

PRRAEPGDA 2020

Personal and Regulatory Resources in Achieving Educational and Professional Goals in the Digital Age

MENTAL REGULATORS OF SHIFT EMPLOYEES IN DIAMOND MINING IN THE FAR NORTH

Anna Sergeevna Yurjeva (a)*, Yana Aleksandrovna Korneeva (b)

*Corresponding author

(a) Northern (Arctic) Federal University named after M.V. Lomonosov, Emb. of the Northern Dvina, 17, Arkhangelsk, Russia, a.yurjeva@narfu.ru

(b) Northern (Arctic) Federal University named after M.V. Lomonosov, Emb. of the Northern Dvina, 17, Arkhangelsk, Russia, ya.korneeva@narfu.ru

Abstract

The article presents an analysis of mental regulators of fly-in-fly-out personnel in diamond mining in the Far North. The study involved 70 fly-in-fly-out workers operating in the diamond mining in Far North. In our study, we relied on the concept of Klimov, who distinguished three groups of mental regulators of labor: representation of labor object, representation of labor subject, subject-object and subject-subject relations. Research methods are psychophysiological and psychological testing aimed at the diagnosis of mental regulators of labor, as well as questionnaires and projective methods for a qualitative study of mental regulators of labor. We have developed a questionnaire, which included such parameters as the assessment of comfort/discomfort of climatic and geographical, industrial and social conditions; assessment of the degree of danger of various professional situations that may arise during a fly-in; self-assessment of oneself as a professional, one's professional skills, knowledge and adherence to safety precautions, personal qualities, job satisfaction, "price" of activity. We also developed a method of unfinished sentences. We conducted a content analysis of the results of the method of unfinished sentences, where we identified categories and subcategories related to the representation of labor object, representation of labor subject, subject-object and subject-subject relations. Statistical processing was carried out using multidimensional methods. As a result of the study, the peculiarities of the mental regulators of labor of fly-in-fly-out workers in diamond mining were identified, which must be taken into account when developing more targeted programs for supporting fly-in-fly-out work and selecting personnel in mining companies.

2357-1330 © 2020 Published by European Publisher.

Keywords: Fly-in-fly-out work, extreme conditions of professional activity, mental regulators of labor, diamond mining.



This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 Unported License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

1. Introduction

For the possibility of exploration and mining in hard-to-reach regions with extreme climatic conditions, the fly-in-fly-out method of labor organization is used. Diamond mining professions are high-risk professions due to the fact that work is carried out in adverse conditions with increased tension, with chemically unsafe substances, with strong noise and vibration. The complexity of professional activity, the unpredictability of emergencies that require quick decision-making, and other production and social factors place too high demands on the organism of fly-in-fly-out worker, which often exceed his reserves. The success of the professional work of fly-in-fly-out workers in the Far North largely depends on the mental regulation of labor, which ensures the adequate implementation of the subject of labor in professional activity.

2. Problem Statement

Studies by many authors have found that fly-in-fly-out workers in extractive industries may experience many problems: increased psycho-emotional stress (Khasnulin & Khasnulina, 2012), problems of psychological adaptation (Korneeva & Simonova, 2019), family relationships (Cooke et al., 2018), suicide risk (Vojnovic, 2016). The researchers also focused on studying the impact of fly-in-fly-out method on health: problems of mortality (Hermansson et al., 2019), nutrition (Assis et al., 2003); sleep (Niu et al., 2017; Sachdeva & Goldstein, 2020) the relations between the locus of control and morbidity (Smith et al., 2001).

The appearance of these properties and unfavorable functional states causes a decrease in labor productivity, efficiency, leads to errors in the workplace of fly-in-fly-out workers (Albrecht & Anglim, 2017; Korneeva & Simonova, 2018; Langdon et al, 2016). The human organism react to negative environmental factors variably, therefore one of the most promising ways to reduce the negative effects of the Far North is an approach that takes into account this diversity not only at the physiological, but also at the psychological level. In this regard, researchers are now engaged in studying the mental regulation of fly-in-fly-out workers.

