# PHYSICAL TRAINING IN THE PREVENTION OS SEA SICKNESS

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## ABSTRACT

Disorders related to labyrinth irritation (kinetosis) constitute a significant problem in sea travel, especially in sea service. A team of military researchers conducted research on a very large group (over 200 people) regarding the possibility of preventing seasickness through physical training. An original set of exercises was developed and performed by the study group. Then, the sensitivity of the test group and the control group to rocking was checked in laboratory and real conditions (sea cruise). The method has been shown to be over 50% effective in preventing and alleviating the symptoms of seasickness. The use of selected physical exercises may be an effective training against the risk of kinetosis.
**Keywords:** seasickness, prevention, prevention, physical exercises.

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## INTRODUCTION

Seasickness creates difficulties in training and performing daily duties for seafarers who are particularly sensitive to the type of acceleration occurring in sea conditions. Long-term training of sailors or cadets who are not able to adapt to such conditions or do not have the opportunity to acquire adaptation due to their low "flow" results in large material losses for training institutions, constitutes a waste of time of the trainees or exposes them to danger a group of people, sometimes dependent on the proper performance of an appropriate task by a crew member who is seriously ill with seasickness.

Seasickness prevention can be passive, active, or a combination of both. Passive prevention involves the design of the ship or its parts, elements and devices that reduce heeling (or some type of heeling) in rough seas. We need to replace side keels, gyroscopic tops, Frahm tanks, and berth suspension on cardan joints (in passenger liners). None of these methods provide satisfactory protection against seasickness.They are expensive and sometimes take up a lot of space inside the unit.

Active prevention includes measures and undertakings that reduce the way a person reacts to stressful environmental factors. In this case to linear and angular accelerations that stimulate the vestibular analyzer of the inner ear. This includes pharmacological agents of various types and with multiple effects (antihistaminica, sedativa, parasympatolytica), used preventively, and physical training, which is a set of specialized exercises that, to a greater or lesser extent, simulate accelerations unusual for terrestrial conditions, encountered in the sea during stormy conditions.

This work examines this last issue in more detail. The idea of "land hardening" is not new and has been known for over a hundred years, but despite numerous attempts, this issue has not been satisfactorily solved to this day. "Such training involves the gradual accustoming of the balance organs to functioning while excluding certain false information flowing from the circuit" [1] or "it promotes the creation of new pathways within the brain, which, to a greater or lesser extent, prevents the inflow of afferent stimuli through previously functioning pathways - to neurons causing a reaction" [2]. Here are two definitions defining the theoretical premises of the methods used.

It has long been noticed that people professionally involved in physical activities that require sudden head movements or maintaining delicate balance (acrobats, ice skaters, dancers, gymnasts) fall ill much less often. This was confirmed in field conditions (storm) and by assessing neuro-vegetative reactions after vestibular stimulation in laboratory conditions.

Among numerous studies in this field [1-5], I will mention only a few. Systematic performance of specialized physical exercises alone during a month reduced vestibular reactions in 37% of respondents. Combining exercises with swinging on a parallel swing increased these results to 65%, while the use of a Barany chair and a swing - up to 75% of the respondents.

In 1958, Okuniew [1] examined a group of 70 sailors. Over a period of 3 months, they performed special physical exercises during morning training, on which our current set of exercises is largely based. Such training reduced the crew's susceptibility to artificial waves by 10% and the author came to the conclusion that active training was not enough and should be supplemented with passive training, specifically stimulating the vestibular analyzer.

The general conclusion from these studies emphasized that specially targeted and properly conducted exercises not only have a positive impact on the general health of seafarers, but also reduce their sensitivity to acceleration. Ship doctors wrongly question the importance of vestibular training, which can be carried out even in simple ship conditions. The effectiveness of the recommended exercises has not yet been clearly confirmed, but - as Vozhova [1] rightly writes - if they contain elements of various accelerations that are an adequate factor irritating the vestibular analyzer - it can be assumed that habituation will have a beneficial effect on vestibular reactions (or those controlled by the vestibule) in natural sea conditions.

