



## Methodological provision of determining individual typology peculiarities in winterers concerning the adaptation to extreme conditions of life activity

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**Abstract.** The prospects for international cooperation between Ukraine and the countries of the Antarctic Treaty depend on the level of professional training of specialists who carry out professional activities in the harsh conditions of Antarctica. The purpose of the article is to substantiate the feasibility of using psychological methods for studying the individual typological characteristics of winterers in terms of adaptation to extreme living/working conditions. The tasks of the research are to provide a description of the authors' methodology for determining the character types of winterers and to prove the effectiveness of implementing the methodology in the psychological selection of participants for Antarctic expeditions. The study was conducted at the National Antarctic Scientific Center of the Ministry of Education and Science of Ukraine, Kyiv and at the Akademik Vernadsky station. The sample consisted of 71 winterers of ten Ukrainian Antarctic expeditions, the age of the subjects varied from 22 to 64 years. Measurements of the adaptation component indicators within the methodology for determining the character types of winterers were made due to online testing platform. The research enables to identify 12 psychological types of character (persistent-distrustful, authoritarian, demonstrative, hyperthymic, withdrawn-introverted, conscientious-pedantic, emotional, dysthymic, conformal, anxious, unstable, labile). Each of the 12 types of character has been described with outlining a set of psychological traits that are to be put into consideration while analysing the winterers' adaptation to extreme conditions of Antarctica. The conclusion has been made, which with certain in-depth studies may acquire a level of psychological regularity: the representatives of different character types characterised by different strength of nervous processes (hyperthymic and authoritarian) adapt to extreme conditions in opposite ways, when the action of extreme factors has an opposite effect on representatives of these character types. So, the influence of extreme factors on representatives of the hyperthymic type reduces their adaptive capabilities, and this influence on representatives of the authoritarian type increases their adaptive capabilities.

**Keywords:** adaptation, Antarctic station, character types, readiness to work in extreme conditions

### 1 Introduction

Ukraine, being an independent state, joined the Antarctic Treaty and became one of the states having research stations in Antarctica. Such an international mission posed a certain challenge for Ukrainian scientists (Gozhyk, 2013). Therefore, the prospects for international cooperation between Ukraine and other countries of the Antarctic Treaty

depend on the level of professional training of specialists who carry out professional activities in the harsh conditions of Antarctica. Accordingly, the State Institution National Antarctic Scientific Center of Ukraine (SI NASC) is responsible for selecting candidates for Antarctic expeditions. This selection ensures high labor productivity and work satisfaction of the specialists who live and work in extreme conditions and presupposes ensuring

their further personal and professional development. One of the components of professional selection is psychological selection, which aims to investigate the psychological readiness of candidates to work in the polar environment. The level of fulfillment of their professional duties in Antarctica largely depends on the winterers' psychological readiness, and an important component of the latter is adaptation to extreme living conditions. Therefore, studying this issue is important and relevant since studying the features/mechanisms of people's adaptation to extreme Antarctic conditions will contribute to solving many complex psychological and interdisciplinary scientific problems of the winterers.

The adaptive component is one of the most important in the system of readiness for activity in adverse/extreme conditions (Tortello et al., 2018). Today, when the majority of Ukraine's population is in a state of permanent distress due to a full-scale war, the research into human adaptive capacities for activity in adverse conditions is relevant and timely, since the obtained data in the specific sphere of adaptation of Ukrainian winterers to Antarctic conditions can be extrapolated to a wider range of research.

### **Current state of the issue**

Numerous studies show that a stay in Antarctic conditions, especially when it is long enough, can worsen people's psychophysiological state. This can be accompanied by adaptation disorders with the subsequent onset of certain health problems. Expedition participants become the object of the influence of numerous extreme factors that complicate psychological adaptation and increase psycho-emotional stress.

Under such conditions, studying the psychological characteristics of participants in scientific expeditions to the continent plays an important role in predicting the professional suitability and adaptation of the wintering individual to extreme environmental conditions.

The concept of adaptation in various areas of scientific research has been greatly developed in

the last decades, embracing the problems of adaptation to space travel (Dudley-Rowley, 1997; Palinkas, 2001; Sandal, 2001; Lugg, 2005; Tortello et al., 2018), the issues of adaptation in isolated and confined extreme environments (Suedfeld, 1991; Suedfeld & Weiss, 2000; Stuster, 1998; Palinkas, 2003; Flynn, 2005; Hensel & Visser, 2018). The peculiarities of adaptation in closed communities of polar expeditions have been studied by a lot of scientists (Mullin, 1960; Bhargava et al., 2000; Barbarito et al., 2001; Gozhyk, 2013; Nicolas et al., 2015; Anton-Solanas et al., 2016; Blight & Norris, 2018; Bakhmutova, 2019; Miroshnychenko et al., 2020; Miroshnychenko, 2021; 2023; Miroshnychenko & Voznyuk, 2022).

The authors emphasize that the factors of harmful impact on the functional state of winterers, on their health and psychological well-being include such factors as harsh climate, peculiarities of regional photoperiodism, time zone shift, activation of meteorological and heliophysical phenomena, increased infrasound radiation, the impact of the ozone hole, active atmospheric processes, etc., as well as conditions of isolation from the outside world, sensory and social deprivation (Mocellin et al., 2000; Harris et al., 2010; Leon et al., 2011; Khandelwal et al., 2017; Palinkas & Suedfeld, 2021). The mentioned factors negatively affect the psychophysiological state of a winterer, which is manifested in the symptom complex of the Antarctic syndrome: sleep disturbances, headaches, and deterioration in mood and well-being. The mentioned factors determine the need for special psychological selection and training of specialists for life in Antarctic conditions (Peri et al., 2000; Palinkas, 2001; 2003; Palinkas & Suedfeld, 2008; Anton-Solanas et al., 2016).

Human adaptive capabilities enable one to adapt to complex living conditions in different places on our planet. Our research over the past 10 years has been devoted to the readiness of Ukrainian winterers for extreme living conditions in Antarctica, at the Akademik Vernadsky station (Miroshnychenko, 2021; 2023).

Research proved that the peculiarities of human adaptation to Antarctic conditions are determined

by long-term deprivation, both physiological (primarily sensory) and social, as well as the impact on the human body of unusual environmental and meteorological factors (Suedfeld & Weiss, 2000; Steine et al., 2003; Wood et al., 2005; Moiseyenko et al., 2016). Researchers of the peculiarities of adaptation of winterers from those countries that have Antarctic polar stations also note the negative impact of harsh conditions on human adaptation to activities in Antarctica (Blight & Norris, 2018).

The psychology of activity in special conditions studies problems of readiness for life in extreme conditions. It is a branch of psychology that studies the patterns of changes and restoration of mental activity (Kokun, 2010).

According to estimates, the categories of persons working in extreme conditions include firefighters, rescuers, law enforcement officers, specialized agencies, military personnel, astronauts, sailors, pilots, athletes of certain sports, and winter personnels at polar stations. The object of the psychology of activity in special conditions is the facts, laws and regularities of formation and functioning of subjects of activity (individuals and groups) in various environmental conditions (Hensel & Visser, 2018). This refers to the environment in a broad sense – as one that contains objective, socio-psychological, psychophysiological, organizational, hygienic, and aesthetic components and factors of activity safety. The discipline studies, projects, programs, and manages processes that characterise the subjects of activity in extreme environments.

The activity in extreme conditions involves increased risk factors relating to a lack of information and time for reflection, the need to make an adequate decision, high responsibility for completing the tasks, unexpected obstacles in the performance of technical and psychological tasks, etc. (Khandelwal et al., 2017; Hensel & Visser, 2018).

All the factors mentioned by the authors are also observed in the activities of Ukrainian winterers at the Akademik Vernadsky station. Accordingly, such life activity puts forward increased

requirements both for polar explorers' mental health and adaptation. Strong emotional and physical stress creates the prerequisites for developing some mental and somatic disorders in representatives of risky professions since, in such extreme working conditions, important factors for successful activity are stress resistance and adaptability of the personality; otherwise, emotional burnout is possible. One should also note the tendency to self-sacrifice in representatives of risky professions, including the winterers, which is due to their high social responsibility and altruism (Moiseyenko et al., 2016; Miroshnychenko et al., 2020; Miroshnychenko, 2021; 2023; Miroshnychenko & Voznyuk, 2022).