A great contribution to the development of mental regulation of labor was made by Klimov (2003). He argued that the main task of labor psychology is to study the factors and patterns of the mental regulation of the functioning and formation of a person as a subject of labor, in creating the conditions for the foundation of the necessary system of mental regulators of labor. Knowing the characteristics of mental regulators among fly-in-fly-out workers will reveal their attitude to professional activities, understanding those conditions that are specific to fly-in-fly-out work organization will help to reveal the dynamics of professional development and the level of professionalism. This makes it possible not only to develop impact programs to achieve the conformity of a person with a profession, but also to create support programs for a specialist developing in his professional activity.

3. Research Questions

Extreme factors in diamond mining in the Far North negatively affect and hamper the processes of mental regulation. In this regard, it is important to study the mental regulators of the labor of fly-in-fly-

out workers in diamond mining in the Far North, so that they can be taken into account when developing more targeted programs for supporting fly-in-fly-out work, as well as in the selection of personnel in mining companies.

4. Purpose of the Study

The purpose is to study the mental regulators of labor of fly-in-fly-out workers in diamond mining in the Far North.

5. Research Methods

We relied on the subject-activity concept of professional work by Klimov, in which the author singled out mental regulators of labor: “the representation of the object”, “the representation of the subject” and “the representation of subject-object and subject-subject relations”. In our study, we clarified the typology of the author, combining all the regulators in two blocks: the representation of the object and subject-object relations and the representation of the subject and subject-subject relations (Table 1).

Table 1. Methods and techniques for the diagnosis of mental regulators of labor

Mental regulators	Methods and techniques
The representation of the object and subject-object relations	1. Questionnaire including blocks: 1) A subjective assessment of the adverse climatic, geographical, industrial and social factors that affect workers during a fly-in-fly-out visit; 2) Features of the organization of free time during the fly-in period; 3) Subjective hazard assessment of various situations that may arise during the fly-in period; 4) Subjective assessment of danger in the workplace and factors contributing to its formation. 2. The method of unfinished sentences, including the concepts: “my job is”, “fly-in-fly-out method is”.
The representation of the subject and subject-subject relations	1. Questionnaire including blocks: 1) Subjective assessment of their professional effectiveness and professionalism; 2) General information about education and work experience; 3) Marital status. 2. Method for the diagnosis of socio-psychological climate (O. Mikhalyuk, A. Shalyto). 3. The method of unfinished sentences, including the concepts: “I am”, “I am in a collective”, “I’m as a professional”, “my collective is”, “my colleagues are”.

To study the mental labor regulators of shift workers, we used the following methods: questioning, psychological testing, projective methods, content analysis. Statistical data analysis was performed using the IBM SPSS 23.00 software package using descriptive statistics and cluster analysis.

The study was conducted in July-August 2017 at a diamond mining facility in the Arkhangelsk region, where 70 employees took part (average age 38.56 ± 1.151 , average fly-in-fly-out work experience 8.16 ± 0.701 , the fly-in duration is 14 days).

6. Findings

6.1. Research Results

At the first stage of the study, we conducted a content analysis of the results of verbal completion of unfinished sentences. The categories related to the representation of the object of labor and subject-object relations were the concepts of “my job”, “fly-in-fly-out method” (Table 2).

Table 2. Content Analysis Results

Mental regulators	Categories	Subcategories
Representation of labor object and subject-object relations	My job is	1. Salary, stability 2. Development 3. My choice 4. Responsible, difficult 5. Necessity 6. Route, forest
	Fly-in-fly-out work is	1. Free time in the fly-out period 2. Remoteness from home, family 3. Salary, stability 4. Convenient method of work 5. Hard work, necessity 6. Just a work

The categories related to the representation of the subject of labor and subject-subject relations were the concepts of “I’m”, “I’m in a collective”, “I’m as a professional”, “my collective is”, “my colleagues are” (Table 3).

Table 3. Content Analysis Results

Mental regulators	Categories	Subcategories
Representation of labor subject and subject-subject relations	I am	1. Human, person 2. Social roles 3. Professional 4. Negative qualities 5. Positive qualities
	I’m in the collective	1. Equal 2. Like everyone else 3. Leader 4. Friend 5. Isolated
	I’m, as a professional	1. Developing 2. Do the job 3. Mediocre 4. Positive qualities
	My collective is	1. Diverse 2. Good 3. Friends 4. Not good 5. Professionals 6. Colleagues
	My colleagues are	1. Professionals 2. Friends 3. Collective 4. Not good 5. Specialty

In order to study the mental regulators of labor of fly-in-fly-out workers, we carried out two hierarchical cluster analyzes on variables related to the representation of the object of labor and subject-object relations, and on variables related to the representation of the subject of labor and subject-subject relations.

