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ATTEMPT AT DETERMINATION OF SUSCEPTIBILITY TO SEA SICKNESS ON THE BASIC OF THE AUTONOMIC NERVOUS SYSTEM REACTIONS AFTER EXCITATION OF THE VESTIBULAR ORGAN

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ABSTRACT

55 men were submitted to examination with method of electric resistance of the skin of the forehead after excitation of the vestibular organ („swing" according to Hulk and Henkes). In group of 43 people with a history of a disposition to sea-sickness, na 28 cases a lowering of electric resistance was stated and in the majotity of cases a simultaneous acceleration of the pulse rate was also observed. In group of 7 people especially sensitive (sweating, turning pale, headache, nausea – the necessity of checking the examination because of vomiting) the lowering of elctric resistance of the skin was stated in 6 cases. 17 people were examined under maritime conditions with the results depending on the method used. It is concluded that the method of vegetative reaction of the vestibular organ may give valuable results in cases of overexcitability of the labyrinth. In other cases consideration should be given to a possibility of an adaptation to sea conditions. The results must be confirmed on larger material.
Keywords: kinetosis, seasickness, motion sickness, research in marine conditions, electrical resistance of the skin.

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INTRODUCTION

The pathogenesis of kinetosis is complicated and getting to know it is important for proper prevention and treatment of these diseases. On the other hand, in the light of recent works, the possibilities of proper testing of candidates for various services, including maritime and aviation, in which individuals not corresponding to the requirements should be eliminated. In this work, we relied on already published insights [1,2,3,4].

METHODOLOGY OF RESEARCH

For the examination, we used a bridge for measuring the electrical resistance of the skin, based on the assumption that one of the reactions of the vegetative nervous system, which can occur after stimulating the vestibular organ, is an increase in skin sleep, which in effect gives a decrease in electrical resistance [2]. The vestibular organ was stimulated with a swing based on the experiences of Hulk and Henkes [1], but somewhat modified (a board with a frame, suspended on two points on steel links).

RESULTS OF THE STUDY

In the above manner, 55 men were examined aged 20-23, cadets from the Naval Academy and sailors from naval units.

55 men aged 20-23, cadets from Naval Academy and sailors from ships Polish Navy were examined in the above way.

Group 55 respondents were divided into 2 groups:

I - sensitive to sea disease, i.e. sick (from intelligence). This group had 43 people.

II - not sick (from the interview). This group had 12 people.

The relationship of the suffering to non -sick in our material does not reflect the average data for the navy, but is the result of the specific selection of candidates for our research. In the first group of sick people (from the interview), a tendency to vegetative reactions was found in 28 people, the lack of this tendency was found in 15 people. Vegetative nervous system lies were assessed on the basis of a decrease in the electrical resistance of the skin of the forehead, acceleration or lowering of heart rate, redness or face detection and nausea or threatening vomiting. These symptoms were assessed after a 5-minute hesitation of the examined on the swing. Of the 28 sweating, clear heart rate acceleration was noticed in 15 people, heart rate slowing in 4 people, lack of impact of the test on the frequency of heart rate in 9 people (Fig. 1a and 1b).

From this group, 7 people were particularly sensitive to stimulating the vestibular organ, which gave in an interview a great tendency to maritime disease. During hesitation, they were observed in their face, headache and nausea. Each of these respondents had to stop fluctuations in the face of threatening vomiting and other unpleasant subjective sensations (dizziness). Therefore, the test lasted from 2 to 4 minutes. In this group of respondents, a tendency to vegetative reactions was found in the interview in 6 people, and during the examination the same people found a decrease in theelectrical resistance of the skin of the forehead and acceleration of heart rate in 4 cases, the heart rate remained unchanged in 2 cases. 1 person did not find a decrease in the electrical resistance of the skin, and only quite significant acceleration of heart rate was observed. Dig. 2a and 2b present a heart rate and electrical resistance in this group.