Habituation is the gradual decrease in response as a result of repetition of a specific stimulus. This is not synonymous with receptor adaptation, which means a localized and rapid loss of excitability as a result of its constant stimulation [2].

If, the mass use of training is prevented by its labor-intensive nature or difficulty in combining it with the daily routine, it can be limited to certain crew members who are difficult to replace, people with specialized training or for whom other methods of preventing seasickness fail.

The current work summarizes two stages of the experiment. The first one was carried out over 6 weeks in 1966 on 60 sailors, 30 of whom constituted the training group from the Polish Navy Physical Fitness Center in Oksywie and 30 the control group from the same ship. Both groups were randomly selected and consisted of sailors not accustomed to sea conditions. The training consisted of performing a set of special exercises every day (which was scrupulously observed) and swinging on a parallel swing.

The obtained immunity was monitored by a sea cruise on the "KT Bryza", lasting 6 hours at a sea state of 3°B, which was quite enough for this type of vessel to develop seasickness in individuals with average susceptibility.

Both groups were arranged on the ship in such a way that all those on board found themselves in similar social and living conditions (visual contact with the surroundings, ability to communicate) and were subjected to similar types and intensity of accelerations. Failure to meet these conditions constituted a serious objection to some work carried out in the United States in previous years, the results of which were considered unreliable if they lacked information on the arrangement of the two groups, or when the control group was amidships and trained in the bow rooms or vice versa.

At this stage of work, the results presented in Table I were obtained.

Tab. 1

Results.

| | | |
|---|---|---|
| Trained group (30 people) | | |
| a) | Ailments during training | 14 person (46%) |
| b) | Ailments during the cruise | 8 person (26%) |
| Control group (30 people) | | |
| a) | Ailments during the cruise | 16 person (53%) |

The fact that both homogeneous groups of sailors, differentiated only by training, had an incidence that was approximately 50% higher in the control group, was considered a result encouraging further research and it was proposed to carry out the second stage of research on a larger group.

Such research was carried out in the summer of 1972. A group of 100 healthy sailors aged 19-21, who had not sailed before, were selected for this purpose. The control group also included a group of 100 sailors from the same age group, in similar conditions and also without maritime experience.

At the beginning, it should be noted that conducting a 45-minute training every day for 6 weeks with such a large group in a way that does not interfere with service and other activities, and during the period of intensive general military training, is troublesome, requires the support of commanders at various levels and significant effort of those conducting and supervising the training, for which thanks are due to all those involved.

The training, similarly to the first stage, consisted of a set of exercises performed for 15 minutes (active part) and also a 15-minute swing on parallel swings specially built for this purpose (passive part of the training).

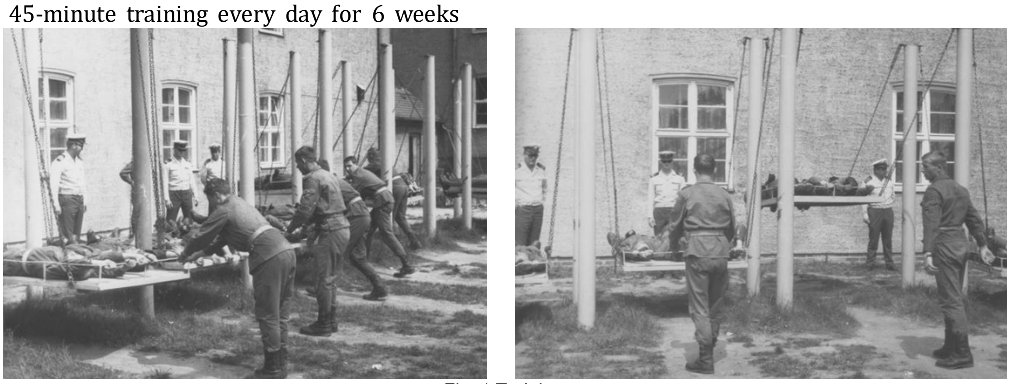

Fig. 1 Training.

