BIORHYTHMOLOGICAL PORTRAIT OF WORKERS OF THE DRILLING CREW IN EXTREME NORTHERN LATITUDES

Bashkireva Anastasia¹, Bashkireva Tatiana¹, Fateeva Nadezhda², Severin Alexander³

¹Ryazan State University named after S.A. Yesenin, Ryazan, Russia
²Tyumen State University, Tyumen, Tyumen region, Russia
³Peoples' Friendship University of Russia, Moscow, Russia

bashkireva32@gmail.com

Abstract. Each organism at an individual level builds its system of temporary relationships with the different amplitude of oscillations - an individual biorhythmological portrait. Using Holter monitoring in the AnnaFlash2000 software in the ISCIM6 statistical processing, the ultradian rhythms of the driller crew in extreme northern latitudes studied. It revealed that the individual rhythmic processes of acrophase and cardiac rhythm bathyphase, which testify to the leading role of hypoxia, hypercapnia in adaptive mechanisms, influence the joint professional activity of small labour groups. It established that working in different biological rhythms, the driller’s team has a low degree of compatibility. The synchronization of biological rhythms in the team is achieving by the general properties of temperament as phlegmatic. More successful in adaptation - phlegmatic sanguine.

1. Introduction

In the territories of the extreme northern latitudes, in the summer period, the amount of daylight time significantly increases [7]. Despite studies in the field of the influence of summer photoperiodism on human performance, the problem of the compatibility of workers engaged in labour activities remains insufficiently studied [1-3]. For example, workers of the drilling crew, due to the specifics of the organization of labour, carry out drilling operations at a considerable distance from their permanent place of residence, moving along the geological exploration route. In this regard, the study of ultradian, circadian and other long rhythms is relevant, which would allow us to develop a biorhythmological portrait of shift workers in northern Arctic regions taking into account individual psychological characteristics. [9; 12-14; 16; 22].

It noted that in professional activities, drilling exploration carried out entirely in the open air and workers are not protect from meteorological factors [8; 10]. The technological process of drilling consists of preparatory work for launching drilling, mechanical drilling, building up drilling tools, hoisting operations, casing fastening of wells, auxiliary work (preparation of flushing fluid, flushing the well, refitting of the hoist system, preparation and conduct of geophysical work) [19; 21].

Working conditions of drillers for leading hygiene factors are harmful, including physical and neuropsychic stresses. When servicing drilling equipment, workers affected by a set of adverse physical and chemical factors: noise, vibration, harmful exhaust gases from diesel engines, etc. Work carried out in any weather conditions

The teams working together for a long time experience excessive psycho-emotional stress [15].
Research J.P. Henry & P. Stephens (1977), R. Eliot (1979), N.A. Agadzhanyan (1997), B.M. Fedorova (1997), S.G. Krivoshchekov (1998) and others, it was shown that among the workers of the Far North mobilization of reserve capabilities of the organism was observed, psychosomatic pathology develops. According to the authors, borderline arterial hypertension, neurosis, cardioneurosis, and vegetative-vascular dystonia were caused by prolonged acute emotional upheavals. This is because under stress factors of various natures, the cardiorespiratory system with the participation of the properties of the nervous system is first included in the adaptation process [18; 20; 23]. The study of individual typological characteristics of the personality, affecting adaptive reactions, is important when developing a biorhythmological portrait of a team in conditions of joint professional activity.

Biological rhythms have developed evolutionarily and are resistant to random factors, at the same time, they participate in adaptation reactions to create optimal conditions for a living system, primarily geophysical factors. Each organism at an individual level builds its system of temporary relationships with the different amplitude of oscillations - an individual biorhythmological portrait. The study of rhythmic processes, especially cycles, is important for understanding the adaptive value that contributes to the survival of people, including extreme situations. [11].