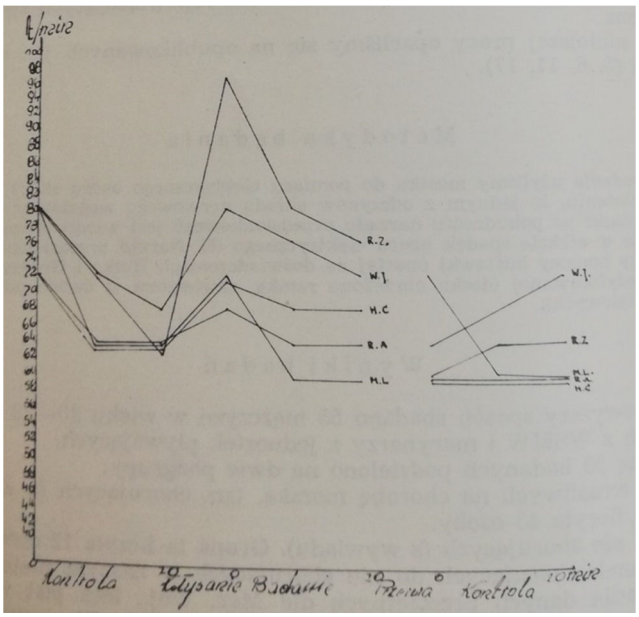

Fig. 1a Plot of heart rate in 5 cases selected from a group of 15 subjects responding to stimulation with accelerated heart rate.

In a group of 43 sick people (from an interview), apart from a group of 28 people reacting sweating to stimulate the labyrinth and discussed above, a 15-person group was also observed in which such a reaction was not noticed. However, these people, in the interview, mostly gave a tendency to vegetative reactions. This group observed acceleration of heart rate in 3 cases, heart rate slowing down in 8, no effect on the heart rate in 4 cases.

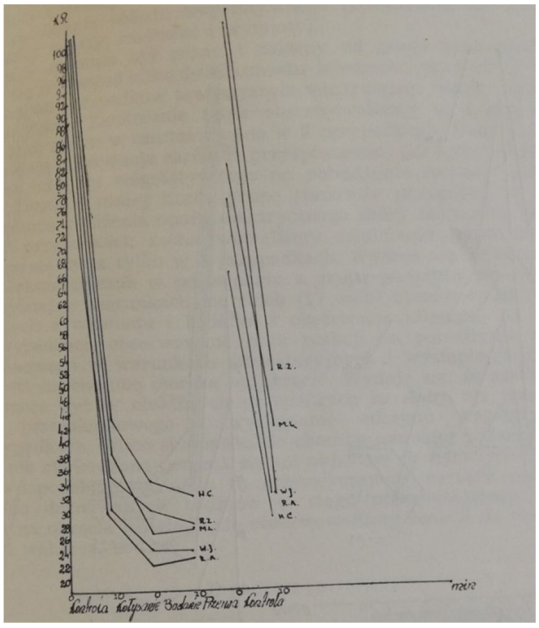

Fig. 1b. Graph of electrical resistance in 5 cases selected from a group of 15 subjects responding to arousal by sweating.

In group II, 12 people were observed who did not tend to maritime disease in an interview. As a result of stimulation of the vestibular organ by fluctuations, a reduction in the electrical resistance of the skin was observed in this group, and in 5 cases this symptom was not found. In both of these subgroups, there was no clear change in the frequency of heart rate characteristic of any subgroup. The number of cases with acceleration and heart rate release was almost equal. In addition to lowering the electrical resistance of the skin in some of the respondents, other symptoms of stimulation of the vegetative system were not observed.

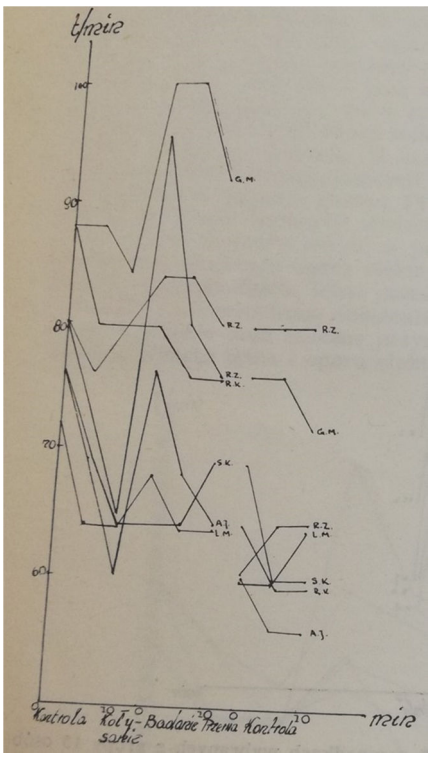

Fig. 2a Plot of heart rate in a group of 7 individuals particularly sensitive to kinetosis.