Table 4. Results of cluster analysis for the representation of the object of labor and subject-object relations

Cluster 1	Cluster 2	Cluster 3	Cluster 4
– «responsible, difficult work»	– «no support from colleagues»	– «UV radiation»	– «enhanced control»
– «negative attitude to job»	– «frequency of work»	– «free time in the fly-out period»	– «chronic diseases»
– «change of time zones»	– «radiation»	– «lack of infrastructure»	– «working without individual protection means»
– «lack of psychological support»	– «static electricity»	– «chemical factors»	– «working without instructions»
– «placement conditions»	– «necessity»	– «wind»	– «risk prevention»
– «equipment temperature»	– «impossibility of privacy»	– «noise»	– «situation when you are sick»
– «remoteness from home, family»	– «air humidity»	– «vibrations»	– «problems at home»
– «route, forest»	– «atmospheric pressure differences»	– «physical exercise»	– «convenient method of work»
– «water shutdown situation»	– «polar day»	– «monotony»	– «mobile deprivation»
– «magnetic storms»	– «smoking ban»	– «nerve overload»	– «first aid»
– «oxygen content in the air»	– «information exhaustion»		– «injury»
– «salary, stability»	– «forced circle of contacts»		– «fire»
– «negative attitude to fly-in-fly-out work»	– «polar night»		– «a mistake that can cause harm»
– «necessity»	– «development»		– «hardware malfunction»
– «humidity»	– «difficulties with transport and communication»		– «job is dangerous for health»
– «workplace temperature»	– «illumination»		– «lack of colleagues in the workplace»
– «neutral attitude to job»	– «lack of food»		– «social isolation of the collective»
– «inability to leave the workplace»	– «inability to choose a break time»		– «low temperatures»
– «power outage situation»	– «positive attitude to fly-in-fly-out work»		– «positive attitude to the job»
– «weather change»			
– «discomfort»			

As a result of the cluster analysis of the characteristics of the representation of the object of labor and subject-object relations, we obtained 4 clusters (Table 4). The first cluster combines a negative attitude to job and the fly-in-fly-out method of work in general, a neutral attitude to job and the fly-in-fly-out method, as well as some climatic-geographical, production, and social factors that are perceived by

workers as unfavorable. Also the cluster included are such concepts as “difficult, responsible work”, “remoteness from home, family”, “necessity”, “salary, stability”. This may indicate that for some shift workers, work is a difficult necessity and only a means of subsistence and providing for a family that does not bring satisfaction. Such employees are difficult to adapt to adverse environmental factors that exist in fly-in-fly-out work.

The second cluster combines a positive attitude to the fly-in-fly-out method and the concepts of “good job”, “development”, it also includes some climatic and production factors that may be assessed by employees as uncomfortable, but, nevertheless, they are already adapted to these features of diamond mining. Therefore, this cluster combines a differentiated positive representation of fly-in-fly-out method.

The third cluster includes the climatic and production factors that most affect workers and are typical for diamond mining in the Far North, which is also noted in the works of Korneeva and Simonova (2019). In other words, we can say that in the representation of object of the fly-in-fly-out work for a number of employees a separate sector is occupied by the most complex factors from the point of view of production, which require large resources to overcome them.

The fourth cluster combines a positive attitude to job, the concepts of “I like the fly-in-fly-out method”, “the fly-in-fly-out method is convenient”, and also includes the majority of possible dangerous situations and factors that can cause them during the fly-in-fly-out period. This may indicate that workers who are positive about this method of work organization adequately assess the negative environmental impacts and possible risks of dangerous cases.

As a result of a hierarchical cluster analysis of the characteristics of the representation of the subject of labor and subject-subject relations, we received 2 large clusters. Three subclusters stood out in the first cluster (Table 5). The first subcluster included a negative attitude to colleagues, to the collective as a whole, to oneself inside the collective and outside it, as well as a negative attitude to oneself as a professional. This may indicate that in a team where someone can betray a colleague for their own purposes, employees do not see opportunities for professional development and evaluate their professionalism low. In a collective with an unfavorable socio-psychological climate, workers may experience negative emotions that can impair the quality of their professional duties and reduce their effectiveness. We can also note that a negative self-representation is perceived in connection with a negative assessment of others. This may be due to the fact that the fly-in-fly-out method of work for these employees may be unacceptable, which causes negative assessments of themselves and others.

