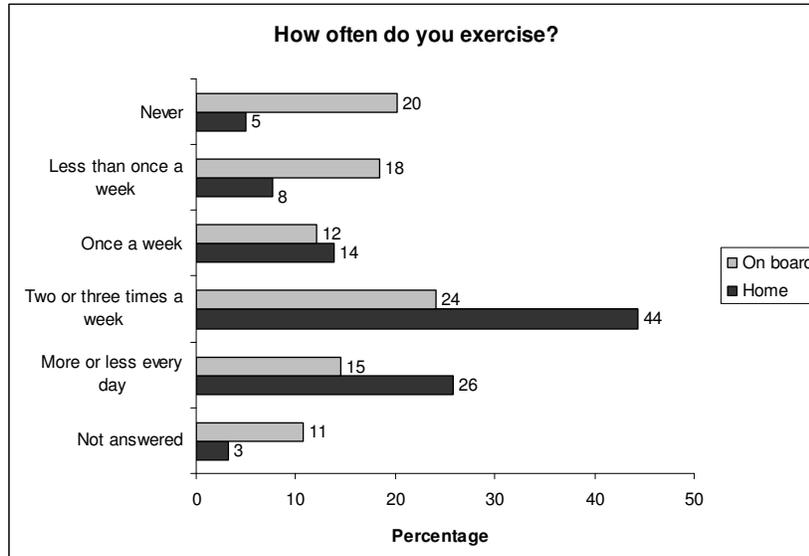


pain or stiffness in their joints. Figure 2 shows where these pains are localised. Seventeen per cent report that these problems reduced their ability to work to some extent, and 3% to a great extent.

The most common problem areas are in the lower back, shoulders and neck, just as in the general population. Of those who report such pains, 47% said that they had them more often at sea than when they are at home. A reason for this could be that their work involves monotonous repeated movements. Another possible explanation is that some working positions increase strain on the back, particularly due to poor ergonomics or because the respondents are working on a moving surface. Organisation of the work is also a crucial factor, and half of the respondents said that they only partly agreed that their workplace was well designed. At home, they are able to rest more, in addition to being more physically active, with the result that they use their bodies in a wider variety of ways. Focused exercise, ergonomic improvements in workplaces and more job variation on board seem to be necessary measures.

Self-reported exercise levels on board and at home are shown in Figure 3. Physical inactivity is defined as never exercising (13). This means that 20% of the seafarers are

inactive on board, and 5% at home. In HUNT 1, 14.3% of the participants were categorized as inactive, while ten years later, the number of inactive persons was 8.3 %. These results show that when the seafarers are at home they are more active than the population in the HUNT study. A likely explanation is that they have more time to go for walks, do manual work or take exercise.



**Figure 3. The responses to the question: “How often do you exercise, on board and at home?” Numbers are percentage of total (n=577).**

Seventy per cent reported that they exercise twice or more times per week when they are at home, compared to 39% on board (Figure 3). However, the amount of exercise taken differs between age groups. On board, 58% of the seafarers aged 29 or less exercise more than twice a week, compared to 38% of the group 50 years or older. This corresponds to the result in HUNT 1 (13). Of those exercising once or more a week at home, 48% exercise so hard that they are sweating or becoming breathless. Seventy-two per cent report that they exercise 30 minutes or more at a time at home, and 54% on board. Thirty minutes exercise per day is recommended to maintain good health (11).

These results show that there is a significant potential for raising exercise levels by improving facilities and organising daily activities on board. In interviews and in the course of our field observations, crew members explained that lack of time and weather conditions were the main reasons for not exercising on board. In high seas, sleep quality is often reduced, and the majority therefore prioritize resting during their off-duty hours.

Vessel motions per se also influence the ability to exercise on board. Those who exercise less than once a week at home and on board, respectively, show that exercise levels are approximately 10% higher among seafarers in the North Sea than offshore South America. Arranging activities that can be performed effectively and in heavy seas increase the exercise levels.

The results show minor differences between professions and exercise levels. On board, manual labour is a part of the daily work for some occupations. Able seamen were most physically active on average, although engineers and their mates are also physically active on a daily basis.

Forty-five percent of the seafarers who reported problems with muscular pains/stiffness were exercising less than once a week on board. In comparison, only 31% of those who were not suffering from pain exercise less than once a week on board. One factor that needs to be taken into account is that 15% of the group without pain did not answer this question, compared to only 6% of the group with musculoskeletal pains. Experience suggests that many members of this group never exercise. There is no significant difference between the groups as regards the levels of strength training. One of the most powerful remedies to prevent or heal muscular problems is exercise in general, and especially muscular strength training. Action should therefore be taken to encourage seafarers to be more physically active.