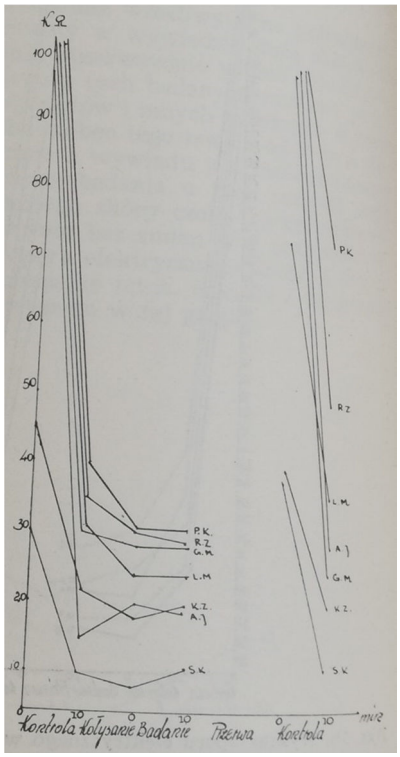

Fig. 2b Graph of electrical resistance of the skin in a group of 7 people particularly sensitive to kinetosis.

A group of 17 cadets was observed for control purposes in the number of 55 respondents, who previously sailed on ships in the sea for about 4 weeks before the examination in various weather conditions at sea. This group was separated due to the uniformity of the material and the method of subsequent control (almost the same conditions on the ship for the whole group).

DISCUSSION OF RESULTS

The conducted tests allowed to observe vegetative reactions after stimulating the labyrinth and assess their intensity, depending on the individual sensitivity of the respondents. The main attention was attracted to the degree of skin sleep and change of heart rate frequency, but other symptoms of stimulating the vegetative system (fainting or redness of the face, nausea and vomiting) were also observed.

The degree of sweating was different and the electrical resistance dependent on it was expressed in a difference from a few to several kilos, with the vast majority of cases accompanied by the pulse acceleration that lasted differently. We observed the heart rate in 4 cases (out of 28), no changes in the frequency of heart rate in 9 cases. Data from the literature provide observation of both acceleration and heart rate as a result of a vegetative reaction to stimulating the vestibular organ. A much less numerous group were cases in which a decrease in the electrical resistance of the skin (15 people) was not noticed. In this group, in 8 cases we observed a heart rate, while the acceleration of heart rate only in 3 cases. It seems that the difference is quite characteristic compared to a group of sweating. In a group controlled in maritime conditions (17 people), we observed the compatibility of data from the interview and research with clinical observation on the ship. In 2 cases, there was a lack of response to the stimulation of the vestibular organ in laboratory conditions and the occurrence of symptoms of sensitivity to maritime disease on the ship. It seems that the stimulus used may in some cases be too weak to stimulate the vestibular organ and the occurrence of a vegetative reaction. In 4 cases, despite the tendency to the maritime disease given in the interview, there was no sweating or disease symptoms on the ship. Probably the habit of the vestibular organ to the stimuli experienced during the preceding survey of the ship's sailing and therefore we did not observe the reaction to the stimulus used in the form of fluctuations.

The described method of testing the vegetative reaction deserves attention due to the fact that it emphasizes the pathogenetic mechanism of kinetosis, which has not yet been included in the proper way. A whole range of clinical and experimental works deepened our news about the relationships existing between the vestibular organ and the central nervous system and the vegetative nervous system. In some works, attempts were made to successfully determine even quantitatively this relationship and express it with the help of various tests in measurable, comparable values [3]. In various qualifying studies, Barany's test was most often used as the best orienting in the assessment of the degree of excitability of the vestibular organ, although this attempt in its current form does not allow the isolation of the stimulation, acting on the semi – circular channels (above all) from the reaction that is the result of irritation of the vestibular organ. The proposed special head settings while performing this test also insufficiently differentiate these two moments.