The second subcluster includes a neutral attitude to colleagues and the collective as a whole, concepts such as “my colleagues are professionals”, “my collective is specialists”, “my collective is my friends”, also included “I am a professional”, “I’m a leader in the collective”, “positive qualities about myself as a professional”, “I, as a professional, do the job”, “I, as a professional, develop”. This may indicate that employees who see good specialists in their colleagues, which contributes to the success of their joint activities, highly value their professionalism. In other words, this cluster combines the representation of professionals in their field, who correlate their successes with development in their work.

Table 5. Results of cluster analysis for the representation of the object of labor and subject-object relations

Cluster 1			Cluster 2
Subcluster 1	Subcluster 2	Subcluster 3	
<ul style="list-style-type: none"> – «negative attitude to colleagues» – «don't like my colleagues» – «negative attitude to myself» – «negative attitude to collective» – «I don't like my collective» – «negative attitude to myself in the collective» – «negative qualities about myself» – «negative attitude to myself as a professional» – «I am human» 	<ul style="list-style-type: none"> – «colleagues» – «diverse collective» – «I am a leader in the collective» – «my collective is my friends» – «neutral attitude to colleagues» – «neutral attitude to collective» – «positive qualities about myself as a professional» – «I'm professional» – «I'm a friend in the collective» – «I, as a professional, do the job» – «my colleagues are professionals» – «I'm in the collective like everyone else» – «I, as a professional, develop» – «my collective is specialists» 	<ul style="list-style-type: none"> – «I am equal in the collective» – «neutral attitude to myself as a professional» – «I, as a professional, mediocre» – «neutral attitude to the collective» – «neutral attitude to myself in the collective» – «I am isolated in the collective» – «social roles» – «I became a professional» – «neutral attitude to myself» 	<ul style="list-style-type: none"> – «positive attitude to the collective» – «positive attitude to the colleagues» – «my colleagues are friends» – «positive attitude to myself in the collective» – «positive attitude to myself» – «positive qualities about myself» – «I like my collective» – «efficiency» – «salary» – «assessment of professional skills» – «job satisfaction» – «safety precautions» – «assessment of personal qualities for the position» – «positive attitude to myself as a professional» – «socio-psychological climate in the collective»

The third subcluster combined a neutral attitude to the collective, to himself in the collective and outside him, a neutral attitude to himself as a professional, as well as concepts such as “I’m in the collective - equal”, “I’m in the collective - isolated” and various social roles. This may be characteristic of professionals who work primarily in a collective and share all the positive and negative in working with each other.

The second large cluster combines a positive attitude to colleagues and the collective as a whole, a positive attitude to oneself in the collective and outside it, a positive attitude to oneself as a professional, components of the socio-psychological climate, as well as all indicators for assessing one's professional effectiveness and professionalism. This suggests that in a favorable socio-psychological climate, employees give high marks to their professionalism, highly evaluate the effectiveness and efficiency of their activities, and also note the conformity of their position. In a close-knit team, the working environment has a positive effect on each employee and on the fulfillment of a common professional

goal. This representation corresponds to those employees for whom the fly-in-fly-out method has become a lifestyle, is a convenient method of work organization, therefore employees see their further development in it.

6.2. Discussion of the results

Cluster analysis made it possible to identify the characteristics of the mental regulators of labor of workers in diamond mining. The representation of the object of labor and subject-object relations among the fly-in-fly-out workers in diamond mining has the following variety: the fly-in-fly-out method as a forced heavy need; as a convenient way of working, including a large number of unfavorable factors in which they should to adapt; and acceptable work, including certain risks. These differences are due to the adaptation of staff to work.

7. Conclusion

For the successful implementation of their professional activities and their adequate implementation, fly-in-fly-out workers must not only possess the knowledge, skills and abilities necessary for their professional activities and have an idea of the labor process in a diamond mining enterprise and of climatic and geographical conditions in the Far North. But they also need to be aware of the value of their work, the responsibility to perform work in strictly defined standards, the possible risks in the workplace, they need to adequately assess the success of their activities and strive to increase the level of professionalism. The development of a professional occurs when a person as a subject of labor and their objective requirements comply. The obtained results will allow us to put forward a hypothesis about the relationship between the identified representation of the object of labor and subject-object relations and the representation of the subject of labor and subject-subject relations. This will be a continuation of this study.

