

Main features of expeditioners'personality traits in Antarctic conditions

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Abstract

Introduction. Determining the benefits of basic human personality traits is one of the main components of the selection and staffing of small groups of peoples that are working in extreme environmental conditions and socio-spatial isolation. These groups include teams of polar explorers, scientists from outlying research bases, ship and submarine crews, and aircraft and space shuttles teams.

Purpose. To identify the prevailing type of temperament of and personal changes in people working on the Antarctic station during a one-year period of isolation to develop measures to maintain their mental and physical health.

Methodology. A total of 48 people (46 men and 2 women aged from 23 to 63 years) from four wintering teams of the Ukrainian Antarctic station (UAS) "Akademik Vernadsky" were voluntarily interviewed according to the Eysenck Personality Questionnaire (EPQ). The poll was conducted twice – before the departure to the Antarctic station and after their return after a year. Participants were studied in two groups (24 peoples) once again after a 6-month stay on the Antarctic station, to determine the level of psychoticism. The research was based on the analysis of preferences and changes in personality traits: Extraversion/Introversion, Neuroticism/Stability, and Psychoticism/Socialization.

Results. Based on the analysis of indicators such as Extraversion/Introversion, Neuroticism/Stability, and Psychoticism/Socialization, we determined the general structure of the personal characteristics of the expeditioners. Indicators of these characteristics showed that more than a third of the expeditioners (36.1%) were pronounced extroverts. A majority (61.1%) of the respondents were characterized by an intermediate between extraversion and introversion, and only 2.8% were pronounced introverts. 58.4% of the respondents were characterized by a low level of neuroticism, while 33.3% were characterized by medium level of neuroticism. Only 8.3% were found to have a high level of neuroticism. Low levels of psychoticism were predominant in 56.3% of the respondents while the remaining 43.7% had medium levels of psychoticism. A high level of psychoticism was absent in the respondents which indicates a psychologically correct selection of the team. Analysis of the dynamics of psychoticism revealed that there were higher growth rates (+0.97) of average indexes of psychoticism during the first 6 months of the expeditioners' stay at the Antarctic station than at the end of the activity. This was due to the "acute adaptation" period when the respondent fit in the natural conditions of Antarctica. Furthermore, there was a development of psychoticism in the expeditioners during the "polar night"; the growth rates of psychoticism decreased after adaptation.

Conclusions. To maintain people's mental health at the Antarctic station, it is optimal to select candidates for a one-year expedition with average rates of extraversion-introversion, and mostly low rates of neuroticism and psychoticism. These personal characteristics must be taken into account when forming an expedition team. The level of psychoticism during the expedition increases under the influence of the adverse environmental conditions of Antarctica and the socio-spatial isolation.

Keywords





adaptation, Antarctic expeditioners, extraversion, introversion, mental health, neuroticism, psychological changes, psychoticism, personality traits, socio-spatial isolation, winter-over syndrome, wintering teams.

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Introduction

On extreme conditions of the Antarctic environment, Palinkas (2002)wrote that «Antarctica is the highest, driest, coldest, and windiest of the earth's continents». The vast majority of this continent is an ice desert, where people are exposed to prolonged low temperatures, high solar radiation (due to opening in the ozone hole), strong geomagnetic disturbances, and the effects of polar day and polar night. Thus, the Antarctic continent is not suitable for human life and activity. These natural factors significantly affect the functional and psychological state of people who work at polar stations under extreme conditions for a long time. As a result, this leads to negative consequences in their physical and psychological state such as deterioration in health, well-being, mood, and performance; and weakening of cognitive functions. The signs of psycho-physiological and psycho-emotional disorders such as chronic stress, anxiety, grumpiness, depression, fatigue, low activity, reduced performance, and violations in the social sphere appear (Romash, 2019; 2020). These disorders are called "winter-over syndrome". Studying the impact of the "winter-over syndrome:" on human health has been repeatedly investigated by many authors: Alfano et al. (2021); Chen, Wu, Li, Zhang, and Xu (2016); Cravalho (1996); Miroshnychenko et al. (2020); Palinkas (2002; 2017); Palinkas, Reed, and Do (1997); Sandal, van deVijver, and Smith (2018); Steinach and Gunga (2021); Suedfeld (1998); Chengli et al. (2003) etc.