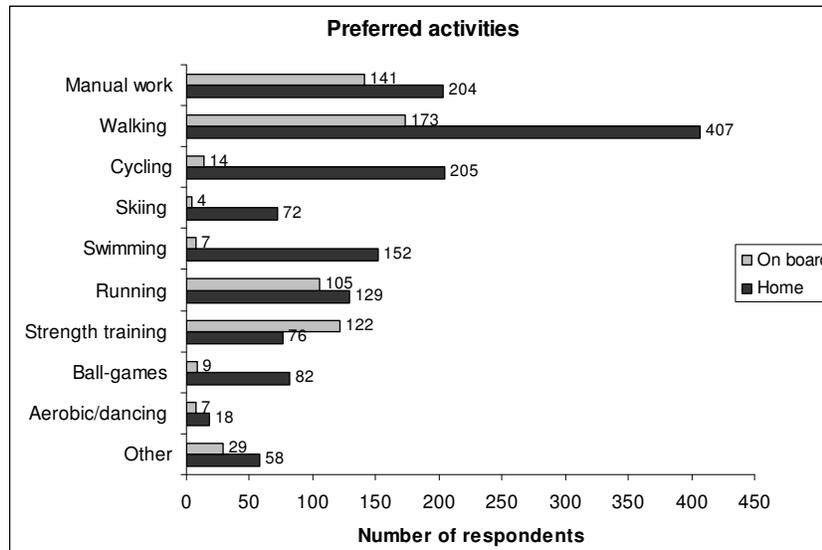


Figure 4. Priorities regarding physical activities on board and at home. The figures refer to the actual number of respondents who selected the different activities.

Figure 4 shows which activities seafarers prefer when they exercise, both on board and at home. Walking and performing manual tasks are activities that the majority pursue at home, while 30% also go for walks when they are on board. This might involve walking on a treadmill or walking ashore when the vessel is moored. Twenty-one per cent prefer weight training while they are on board, whereas only 13% train with weights at home. One reason can be that when seafarers are at home, they prefer to go for walks outside instead of exercising indoors. The availability of weight-training equipment and a dedicated area on board are also crucial factors.

The personnel were also asked to evaluate the motivational factors that were more or less important for physical activities (Table 2).

**Table 2. The degree to which different factors motivate seafarers to go in for more physical activity. Numbers are presented as percentages of the total (n=577). The response rate is shown for each factor.**

	Not/ slightly important (%)	Fairly/ very important (%)	Response rate (%)
The gym on board is equipped to train all parts of the body	23	62	85
The gym on board is pleasant and inviting	21	62	83
Guidance and personally adapted training is offered on board	51	30	81
Organised athletics competitions	70	12	82
Organised activities on board/ashore	62	21	83
Maintaining my body shape/appearance	31	55	86
Preventing illness and injury	11	75	87
Keeping my weight under control (Body Mass Index <35)	22	64	86
Guidance and personally adapted training at home	53	29	82
Organised athletics competitions during my time ashore	71	11	82
Offer of training at health club	45	37	82
My husband/wife makes me train	59	21	80

Preventing illness and injury was regarded as important by 75% of the respondents. Other important motivation factors included: Keeping one's weight in check (64%) and that the gym on board is equipped to train all parts of the body, pleasant and inviting (62%). Organised activities or athletic competitions were of minor importance.

The designs of the fitness rooms are very different from one ship to another. On board newer vessels, the fitness rooms have been designed on the drawing board; however, on older ships the gym is located in a cabin where the berths have been removed, or in a storage room. Measures need to be taken to improve and organise the

gym facilities on board these older ships, in order to motivate crews to take more exercise.

## CONCLUSIONS

We have identified musculoskeletal problems, physical activity levels and the motivational factors that influence levels of exercise on board the offshore vessels operated by a Norwegian shipping company. The level of exercise taken at home among the participants in this survey is higher than the average in a Norwegian population, but is lower when they are on board during their working periods.

The results demonstrated that 70% of the respondents exercised twice or more per week at home, whereas only 39% exercised as often as this on board. Twenty per cent never exercised on board, and 5% never at home. These exercise levels are considerably below the physical activity recommendations of the Norwegian health authorities.

Preventing illness and injury, having a pleasant and inviting gym on board, and keeping one's weight under control are the three most important factors that encourage exercise.

The results show that there is a great potential for improving and organising exercise-related activities on board offshore vessels as a way of preventing work-related disorders and repetitive strain injuries among seafarers, maintaining good health and thus improving their performance at work.

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