

## **WORK-RELATED STRESS AT SEA POSSIBILITIES OF RESEARCH AND MEASURES OF STRESS**

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### **ABSTRACT**

The present concept of stress is related with the necessity of triangulation in research. Triangulation means collecting evidence of stress from at least three sources: a) precursors – perception and feeling (moderating factors), b) direct consequences, c) state of health. Is it possible to implement triangulation in the investigations of work-related stress at sea?

In the present paper, possibilities of collecting data on the work at sea are analyzed as regards individual aspects – stages of triangulation. The employment of triangulation principles to examine stress in persons working at sea requires both time and application of certain corrections to methodology of examinations carried out in Poland. When examining seafarers, we deal mainly with subjective information on perception of work and individual feeling of work-related stress. A proposition to expand the methodological workshop of examining stress at sea according to triangulation principles has been presented.

**Keywords:** work-related stress at sea, concept of triangulation.

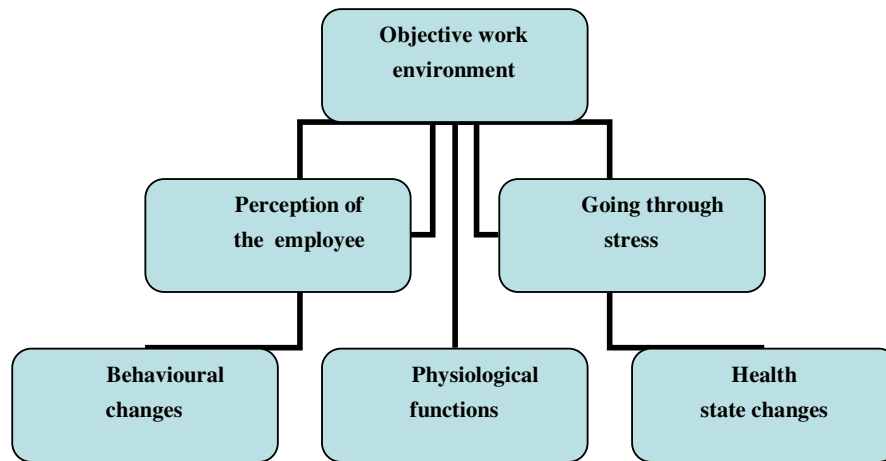
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## WORK-RELATED STRESS AT SEA

Stress is defined as a mental state which both reflects a broader process of an interaction between an individual and his/her work environment, and is also its element. This process is based on a sequence of relations between objective work environment and perception of the worker, between perception of the worker and dealing with stress, between going through stress, behavioral changes, physiological functions and changes in health state (Fig. 1) [1].