Some of them, for example, Chen et al. (2016) and Kuwabara et al. (2021), study the processes of human adaptation to polar conditions. It was universally defined that sleep disorders in Submitted for publication: 03 April 2021 Revised: 10 August 2021 Accepted for publication: 25 September 2021

members of winter teams increase. The study of the regime, quality, and duration of sleep at the Antarctic station are described in Collet et al. (2015); Folgueira et al. (2019); Sandal, van deVijver, and Smith (2018); Shylo, Lutsenko, D., Lutsenko, O., Babiychuk, and Moiseyenko (2020).

Polar expeditioners often note the unwarranted occurrence of headaches and vegetativevascular reactions, and the deterioration of mood and well-being, mostly during the Antarctic winter (Temp, Lee, & Bak, 2017). The influence of seasonality (polar day and polar night) and longterm isolation was studied among the winterers of the Indian expedition to Antarctica (Bhagava, Mukerji, & Sachdeva, 2000).

The team's psychological climate is negatively affected by the limited number of people who are in a small space of the base during the entire year. At the same time, the processes of chronic stress and fatigue progress while the processes of adaptation of psychophysiological functions slow down (Bakhmutova (2020); Mohapatra, Anand, and Raju (2020); Nirwan et al. (2020); Palinkas (1992). This increases the risk of psycho-emotional disorders and contravention of interpersonal interaction. The psychological consequences of isolation and prolonged stays in small expeditionary groups have been studied in Oliver (1979); Mullin (1960); Suedfeld and Steel (2000); Tortello et al. (2020).

The relationship between individual psychological characteristics of people and the emergence of psychosocial issues in small group during isolation on the Antarctic station are presented by Kokun and Bakhmutova (2020; 2021 and Palinkas and Suedfeld (2021).

One of the main components of the psychological selection of a candidate to the UAS "Akademik Vernadsky" is to determine the benefits





of individual psychological characteristics of the expeditioners.

Here, the main criteria are the indicators Extraversion/Introversion, Neuroticism/Stability, Psychoticism/Socialization. The concept of Extraversion/Introversion was developed by Eysenck H. J. (Eysenck, S. B. G., Eysenck, H. J. & Barrett, 1985; Evsenck, H. J. & Evsenck, S. B. G., 1993), where the physiological interpretation of the benefits of Extraversion or Introversion was defined. It is a feature of the central nervous system, which depends on the balance between the processes of excitation and inhibition.

Extraversion/Introversion balance together with more pronounce factor Neuroticism/Stability (emotional-volitional stability or instability) is considered as the main characteristic of the personality. Jung (1995) defined introversion as an "attitude-type characterized by orientation in life through subjective psychic contents", and extraversion as "an attitude-type characterized by concentration of interest on the external object."

Neuroticism is one of the more than wellestablished and empirically validated personality traits. Widiger and Oltmanns (2017) noted that "Persons with elevated levels of neuroticism respond poorly to environmental stress, interpret ordinary situations as threatening, and can experience minor frustrations as hopelessly overwhelming". Numerous studies are currently being conducted to establish the links between these personal qualities and the peculiarities of mental processes (including cognitive processes).

Psychoticism is the third personality trait in the Eysenck personality model and is defined as a personality type that is prone to risk-taking, possibly engaging in anti-social behaviors, impulsiveness, or non-conformist behaviour (Eysenck, S. B. G., Eysenck, H. J., & Barrett, 1985).

Taking such characteristics into account in the recruitment processes to work at the Antarctic station allows to make an optimal selection of team members and the rational use of individual characteristics to effectively perform tasks by each of the expeditioners. Moreover, the presence of high levels of neuroticism and psychoticism can adversely affect the mental health of people. Therefore, we recommend the Eysenck Personality Questionnaire (EPQ) as a necessary tool to maintain the mental and physical health in extreme environmental conditions.