In all considerations about the pathogenesis of kinetosis, it is necessary to distinguish between the reaction of two parts of the vestibular organ to different types of acceleration. From the works of Breuer (quoted for 1), which first found the difference of activities between semi -circular channels and utricle, further work on this subject shows that the semi -circular channels react primarily to angular acceleration, while the otolite organ of utricle and the bag reacts to linen acceleration.

Angle acceleration is expressed in degrees per second to a square (°/ sec^2) and the excitability threshold for semi-circular channels is 1-2 °/ sec^2, or slightly less [5]. Angle accelerations less than 1 °/sec^2 are not registered by semicircular channels and do not reach our consciousness. The angular accelerations found on ships at a large wave are usually 2-5 °/sec^2, so only several times exceed the threshold of the physiological excitability of semi-circular channels.

Line acceleration is usually expressed in multiples of earthly acceleration "G", with 1 g = 981 cm/sek^2. The threshold of the otolite organ excitability is 0.006 g. Linen acceleration acting towards the head of the head is expressed by the "+" sign, while acting in the direction of the leg-head, the "-" sign. Line acceleration observed on ships reaches ± 0.4 g, and de vitamin [5], based on Quix works, even gives values of 0.5 - 1g, i.e. exceeding the threshold of the physiological excitability of the vestibular organ [6] exceeding the threshold of the physiological excitability of the physiological organ [6]. Acceleration or their combinations depend mainly on the nature of the ship's movements, i.e. on the type of tilts around the longitudinal or transverse axis.

In the light of the above observations, it can be stated that classic attempts to examine the reaction of the labyrinth, consisting of a rotating test, could not give a proper explanation of the pathogenesis of kinetosis. Angle accelerations with varying degrees of intensity were used here, while in the pathomechanism of kinetosis the main role is played by linear acceleration. The conditions in which sea kinetosis (sea disease) arises is the most suitable for the method used by Hulk and Henkes. In this method, the stimulation of the vestibular organ is obtained with a horizontally suspended swing, which, thanks to fluctuations in the horizontal plane, with the examined back on it, allows selective stimulation of the vestibular organ.

There is a connection between the vestibular nerve and the vegetative centers in the interstat and stimuli flowing from the vestibular organ are reflected in a series of reactions of the vegetative system. You can observe vegetative reactions of varying intensity both in the pathological states of the labyrinth and with the experimental stimulation of this organ. Symptoms on the part of the vegetative system, such as the feeling of dizzy, pallor, sweating, nausea or vomiting accompany to a greater or less extent stimulation of the labyrinth, while according to Hulk and Henkes, the referral of stimuli sedated semi-circular channels does not cause a neuro-vegetative reflex. The tests were performed using fluctuations within 2, 3 or 5 minutes, while symptoms similar to maritime disease were observed. The tendency

to occur these symptoms is very different and depends on the coexistence of further factors that can not be omitted in the overall kinetosis. In the attempts in question, you can not capture such an important moment as getting used to maritime conditions, as well as a number of endogenous factors and reflexes (physical and mental condition, external conditions: noise, fragrances, etc.).

Based on the material tested by us, you can observe a much more frequent occurrence of vegetative reactions in cases with a positive interview about maritime disease; This was accompanied by acceleration of heart rate. The interview regarding the tendency to vegetative reactions and maritime disease is an important part of the study, although the possibility of providing false data should be taken into account. Regardless of this data, it was possible to find out only on the basis of examination of cases with excessive excitability of the vestibular organ.

CONCLUSION

- Examination of the electrical resistance of the skin as a vegetative reaction following stimulation of the vestibular organ may be useful for assessing susceptibility to seasickness.
- A much more frequent occurrence of vegetative reaction was observed in cases with a positive interview, which was confirmed during observation on the ship.
- The method of examining changes in the electrical resistance of the skin, which is a reaction to the stimulation of the vestibule, may give particularly valuable results in cases of hyperactivity of this organ.
- In cases of normal excitability of the vestibular organ, the moment of adaptation to sea conditions should be taken into account.

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