Fig. 1. Process of stress

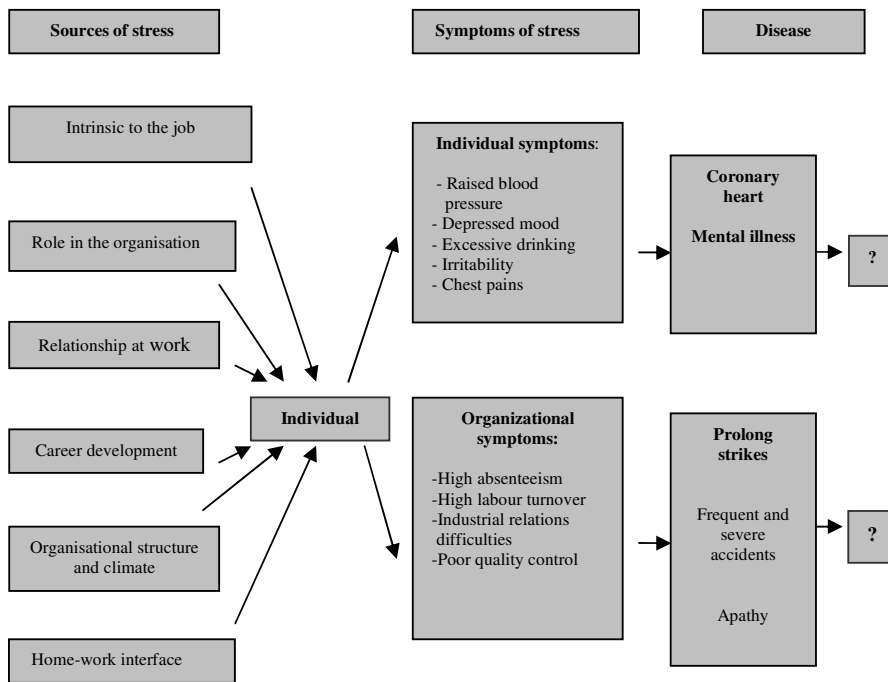


In the considerations on the work in maritime environment the particularly important is the concept of mental stress, as well as the share and role of underlying psychosocial factors. The exposure to harmful physical factors adds to the psychosocial ones. In such an approach we deal with at least two processes: a direct somatic mechanism and psychological effect of stress. These two mechanisms are not alternative explanations of the interaction between the state of health and harmful factors. They constitute a unity, exerting their influence within various scopes and in diversified ways.

The degree of becoming aware of stress changes with development of this state. Relations between the objective work environment and its perception by the worker, between perception and going through stress, as well as between going through stress and changes in behaviour, physiological functions and state of health are a kind of variable interaction. Although coping with stress is an essential element of this process,

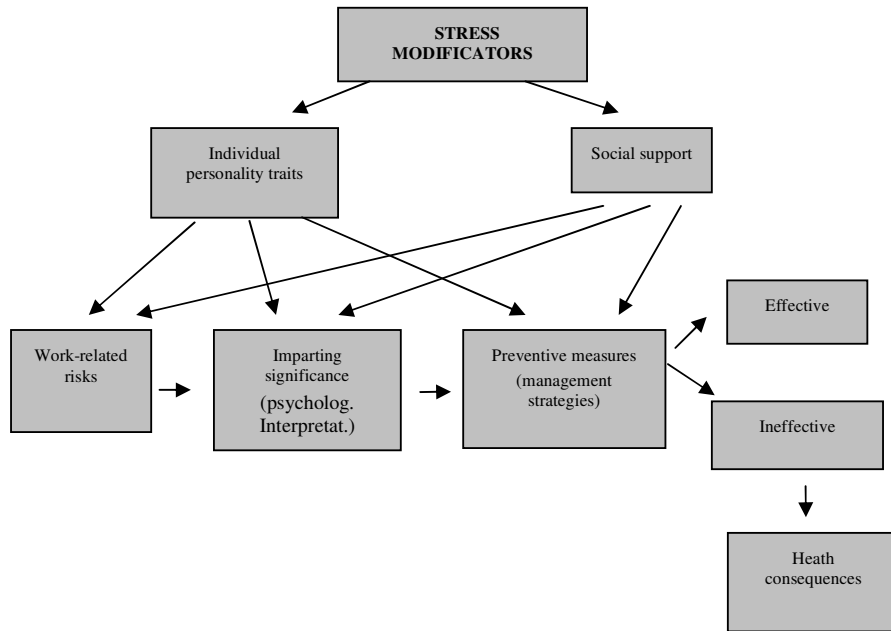
the degree of its understanding is poor and requires conscious training and education. Figure 2 shows a model proposed by Cooper and Marshall [2], focusing on the nature and elements of stress connected with the interaction between work and an individual and on the consequences of stress for an individual and an organization.

Fig. 2. Dynamics of work-related stress (according to the model of Cooper and Marshall) [3, 6].



According to R. Lazarus [4], two types of assessment are distinguished in diagnosing work-related stress: primary assessment of the significance of situation, and secondary assessment, when one's all accessible reserves are used to cope with the situation. The modifiers of work-related stress are: individual traits (what is the person like) and social situation (can one count on others' help). Appropriate personality traits play the role of a defense mechanism. They may change one's relations with work environment by affecting directly the extent of stress perceived and the course of causal relation between becoming aware of stress and reacting to it, whereas the sense of social support neutralizes causal relations between perceived work-related stress and direct reactions to it, which is illustrated below (Fig. 3).

Fig. 3. Stress modifiers



Cox [5, 6] described process of stress in terms of a five- stage model:

1. The first stage represents the sources of demand faced by the person, which constitute a part of their environment.
2. The second stage is the person's perception of these demands in relation to their ability to cope; in fact, it is the first stage of assessment.
3. The third stage of the model is represented by psychological and physiological changes related with the occurrence of stress, embracing also stress management. Emotional changes are an important element of stress condition. Their character is usually negative and they frequently determine the experience of stress by an individual.
4. The fourth stage is related with consequences of coping.
5. The fifth stage involves general feedback information, as well as that conveyed to others, related with all other stages of the model.