In addition, considered such psychological preliminaries in Antarctica could be demand in the preservation of the mental and psychological health of people in long term cosmic missions (Tortello et al., 2018). Antarctica is seen as a natural laboratory analogue of a space for psychological research. Suedfeld (2018); Suedfeld and Weiss (2000) (as cited in Mohapatra, Anand, and Raju, 2020) stated that "Understanding of human behavior and performance in isolated and confined environment (ICE) has been the area of interest for all those involved in human space program". All of the above confirm the importance of defining and studying the structure of individual psychological personality traits in polar expeditions as a factor of human mental health.

Purpose

The exploration of the predominant type of fundamental personality traits (Extraversion/Introversion, Neuroticism/Stability, Psychoticism/Socialization) is aimed at maintaining mental health, and understanding and predicting changes in the psychological and physiological state of expeditioners.

The aim of study was the assessment of the predominant type of the temperament of people working in Antarctic expeditions and identification of personal changes under the influence of extreme environmental conditions of Antarctica and socio-spatial isolation. Usually, these indicators are recorded using various scales and questionnaires.

Design/Methodology/Approach

An Eysenck Personality Questionnaire (EPQ) was used for the expeditioners of the Ukrainian Antarctic expeditions at the "Akademik Vernadsky" station. The scales measured by the EPQ are: Extraversion/Introversion, Neuroticism/Stability, Psychoticism/Socialization in addition to the Lie Scale (Timo Lajunena & Hanna R. Scherler (March 1999). Extraversion and introversion are typically viewed as a single continuum; therefore, being high in one necessitates being low in the other. This version has 100 Yes/No questions.

Participants and Procedure

This study involved 48 expeditioners (46 men and 2 women; aged 23 to 63 years) from the the Ukrainian Antarctic "Akademik Vernadsky" station who participated in four annual expeditions (12 people in each group) between 2016 and 2020. This Antarctic station is located in West Antarctica on Galindez Island.

The research was conducted on the basis of the State Institution National Antarctic Scientific Center of the Ministry of Education and Science of Ukraine (http://uac.gov.ua/en/) that organizes the annual scientific expeditions to the Ukrainian Antarctic station "Akademik Vernadsky". According to State Special-Purpose Research Program in Antarctica for 2011-2023 (http://uac.gov.ua/en/research-program-en/), this





is main operator in Ukraine for coordination of logistic operation and scientific research in Antarctica.

Statistical Analysis

The Statistical Package for the Social Sciences version 22.0.0.0 was used for statistical analysis. Descriptive statistics (frequencies, mean, standard deviation) and a paired sample t-test were used. We used paired samples because data distributions for all indicators were close to normal (modulo sum of skewness and kurtosis < 1).

Results

According to the EPQ, we diagnosed the severity of individual psychological personality traits after the type of temperament. Based on the analysis of the frequencies of the dichotomous Extraversion/Introversion, indicators Neuroticism/Stability, Psychoticism/Socialization, we determined the general structure and severity of personal characteristics in the sample (Table 1). More than a third of the expeditioners (36.1%) were pronounced extroverts. The majority of respondents (61.1%) were characterized by an intermediate position between extraversion and introversion, and only 2.8% were pronounced introverts (Table 1).

Table 1

The structure of personal characteristics in expeditioners at the UAS "Akademik Vernadsky"

The structure of personal	Levels of personal characteristics (%)			
characteristics	Low	Middle	High	
Extraversion/Intr oversion	2,8	61,1	36,1	
Neuroticism/Sta bility	58,4	33,3	8,3	
Psychoticism/So cialization	56,3	43,7	0	

It is well known that neuroticism is a fundamental domain of personalities with huge public health implications. It was proved that the people with high levels of neuroticism respond poorly to environmental stress, interpret ordinary situations as threatening, and can experience minor frustrations as hopelessly overwhelming (Widiger & Oltmanns, 2017). That is, the benefits of Neuroticism/Stability (a characteristic of emotional instability or resilience) as a personality trait feature that maintains purposeful behavior in normal and stressful (extreme) conditions, which is especially important to consider when selecting expeditioners for long Antarctic expeditions.