As life activity in extreme conditions involves a certain threat to health, so stable personality traits and attitudes are quite clearly manifested. However, the role of moral and psychological factors and professional training for extreme conditions should not be overestimated. It is necessary to take into account the stress that affects the human psyche when life is threatened, first of all, affecting the winterers' nervous system. The properties of the nervous system of each person are individual; therefore, extreme stress affects the well-being of different people in different ways. Some people may enter a stage of mental instability at a moment when a critical situation puts forward specific requirements for activity. Therefore, the issue of psychological selection from the point of view of both the psychophysiological ability of candidates to work in extreme conditions and their socio-psychological qualities is extremely important (Miroshnychenko et al., 2020; Miroshnychenko, 2021; 2023).

Studies conducted at Antarctic stations in other countries also demonstrate that the winterers experience a deterioration in well-being and mood. Sleep disorders, decreased performance (Grant et al., 2007; Chen et al., 2016), increased tension, irritability, and even anger towards other team members take place (Zimmer et al., 2013). Some winterers develop long-term mood disorders with signs of depression (Khandelwal et al., 2017). As

a rule, an increased level of anxiety and persistent stress is more characteristic of the final phase of an Antarctic expedition (Leon et al., 2011; Khandelwal et al., 2017; Hensel & Visser, 2018).

As for the problems of readiness/adaptation for extreme conditions of life of Ukrainian winterers, such issues have been dealt with a group of scientists of the SI NASC for a long time. The research has proved that in the process of life during wintering, not only the individuals but also the environment change, as a result of which adaptive relationships are established between people, and people and environment. They are not always balanced since expeditionary activities are associated with the impact on winterers of numerous extreme factors, which creates an additional load on the functional systems of a human body (Moiseyenko et al., 2016).

Human behavior in extreme conditions and the consequences of the conditions' impact on the personality belong to promising issues of psychology. Among the mental abnormalities diagnosed in people who have been in extreme conditions, there are violations of cognitive mental processes, mental maladaptation, a spectrum of psychosomatic disorders, affective-shock reactions, hysterical psychoses, various types of neuroses, etc. (Suedfeld, 1991; Palinkas, 2001; 2003; Flynn, 2005). In turn, life in extreme environments places high demands on specialists who work in such conditions. They must be able to constantly monitor their condition, make quick decisions, adequately assess the situation, and be ready to help others. This requires significant mental effort and psychological resilience from those who work in extreme conditions (including winterers).

Therefore, we believe that it is advisable to diagnose individual and typological features (Bondarenko et al., 2022) regarding the adaptation of a person to extreme conditions of activity. In particular, it is important to introduce new methodological tools regarding the ability to adapt to complex extreme conditions of activity.

It is important to emphasise that the typological approach has been used to select people working

in various extreme conditions. One of the reasons for the heuristic use of this approach in the context of psychological research is that the typology of human personality expresses the systemic nature of these studies, which allows for obtaining quite transparent and reliable research data. Due to this, the typological approach cannot be considered outdated; many outstanding scientists conducting interdisciplinary research have studied and are studying it, since the typological approach is used in many subject areas (Alfred Adler, Anne Anastasi, Claudio Naranjo, Raymond Cattell, Hans Eysenck, Sigmund Freud, Franz Joseph Gall, Francis Galton, Karen Horney, Edmund Husserl, William James, Carl Jung, Ernst Kretschmer, Oswald Külpe, Karl Leonhard, Cesare Lombroso, Isabel Briggs Myers, Théodule-Armand Ribot, Hermann Rorschach, William Stern, and others). Particularly important are current studies (Anastasi, 1985; Kagan, 1994; Robins et al., 1998; Asendorpf, 2003; Furnham & Crump, 2005; McCrae et al., 2006; Castanier et al., 2010; Kozina & Iermakov, 2015; Bergman et al., 2017; Simko, 2018; Miroshnychenko & Voznyuk, 2022; Garavan et al., 2024).

Of particular importance is research that implements the typological approach to studying human activity in extreme conditions (Castanier et al., 2010; Perelygina & Mykhlyuk, 2017; Simko, 2018; Miroshnychenko & Voznyuk, 2022). These studies are conducted in sports, which can be considered activities in extreme conditions – downhill skiing, mountaineering, rock climbing, paragliding, or skydiving, etc. (Castanier et al., 2010; Simko, 2018). Perelygina and Mykhlyuk (2017) have outlined the manifestations of character typology in employees of the State Emergency Service of Ukraine, who perform their duties in extreme conditions. Their data indicate a more pronounced form of character accentuations than in winter workers, which leads to professional fatigue. N. Poludyonna, in her dissertation, studied the typology of employees of the Ministry of Internal Affairs of Ukraine and conducted diagnostics of the dependence between the individu-

al typological properties of the personality and the level of development of their professionally important qualities, which can serve as the basis for predicting professional suitability and psychological readiness for activity in extreme conditions (Poludyonna, 2009). However, modern psychology lacks empirical studies concerning the typology of character and its manifestations in winterers in the conditions of life at the Antarctic stations. Therefore, their analysis is of great importance for solving professional tasks regarding selecting candidates for wintering. As a rule, the most diverse representatives of clinical typologies of character are limited to phenomenology, which can serve as the basis for making a diagnosis. We are interested in such a sphere of the typology of character, which can reveal the manifestation of traits inherent in those working in extreme conditions. In such conditions, as a result of the strengthening of individual character traits, a person may manifest increased sensitivity and vulnerability to some stress factors while simultaneously remaining resistant to others; that is, certain accentuated traits may manifest or become actualized, which is the basis for the typology of character. Our research has proven that the composition, characteristics, and strength of manifestations of individual typological characteristics of winter workers differ significantly from similar psychological phenomena in representatives of other professions.

In this regard, our studies are devoted to the role of character accentuation in the adaptation of Ukrainian polar explorers to life in Antarctica. The analysis of the research on the role of winterers' accentuation in the process of adaptation to extreme living conditions being conducted during 10 years has shown that the main types of accentuation in the winterers are as follows: hyperthymic, emotional, stuck, and demonstrative. These accentuations of character mainly contribute to the successful psychological adaptation of winterers to life in Antarctica. The types of accentuations (conformity, dysthymia, anxiety, instability, schizoid orientation), which may in-

terfere with psychological adaptation, have a small percentage of representation in the winterers, or are not represented at all. The results have proven that the psychological adaptation of Ukrainian winterers to extreme conditions has a complex hierarchical structure and is based on individual qualities and the influence of appropriate natural, interpersonal, and professional conditions (Miroshnychenko & Voznyuk, 2022).

The article aims to substantiate the feasibility of using psychological methods for studying the individual typological characteristics of winterers in terms of adaptation to extreme living/working conditions.

The tasks of the research:

- to provide a description of the methodology for determining the type of character in winterers "Study of character in the personality structure" (SCPS) (refer to <https://jokersevs.github.io/testzdu/>),
- to prove the effectiveness of implementing the methodology in the psychological selection of participants in Antarctic expeditions (refer to Materials and methods).

## 2 Materials and methods

To verify the main provisions regarding the adaptive component of the winterers, we conducted a series of studies using SCPS. The authors' SCPS methodology was based on well-known methods for determining types and accentuations of character, recommended by the Ministry of Education and Science of Ukraine, Miroshnychenko et al. (2015), pp. 264–272: "Determination of character accentuations" method (K. Leonhard and S. Shmishek) (Müller, 1974), the MMPI questionnaire being a shortened version of the Minnesota Multiphasic Personality Inventory MMPI (Butcher, 2010), "Personality Self-portrait" personality questionnaire of Oldham and Morris (1991).

