



## Motivational aspects of wintering in polar stations

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**Abstract:** For over one hundred years, humans have been actively exploring polar regions. At present, each year, several thousand people work at polar stations in the Arctic and Antarctica. Polar stations have unique workplace characteristics; the conditions are classified as isolated, confined, and extreme. This leaves the important question of what motivates people to carry out professional tasks in such a context, particularly during wintering over in a polar station. The current study was designed to answer that question. Eighty-six winterers (22 women and 64 men) from ten different countries described their motivation to winter over. The qualitative approach, thematic analysis, was applied to data analysis. Two coding cycles were applied: initial coding and theming of the data. Fifty-six detailed categories were identified and then grouped thematically, resulting in 17 main categories. The three main motivation categories were challenge and adventure (N = 36), unique experience (N = 16), and performance of the job (N = 15). There were also differences in motivation between explorers from different countries, from Arctic and Antarctic polar stations, from civilian and military polar stations, and between female and male polar expeditioners. Obtained results can be applied to improve selection procedures and better support expeditioners during their stay in the polar station.

**Keywords:** the Arctic, Antarctica, psychological challenges, motivation, winter over.



## Introduction

Humans are present in various extreme environments, some of them with characteristics of isolated and confined contexts (ICE), and much of their current activities would not have been possible even a hundred years ago (Mocellin and Suedfeld 1991; Sandal *et al.* 2006). Military personnel operate underwater in submarines for long months, scientists work in sub-zero temperatures in Antarctica, and space crews live in a gravity-deprived environment with risks related to radiation (Suedfeld 1991; Butters 2017). A unique set of challenges characterizes each extreme environment due to its specific nature. However, without adequate knowledge, cooperation with a wide range of specialists, and the support of technology, humans would not survive in most of these environments (Barnett and Kring 2003). The polar environment is one of the extreme contexts worth paying particular attention to.

The exploration of the polar regions began with the declaration of the Sixth International Geographical Congress in 1895 and was motivated by the desire to discover unknown lands (Rei 2019). Polar expeditions were tasked with discovering and exploring the Arctic and Antarctica (Guly 2012). At present, three groups of people in polar areas can be distinguished: (1) indigenous and migrant residents, (2) participants in sports and travel expeditions, (3) employees of civilian and military polar stations. These groups are exposed to different factors affecting their psycho-physical well-being (Leon *et al.* 2011; Skorupa 2015). This article focuses specifically on representatives of the third group, analyzing the motivational aspects of working in polar stations.

Employees of polar stations spend the most prolonged time in polar habitat research bases (Tafforin 2015). In Antarctica, for example, 33 nations continuously operate one or more scientific stations, totaling 75 units by 2017, of which 39 operate year-round and another 36 only in summer (<https://www.comnap.aq/antarctic-facilities-information>). The population of these stations ranges from 1 to more than 5000 men and women in the summer months (October to February) and from 2 to 1000 in the winter months (March to September). Most of their residents are between the ages of 18 and 60. Comparable stations exist in the Arctic (Palinkas and Suedfeld 2008). Participants in such expeditions are usually researchers in marine biology, astronomy, atmospheric research, meteorology, seismology, geology, and glaciology. They spend most of their time at polar stations, especially in winter, and usually have many of the comforts of modern life, including warm shelter, adequate quality food, the ability to communicate with the outside world, and a variety of leisure amenities like access to a gym, television or books (Palinkas and Suedfeld 2008; Barros-Delben *et al.* 2020).

During long-term missions, people are chronically exposed to many stressors that can negatively affect health, behavior, performance, and even safety (Burns and Sullivan 2000; Sandal *et al.* 2006; Barros-Delben *et al.* 2019; Skorupa 2019).

The conditions in which polar station personnel live and work are referred to as ICE (Sandal *et al.* 2006). The isolation aspect of the ICE environment is understood as separation from family and friends (Palinkas 2003). Loneliness, lack of social and emotional relationships, and loss of standard social rules are the main consequences of this isolation (Barcinski 2014). Factors mitigating isolation may include satellite or Internet connectivity with relatives remaining in the country (Bhargava *et al.* 2000; Bishop 2004), and contact with objects sent to them (Barros-Delben *et al.* 2020). Confinement is understood as the need to stay in a small space, unable to leave the polar habitat entirely freely (Tafforin 2015). At the same time, confinement in isolated small groups implies a lack of privacy (Skorupa 2015).