The physical exercises included: running in place (approx. 40 seconds), head rotation left and right (40 times), arm rotation left and right (15 times), trunk rotation (30 times), head tilt forward and back (20 times), front and back rolls in total (3-5 times), squats (20 times), torso bend with left and right circles; every 3 rounds to one side, quickly straighten the torso and rest for 2 seconds; the same the other way around; a total of 15 turns in each direction. Additionally, jumping on the toes and chewing sideways (3-5 in each direction). As a condition, the level of physical fitness of seafarers must ensure proper and safe performance of these exercises.

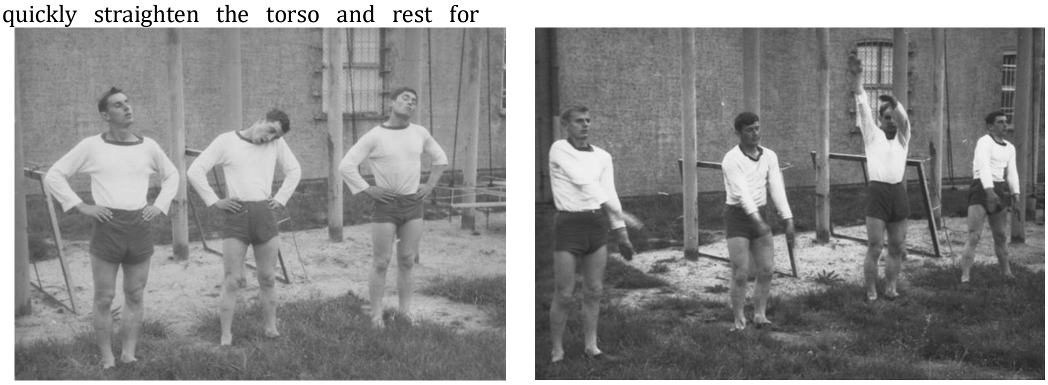

Fig. 2 Training.

The officer conducting the classes recorded the presence of sailors in the training log and described the ailments occurring during the training. The rule was for currently healthy sailors to participate in the training. Other ailments occurring before the training excluded the subject on a given day. The most common complaints reported during swinging were nausea, headaches, dizziness, and malaise. Vomiting was also observed several times in the first phase of the experiment.

Overall, these symptoms were similar to those observed during seasickness and other kinetoses. Initially, these ailments occurred in 42% of the subjects and their number was greatest in the first days of training

and decreased gradually as they got used to the repeated stimuli. The ten most sensitive subjects reported subjective complaints almost until the end of the training period. As time passed, these symptoms became less and less severe and after a month there was no more vomiting, only occasional dizziness and nausea.

The day after the training, a control cruise was carried out in which a 100-person test group and a 100-person control group took part. The groups were deployed on two ships of the same class, significantly larger than KT Bryza, maintaining the conditions as in the first part of the experiment. The cruise lasted 6 hours and took place at a sea state of 3˚B, which was enough for the development of ailments in sensitive individuals, but - due to the class of the ships - we found these conditions to be too mild and did not clearly differentiate the two groups. Unfortunately, the cruise could not be repeated in more severe conditions.

The well-being of the subjects was checked at 30-minute intervals by support staff who did not know the division into groups, which additionally ensured objectivity in the assessment of the subject's condition. The results were entered into individual questionnaires, and to simplify the recording, the symptoms were divided into 4 groups depending on the severity of the condition. They were: "0" - no symptoms, no subjective complaints, feeling very good; "1" – mild nausea, loss of appetite, paleness, sweating; "2" - severe nausea, periodic vomiting, dizziness or headaches; "3" - repeated vomiting.