Psychophysiological studies were conducted in accordance with the methodological recommendations of the Scientific and Technical Council of the State Special-Purpose Research Program

in Antarctica. Based on the ethical norms for conducting psychological and psychophysiological studies, appropriate consent was obtained from candidates for participation in Ukrainian Antarctic expeditions to conduct the specified studies. The study of the candidate's individual typological characteristics was carried out in compliance with the principles of the World Medical Association General Assembly (2024) (<https://www.wma.net/policies-post/wma-declaration-of-helsinki/>), with the requirements of psychological ethics based on the provisions of the "Code of Ethics for Psychologists" of the Society of Psychologists of Ukraine (<https://npa-ua.org/pub/files/5a70319ea92e75d0.pdf>), with the Code of Academic Integrity of Ivan Franko Zhytomyr State University (<https://eportfolio.zu.edu.ua/media/PublicFile/9po6uhbq.pdf>).

The study was conducted from 2012 to 2019 at the National Antarctic Scientific Center and the Akademik Vernadsky station. The sample consisted of 71 winterers of ten Ukrainian Antarctic expeditions (UAE); the age of the subjects varied from 22 to 64 years. The subjects were divided into three groups: high level of adaptation (25 winterers), average level of adaptation (21 winterers), and sufficient level of adaptation (25 people). The justification for the division into groups by levels of adaptation was presented in previous works (Miroshnychenko, 2021; 2023).

The validity and reliability of the mentioned method have been confirmed by the results of

O. Miroshnychenko's doctoral dissertation "Psychological readiness of an individual for life in Antarctic conditions" (2023), being reflected in the monograph "Age-related features of the psychological readiness of Ukrainian winterers for life in Antarctic conditions" (<http://eprints.zu.edu.ua/37125/>). The mathematical and statistical methods of analysis have been applied. To investigate the relationship between the SCPS method and the Oldham and Morris method, we calculated the Spearman correlation coefficient. The Spearman rank correlation coefficient is a non-parametric measure of the statistical relationship between two variables. It assesses how well the relationship between two variables can be described by a monotonic function. If there are no repeated data values, the Spearman coefficient is 1 or -1, which occurs when each variable is a monotonic function of the other variable. The correlation coefficient, like any correlation calculation, is suitable for continuous and discrete variables, including ordinal ones.

The Spearman correlation coefficient was calculated using the formula:

$$\rho = 1 - \frac{6 \cdot \sum d^2}{n^3 - n},$$

where  $d$  is the difference between ranks,  $n$  is the number of participants. The first step of our study was to sort the data of the selected scales and determine the ranks ( $d_1$  and  $d_2$ ). The next step was to determine the difference between these ranks

**Table 1.** Correlation between defined scales and corresponding scales in the Oldham and Morris method

No.	SCPS Method Scales	Scales of the Oldham and Morris method	Spearman's correlation coefficient value
1	Persistent-distrustful type	Vigilant type	0.967
2	Authoritarian type	Aggressive type	0.800
3	Demonstrative type	Dramatic type	0.984
4	Hyperthymic type	Confident type	0.962
5	Conscientious-pedantic type	Dutiful type	0.959
6	Emotional type	Altruistic type	0.954
7	Labile type	Active type	0.867

( $d = d1 - d2$ ) and square the difference ( $d * d$ ). This calculation was performed similarly for all the scales studied. We present the correlation between the scales we defined (7 of which were present in at least 10% of winterers) and the corresponding scales in the Oldham and Morris method (Table 1).

The result shows that the indicators, according to the two methods, have a fairly close relationship since the values of the correlation coefficients are close to 1.

Measurements of the adaptation component indicators within the SCPS were done using the online testing platform (<https://jokersevs.github.io/testzdu/>).

The indicators were measured twice in each expedition: at the beginning of wintering, during the formation of expedition teams – March of the corresponding year of the expedition, and six months later, when the main adaptation processes took place – October of the corresponding year of the expedition.

Psychological diagnostics in both experimental sections took place in two stages. The first one involved identifying the individual typological qualities of the winterer's personality using SCPS. The second one involved a psychodiagnostic interview, during which the characteristics of an expedition member identified at the first stage were clarified. In addition, during the study, behavior, facial expressions, and vegetative-vascular reactions were observed in order to obtain additional data characterizing the emotional stability of winterers.

Our research has been based on some theoretical and practical prerequisites.

1) Activities in extreme conditions impose certain requirements for a person's psychological and physical capabilities and properties. When the existing system of a person's properties meets these requirements, the person can successfully and at a high level carry out the relevant activity. Otherwise, the person cannot carry out the activity. First of all, this applies to the activities of a winterer in extreme conditions of Antarctica.

2) The neurophysiological functions of winterers are to meet the following requirements: high

emotional stability; resistance to fatigue; distinct manifestations of a strong, balanced mobile type of higher nervous activity; high indicators of sensorimotor reactions, attention, reaction to a moving object, speed of switching attention; good visual and auditory memory.

3) Individual neuropsychological and psychological indicators reveal mutual dependence and interconnection, thus forming a holistic system. That is why, when a researcher has studied a person's psychological traits/qualities, this researcher can assume the presence of other traits that may manifest themselves in extreme conditions.

## 3 Results

### 3.1 Peculiarities of psychological selection of winterers

We consider the main goal of psychological selection of winterers to reveal their psychological qualities and psychophysiological properties that meet the requirements for activity in extreme situations, as the activity of winterers is accompanied by significant neuropsychic tension, hypodynamia in the conditions of the confined space of the station, as well as disruption of the natural sleep pattern, increased loads on the analyzer systems, sensory deprivation, the possibility of stressful situations, etc.

The main goal of psychological selection presupposes maintaining working capacity and good health and preventing the formation and development of professional fatigue and emotional burnout, thus reducing the level of accidents and injuries in the winterers in the process of expeditionary activities. The goal is achieved by confirming the compliance of the winterer according to his/her professionally important psychological qualities with the requirements for performing specific activities.

The system of psychological selection of candidates for wintering at the Ukrainian Antarctic Station, as our research has shown, should be built according to certain interconnected stages:

- psychological study of a professional activity in order to identify requirements for individual characteristics of a person;

- development of criteria for the effectiveness of activity, selection of indicators of success in performing professional activity;
- selection of methods for psychological diagnostics of professionally important personal qualities;
- psychological diagnostics of applicants for participation in UAE;
- analysing the diagnostic work conducted, processing conclusions/data for each candidate, and providing psychological recommendations for participation in UAE.

Thus, professional training is organised by the SI NASC to prepare the Ukrainian winterers for a long-term expedition, during which future winterers spend some time in conditions close to the actual ones. They live in a closed group and train to establish interpersonal relationships. They also develop the skills in extreme conditions (during a fire, frostbite, flood, etc.), and provide first aid.

During the training meetings, a psychologist conducts psychological examinations and organises special trainings, namely, observations, individual conversations, business games, and testing.

According to the developed concept of the typology of a Ukrainian winterer, as well as taking into account age characteristics, the greatest attention is paid to the readiness/adaptation of the candidate for UAE. Therefore, studies of psychological and age-related characteristics of the winterer personality occupy key positions in the system of examination of specialists in extreme activities, thus forming the basis for predicting professional suitability and successful adaptation of the individual to conditions of social isolation and permanent influence of extreme force of environmental factors. Preference is given to candidates with indicators of a strong, balanced nervous system, professional-productive and social motivation for activity, high indicators of adaptation to extreme and stressful conditions, and who do not have high indicators of character accentuations.

Also, great attention is paid to the study of the personality qualities of candidates for wintering from the point of view of how the winterer will behave in isolated and confined extreme environ-

ments, because for most of wintering period, a group of winterers exists as a group of 12 people.

### **3.2 The adaptive component of functional readiness for life in Antarctic conditions**

One of the predictors of the readiness of a winterer for life in Antarctic conditions is adaptability, which is a property of an individual to adapt to changeable physical, psychophysiological, and socio-psychological conditions. Within the framework of this article, we present the results of empirical studies of the adaptive component of functional (as part of the general psychological readiness) readiness for life in Antarctic conditions. Therefore, we consider such basic concepts related to this component as the adaptation process, the adaptability as a state, and a set of skills.

We define personality adaptation as a complex dynamic process of multi-level adaptation to the changeable conditions of the external and internal environment, which covers such levels of human organization as the organismic (biological level), individual (psychophysiological level), personality (socio-psychological level), specialist (professional level), and presupposes the activity of the subject of activity, which requires of the winterer to understand one's actions and conduct, find ways of making decisions in specific life conditions, and to analyse the characteristic features and results of interaction with new people and circumstances.