Moreover, the presence of others in this crowded and restricted space increases the chances of conflict (Bhargava *et al.* 2000; Bishop 2004), and even criminal behavior (Bilder 1966; Mueller and Adler 2004). The extreme is understood as the necessity to pursue life and work activities in unfavorable environmental conditions, exposure to long periods of darkness, moving through rugged terrain such as the risk of falling into a crevasse, and danger from fauna (Décamps and Rosnet 2005; Palinkas and Suedfeld 2008).

On the one hand, polar explorers experience time pressures, lack of autonomy, and rapid changes between periods of high and low workload (Nicolas *et al.* 2016; Skorupa 2019). On the other, the routine of work and the monotony of the social environment, especially in winter, also poses challenges and opportunities (Palinkas 1991). There is additional deprivation of some basic needs, such as sex (Bhargava *et al.* 2000). Also, the exposure to the natural environment can be at the same time stressful and rewarding (Skorupa 2019). The question then becomes what motivates people to work in polar stations facing so many challenges, stressors, and having only some positive outcomes.

Motivation, defined as a psychological phenomenon that regulates and is regulated by autonomy and self-determination, is a multifaceted construct (Ntoumanis *et al.* 2021). The variety of theories of motivation is really large. From the perspective of social cognitive theory, proposed by Bandura, the social environment implies motivation, which is conceptualized as supporting processes that instigate human direction in activities to achieve objectives (Schunk and DiBenedetto 2020). Within the scope of self-determination theory, motivation is a fundamental construct based on aspects inherent to people so that they can grow and learn (Ryan and Deci 2020). Some theories divide motivation into intrinsic and extrinsic. Intrinsic motivation is related to a type of self-determined motivation that generates involvement due to personal satisfaction, by achieving set objectives and goals, even if they are not encouraged by society. Extrinsic motivation is relatively managed by autonomy, in an introjected way and influenced by contingent self-esteem, by the need for approval from third parties, or in an externally regulated way, when there are pressures or rewards for

behavior, such as tangible financial benefits (Ntoumanis *et al.* 2021). Reiss (2000), an author of the theory of motivational sensitivity, even claims that there is no external motivation, all actions are motivated internally. An individual motivational profile should always be considered to understand a person, and for selection for a job, expecting high performance with autonomy.

Although there is a wide variety of theoretical approaches in conceptualizing motivation, and research on motivation has a long tradition, little attention has so far been paid to exploring the motivation of polar station workers. Studies conducted on members of Arctic and Antarctic polar expeditions indicate that those who take part in extreme adventures exhibit high levels of achievement motivation (Leon 1991). As such, they set ambitious goals, take personal responsibility for achieving them, and persistently pursue them (McClelland 1987). Individuals in polar stations on a short-term basis have a higher need for achievement than winterers (Palinkas *et al.* 2008). Even so, polar station workers do not score as high in this regard as, for example, astronauts (Musson *et al.* 2004). Domuschieva-Rogleva and Iancheva (2017) pay attention to safety needs and thrill-seeking, as motivation to participate in an Antarctic expedition. Other researchers even claim that polar station workers motivated by a desire for self-education and self-improvement are characterized by high psychological readiness expedition (Miroshnychenk *et al.* 2020).

One might suspect that polar explorers are also intrinsically motivated because they accept the hardships of the expedition and cope with them effectively. In Domuschieva-Rogleva's (2016) study, it was observed that high intrinsic motivation leads to improved well-being at the end of the expedition. In most cases, however, workers of polar stations reveal mixed motivations. Polar personnel from the Ukrainian Antarctic station *Academic Vernadsky* is directed by three motives: spiritual, *e.g.*, curiosity, idealism, social, *e.g.*, acceptance, desire for competition, and material, *e.g.*, conservation, romantic relationships (Bakhmutova 2023). Members of the Indian Scientific Expedition to Antarctica revealed high achievement motivation. They were success-oriented and meantime derived by extrinsic motivators such as earnings, job promotions, and awards (Mehta and Chugh 2011).

