Integrated Assessment of the Psychological Characteristics of the Individual Who Can Adapt Successfully to the Arctic Environment

V Sharok
Saint-Petersburg Mining University, St. Petersburg, Russia

sharok_vv@pers.spmi.ru

Abstract. The purpose of the research was to identify differences in the psychological characteristics of actual and potential employees in the Arctic and compare them with expert assessments based on an empirical study enrolled a total of 717 people, including 15 experts, 84 people working in the Arctic and 618 students. For self-assessment and expert evaluation, respondents were offered 12 personality traits that impact successful adaptation to the Arctic working conditions. The following conclusions can be made based on study results. Experts believe that a well-adapting person features self-possession, friendliness, sociability and calmness to a great extent, while strength, ability to withstand sustained loads, cold-headedness, prevailing cheerfulness and high self-esteem are developed to a lesser degree with such traits as decisiveness, perseverance and steadiness being even less prominent. So, the traits that promote successful building and maintenance of interpersonal relationships are of primary importance, while strength and emotional stability are slightly less so. The students who are more willing to work in the Arctic have more pronounced psychological characteristics that promote adaptation to the Arctic. Rotation employees describe themselves as more irritable and anxious, more likely as sprinters.

1. Introduction
When training skilled talents to work in the Arctic, a focus must be on the method of future work: either permanent work or fly-in fly-out work practice.

The fly-in fly-out method helps to improve production performance by reducing costs of employee delivery to actual work site and a work period so that this method is the most reasonable one for remote areas with harsh climate and the Arctic is exactly this type of location.

However, the fly-in fly-out work practice, especially in a severe climate environment, is associated with a number of social and psychological challenges, in particular, difficulties with adapting to the living and working conditions. It should be noted that people arriving in the Arctic for a longer period and those working there on a permanent basis face adaptation challenges. However, the adaptation and maladaptation factors for the people engaged using the fly-in fly-out method or on a permanent basis may differ due to the nature of their work, their personal and physiological characteristics that are essential for successful adaptation to different work method, and then due to the employee's professional and personal goals.

There are many publications on adaptation factors. Researchers share the opinion that adaptation to the Arctic is extremely difficult [1], [2], [3], [4]. And it becomes especially challenging with the fly-in
fly-out work practices when people are exposed to unfavourable factors in certain periods of time rather than on a permanent basis. Main unfavourable factors apart from severe climatic conditions include such production factors as intensive exertion and fatigue and such social and psychological factors as for example social isolation and lack of information. All of the above requires increased functioning of all body systems and involves chronic stress for resource and adaptation systems [5; 6; 7; 8]. Nevertheless, the cases when employees overestimate their capabilities and express their willingness to endure any hardship are no exception, and they eventually result in serious physiological or social and psychological issues for the sake of financial welfare when another solution to a financial problem does not seem evident. Therefore, these circumstances require special attention to the psychological component during occupational selection.

Let us consider the social and psychological factors that promote and prevent adaptation to the working and living conditions in the Arctic. Researchers name interpersonal relationships as one of the key factors that have a significant impact on coping behaviour and psychological well-being which is greater than that of environmental factors [9], [10]. It means that the people who have communicative competency will find it easier to adapt to the Arctic [11].

One of important psychological aspects is ability to cope with stress. In order to cope with stress factors inherent to the adaptation process, an individual resorts to coping strategies. The studies of the people engaged using the fly-in fly-out work practices show that non-adaptive coping strategies, such as avoidance and emotion-oriented coping, are often used. The predominance of passive strategies is attributable to increased uncertainty with the fly-in fly-out method and inability to forecast own performance [12]. Whether these coping strategies are optimal for such conditions is still an open question.

The study of psychological adaptation factors of the people working on the fly-in fly-out basis revealed the interrelation between stress and worries about their family that became more intensive towards the end of the rotation shift, as well as the interrelation between a stress level and type of relationship [13].