2. Materials and method
Purpose of work: to compile a biorhythmological portrait of the drilling crew workers in the dynamics of the summer shift in the extreme northern latitudes. We have studied the biorhythmological features of the adaptation of the driller crew in the dynamics of the summer shift in the extreme northern latitudes in terms of heart rate variability (HRV). The measurements were carried out during the working day according to the indicators of the analysis of heart rate variability (HRV) using Holter monitoring in the AnnaFlash2000 software and the statistical processing of ISCM6 [5]. The cardiogram of the heart was recorded during the working day from 8.00 to 18.00 hours [4]. The following indicators were analyzed: stress index (SI), pulse (HR), spectral analysis indicators (HF - the activity of the parasympathetic regulation link; LF - the activity of the vasomotor centre, VLF - the activity of the sympathetic regulation link, ULF - the activity of higher vegetative centres), the activity of the parasympathetic link regulation (RMSSD), the total effect of autonomic regulation of blood circulation (SDNN), stress index (SI) and others [6].

Constructive joint professional activity was influenced by temperament. Temperament as a property of the psyche, stable during a person's life, has a high level of correlation with the psychological characteristics of the person.

According to I.P. Pavlov, it is precisely those behavioural features in which the properties of nerve cells it would manifest that make up the temperament [17]. It would be noted that, despite the knowledge of temperament, there is no single point of view on this phenomenon and valid methods for measuring it. In our study, A. Belov's "Temperament Formula" methodology was used.

3. Results and discussion
Analysis of heart rate variability in terms of RMSSD and SDNN showed that the autonomic nervous systems of each driller synchronized at the individual level. The acrophase RMSSD and SDNN in the first driller was noted at 13 o'clock in the morning and at the second at 8 o'clock, which indicates biorhythmological adaptive differences (Pic. 1).
The acrophase of the stress index (SI) in the first driver-driller fell at 18.00 hours, and in the second - at 13 hours and was noted to be higher than the norm for the first driver at 65.9, and for the second 6.3 times. The SI bathyphase in the first and second drivers was marker at lunchtime and coincides with the daily minimum of working capacity. In general, the stress index remained above the norm for both drillers throughout the working day.

Analysis of heart rate variability in daytime monitoring showed that during the shift the failure of the adaptation systems was observe in the first driller, and in the second - mobilization (Pic. 2-3).
Picture 2. HRV indicators of the first driller in the dynamics of the daily summer shift
The results of the study showed a violation of the synchronization of biological rhythms in the examined drillers and desynchronosis at various levels of heart rhythm regulation.

Biorhythmological incompatibility of drivers participating in joint labour activities creates a high probability of the frequency of conflicts that reduce the efficiency of production activities. This harms the psycho-emotional state of drivers operating in the context of a complex of stress factors in extreme northern latitudes.

The study of the properties of temperament showed that with incontinence, the hot temper of one and sensitivity, resentment of the other, the likelihood of both labour and domestic conflict situations
increases, which inevitably leads to a violation of labour discipline, emergency. This team of drilling rig workers in terms of biorhythmological and mental properties can be attributing to the production risk group ◊6◊.

It would be note that in extreme conditions of professional activity, the synchronization of biological rhythms in workers is achieving by common properties characteristic of a strong type of nervous system. However, the price of adaptation is different. More successfully, adaptation reactions to the Arctic latitudes are carrying out at the phlegmatic-sanguine.

4. Conclusion
Thus, it was reveal that in the formation of the workers of the drilling crew to work in extreme northern latitudes, one should take into account not only psychological characteristics but also individual rhythmic processes. It was reveal that biorhythmological indicators of acrophase, heart rate bathyphase of drilling rig workers is not synchronize. This indicates that the body of the examined has individual characteristics of synchronization of ultradian rhythms. A long stay of workers in one space synchronizes rhythmic processes, which positively affects the effectiveness of labour processes. However, the psychological characteristics of a person can provoke conflicts. It is known that the properties of temperament are included in extreme cases, realizing the needs of the body in a safe existence. Our studies have found that combining and staying in extreme situations synchronizes all biological rhythms, including mental ones. Research on the compatibility problem in small groups has not lost its relevance and remains insufficiently studied in the aspects of developing a biorhythmic portrait to prevent technological disasters and the professional health of workers in extreme northern latitudes.

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