Motivational factors influence human behavior, especially concerning health and safety. Being motivated, people can adjust effectively to the environment. Adequate adaptation strengthens further actions and motivation to persevere longer, *e.g.*, in an unfavorable environment (Yoo *et al.* 2006). However, even highly trained specialists such as polar expeditioners or space explorers can lose motivation when exposed to long-lasting isolation (Stuster 2007). To reduce job dissatisfaction and provide high motivation, job design has been an approach used with promising results, highlighting the model of job characteristics, moderated by the need for growth, satisfaction with the context, knowledge, and skills for achievement at work (Liu *et al.* 2022). It is worth highlighting that motivation is an "invisible" force that can hardly be observed externally, which

requires means to assess with people how motivated they are and for what reasons, defining a set of standard attributes or qualities for each type or context of work. That is why it is extra important to discover what motivates people to perform their work in extreme contexts and how to craft work surroundings to make people continuously motivated to perform their work with the highest attention, to maximize safeties of the particular individual and the whole isolated groups (Barros-Delben *et al.* 2019).

The authors of this paper start from the premise that self-determination theory and intrinsic-extrinsic motivation theories would be the concepts explaining the polar personnel motivation to participate in expeditions. However, the current study is exploratory in nature and it aims to answer the following research questions. (1) What factors motivate people to work in polar stations? (2) Do the motivations of expeditioners from different countries differ? (3) Do the motivations of polar personnel staying in the Arctic or Antarctica differ? (4) Do the motivations of workers of civilian and military polar stations differ? (5) Do the motivations of female and male polar expeditioners differ?

## Material and methods

**Participants and procedure.** — The study was conducted among people who have been at least once in their lives working in polar stations. The research was designed in accordance with the Declaration of Helsinki and was approved by the University of Silesia Research Ethics Committee (approval no. KEUS 156/07.2021). The survey was performed using the LimeSurvey tool and distributed through institutions that bring together people working in the Arctic and Antarctic, such as the International Arctic Science Committee (IASC), Council of Managers of National Antarctic Programs (COMNAP), the Polish Polar Consortium, Association of Polar Early Career Scientists (APECS), the Committee on Polar Research of the Polish Academy of Sciences, the Center for Polar Studies, Universities from Brazil, considering the inexistence of a Polar Brazilian Institute that could concentrate the researchers, and Brazilian Antarctic Program (PROANTAR), which is responsible for the employment of military personnel in Brazilian Antarctic Station. Research questionnaires were also distributed through thematic Facebook groups.

The research analyses presented in this article are part of a larger research project that examined the relationship of selected psychological traits to motivation and adaptation to work in a polar station. The main survey consisted of qualitative and quantitative sections and included people who worked in polar stations on both a short-term and long-term basis. In total, 149 people participated in the study, including 53 women and 96 men. The respondents came from 16 countries. There were 86 winterers among the subjects. Only responses of these participants are presented in this paper, in qualitative manner only.

Among those who wintered at the polar station, there were 22 women and 64 men. The average age of the winterers was 50.16 (min = 29, max = 82, Mdn = 50, SD = 12.99), of which the average age of the women was 44.23 (min = 30, max = 68, Mdn = 40, SD = 10.28) and that of the men was 52.2 (min = 29, max = 82, Mdn = 51.5, SD = 12.26). Among the winterers, there were 58 people with higher education, 25 graduated from high school, and three from vocational school. Among those with higher education, 18 had bachelor's degrees, seven were engineers, 14 held master's degrees, nine had doctoral degrees, five held post-doctoral degrees, and five were professors. The respondents came from ten countries. Respondents most frequently represented Poland (N = 39), the USA (N = 19), and Brazil (N = 18). For a detailed summary of countries of origin, see the OSF repository ([https://osf.io/7qmeb/?view\\_only=26d0b4d0b3e2487196b8f05d58c0781c](https://osf.io/7qmeb/?view_only=26d0b4d0b3e2487196b8f05d58c0781c)). Seventy six respondents wintered in Antarctica and 20 in the Arctic. Of these individuals, ten wintered in both locations. Most of those surveyed have wintered once (N = 63), although there are some respondents who have spent the entire year at the station multiple times (N = 23). A detailed summary of the location and frequency of wintering is depicted in the OSF repository.

Most respondents wintered in civilian polar stations (N = 66). No woman worked year-round in the military polar station (see the OSF repository). Among the respondents, the largest number of people indicated that they worked in the polar station as logistics staff and suppliers (N = 17) and station administrators (N = 15). Twelve people were expedition leaders, technical workers, and meteorologists. Thirty one persons worked in positions other than those that were selectable in the survey. Taking gender into account, the largest number of women indicated that they worked as station administrators (N = 7), and the largest number of men were in logistics and supply roles (N = 13), for more details see the OSF repository.