Many researchers commented on the role of the family in the Arctic. Thus, families with husbands working on the fly-in fly-out basis were found to have a lower communication level and fewer joint decisions, as well as a lower level of intra-family interpersonal relationships. Moreover, such families face difficulties with exercising a psychotherapeutic function and mental closeness. Women whose husbands work on a permanent basis give a more positive assessment of their spouses, while women whose husbands work fly-in fly-out have a more positive view of themselves. This trend certifies to underdeveloped intra-family interpersonal relationships in the families where husbands work fly-in fly-out [14].

As regards personal psychological characteristics, they were found to change in case of long-term stay and work in the Arctic [15]. That can be explained by reduced psychological well-being during adaptation to the Arctic environment since this adaptation involves negative psychological effects, including increasing depression, irritability, worsening cognitive functions, social withdrawal, worsening interpersonal relationships, hostility, fast rage, sleep disorders, loss of appetite, anxiety and apathy [16]. It is therefore important to know how to facilitate adaptation and prevent such negative aspects [17].

Some researchers also comment on the important role of values and moral potential of an individual when adapting to the Arctic [18]. Long-term stay in extreme conditions accompanied by monotony, stress and emotional overexertion leads to reduced significance of values which has an unfavourable effect on the working process: weaker attention, weaker vigilance and inert decision-making process [19].

Reportable goals and reason for being improves resistance to unfavourable factors, while not seeing reason for being and spiritual crisis make a person vulnerable [18].

Therefore, a maladaptive individual finds various spheres of life and values less important [9], [20], [21], [22], [23] and experiences a spiritual crisis. However, the moral potential of an individual is seen
to compensate for the depletion of psychological and physiological resources and facilitate adaptation to fly-in fly-out work practices [24].

Furthermore, some people experience more difficulties in the adaptation period, while others do not. It is therefore crucial to perform adequate occupational selection taking into account this aspect, too. One of the reasons behind differences in the nature of adaptation is a constitution type: a stayer or a sprinter. Sprinters adapt to extreme conditions faster than stayers but stayers show higher adaptivity during long-term stay in the extreme environment. So, we need to determine which of the types is more professionally suitable to work in the Arctic. This requires a focus on the psychological traits of these types. Sprinters have enhanced activation of the central nervous system, mobility, extroversion, and neuroticism [25]. This increases their resistance to intensive short-term loads but results in faster fatigability when carrying out monotonous work. They are impulsive and unbalanced. When exposed to chronic psychoemotional stresses, sprinters may develop maladaptation, neurotic and autonomic disturbances [26]. Stayers are less prone to experience maladaptation and have a higher level of mental capacity and a higher adaptive potential and resilience [27], [28]. It should be stated that a share of stayers among all people living in the unfavourable Arctic environment significantly exceeds the share of sprinters [27].

It is important to note that adaptation factors in the Arctic are closely related to motivation to work there. In view of such potential harmful personal changes in the Extreme North, people must clearly understand their motivation to work in the Arctic which could include not only financial incentives but the understanding of their role in society and the role of humans towards the nature [29]. However, motivation does not guarantee successful adaptation to a complex climatic and working environment. There is a concept of "northern magnetism". It is demonstrated as escapism, love of the northern nature, desire to test your limits and find personal and professional self-fulfilment [30]. However, it is necessary to explain other factors to be present apart from motivation for a person to not only successfully adapt to the new complex conditions but to also show high performance at work.

There is fairly large experience in studying the factors that have negative and positive impacts on the ability to adapt to the Arctic conditions [10], [16], [17], [20], [26], [27], [31], [32], [33], [34], [35], [36], [37]. The need to study and understand as many factors promoting and preventing adaptation in the Arctic region as possible is still other proof of the relevance of this study focused on the review of psychological aspects. It is also interesting to compare not only the psychological traits of rotation employees and permanent staff in the Arctic, but also the psychological characteristics of potential employees (current students) and to compare obtained data versus expert opinion.

Therefore, the novelty of this study is comparison of the psychological characteristics of the persons experienced in fly-in fly-out work practices, permanent employees and students who intend to work in the Arctic with expert opinions on the psychological traits that promote successful adaptation.