We consider adaptability as the ability of an organism to adapt to changeable conditions of existence, expressing the level of adaptation enabling a person to live and perform activities in a certain environment. We understand the adaptability of Ukrainian winterers at the Akademik Vernadsky station as the result of adaptation to external and internal changed conditions of life, that is, psychophysiological adaptation to extreme climatic (in all its manifestations) conditions and the acquisition of professional competencies (in new working and living conditions) and social com-

petence (the ability to adequately reflect changes in interpersonal relationships). We studied the adaptability of winter residents through social, psychophysiological, and characterological indicators. The results of the adaptability study are presented in more detail in previous works (Miroshnychenko, 2021; 2023).

Scientists have established some important traits of the social sphere of the personality, which help to adapt to unusual life activities (Mehta & Chugh, 2011; Kokun & Bakmutova, 2020; 2021). At the same time, it was found that the negative effects of stressful situations are counteracted by the active position of the personality and independence in decision-making (Sannikov, 2016). As for the *criteria for the effectiveness of the adaptation of winterers to the conditions of activity at the station*, they were developed by us in our previous studies (Miroshnychenko, 2021) and concerned: 1) the number of winterings; 2) the social status of the expedition member; 3) the presence of personality traits.

The number of winterings we consider to be indicating of whether a person has successfully adapted to extreme conditions, whether the winterings become acceptable for a person wishing to take part in them. The largest number of winterings among the studied persons was 8, the smallest – 1. In this way, a rating of winterers was built in relation to the number of winterings.

As for social status, the higher it is, the better the expedition member adapts to the team and the peculiarities of relations in socially, psychologically, and naturally extreme conditions. To determine the sociometric status of expedition members, sociometric measurements developed by J. Moreno (Hale, 2009) were used in our modification: sociometric preferences were measured in three areas – professional activity, personality relationships, and leisure activities. The winterers were asked three questions each, to which they had to provide answers: “Which expedition member do you like to work with the most at the station?”, “Which expedition member would you tell about your personal problems?”, and “Who do

you like to spend your free time with the most when you have leisure time?”. It was necessary to choose three people for each question. The study was conducted by a psychologist, maintaining the confidentiality of the results. After processing the questionnaires, a rating of winterers was built separately for each expedition. The highest number of points – 12 (by the number of winterers in the expedition) was assigned to the first person in the rating, who has been chosen by her/his colleagues the most often, the lowest – 1 point – to the last person in such rating.

The third indicator – the presence of certain personal traits in the subjects – was entrusted to determine by the expert group, which included the head and an experienced researcher of the medical and psychological department of the SI NASC, as well as the heads of Ukrainian expeditions for the ten years under study. Thus, during the years covered by the research, the head and the researcher conducted psychological examinations of winterers during their selection, preparation for wintering, and psychological support from the “Big Earth” via telephone and Internet connection with the station. For their part, the expedition leaders directly managed, cared for their subordinates, and were responsible for them before the SI NASC and their loved ones, as a result of which they can objectively and impartially characterise the adaptation of winterers to life in Antarctic conditions. In total, the expert group included 17 people.

In order to objectively describe the personality qualities necessary for life in Antarctic conditions, a preliminary survey was conducted with a group of winterers from 3 previous expeditions (a total number of 36 people) who wintered in different years during the studied period. They were asked to name up to 10 personality qualities that are most important, in their opinion, for a winterer who works during the year at the Ukrainian Antarctic Station. From the qualities named by the winterers, the 10 most highly rated were selected, and a questionnaire was developed for the expert group, in which the first ten most im-

portant personality qualities and the surnames of the studied winterers were presented in alphabetical order. The experts were given the following instructions: “Dear member of the expert group! We ask you to take part in the scientific development of the “Personality Type of the Antarctic Winterer of Ukraine”. To do this, please answer the question of our questionnaire: “What qualities do you think every Ukrainian winter resident from the proposed list has?” (these ten main qualities were selected by winter residents through a survey, they are given in alphabetical order: benevolence, cheerfulness, collectivism, creativity, diligence, honesty, humanism, responsibility, restraint, tolerance). Mark the qualities that are expressed brightly with the number 3, those expressed moderately – 2, those expressed weakly – 1, and those not expressed – 0. The questionnaire is anonymous.”

The results of all three studies (wintering rating, sociometric rating and rating of certain personality qualities) had to be brought to a single measurement. Since the highest indicator was the number 12 from the sociometric rating, the indicators of other studies were also brought to this number: since the highest indicator of wintering is 8, the number of wintering was multiplied by a factor of 1.5; the indicators of the presence of personality qualities were added (the maximum possible score was 30 points) and divided by 2.5. In this way, all selected criteria were measured in the same calculation system. From the group of data processing methods, quantitative analysis was also used: mathematical statistics; comparison of average values using parametric and non-parametric methods. The distribution of subjects by adaptability levels was established using the method of distributing indicators of psychological phenomena by rank. At the same time, qualitative analysis of the obtained data was applied: differentiation of material by types of subjects. From the group of interpretative methods, the structural and qualitative interpretation of the features of the results was used (Miroshnychenko, 2021).

### **3.3 Conducting a longitudinal study of the psychological characteristics of winterers**

During the longitudinal study of the psychological characteristics of winterers, we developed and tested/verified the SCPS methodology. The name of the methodology is associated with the description of individual-typological character traits/qualities in the structure of the personality, which we define as consisting of 4 main and 2 additional substructures (Rybalka et al., 2020). There 4 substructures in the structure of the personality are:

- psychophysiological level (or composite) expressing the properties of the nervous system, temperament features, age features, etc.;
- cognitive level covering the manifestation of cognitive processes (attention, sensation, perception, memory, thinking, imagination) and the emotional-volitional sphere (emotions, feelings);
- level of experience and communication reveals the manifestation of professional traits, business qualities, attitude to work, communicative sphere (sociability, friendliness/aggressiveness, etc.);
- level of the orientation of the personality (drives, inclinations, interests, needs, motives, ideals, convictions).

The questions of SCPS and the answers to them characterise the manifestations of character traits/qualities in the structure of the personality because the character is an additional substructure and pervades/permeates all the main substructures of the personality. The analysis and interpretation of the respondents' answers have been carried out according to the manifestations of character in the corresponding structures. Here we consider 4 groups of character properties based on certain psychophysiological indicators.

1. Properties that characterise a person's attitude towards surrounding people (kindness, responsiveness, demandingness, etc.).
2. Properties that characterise a person's attitude towards work (hard work, laziness, conscientiousness, responsibility or irresponsibility, etc.).

3. Properties that characterise a person's attitude towards oneself (self-love, pride, vanity, inferiority complex, sense of self-esteem, self-criticism, ambition, modesty, etc.).

4. Properties that characterise a person's attitude towards the material world (thriftiness, accuracy, sloppiness, attitude towards money, etc.).

We have identified 12 psychological types of character, which are presented in SCPS: persistent-distrustful, authoritarian, demonstrative, hyperthymic, withdrawn-introverted, conscientious-pedantic, emotional, dysthymic, conformal, anxious, unstable, labile. We characterise the mentioned types as follows.

*Persistent-distrustful type.* Representatives of this type are characterised by purposefulness. They are extroverts and active politicians; they know well how to work with the masses and how and where to lead them. People of this type are characterised by communication from the position of a senior, a tendency to teach. As employees, they strive to achieve high performance in any sphere, having increased demands on both others and themselves. They are sensitive to social injustice, and can pursue justice; at the same time they are suspicious, distrustful, sometimes extremely self-confident, jealous. They are characterised by getting stuck (fixed) on thoughts, feelings, ideas, especially when they have a social orientation. They cannot forget an insult, being intransigent, prone to initiating conflicts, and revealing a love of power. Personalities of this type are independent, consult exclusively with themselves, easily make decisions, take responsibility and can take care of themselves. They take criticism very seriously and do not evaluate it as intimidation. They work intensively to deserve a good attitude in the team. They are careful in working relationships, rely on devotion and loyalty to them, and try to learn as much as possible about persons before contacting them. They have abilities for social perception and quickly notice hidden messages, or attempts to mislead them, which makes them dangerous rivals, especially in business relationships.