According to our results, 58.4% of the Ukrainian expeditioners had a low level of neuroticism, 33.3% were characterized by a medium level of neuroticism, and only 8.3% had a high level of neuroticism (Table 1).

Psychoticism determines the presence of personality traits that are manifested in interpersonal relationships: aggression, impulsivity, aloofness, and antisocial behaviour, indicating a susceptibility to psychosis and psychopathic disorders (https://dictionary.apa.org/psychoticism). Psychoticism is associated not only with antisocial behaviour, but also with aggression. Human psychotic behaviour is characterized by severity, conflict, inattention, carelessness, hostility, anger, egocentrism, and impulsiveness in interpersonal interaction. The psychoticism scale study was conducted only for two groups of UAE winterers with a total of 24 people. This indicator may show the respondent's antisocial behavior, inadequate emotional reactions, high levels of conflict, noncontact, which is unacceptable for work in extreme conditions of group isolation. We found that most of the UAE winterers—56.3%—had a low level of psychosis, and 43.7% possessed a medium level of psychosis (Table 1). High levels of psychoticism were completely absent in the expeditioners. This indicates a psychologically correct selection of the team.

An analysis of the dynamics of psychoticism in two groups (24 people) found that during the first 6 months of the period of "acute adaptation", which coincides with the "polar night" (study D1-D2; Table 2), a higher growth rate (+0.97) of the average indicators (M1-M2) of psychoticism was observed than in the previous 6 months (study D2-D3). This indicates the significant influence of the Antarctic environment and the effect of the body's adaptation processes on the mental health of expeditioners.

Table 2

Dynamics of psychoticism in the group of expeditioners at the UAS "Akademik Vernadsky"

	Indicators of psychoticism in the group				
Dynamics	Mean (M)		Standard Deviation (σ)		(+; -)
Before the expeditio D	M 1	4,58	σ1	2,67	_





Middle of the expedition	D M 2	5,55	σ2	2,42	+0,97
At the end of the expedition	P M 3	6,00	σ3	2,45	+0,45

In the second half of the year, psychoticism increased at a slow rate (+0.45)(Table 2) because the period of psychophysiological adaptation to Antarctic conditions had passed. It should be noted that at the end of the year, the growth of psychoticism remained within the average, which indicates a quality selection of the expeditioners to the team and effective psychological support throughout their period of stay at the UAS "Akademik Vernadsky". Psychological support is provided to prevent the significant progress of psychoticism among team members, as it is one of the methods of maintaining the mental, physical, and psychological health of people living in extreme environmental conditions and long-term sociospatial isolation.

Conclusions (and Future Work)

One of the components of successful and preservation of the mental psychophysiological health of people at the Antarctic station is the knowledge of the structure of personal characteristics of the selected personnel. The predominant group characteristic of the Antarctic expeditioners is extraversion and most of the people in the year-long residence in socio-spatial isolation are extroverts. The last ones contribute to the effective establishment of interpersonal relationships within the group, communication both within the group and with the outside world, demonstrate enthusiasm in professional activities and interaction with the extreme environment of Antarctica.

In well-formed groups Antarctic of expeditioners, a high level of neuroticism is quite rare (8.3% of people). Psychoticism does not reach a high level in spite of growing by the end of a year of wintering. To maintain the expeditioners' health, mental selecting candidates with average rates of extraversionintroversion and low rates of neuroticism and psychoticism is optimal. These personal characteristics must be taken into account at the phase of group formation. The level of psychoticism during wintering is a variable characteristic. Its growth is associated with

changes in the individual's psycho-emotional state during the adaptation and influence of the extreme environmental conditions and sociospatial isolation. The current research has practical and social value, as it is aimed at preventing the development of negative mental states of participants in long-term Antarctic expeditions and the formation of positive social relations in a small isolated group.

Future research may reveal relationships between personality traits and changes in other influences on the freight forwarders' mental health. These are indicators of the emotional state, social relationships, professional vitality, etc. We believe that is advisable to continue to study the peculiarities in psychophysiological changes in the dynamics between those people whose professional activities take place in extreme environmental conditions and expand the methodological basis of research.

Conflict of interest

The author declares that she has no conflict of interests.

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