1.1. Purpose of the Study
The purpose of the research was to identify differences in the psychological characteristics of actual and potential employees in the Arctic and compare them with expert assessments based on an empirical study.

1.2. Research Questions
1. The psychological traits of stayers are noted by experts to promote adaptation in the Arctic.
2. Students who consider working in the Arctic have psychological traits that promote adaptation.
3. The psychological traits of the people who work in the Arctic on a permanent basis promote adaptation to a large extent.

2. Materials and methods

2.1. Materials
A questionnaire survey was used to achieve the goal and test the hypothesis. For self-assessment and expert evaluation, respondents were offered 12 personality traits that impact successful adaptation to the Arctic working conditions (using the personality differential method with opposite personality traits placed on different sides of the scale when a respondent is offered to choose the side which characterises him/her best by assessing the degree of manifestation of each trait on the scale from 0 (no specific side chosen) to 3 (one side fully describes his/her personality). When processing data, one pole of the scale was assigned 1, while the other was assigned 7.

2.2. Data analysis
The statistics processing methods applied to data included: analysis of primary statistics and analysis of variance. Statistics processing was done using Statistica 10.0 software.

2.3. Participants
The study enrolled a total of 717 people, including 15 experts, 84 people working in the Arctic and 618 students. Let us consider the sample in more detail.

A total of 15 people were selected randomly from an expert group, representatives of different industries present in the Arctic region, who were pre-screened on the basis of their work record (practical and scientific) in a specific area, management position, scientific degrees and ranks, competency and work experience in related areas. An expert group included scientists, engineers, HR specialists, occupational health and safety specialists, economists, physicians and infrastructure facility employees. The average age of respondents was 44.53 years old, nine respondents were male and six respondents were female.

A total of 72 respondents out of 84 people with a work record in the Arctic are employed there on a permanent basis (38 women and 34 men of an average age of 45.22 years old), and 12 were rotation employees (12 men of an average age of 30 years old). There is a good reason for gender and age differences in studied groups: fly-in fly-out work practice is preferred by young men mostly. Moreover, a small number of respondents who work fly-in fly-out is explained by difficulties to collect data in this empirical group: the study was conducted online and not all employees have Internet access and since they do not work on a permanent basis, access to potential subjects is not available all the time. Nevertheless, obtained results fit in with the existing perceptions of adaptation factors for rotation employees seamlessly and can be used to make adequate conclusions on the existing social and psychological differences.

The study also enrolled 618 students who were considering work in the Arctic region with different degrees of probability: a total of 188 people were considering the possibility positively (“Yes” group, 201 respondents were rather in favour than against this possibility (“Yes/No” group), 169 people rather decided against it (“No/Yeas” group), 314 respondents were not considering this possibility (“No” group), and 28 respondents could not answer (“?” group). The average age of respondents was 19.68 years old, 335 respondents were men and 283 respondents were women, including 194 first year students, 132 second year students, 118 third year students, 111 fourth year students, 38 fifth year students, and 25 sixth year students.

3. Findings
The results of the analysis of mean values based on the expert assessment of the psychological characteristics of a typical successfully adapted person in the Arctic region are summarised in table 1.

| Psychological characteristics | Means |
|------------------------------|-------|
| (1) Hostile / (7) Friendly   | 5.80  |
| (1) Unsociable/ (7) Sociable | 5.80  |
| (1) Cold-headed / (7) Irritable | 2.47  |
| (1) Impulsive / (7) Self-possessed | 5.93  |
Psychological characteristics | Means
--- | ---
(1) Sad / (7) Cheerful | 5.47
(1) Calm / (7) Anxious | 2.13
(1) Shifty / (7) Steady | 5.13
(1) Fidgety / (7) Diligent | 5.20
(1) Indecisive / (7) Decisive | 5.33
(1) High self-esteem / (7) Low-self-esteem | 2.53
(1) Weak / (7) Strong | 5.60
(1) Sprinter / (7) Stayer | 5.53

Table 1 shows that the experts believe that a well-adapting person features self-possession, friendliness, sociability and calmness to a great extent, while strength, ability to withstand sustained loads, cold-headedness, prevailing cheerfulness and high self-esteem are developed to a lesser degree with such traits as decisiveness, perseverance and steadiness being even less prominent. All these traits are typical for stayers. Therefore, the survey of experts helped to confirm the first research hypothesis.