**Measures.** — All winterers were asked the open-ended question: *Please describe what was the main motivation for you to winter-over at the polar station?* In writing, the polar explorer's answer could be of any length, and there were no restrictions in this regard. Basic sociometric data of the candidates, like age, gender, job position, and place of wintering, were also collected and analyzed in this study.

**Data qualitative analysis.** — The collected material was subjected to thematic analysis, using an inductive approach, *i.e.*, identifying themes on the basis of the statements of the respondents rather than with reference to categories distinguished based on already existing research studies (Braun and Clarke 2006). Although the topic of motivation itself has a long research tradition, the issue of motivation to participate in polar expeditions is relatively rarely explored. Hence, we have explored this phenomenon as presented rather than limiting it to predefined categories that could prove to be non-comprehensive.

The analysis followed the thematic analysis steps indicated by Braun and Clarke (2006). At first, the researchers familiarized themselves with the data by reading it repeatedly. In the second step, they generated preliminary codes by considering the entire data set. The third stage was the compilation of the generated codes into potential themes. In the final stage, the themes were revised, and the final themes were defined.

Due to the diversity of researchers' approaches in terms of the size of the text area to be coded (Elliott 2018), the decision was made to code sentence fragments, which seemed to be the most appropriate given the collected research material, *i.e.*, relatively short answers to the open-ended question. The question answered by respondents directed the entire statement to describe their motivation for participating in the polar expedition. Hence, the analysis was performed at the semantic level (Braun and Clarke 2006). Coding was subject to all respondents' beliefs, emotional states, experiences and behaviors that support the processes of the decision to work in the polar station. We coded what was important about the data in relation to the research question (Braun and Clarke 2006), capturing the essence of the answered question (Saldaña 2012). According to the principles of qualitative analysis, researchers usually arbitrarily recognize the amount of coding (Elliott 2018). A code was accepted when two people agreed on its occurrence in the analyzed passage. Depending on a participant's statement's length and content saturation, more than one motif could be coded in it.

## Results

To answer Question 1, a content analysis of the motivation declarations of polar expeditioners was conducted. Fifty-six detailed categories were identified and then, as a result of data thematization, *i.e.*, code selection to generate a theme (Onwuegbuzie *et al.* 2016), sorted thematically, resulting in 17 main themes for wintering in a polar station. In the response of one respondent, it was possible to identify more than one category, which then saturated the main theme. The three most frequently indicated motives were challenge and adventure ( $N = 36$ ), unique experience ( $N = 16$ ) and performance of the job ( $N = 15$ ). Table 1 contains the full list of main themes and specific categories.

To answer Question 2, the main themes of motivation for year-round work at the polar station were divided by nationality of respondents and shown in Table 2. If there were one or two representatives from a country, their results were merged into the "other" category. Single responses came from France – challenge and adventure motivation, India – performance of the job and scientific experience motivations, South Africa – unique experience motivation, Sweden – a unique experience and fulfillment of dream motivations, and the United Kingdom – scientific experience, curiosity and exploration, and professional development motivations. Two respondents came from Germany – performance

Table 1.

Main themes and specific categories of motivation for wintering.

Main themes	N	Specific motivation categories	N
Challenge and adventure	36	Adventure	18
		Desire to test oneself	12
		Preference for challenges	6
Unique experience	16	Unique experience	6
		Unique opportunity	5
		Life experience	5
Performance of job	15	Fulfillment of work	7
		Element of professional work	6
		Matching professional competencies	2
Scientific experience	12	Scientific research	9
		Scientific curiosity	2
		PhD promotion	1
Personal development	12	Personal development	6
		Opportunity to learn to live with others	3
		Opportunity to live in a small group	2
		New knowledge	1
Curiosity and exploration	12	Exploration of new areas	6
		Exploration of polar regions	4
		Curiosity	2
Fulfillment of a dream	12	Fulfillment of a dream	5
		Fascination with polar regions	4
		Fascination with polar nature	3
Experience polar natural phenomena	11	Experience wild animals	3
		Experience polar winter	3
		Experience polar year-round changes	3
		Experience aurora	1
		Experience glaciers	1
Professional development	9	Professional development	4
		Career advancement	3
		Work experience	2
Financial issues	7	Earnings	6
		Financial support for the family	1
Social context	6	Local tradition	2
		Friends at the station	1



Table 1 – *continued.*

Main themes	N	Specific motivation categories	N
		Meeting life partner at the station	1
		People at the station	1
		Persuasion by others	1
Contributing to a greater cause	6	Opportunity to contribute to the country	3
		Contribution to station maintenance	2
		Nature conservation	1
Life in a specific context	5	Life away from civilization	3
		Life in polar regions	1
		Life in polar station	1
Performance of satisfying job	5	Enjoyment of the job	3
		Performance of an interesting job	1
		Performance of meaningful job	1
Previous experience	5	Previous positive experience	5
Performance of job in extreme contexts	3	Working under unusual conditions	2
		Working in polar regions	1
Other motivations	9	Desire to leave the country	2
		Inspiration from books/films	2
		A feeling that this is something for me	1
		A reason to brag	1
		Loss of employment	1
		Passion	1
		Visit to international stations	1

Table 2.