The concept of stress outlined above involves the necessity of triangulation in the research on stress (European Agency of Occupational Safety and Health. Studies on work-related stress. Luxembourg: Bureau of Official Publications of European Commonwealth) [6].

## TRIANGULATION CONCEPT IN RESEARCH OF WORK-RELATED STRESS

**Triangulation** consists in gathering evidence of stress from at least three sources. As a complex process, stress itself cannot be examined using one measure only. The examinations should take into account the complexity of measurement, include a greater number of diverse investigations from different sources and, if possible, have a prospective character. In general, stress is associated with subjective psychological discomfort. Employees are most often asked about subjective feelings connected with perception of stress at work, attempts to cope with it, as well as psychological and health consequences. Therefore, the information thus gathered have a subjective character and the accuracy of data obtained based on the description of the person examined may be questioned, particularly in view of the problem of negative affectivity (NA). In psychology, NA is defined as a “general personality trait, reflecting individual differences in negative emotionality and conception of oneself, i.e. concentration on negative aspects of events and experiencing stress in every situation” [7]. There is a danger, therefore, that data obtained from examined persons only may be not reliable in view of individual tendency towards pessimistic way of perceiving and interpreting reality. Not only would negative affectivity influence the perception of work environment by the employee, but also his assessment of own’s state of health or general feeling. Thus, it may be an intervening variable, accounting for marked percentage correlation between perceived hazards and their consequences. Assessment based on the opinion only would have been very weak evidence and should therefore be supported by data from other fields.

Is it possible to employ triangulation concept in the examination of work-related stress at sea? According to Cox [6], triangulation should include data consistent with the following simplified schematic: “work-related hazards – stress – damage”.

In triangulation, the measured quantity is a three-stage process:

1. Precursors – perception and feeling (moderating factors)
2. Direct consequences
3. Health state

The principles of triangulation were described in a simplified way by Kristensen [8] according to the matrix: stressors, stress and disease.

Triangulation should embrace:

### **1. Work-related hazards**

Evidence from the inspection of work environment - audit, including both physical and psychosocial aspects (different physical and psychosocial stress precursors may be encountered, which can be assessed at the workplace).

### **2. Subjective work-related stress**

Investigations on perception of work and reaction to it by employees.

### **3. Consequences of stress**

Examinations of the behaviour of employees towards work and of their physiological and health condition. In an ideal case, the principle of triangulation should be applied inside these areas and between them. Let us analyze possibilities of collecting data on the work at sea in individual aspects of triangulation.

### **Work-related hazards**

Physical, chemical and biological hazards have been fairly well identified in the maritime environment. Such data come from investigations carried out by specialists. Psychosocial factors which are the source of work-related stress at sea are also well recognized. These are: type of work, risk of work loss, work safety, work schedule and fatigue, sense of control, organizational culture, multinational character of crews, isolation, development of career, work-home interface [9, 10].

To become certain, a potential harmful psychosocial or organization factor should be identified with reference to at least three different types of evidence. According to Cox [6] these may be:

- evidence referring to objective and subjective factors preceding the occurrence of stress,
- own account concerning stress,
- all changes in behavior, physiology or health state.

The presence of psychosocial factors as potential stress sources is examined based on “Work Features Assessment Questionnaire” by B. Dudek and M. Waszkowska [11]. This method is used to measure global load of workplaces with psychosocial factors and to determine work factors and features that are the greatest sources of work-related stress. Potential factors are assessed by experts (2–3 experts) who know the workplace but do not work in it. Although this approach may be taken for other occupations, in maritime environment, where ships are owned by international corporations, this form of gathering data has not found practical application. Thus standardized version of questionnaires for work features assessment by experts (ship owners and their representatives) should be worked out and implemented.

Therefore, problems with objectification of data appear. We use the following methods for subjective work perception: “Stress at Work” and “Subjective Work

Assessment Questionnaire” by B. Dudek and M. Waszkowska [11] and a questionnaire for examination of psychosocial situation “Psychosocial work conditions” by M. Widerszal-Bazyl and R. Cieślak [12].

In our opinion, the results of investigations on potential physical, biological and chemical risk factors are not complementary with psychological examinations. Physical factors are measurable, while psychological ones are of a qualitative character; hence it is difficult to compare them.

It is therefore necessary to acquire data from superiors who assess the intensity of psychosocial factors which are potential stress sources at sea based on standardized research methods in view of international character of the seafarer job.