*Authoritarian type.* People of this type work best in such power structures where everyone knows their place, and everyone understands their powers. They are purposeful, have a pragmatic approach to achieving their goals. They do everything to get the desired result. Such individuals are physically strong and often take part in sports competitions, especially where there is close contact with the opponent. They have reduced communication contact, eschewing verbal and non-verbal reactions. In an emotionally calm state, they are conscientious, neat, even pedantic, love animals and children. Under adverse conditions, they can be boring, gloomy, and prone to rudeness and quarrels. Excited, they have poor control over their behavior; under the influence of stress factors, they act impulsively, with a tendency to conflict, which leads to misunderstandings and even to despotism and cruelty in the working team and in the family. However, besides the fits of anger and irritation, this type is characterised by conscientiousness, neatness, and perfectionism. Such people have a high opinion of themselves, which is revealed when disagreement is perceived as a personal insult. They are not flexible, have difficulty adapting to changes, are conservative, too straightforward, and often suspect people of insincerity, which is why they tend to hurt and offend loved ones, and they consider being the first to reconcile to be a humiliation of their dignity. This creates additional problems in relationships. However, a person of this type can cope well with analytical activities: in any dispute or interaction, they play the role of a leading analyst.

*Demonstrative type.* People of this type are given a wonderful gift with which they enrich the life content of others. For them, the whole world is a theater; life is never sad or boring, including close friends. That is why they are also called the dramatic type. They are demonstrative, emotionally and physically tender, expansive, lively, and bright and quickly react to all events. They have a rich imagination, can tell interesting stories, and love romances and melodramas. They want

to be singled out and noticed, to be the focus of attention. They pay a lot of attention to their appearance and enjoy their clothes, style, and image. They are seductive, sexy, charming, and temperamental. They quickly get involved in relationships, easily supporting new ideas and suggestions from others. They are characterised by the ease of establishing contacts, the desire for power, leadership, and praise. Therefore, they adapt well to people, tend to intrigue, and sometimes annoy others with their self-confidence and provoking conflicts. Positive qualities: gallantry, artistry, the ability to captivate others, unusual thinking and actions. Negative qualities: selfishness, hypocrisy, boastfulness, a pronounced desire to be the center of attention and achieve their goals at any cost: with tears, clothes, unusual hobbies. For this type, others' opinions are important. People of the demonstrative type are emotional and often act without thinking, and planning is not their strong point. In work, they are prone to social diversity but do not cope well with painstaking work that requires concentration on details. The demonstrative type easily adapts to new situations and tends not to dwell on the past.

*Hyperthymic type.* Hyperthymic persons stand out among others with increased mood and optimism. They are leaders, bright lights, the center of attention of society and family, confident in their abilities and open to their possibilities. They always expect only good treatment from others and can take advantage of the strengths and abilities of other people to achieve goals. They are emotionally oriented, can understand their own feelings, thoughts, and inner states. They highly value and protect comfort, free time, and the joys of life. No one can take away the right to personal freedom from such a person: if something threatens their personal freedom, they energetically defend their right to do what they want. They avoid any exploitation and resist demands that they consider unreasonable or above their strength. They are cheerful and optimistic if presented with reasonable demands. People of this type are characterised by sociability, bright-

ness of facial expressions, and gesticulation. They often deviate from the topic in conversation. They have conflicts with others about negligence and a frivolous attitude towards official and family duties. Positive qualities: energy, initiative, optimism, thirst for activity, their mood is always good. Negative qualities: tendency to ill-considered actions, increased irritability, frivolous attitude towards their duties. They have difficulty in enduring discipline, monotonous activity, loneliness. In childhood and adolescence, they have many different hobbies, but as a rule, these hobbies are superficial and quickly pass. According to our observations, they are prone to travel, to long journeys, and can tolerate adverse living conditions.

*Withdrawn-introverted type.* Such individuals are very different from others. They are dreamers, great originals, and often differ from others in their eccentricity and sometimes in their genius. They are tuned in to themselves and support their own dreams, it does not matter to them whether others accept their attitude to life. They are self-oriented and independent, need little closeness in relationships, they are characterised by little friendliness. They are characterised by abstract reflections in solitude; therefore, they do not need anyone but themselves, being free from emotions and entertainment, which can be annoying to other people. They are inferior to others in sensitivity, in close relationships; the area in which they excel is observation: they know how to discover such facts in life that others do not notice. These people are calm, dispassionate, and unsentimental. They demonstrate indifference to pain and pleasure. They are not bothered by criticism, they are also indifferent to praise, they themselves evaluate their behavior. Positive qualities: they are reserved, have strong beliefs, and are principled. Negative qualities: they poorly understand the states and experiences of other people, they do not know how to empathise, and their inner world is most often filled with various fantasies and unusual hobbies. In the external manifestation of their feelings, they are quite reserved and

not always understood by other people who, as a rule, do not like them very much.

*Conscientious-pedantic type.* People of this type reveal high moral principles, being very responsible, they do not allow themselves to rest until the work is done and done correctly. They are devoted to their families, their work, and their leaders. They rarely enter into conflicts, being on the passive side. At work, they make too high demands on others but are inferior in leadership. Positive qualities: conscientiousness, accuracy, seriousness, and reliability in business and feelings. Negative qualities: formalism, pedantry, and excessive scrupulousness. People of this type are characterised by early intellectual development, a tendency to reasoning, introspection, and assessments of other people's behavior. Most anxious people belong to this type; they are worried that they may not meet the requirements of management, colleagues, or loved ones. These people may feel ashamed for others and be worried about the world's "imperfection". Due to their pronounced perfectionism, people with this personality type may suffer from psychosomatic illnesses.

*Emotional type.* They prefer to communicate in a narrow circle of people with whom they have established good relations and understand them "at a glance". They rarely enter into conflicts. They carry resentments within themselves and have deep reactions in the sphere of subtle emotions, humanity, and sensitivity. Such people deeply experience the slightest troubles, are too sensitive to remarks, failures, are non-conflict type. Being altruists and good family men, they rejoice in other people's successes and have a high sense of duty. They believe that life is for serving and love is for giving. They know how to empathise, love children, animals, help the weak. Being non-ambitious, they are accessible in relations with others. People of this type are always excellent in business relations; they are honest, ethical, sociable, and do not require much attention. Positive qualities: kindness, empathy, sense of duty, diligence, and thoroughness. Negative qualities: excessive sensitivity, tearfulness, insecurity,

indecision. They are very naive and do not realize the profound impact they have on the lives of others to whom they give themselves completely.

*Dysthymic type.* People of this type do not know how to look at things from the positive side, they are more often pessimists than optimists. Their strength lies in the fact that they can help everyone survive in difficult times, as they maintain a "sober" view of things in various circumstances, including extreme ones. They realistically assess their own abilities, are aware of their shortcomings, and do not have inflated self-esteem. Taking responsibility for their actions, they analyse, evaluate, and think about everything before taking action. They criticise themselves and others, always expecting the worst results, and if everything happens that way, they are already prepared for it. People of this type are characterised by low contact with others and a pessimistic mood. Such people rarely enter into conflicts, revealing a closed lifestyle. They highly value friends and are ready to obey them. Positive qualities: seriousness, a heightened sense of justice, and conscientiousness. They are non-conflict and at the same time serious, highly moral, conscientious, fair. Negative qualities: passivity, inhibited thinking, individualism, constantly low mood and activity, sadness, taciturnity, pessimism. Such people consider noisy companies burdensome and do not get along well with their colleagues.