20% of the trained group fell ill during the cruise, including 15 people who had previously reported various types of ailments during training and 5 people who had felt well so far. Individuals who had the worst tolerance for swinging were more seriously ill in the sea.

In the control group, symptoms of varying intensity were recorded in 48% of the respondents. As a rule, these symptoms were more severe than in the trained group. The number of people suffering from illness in this group was almost equal to the number of people who had a bad experience with swinging at the beginning of training - in the trained group. It can therefore be assumed that both groups had a similar susceptibility to seasickness, which varied as a result of training in favor of the exercising group.

Training was therefore a probable cause of the reduced susceptibility of the "trained" ones. These data are illustrated in Table 2.

Tab. 2

Results.

| | | |
|---|---|---|
| Trained group (100 people) | | |
| a) | Ailments during training | - 15% |
| b) | Ailments during the cruise | - 20% |
| Control group (100 people) | | |
| a) | Ailments during the cruise | - 48% |

It is difficult to provide a sufficiently objective assessment of the effectiveness of methods used to prevent seasickness. With some simplification, we can treat the training as the equivalent of a "drug" and the control group as a "placebo" and use the formula proposed by Chinn [2] and commonly used to assess the effectiveness of prophylactics drugs in seasickness. This formula determines the number of susceptible people (both groups equally susceptible, randomly selected) who did not get sick thanks to the use of a given drug (in this case training):

| Method effectiveness = (%) | % of patients in the control group | % of patients in the trained group x 100 |
|---|---|---|

% of patients in the control group

After substituting the results from Tables I and II into the formula, the effectiveness of the method is 54%. This value is similar to the estimates obtained during research on drugs to prevent seasickness which are considered effective. The "effectiveness" of the commonly known dramamin is estimated based on the above formula at about 50%, and the "effectiveness" of hyoscine, considered to be the best drug, at 60-80%. The assessment largely depends on the cruise conditions, which are beyond the experimenter's influence, unless an artificial one with known wave parameters is used in the pools [2]. In mild conditions, "effectiveness" is rated very high, in severe conditions - too low.

The results obtained during the experiment conducted on a total of 260 sailors seem to indicate that specially selected physical exercises combined with swinging on a parallel swing can be considered one of the methods of adaptation to sea conditions for an average selected group of people. The method is also useful because the training can be carried out in the winter, i.e. during rare trips to the sea and when there are objective difficulties in habituation in natural conditions.

Moreover, such training may serve not only the purpose of habituation, but in individual cases it may constitute an attempt to select sailors who are not suitable for service on ships. In such a case, sailors who had ailments during the entire training cycle should not be sent to sea duty, but should be sent to the Naval Hospital for specialist examination. The rest, with moderate susceptibility, who stopped feeling the initial symptoms as a result of training, can perform exercises twice a week as part of the PE program during the entire training period on land in order to maintain habituation.

The main objection to the land-based habituation method is the inadequacy of the stimuli used to those later encountered in marine conditions. However, recently it has been shown that exposure to vestibular stimuli of a magnitude too small to induce motion sickness reduces susceptibility to the same stimulus of greater intensity [4].

The discussion on particularly stressful stimuli in seasickness has not been definitively concluded, although the vast majority of researchers support the decisive role of linear accelerations (parallel swing) in this kinetosis. Although habituation concerns a specific vestibular stimulus, so acquired for one type of movement does not have to apply to others [5], the fact of the existence of transfer and the use of different stimuli at the same time allows for habituation for similar types of movement. However, transfer does not occur to the same extent as in the case of drugs used to prevent kinetoses [4].

Nevertheless, the method leading to habituation by repeating exercises combining both types of accelerations, and thus accustoming the body to inhibiting excess stimuli arising from the unusual position of the body in relation to the ground, should result in a gradual reduction of the overall response to these stimuli not encountered in everyday life. The existence of transfer proves that the habituation process takes place mainly in the central nervous system, but the role of the peripheral vestibular organ in this process is not clear.

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