The single-factor analysis of variance resulted in the identification of differences in the students' psychological characteristics depending on their willingness to work in the Arctic.

So, the study revealed that such qualities as cold-headedness, self-possession, calmness, steadiness, diligence, decisiveness and strength, perception of self as an enduring person capable of withstanding arduous physical loads, the traits typical for a stayer, are more pronounced in people who are more eager to work in the Arctic (table 2).

These psychological characteristics are considered to be the most important ones for successful adaptation in the Arctic which confirms the second research hypothesis. These qualities can be considered a motivation factor since, if present, they increase the person's inclination to work in challenging conditions, in particular in the Arctic.

**Table 2: Psychological characteristics of people eager to work in the Arctic with a varying degree**

| Psychological characteristics | Yes | Yes/No | No/Yes | No | ? | F |
|---|---|---|---|---|---|---|
| (1) Cold-headed / (7) Irritable | 3,12 | 3,53 | 3,64 | 3,88 | 3,93 | 4,55** |
| (1) Impulsive / (7) Self-possessed | 5,48 | 5 | 4,95 | 4,38 | 4,43 | 6,19*** |
| (1) Calm / (7) Anxious | 2,55 | 2,74 | 2,96 | 3,06 | 3,25 | 2,81* |
| (1) Shifty / (7) Steady | 4,86 | 4,66 | 4,44 | 3,94 | 3,89 | 4,12*** |
| (1) Fidgety / (7) Diligent | 5,09 | 4,83 | 4,6 | 4,38 | 4,68 | 2,59* |
| (1) Indecisive / (7) Decisive | 5,43 | 5,2 | 4,83 | 4,31 | 4,61 | 6,45*** |
| (1) Weak / (7) Strong | 5,56 | 5,32 | 4,95 | 4,84 | 5 | 5,52*** |
| (1) Sprinter / (7) Stayer | 4,45 | 4,08 | 3,76 | 3,38 | 4,32 | 3,99** |

*p ≤ .05. **p ≤ .01. ***p ≤ .001

The comparison of the psychological characteristics of the persons with a work record in the Arctic on the fly-in fly-out basis and of the students who consider work in the Arctic showed that the students' personal traits are somewhat similar to the psychological characteristics of the people with experience of permanent employment in the Arctic region. Namely, these groups have calmness and tranquillity in common. The scores of these students on the "sprinter/stayer" scale are again rather similar to those of the people permanently employed in the Arctic, although their self-assessment by this parameter is almost in mid-scale position. However, while being within the top range, the sociability indicator in student groups is lower (table 3). Sine this trait is important for successful adaptation and building of interpersonal relationships, it must be identified in potential employees. Social isolation makes communication difficult which has an unfavourable effect on adaptation to the Arctic resulting in the desire to leave an uncomfortable work place.
Speaking about the psychological differences between rotation and permanent employees, it should be noted that people in the first group characterise themselves as more irritable and anxious, more likely, as sprinters.

**Table 3:** Benchmarking of the self-assessment of the psychological characteristics of actual and potential employees in the Arctic

| Psychological characteristics | Students | Fly-in fly-out method | Permanent employment | F      |
|-------------------------------|----------|-----------------------|----------------------|--------|
| (1) Unsociable/ (7) Sociable  | 5,30     | 5,75                  | 5,88                 | 5,04** |
| (1) Cold-headed / (7) Irritable| 3,33     | 4,50                  | 3,39                 | 3,51*  |
| (1) Calm / (7) Anxious        | 2,65     | 3,92                  | 2,68                 | 4,44*  |
| (1) Sprinter / (7) Stayer     | 4,26     | 3,50                  | 4,76                 | 3,04*  |

*p ≤ 0,05, **p ≤ 0,01.