*Conformal type.* People of this personality type clearly follow the leader; they are communicative and talkative and respect authority. In order not to disturb the harmony in relationships and order, they are always polite, courteous, and tactful. They consider it wiser to obey and accept orders from their superiors without hesitation. Both among friends and in the family, they yield leadership to another. This type demonstrates an uncritical attitude and often are opportunistic, revealing submission to any authority, the majority in the group/team. They are inclined to conservatism, and their main life credo is "to be like everyone." We can rarely meet such people in a dispute – they do not like to be in the cen-

ter of other people's attention. If they find themselves involved in a controversial situation, they remain passive onlookers, observing from afar. They being of the non-conflict type are more comfortable following the crowd, rather than defending their own opinion/interests or the opinion of the minority. However, no one but them will cope better with finding a compromise in a dispute. Positive qualities: they are characterised by great friendliness, ready to listen to the "confession" of others, diligent, non-conflict. Negative qualities: as a rule, they do not have their own opinion, are very dependent, disorganised, and inconsistent in their actions, and cannot see the prospects of their life.

*Anxious type.* People of an anxious type, as a rule, have a low mood; they fear for themselves and their loved ones. They are vulnerable and constantly feel their inferiority. As a rule, they are friendly, self-critical, and meticulous. Friendly relationships, comfort, and coziness are typical for this type of individuality. Their imagination and the spirit of inquiry are well developed, but they are very concerned about other people's opinions. In relationships, they show care and behave very tactfully, limiting themselves in their actions. Anxious people are in no hurry to tell others their thoughts and feelings. They are characterised by low contact, some cowardice, insecurity, and a low mood. They rarely enter into conflicts. Positive qualities: sociability, self-criticism, conscientiousness, a sense of duty, high moral demands on themselves and others. Negative qualities: this type is characterised by increased suspiciousness and capriciousness, fatigue, and irritability, especially when performing a difficult task. A tendency to hypochondria is a particularly typical trait. They are characterised by an inferiority complex, having difficulties in adapting to a new team and difficult living conditions. They often compensate for shortcomings in their character traits by choosing difficult activities and increasing diligence.

*Unstable type.* People of this personality type have their own value system, love risk, and usu-

ally take part in the most dangerous activities. They are not very concerned about the problems of others and believe that everyone can take care of themselves, do not feel guilty about the past and do not worry about the future, as they live one day at a time. Planning their actions is not characteristic of them; they act according to the situation and rather intuitively. Their opinion must be valued. They are prone to conflicts; if they are wrong, they prefer to blame others. Positive qualities: they love to travel and go on trips in order to walk, explore, or observe new environments. People with this personality type are usually brave, very energetic, and love risky actions, which can help them perform dangerous activities in extreme conditions. They are courageous, physically strong, tough, and can lead when others are lost. Negative qualities: they show an increased tendency and attraction to entertainment, as well as to idleness and laziness. It is difficult to predict the behavior of this type of personality. They are impulsive; self-control is difficult for them. They can show themselves aggressively, ignoring generally accepted norms of behavior in society.

*Labile type.* People of this type are active, passionate in their desire to connect/interact with life and other people. They cannot easily perceive things that happen between them and other people. They have vivid emotions, high sensitivity to external phenomena, talkativeness, love, high contact. At the same time, such people possess artistic taste and are altruistic, compassionate, and attached to friends. This type is distinguished by energy; such people are always busy, creative, active, and enthusiastic. They show initiative and can also charge others with their activity, constantly searching for something new. They argue very often, but do not initiate conflicts. They are characterised by frequent changes in mood, communication manners. They have a hard time experiencing minor troubles, react extremely irritably to the remarks of others, but can also be passionately happy about something, are exalted. Positive qualities: attentive to loved ones and relatives; altruistic, empathetic; have good taste;

show vivid feelings. Negative qualities: prone to unpredictable moodswings for possibly insignificant reasons. The present and future for them can be colored either in rainbow or dark colors. When people of this type are in a depressed mood, they need help and support from loved ones who can distract, encourage, and entertain them.

The way the selected types are represented in the studied winterers is shown in Table 2.

Having analysed the table, we can determine the most significant character types in winterers with different levels of adaptability. The largest number among the studied individuals is made up of representatives of the hyperthymic type, being revealed in all the groups: in the group of high adaptability level, such individuals make up 76%, in the group of average level – 47.6%, in the group of sufficient level – 44%. Emotional type is in second place in the rating of character types of high adaptability level (56%); in the group of average level, the winterers of the labile type comprise 33.3%; in the group of sufficient level, the representatives of the demonstrative type comprise 32%. A high level of adaptability

is revealed in the winterers of the persistent-distrustful type (28%). The average level of adaptability is discovered in emotional and persistent-distrustful types of winterers (23.8% each); the sufficient level of adaptability is found in representatives of emotional type (24%).

Thus, traits of a hyperthymic, emotional, and persistent-distrustful character types contribute to adaptability in extreme conditions.

The next stage of our study was to determine how the average indicators of the manifestations of the main character types changed in groups of different levels of adaptation of winterers. We revealed 7 main types, those whose manifestations were found in at least 10% of winterers: persistent-distrustful, authoritarian, demonstrative, hyperthymic, conscientious-pedantic, emotional, and labile. The maximum indicator of a typological feature can reach 24 points. Measurements of typological features were carried out 2 times – at the beginning of the expedition (March of the corresponding year of the expedition) and six months later, during the Antarctic winter, when the living conditions were the most

**Table 2.** Quantitative indicators of accentuation peculiarities in wintering groups with different levels of adaptability

Psychological type	Winterers with a high level of adaptability (25 persons)		Winterers with average level of adaptability (21 persons)		Winterers with a sufficient level of adaptability (25 persons)		Total number of winterers (71 persons)	
	Number	%	Number	%	Number	%	Number	%
Persistent-distrustful	7	28.0	5	23.8	5	20.0	17	23.9
Authoritarian	6	24.0	2	9.5	2	8.0	10	14.1
Demonstrative	6	24.0	4	19.0	8	32.0	18	25.4
Hyperthymic	19	76.0	10	47.6	11	44.0	40	56.3
Conscientious-pedantic	4	16.0	3	14.3	4	16.0	11	15.5
Emotional	14	56.0	5	23.8	6	24.0	14	19.7
Dysthymic	—	—	1	4.8	3	12.0	4	5.6
Conformal	—	—	2	9.5	3	12.0	5	7.0
Anxious	1	4.0	1	4.8	4	16.0	6	8.4
Unstable	1	4.0	2	9.5	3	12.0	6	8.4
Labile	3	12.0	7	33.3	1	4.0	11	15.5

difficult. The results of the study are presented in Table 3.

Let us analyse the results obtained. In the group of winterers with a high level of adaptability (which is considered the most desirable for participation in the expedition), the following most noticeable changes occurred in the dynamics of indicators of individual typological features: the manifestations of the persistent-distrustful type (by 17.0%), conscientious-pedantic (by 12.0%) and authoritarian (by 9.2%) have increased. This fact may indicate that adaptation to life in extreme conditions occurs more effectively if the features of the indicated types are manifested to a greater extent: persistence, subjugation of one's desires to teamwork, conscientiousness, purposefulness, etc.

As for winterers with an average level of adaptability, we observe the following changes: lability type increased noticeably (by 13.5%), which may indicate both better adaptability to changeable conditions and variability of mood and emotions in the process of adaptation. At the same time, the indicators of authoritarian features (by 10.2%) and persistent-distrustful features (by 9.5%) de-

creased. In observations and communication with representatives of this group, we have noted that they became less self-confident and less principled and persistent by the middle of wintering.

The group with a sufficient level of adaptation demonstrates the following changes: just like in the group with an average level, the lability indicator decreased (by 11.0%), and the hyperthymia indicator also decreased (by 15.0%). That is, winterers from the group with the lowest level of adaptation became less optimistic, cheerful, and self-confident in the process of adapting to harsh conditions.