Acknowledgments

The study was financially supported by the Russian Foundation for Basic Research, project 18-013-00623 “Comparative analysis of psychological risks in the professional activities of shift workers in the south and the Far North of the Russian Federation”.

References

- Albrecht, S., & Anglim, J. (2017). Employee engagement and emotional exhaustion of fly-in-fly-out workers: A diary study. *Australian Journal of Psychology*, 70(1), 66-75. <https://doi.org/10.1111/ajpy.12155>
- Assis, M. A. A., Kupek, E., Nahas, M. V., & Bellisle, F. (2003). Food intake and circadian rhythms in shift workers with a high workload. *Appetite*, 40(2), 175-183. [https://doi.org/10.1016/s0195-6663\(02\)00133-2](https://doi.org/10.1016/s0195-6663(02)00133-2)
- Cooke, D., Kendall, G., Li, J., & Dockery, M. (2018). Association between pregnant women’s experience of stress and partners’ fly-in-fly-out work. *Women and Birth*, 32(4), e450-e458. <https://doi.org/10.1016/j.wombi.2018.09.005>

- Hermansson, J., Bøggild, H., Hallqvist, J., Karlsson, B., Knutsson, A., Nilsson, T., Reuterwall, C., & Gådin, K. G. (2019). Interaction between shift work and established coronary risk factors. *The international journal of occupational and environmental medicine*, 10(2), 57-65. <https://doi.org/10.15171/ijoem.2019.1466>
- Khasnulin, V. I., & Khasnulina, A. V. (2012). Psikhoemotsional'nyy stress i meteoreaktsiya kak sistemnyye proyavleniya dizadaptatsii cheloveka v usloviyakh izmeneniya klimata na severe Rossii [Psycho-emotional stress and meteorereacton as systemic manifestations of human disadaptation under changing climatic conditions in the North of Russia]. *Human Ecology*, 8, 3-7. <https://journals.eco-vector.com/1728-0869/article/view/17448>
- Klimov, E. A. (2003). *Psikhologiya professionala: izbrannyye psikhologicheskie trudy* [Professional psychology: selected psychological works]. Moscow psychological and social Institute
- Korneeva, Y. A., & Simonova, N. N. (2018). Analysis of psychological risks in the professional activities of oil and gas workers in the far north of the Russian Federation. *Behavioral Sciences*, 8(9), 84. <https://doi.org/10.3390/bs8090084>
- Korneeva, Y. A., & Simonova, N. N. (2019, April 23-24). Psychological features of adaptation of oil and gas workers in the arctic and in the south of Russia. *Society of Petroleum Engineers - Symposium: Asia Pacific Health, Safety, Security, Environment and Social Responsibility*, SPE-195426-MS. <https://doi.org/10.2118/195426-MS>
- Langdon, R., Biggs, H., & Rowland, B. (2016). Australian fly-in, fly-out operations: Impacts on communities, safety, workers and their families. *Work (Reading, Mass.)*, 55(2), <https://doi.org/10.3233/WOR-162412>.
- Niu, S-F., Miao, N-F., Liao, Y-M., Chi, M-J., Chung, M-H., Chou, K-R. (2017). Sleep quality associated with different work schedules: A longitudinal study of nursing staff. *Biological Research for Nursing*, 19(4), 375-381. <https://doi.org/10.1177/1099800417695483>
- Sachdeva, A., & Goldstein, C. (2020). Shift Work Sleep Disorder. In R. Auger (Eds), *Circadian Rhythm Sleep-Wake Disorders* (pp. 149-182). Springer, Cham. https://doi.org/10.1007/978-3-030-43803-6_11
- Smith, L., Norman, P., & Folkard, S. (2001). Predicting shiftwork-related outcomes: shiftwork locus of control and circadian type. *Journal of human ergology*, 30(1-2), 59-64. <https://pubmed.ncbi.nlm.nih.gov/14564859/>
- Vojnovic, P. (2016). Managing suicide risk for fly-in fly-out resource industry employees. *Journal of Health, Safety and Environment*, 32(2), 101-112. <https://researchers.mq.edu.au/en/publications/managing-suicide-risk-for-fly-in-fly-out-resource-industry-employ>