4. **Conclusion**

Therefore, the following conclusions can be made based on study results.

Experts believe that a well-adapting person features self-possession, friendliness, sociability and calmness to a great extent, while strength, ability to withstand sustained loads, cold-headedness, prevailing cheerfulness and high self-esteem are developed to a lesser degree with such traits as decisiveness, perseverance and steadiness being even less prominent. So, the traits that promote successful building and maintenance of interpersonal relationships are of primary importance, while strength and emotional stability are slightly less so. It is essential to identify these properties when employing workforce to the Arctic and, if they are absent, either develop them (if at all possible) or assess the risks related to potential adaptation challenges.

The students who are more willing to work in the Arctic have more pronounced psychological characteristics that promote adaptation to the Arctic.

Rotation employees describe themselves as more irritable and anxious, more likely as sprinters. Since these traits can negatively impact interpersonal relationships that have a significant influence on adaptation to the Arctic environment, it is crucial to consider this and plan psychological activities to improve the adaptation potential of employees in the North by developing their communication skills.

5. **Acknowledgments**

This work was supported by grant of the Russian Science Foundation (project № 17-78-20145 «Social and economic mechanism for mobilising human resources in Arctic region of Russian Federation»).

**References**

[1] Lobova V A 2006 Emotional and mental disorders in the indigenous and alien population of the Far North *Health of the population of the Yamal-Nenets Autonomous Okrug: state and prospects* 203-272

[2] Nasanovich N N 2002 *Psychosocial study of shift specialists working in gas production enterprises of the Far North* (in connection with the tasks of creating a standard of recreational facilities) p 24

[3] Sobakin A K 2004 *Efficiency of shift personnel in gas fields in extreme environmental conditions of the North* p 30

[4] Hansulin V I et al 2012 Adaptation-restoration potential of a person under shift conditions and psychoemotional stress in the north *VII Siberian Congress of Physiologists* 565-566

[5] Gudkov A B et al 2012 *New settlers in the European North. Physiological and hygienic aspects: Monograph* (Arkhangelsk: Northern State Medical University) p 285