## 4 Discussion

Studies of the problem of adaptation to the conditions of Antarctica are conducted by both Ukrainian and foreign scientists and include various aspects. Moiseyenko et al. (2016) investigated the physiological features of adaptation of winterers. Thus, scientists have established that participants of Ukrainian Antarctic expeditions, as well as representatives of such professions as military personnel, air traffic controllers, electronics engineers,

**Table 3.** Dynamics of indicators of individual typological traits in winterers of different levels of adaptation. Sec. 1 and Sec. 2 – initial and subsequent measurements

Traits of psychological types	High-adaptability group			Average adaptability group			Group of sufficient level of adaptability		
	Sec. 1	Sec. 2	Difference (%)	Sec. 1	Sec. 2	Difference (%)	Sec. 1	Sec. 2	Difference (%)
Persistent-distrustful	11.2 (± 3.5)	13.1 (± 2.8)	17.0	13.7 (± 3.9)	12.4 (± 2.5)	–9.5	11.7 (± 3.3)	11.3 (± 1.9)	–3.4
Authoritarian	8.7 (± 2.4)	9.5 (± 3.8)	9.2	9.8 (± 1.6)	8.8 (± 2.2)	–10.2	8.6 (± 2.5)	8.9 (± 2.9)	3.5
Demonstrative	14.5 (± 2.1)	13.8 (± 3.7)	–4.8	11.3 (± 2.1)	12.0 (± 2.2)	6.2	11.7 (± 2.9)	11.8 (± 2.6)	0.9
Hyperthymic	15.5 (± 2.8)	15.0 (± 3.1)	–3.2	16.2 (± 2.6)	15.8 (± 2.7)	–2.5	13.3 (± 2.7)	11.3 (± 2.3)	–15.0
Conscientious-pedantic	9.2 (± 2.5)	10.8 (± 3.0)	12.0	11.2 (± 2.4)	10.6 (± 2.6)	–5.4	9.2 (± 3.5)	10.5 (± 3.2)	14.1
Emotional	15.0 (± 3.0)	14.2 (± 3.2)	–5.3	12.6 (± 2.5)	12.3 (± 3.1)	–2.4	11.7 (± 3.1)	11.6 (± 3.2)	–0.9
Labile	10.0 (± 2.5)	10.6 (± 3.1)	6.0	11.1 (± 3.0)	12.6 (± 3.2)	13.5	10.0 (± 2.9)	11.1 (± 3.1)	11.0

firefighters, etc., have a pattern of transformation of chronic fatigue depending on the level of work intensity. At the same time, we have developed approaches to determine the level of emotional burnout to prevent it, taking into account different mechanisms of development of chronic fatigue of specialists. However, we do not have empirical data on the dynamics of levels of emotional burnout in different age groups.

In general, we can note that the change in the adaptation status of winterers in a certain way affected their health in both positive and negative aspects, which allows us to dwell on the price of such changes concerning every subject of the expedition and to dwell on defining the adaptation features which are more effective and painless for each type. Solving these problems requires additional research, which is a promising direction for further scientific studies. Besides, another promising direction of research concerns changes in the microclimate of a group of winterers, which occur under the influence of changes in each member's adaptation status. For example, if the authoritarian type adapts well, then this, in a certain way, affects the emotional state and professional activity of other group members.

Kokun and Bakmutova (2020; 2021; 2022) investigated the psychological features of interaction between members of Ukrainian expeditions in a closed team. The authors identified three areas of communication of winterers during wintering (professional, personal, leisure) and found that during the annual wintering, qualitative and quantitative changes in the indicators of interpersonal relationships occur in a limited team of polar explorers, that is, the subject of Kokun's and Bakmutova's study (2022) differs to some extent from ours.

Studies conducted at Antarctic stations in other countries demonstrate that as a result of life in Antarctic conditions, winterers experience a deterioration in well-being and mood, developing sleep disorders and reduced working capacity (Chen et al., 2016; Khandelwal et al., 2017). Researchers note that extreme working and living

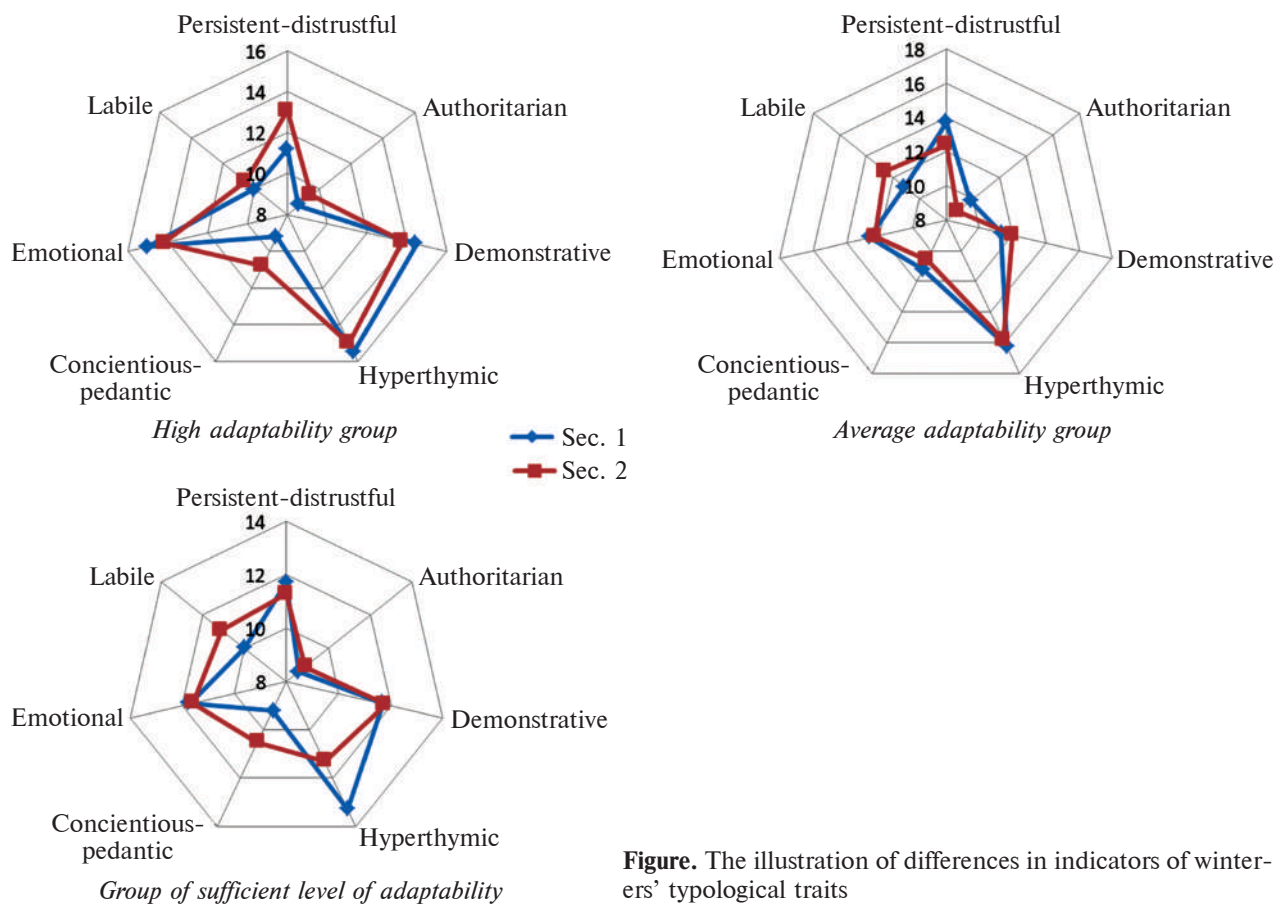
conditions of Antarctic stations, due to low temperatures in the region, increased solar radiation, stormy winds, and the duration of the polar night, negatively affect adaptation processes (Moiseenko et al., 2015).

However, we did not find any studies of adaptation to extreme conditions in the context of age periodization. Our research has proved that the most adapted age group comprises middle-aged people (35 to 45 years): representatives of this group make up about 40% of the participants of the Ukrainian Antarctic expeditions, which indicates a sufficient level of psychological stability in wintering teams (Miroshnychenko & Voznyuk, 2022).

Mehta and Chugh investigated the psychological aspect of motivation for the activities of winterers of Indian Antarctic stations (2011). Scientists have established that an important role in adaptation to extreme conditions is played by such traits of the social sphere of personality that help to adapt to unusual life activities, such as: responsibility for one's actions, cheerfulness, positive outlook on the future, courage, patience, and a friendly attitude towards comrades. This is also confirmed by our data; thus, as a result of our research, it has been proven that the individual's focus on professional duties plays a large role in the process of adaptation to extreme Antarctic conditions (Miroshnychenko et al., 2017).