The main motivation themes for wintering divided by countries.

Main motivation themes categories	N Poland	Share of all Polish responses	N USA	Share of all US responses	N Brazil	Share of all Brazilian responses	N other	Share of all other responses
Challenge and adventure	22	25.29%	8	20.00%	3	9.09%	3	14.29%
Unique experience	5	5.75%	4	10.00%	5	15.15%	2	9.52%
Performance of job	3	3.45%	6	15.00%	4	12.12%	2	9.52%
Scientific experience	9	10.34%	0	0.00%	1	3.03%	2	9.52%

Table 2 – *continued.*

Main motivation themes categories	N Poland	Share of all Polish responses	N USA	Share of all US responses	N Brazil	Share of all Brazilian responses	N other	Share of all other responses
Personal development	3	3.45%	1	2.50%	8	24.24%	0	0.00%
Curiosity and exploration	9	10.34%	0	0.00%	1	3.03%	2	9.52%
Fulfillment of a dream	5	5.75%	3	7.50%	2	6.06%	2	9.52%
Experience polar natural phenomena	7	8.05%	2	5.00%	0	0.00%	2	9.52%
Professional development	3	3.45%	4	10.00%	1	3.03%	1	4.76%
Financial issues	1	1.15%	3	7.50%	3	9.09%	0	0.00%
Social context	3	3.45%	2	5.00%	0	0.00%	1	4.76%
Contributing to a greater cause	1	1.15%	1	2.50%	4	12.12%	0	0.00%
Life in a specific context	5	5.75%	0	0.00%	0	0.00%	0	0.00%
Performance of satisfying job	1	1.15%	2	5.00%	0	0.00%	2	9.5%
Previous experience	2	2.30%	2	5.00%	0	0.00%	1	4.76%
Performance of job in extreme contexts	3	3.45%	0	0.00%	0	0.00%	0	0.00%
Other motivations	5	5.75%	2	5.00%	1	3.03%	1	4.76%

of job, curiosity and exploration, fulfillment of a dream, the experience of polar natural phenomena, performance of satisfying job, and previous experience motivations, and New Zealand – challenge and adventure, social context, and other motivations.

The most frequently indicated motivation among Polish (25.29%), US (20.00%) and other nationality (14.29%) winterers was challenge and adventure while Brazilian polar station workers were looking for personal development (24.24%). What attracts attention is the high representation of scientific experience (10.34%) and curiosity and exploration (10.34%) motives in the Polish sample, performance of the job (15.00%), unique experience (10.00%), and professional development (10.00%) among US participants, and unique experience (15.15%), performance of the job (12.12%) and contributing to

a greater cause (12.12%) in Brazil winterers. Of course, when interpreting data, lack of equal group representations should be also considered.

Division of wintering motivation by place of stay was made to answer Question 3. The group of workers of Antarctic polar stations is dominated by challenge and adventure seeking (20%) while those who wintered in the Arctic and in both types of polar stations reveal more diverse motives representation. However, fewer people stayed all year round in the Arctic and both types of polar stations than in Antarctic facilities. Data distribution can be found in Table 3.

Table 3.

The main motivation themes for wintering including Arctic and Antarctic station profile division.