[6] Korneeva Ya A 2012 Features of motivation and regulatory processes in the structure of the personal resource of adaptation strategies of shift workers in the Far North *Human adaptation in the North biomedical aspects* 138-143
[7] Sarychev A S 2012 *Characteristics of adaptive reactions of shift workers in the Arctic* p 27
[8] Sergeeva I V 2012 Historical features, problems and trends in the organization of labor on a rotational basis in the Far North *Bulletin of the Research Center for Corporate Law, Management and Venture Investment* 2
[9] Sazonova N N and Sorokin S I 2019 Challenges and prospects of management of quality of educational services in Russian technical university *Advances in Social Science, Education and Humanities Research* 333 744-747 doi: 10.2991/hssnpp-19.2019.142
[10] Roberts R 2010 *Psychology at the end of the world* The Psychologist 24 22-25
[11] Sharok V 2018 Role of socio-psychological factors of satisfaction with education in the quality assessment of university *International Journal for Quality Research* 12 281-296 doi:10.18421/IJQR12.02-01
[12] Lobova V A et al 2014 Psycho-functional state and working capacity of shift workers *Journal of Ugric Studies* 4(19) 74-87
[13] Buganov A A and Lobova V A 2008 *Man in the North: psychological aspects of health* (Tyumen: City Press) p 256
[14] Fedotova A N 2016 The study of family relations of specialists working on a rotational basis in the works of domestic scientists Psychology, Sociology and Pedagogy 4
[15] Cgoeva A K 2006 *Features of the socio-psychological adaptation of workers in hazardous production facilities in the Far North* p 22
[16] Leach J 2016 Psychological factors in exceptional, extreme and torturous environments *Extreme Physiology & Medicine* 5(7) doi:10.1186/s13728-016-0048-y
[17] Buchatskaya M V and Kapranova M V 2015 Features of psychological well-being structure in secondary school students and students from different areas of vocational training *Psychological Science and Education* 20(2) 63-69 doi:10.17759/pse.2015200207
[18] Kurapova I A and Dikaya L G 2013 Spiritual and moral personal potential in the regulation of professional burnout of teachers *Psychological studies of the problems of modern Russian society* 335-358
[19] Silin A N 2010 Shift in the Tyumen region: a look into the past and the future *Taxes. Investments. Capital* 1-3 158
[20] Sharok V V, Vakhnina E G and Yakovleva Yu A 2019 Health resource of national physical education and sport system: northern dimension *Teoriya i praktika fizicheskoy kultury* 3(969) 45-46
[21] Vakhnin N A, Sharok V V and Makhovikov A B 2019 Rating students’ satisfaction with academic service quality on the whole and physical education and sport service in particular *Teoriya i Praktika Fizicheskoy Kultury* 4(970) 28-30
[22] Saveliev D S and Sidorenko S A 2017 Effects of competitive martial arts on first-year students' psychophysiological potential *Teoriya i Praktika Fizicheskoy Kultury* 2017(5) 43-45
[23] Grigoryev V I, Gerasimova I G and Novikova E S. 2018 Foresight of university sport progress trends and avenues *Teoriya i Praktika Fizicheskoy Kultury* 2018(4) 25-27
[24] Dikaya L G and Kutlubaeva R–M M 2017 Socio-psychological factors of the transformation of the personality of a professional in shift work in the Far North *Institute of Psychology of the Russian Academy of Sciences. Organizational Psychology and Labor Psychology* 2(1) 91-113
[25] Yurov I A 2013 Interrelation of physical qualities and psychological properties of athletes *Sports science bulletin* 3 23-28
[26] Finogenko E I 2012 Individual and typological aspects of students' learning adaptation *Proceedings of Irkutsk State Technical University* 1(60) 308-312
[27] Hasnulin V I et al 2014 Adaptive types of mobilization of adaptive reserves of the organism and resistance to arterial hypertension in the North *Human Ecology journal* 7 24-29
[28] Hansulin V I et al *Medical and environmental principles of the formation, treatment and prevention of diseases in the indigenous population of the Khanty-Mansiysk Autonomous Okrug. Toolkit for doctors* p 316
[29] Vakhnin N A 2017 Human, nature, society: synergetic dimension *Journal of Mining Institute* **221** 761-765 doi:10.18454/pmi.2016.5.761

[30] Agapov M G and Klyueva V P 2018 "The North is calling!"; "Northern magnetism" motive in the history of the development of the Russian Arctic *Siberian Historical Research* **4** 6-24 doi: 10.17223/2312461X/22/1

[31] Nikulin A and Nikulina A Y 2017 Assessment of occupational health and safety effectiveness at a mining company *Ecology, Environment and Conservation* **23**(1) 351-355

[32] Romasheva N V *et al* 2017 Systematization of methods and tools for staff incentives in enterprises located in the Far North *Journal of Economy and entrepreneurship* **12-4**(89) 410-414

[33] Solonin Y G and Boyko E R 2015 Medical and physiological aspects of life in the Arctic *Arctic: ecology and economics* **1**(17) 70-75

[34] Solonin Yu G, Boyko E R and Velichkovskiy B T 2017 Physiological stress standards at manual labour in high latitudes *Journal of Medical and Biological Research* **5**(1) 25-36 doi: 10.17238/issn2542-1298.2017.5.1.25

[35] Sabaev Yu P *et al* 2018 Antropological understanding of the city and urban research methodology *Monitoring of Public Opinion: Economic and Social Changes* **3** 96-115 doi: /10.14515/monitoring.2018.3.13

[36] Kruk M N *et al* 2018 Opportunities for improving the corporate social responsibility programs for metallurgical companies in the arctic *Non-Ferrous Metals* **44**(1) 3-6 doi:10.17580/nfm.2018.01.01

[37] Sharok V, Iakovleva Iu and Vakhnin N 2019 Social and psychological aspects of individual adaptation in Arctic conditions *IOP Conference Series: Earth and Environmental Science* **302** 012084 doi:10.1088/1755-1315/302/1/012084