We also can trace a certain correlation between the type of nervous system and the adaptation capacities of the winterers in the context of their personality type. It should be noted that we have not considered the problem of the relationship between personality type and nervous system type since this requires additional research, which can be quite diverse and complex (Eysenck, 1967; White & Mangan, 1972; LeBlanc et al., 2004; Pickering, 2006; Bijttebier et al., 2009; Drozdovski, 2015). This sphere of study can be a promising perspective for our further research.

It is important to show the gradation of changes in indicators of individual typological traits in winterers in different adaptability groups from



**Figure.** The illustration of differences in indicators of winterers' typological traits

the highest to the lowest state of adaptability (Figure).

The gradation of changes in *the high-adaptability group* (from the highest to the lowest state of adaptability) is as follows: persistent-distrustful → conscientious-pedantic → authoritarian → labile → hyperthymic → demonstrative → emotional.

The gradation of changes in *the average-adaptability group*: labile → demonstrative → emotional → hyperthymic → conscientious-pedantic → persistent-distrustful → authoritarian.

The gradation of changes in the *sufficient-adaptability group*: conscientious-pedantic → labile → authoritarian → demonstrative → emotional → persistent-distrustful → hyperthymic.

As we can see, certain changes in the adaptation status are representative of different typological traits. These changes indicate, first of all, the pro-

cess of changing the adaptation status of the winterers under the influence of extreme living conditions. As we can see, three types (hyperthymic, emotional, demonstrative), which at the first stage of the study showed the highest level of adaptability to ordinary conditions, under the influence of extreme conditions reduced their adaptation status (the adaptability indicators). At the same time, in further research, it is important to identify the index of hemispheric asymmetry of these types, which, according to our observations, are characterised by sufficient activity of the brain's right hemisphere.

While other types (authoritarian, persistent-distrustful, conscientious-pedantic, labile), which at the first stage of the study showed a lower adaptability status than the previous three types, under the influence of extreme living conditions increased

the adaptability indicators. Also, in further research, it is important to identify the index of hemispheric asymmetry of these types, which, according to our observations, are characterised by sufficient activity of the left hemisphere.

This suggests, first of all, that psychological types reveal a tendency to change and develop under the influence of certain (extreme) living conditions, which is expressed in reducing or increasing adaptability indicators. Thus, the prospect of our further research will be to clarify this conclusion that is very important both in the domains of professional selection and professional training.

It is also important to note that some psychological types were not included in the staff of Ukrainian winterers. They are: withdrawn-introverted type (the representatives of this type are dreamers, great originals and often differ from others in their eccentricity and sometimes in their creativity), dysthymic type (the representatives of this type are more often pessimists than optimists), conformal type (this type demonstrates an uncritical attitude to social developments, and often are opportunistic, revealing submission to any authority – both individual and collective ones), anxious type (the representatives of this type are characterised by a low mood, fearing for themselves and their loved ones, being vulnerable and as a rule feeling their inferiority), unstable type (the representative of this type reveal their own value system, they love risk and usually take part in the most dangerous activities). It should be noted that these types show a certain deficiency of such “winterer-typical” traits as responsibility for one’s own actions, cheerfulness, positive outlook on the future, courage, patience, and a friendly attitude towards members of the expedition.

## 5 Conclusions

Our research focuses on the peculiarities of adaptation in closed communities of Ukrainian polar expeditions at the Akademik Vernadsky station, taking into consideration the fact that the adaptive component is one of the most important in

the system of a person’s readiness for activity in adverse/extreme conditions. This conclusion is relevant in the context of the events in Ukraine where a lot of people are in a state of permanent and detrimental distress due to a full-scale war. So, the obtained data in the specific sphere of adaptation of Ukrainian winterers to Antarctic conditions (having been conducted with the implementation of the authors’ methodology for determining the type of character in winterers SCPS) can be extrapolated to a wider range of research.

The study of the psychological characteristics of participants in scientific expeditions to the Antarctic continent plays an important role in predicting professional suitability and adaptation of the wintering individual to extreme environmental conditions. Since the character “pervades” all the main substructures of the personality, the methodology for determining the type of character in winterers should be based on the conclusion that the manifestations of character traits/qualities in the structure of the personality are very important for studying the peculiarities of adaptation of the winterers to extreme environmental conditions. Our research enables us to identify 12 psychological types of character, which are presented in SCPS, namely: persistent-distrustful, authoritarian, demonstrative, hyperthymic, withdrawn-introverted, conscientious-pedantic, emotional, dysthymic, conformal, anxious, unstable, labile.

As our research has shown, adaptation to life in extreme conditions occurs more effectively if the following traits/qualities of certain character types (persistent-distrustful, conscientious-pedantic, authoritarian types) are manifested to a greater extent: perseverance, submission of one’s desires to the goals of team activities, conscientiousness, purposefulness, etc. At the same time, extreme conditions led to a noticeable increase in lability among winterers and a decrease in the indicators of the hyperthymic type (hyperthymic winterers became less optimistic, cheerful, and self-confident). At the same time, the indicators of the authoritarian and persistent-distrustful types decreased (winterers became more adapted to team interaction).

This allows us to come to a conclusion, which, with certain in-depth studies, may acquire a level of psychological regularity: the representatives of different character types characterised by different strength of nervous processes (hyperthymic and authoritarian) adapt to extreme conditions in opposite ways, when the action of extreme factors (according to the Le Chatelier's principle – refer to (Thomsen, 2000)) has an opposite effect on representatives of these character types (Wood et al., 2000; Zimmer et al., 2013). This conclusion is not final and requires further research.

The obtained results concerning the specialists' readiness for life in Antarctic conditions, as well as the corresponding criteria and indicators for its measurement, may be a certain basis for monitoring the quality of professional training of Ukrainian winter residents, thus helping to outline the practical recommendations for identifying their adaptive potential (Leont'eva, 2016), for the prevention of possible diseases. These recommendations can also be useful for the psychological selection of candidates for extreme activities (the Antarctic expeditions, the crews of long-distance ships, submarines, spacecraft, etc.). Theoretically and empirically substantiated provisions of the study can become a basis for solving some scientific and practical problems of psychological science.

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**Методичне забезпечення визначення індивідуально-типологічних особливостей зимівників щодо адаптації до екстремальних умов життєдіяльності**

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**Реферат.** Від рівня професійної підготовки фахівців, які здійснюють професійну діяльність у суворих умовах Антарктиди, залежать перспективи міжнародного співробітництва України з країнами Договору про Антарктику. Мета статті — обґрунтувати доцільність використання психологічних методів для вивчення індивідуально-типологічних особливостей зимівників щодо адаптації до екстремальних умов життя/праці. Завдання дослідження — дати характеристику авторської методики визначення типу характеру зимівників та довести ефективність впровадження авторської методики в психологічний відбір учасників антарктичних експедицій. Дослідження проводили в Державній установі Національний антарктичний науковий центр МОН України, м. Київ, та на станції «Академік Вернадський». Вибірку склали 71 зимівник десяти Українських антарктичних експедицій, вік випробовуваних коливався від 22 до 64 років. Вимірювання показників компоненту адаптації в рамках методики визначення типів характеру зимівників проводили за допомогою онлайн-платформи тестування. Дослідження дає змогу виділити 12 психологічних типів характеру (наполегливо-недовірливий, авторитарний, демонстративний, гіпертимний, замкнуто-інтровертний, сумлінно-педантичний, емоційний, дистимічний, конформний, тривожний, нестійкий, лабільний). Описано кожен із 12 типів характеру з окресленням набору психологічних рис, які необхідно враховувати при аналізі адаптаційних можливостей зимівників до екстремальних умов Антарктиди. Зроблено висновок, який при певних поглиблених дослідженнях може набути рівня психологічної закономірності: представники різних за силою перебігу нервових процесів типів характеру (гіпертимний та авторитарний) протилежним чином адаптуються до екстремальних умов. За таких умов, дія екстремальних факторів має протилежний ефект на представників цих типів характеру, коли дія екстремальних чинників на представників гіпертимного типу знижує їх адаптивні можливості, а на представників авторитарного типу — підвищує адаптивні можливості.

**Ключові слова:** адаптація, антарктична станція, готовність працювати в екстремальних умовах, типи характеру