#### **Subjective work-related stress**

The investigations of work-related stress at sea are carried out post factum only, when seafarers are staying on land, most often when undergoing routine medical check-up to receive health certificate. The fact that examination of impressions about experiencing work-related stress at sea is only a simplified measure of those formed on land, with family present, where there are no life hazards, storms, crew members in conflicts, is a serious methodological reservation concerning the accuracy of such data.

The methods mentioned previously ( “Subjective Work Assessment Questionnaire” by B. Dudek and M. Waszkowska and “Psychosocial work conditions” by M. Widerszal-Bazyl and R. Cieślak), employed by us [13] to investigate individual impressions of employees about work-related stress; make use of good psychometric parameters. Their standardization, however, performed for a very large group of workers of various occupations did not embrace professions related with the work at sea. Moreover, as shown by the analysis of triangulation, both questionnaires play two roles: first, they serve to examine the assessment of subjective perception of work (1st stage of triangulation), the second one - to evaluate individual impression of work-related stress (2nd stage of triangulation).

There are no specific questionnaires concerning stress load at sea, taking into account the specificity of stressors. It is therefore indispensable to draw up a questionnaire concerning a subjective workload in specific maritime environment. In 1980’s, a questionnaire “Satisfaction with seafarer’s work” by Z. Borucki [14] was worked out. Nonetheless, its substantial value is lowered in view of the fact that it does not comply with current standards and conditions of the work at sea.

#### **Consequences of stress**

Direct examinations of immediate health consequences of the presence of stressors at sea (e.g. when keeping watch in extremely bad weather conditions) are rare. This applies to both medical and psychological examinations. The liquidation of the posts of ship’s doctors caused that even the basic physiological parameters are not monitored

systematically. The value of medical and psychological examinations on health and psychological stress consequences, in fact performed in conditions unnatural and incomparable to the reality of the work at sea, is only a simplified version of this reality. In such cases, the persons examined reveal a tendency to ignore or underestimate the real direct consequences of stress.

The possibility of carrying out examinations at sea might be an invaluable source of reliable information on stress consequences. Although it seems difficult to be implemented in various aspects, the properly trained persons might perform such examinations or observe behaviors in critical situations. Hence, we are calling to introduce a physiological band – for example “Sense Wear BMS” [15] as a useful tool, thanks to which the seafarers might monitor basic physiological parameters in various situations, e.g. before leaving or after watch, or when experiencing poor general feeling. This is consistent with a general tendency adopted in health psychology: to have individual responsibility for own’s health and to transfer the aspects of care organized by institutions to personal engagement in the care of own health.

The employment of the triangulation model in investigation of stress at sea is at this stage (in Poland) rather narrowed. It mainly consists in the application of subjective methods aiming at assessment of both “countable” and psychosocial factors. There is no proper exchange of information on the assessment of the impact of physical, chemical and biological factors on employees’ health.

## RECAPITULATION

The implementation of triangulation in examining stress in persons working at sea requires time and corrections to be introduced in the methodology of investigations carried out in Poland. In the case of seafarers we deal mainly with subjective data on the perception of work and individual experiencing of work-related stress. The examinations are conducted on land, not during work at sea. Is it possible to add a wider scope of evidence of work-related stress according to triangulation principles? How the quality of investigations on work-related stress in seafarers can be improved?

We propose to:

- carry out reliable, standardized examinations of superiors who assess the intensity of psychosocial factors as potential stressors at sea,
- make use of examination results concerning psychosocial loads,
- work out a questionnaire dealing with subjective workload in specific maritime conditions, which would be adjusted to current realities of work at sea,



- introduce and use a “physiological band” [15] as a tool indispensable in monitoring basic physiological parameters, to be carried before and after the watch, or during bad general feeling.

As far as methodology is concerned, there are still problems with establishing standardized procedures to compare qualitative and quantitative data, as well as qualitative data obtained from different sources.

We are optimistic as regards this problem, provided that tools specific for work-related stress at sea will be developed. International cooperation in creating standardized examination tools should also be taken into account.

The programme seems to be strongly recommended and expected by WHO operational plan of activity for the following years 2010-2014 (Madrid 2008) [16].

## CONCLUSION

A new methodological approach to measure, control and manage the stress in maritime work-environment has to be worked out, delivered and implemented within international cooperation net of maritime health reference centers.

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