Main motivation themes	N Antarctic	Share of all responses from the Antarctic	N Arctic	Share of all responses from the Arctic	N Both	Share of all responses from both locations
Challenge and adventure	26	20.00%	4	13.79%	6	27.27%
Unique experience	11	8.46%	2	6.90%	3	13.64%
Performance of job	10	7.69%	2	6.90%	3	13.64%
Scientific experience	8	6.15%	3	10.34%	1	4.55%
Personal development	9	6.92%	1	3.45%	2	9.09%
Curiosity and exploration	8	6.15%	4	13.79%	0	0.00%
Fulfillment of a dream	10	7.69%	2	6.90%	0	0.00%
Experience polar natural phenomena	9	6.92%	2	6.90%	0	0.00%
Professional development	6	4.62%	1	3.45%	2	9.09%
Financial issues	5	3.85%	0	0.00%	2	9.09%
Social context	5	3.85%	1	3.45%	0	0.00%
Contributing to a greater cause	6	4.62%	0	0.00%	0	0.00%
Life in a specific context	4	3.08%	1	3.45%	0	0.00%
Performance of satisfying job	2	1.54%	2	6.90%	1	4.55%
Previous experience	3	2.31%	2	6.90%	0	0.00%
Performance of job in extreme contexts	1	0.77%	0	0.00%	2	9.09%
Other motivations	7	5.38%	2	6.90%	0	0.00%

Also, division by profiles of polar stations, civilian and military, was considered. While answering Question 4, it can be noticed that those who wintered in the civilian station were most frequently looking for challenges and adventure (22.60%) while military station personnel were looking for personal development (21.88%), unique experience (15.63%) and performance of the job (15.63%). Again, the lack of an equal number of subjects in the groups should be taken into account when generalizing the conclusions. Detailed data are included in Table 4. A single respondent who wintered in both types of station, civilian and military, was motivated by personal development, professional development and contributing to a greater cause.

Question 5 focused on the differences between female and male expedition participants in terms of motivation to winter over in the polar station. It was revealed that the top motivations for females were challenge and adventure (20.00%), experiencing polar natural phenomena (12.73%), curiosity and

Table 4.

The main motivation themes for wintering including civilian and military station profile division.

Main motivation themes	N Civilian	Share of all responses from civilian polar stations	N Military	Share of all responses from military polar stations
Challenge and adventure	33	22.60%	3	9.38%
Unique experience	11	7.53%	5	15.63%
Performance of job	10	6.85%	5	15.63%
Scientific experience	12	8.22%	0	0.00%
Personal development	4	2.74%	7	21.88%
Curiosity and exploration	11	7.53%	1	3.13%
Fulfillment of a dream	11	7.53%	1	3.13%
Experience polar natural phenomena	11	7.53%	0	0.00%
Professional development	6	4.11%	2	6.25%
Financial issues	4	2.74%	3	9.38%
Social context	6	4.11%	0	0.00%
Contributing to a greater cause	2	1.37%	3	9.38%
Life in a specific context	5	3.42%	0	0.00%
Performance of satisfying job	5	3.42%	0	0.00%
Previous experience	5	3.42%	0	0.00%
Performance of job in extreme contexts	2	1.37%	1	3.13%
Other motivations	8	5.48%	1	3.13%

exploration (9.09%), and fulfillment of a dream (9.09%). Male expeditioners were mostly motivated by challenge and adventure (19.84%), unique experience (9.52%), performance of the job (8.73%) and personal development (8.73%). There were fewer females than male participants. Full data distribution is covered in Table 5.

Table 5.

The main motivation themes for wintering divided by gender.

Main motivation themes	N Women	Share of all responses from women	N Men	Share of all responses from men
Challenge and adventure	11	20.00%	25	19.84%
Unique experience	4	7.27%	12	9.52%
Performance of job	4	7.27%	11	8.73%
Scientific experience	2	3.64%	10	7.94%
Personal development	1	1.82%	11	8.73%
Curiosity and exploration	5	9.09%	7	5.56%
Fulfillment of a dream	5	9.09%	7	5.56%
Experience polar natural phenomena	7	12.73%	4	3.17%
Professional development	1	1.82%	8	6.35%
Financial issues	0	0%	7	5.56%
Social context	3	5.45%	3	2.38%
Contributing to a greater cause	1	1.82%	5	3.97%
Life in a specific context	3	5.45%	2	1.59%
Performance of satisfying job	3	5.45%	2	1.59%
Previous experience	3	5.45%	2	1.59%
Performance of job in extreme contexts	2	3.64%	1	0.79%
Other motivations	0	0%	9	7.14%

Additional analyses were also conducted in the JASP 0.18.3 program for statistical analysis. The chi-squared test for contingency tables was performed. The comparison was made not on the number of categories entering a given theme but on identifying a given theme in respondents divided into national groups, Arctic vs. Antarctic, military vs. civilian stations, and female vs. male groups. Most of the chi-squared tests were not valid. However, in division by

countries, a relationship has been shown in theme contributing to a greater cause ( $X^2 = 8.452$ ,  $p = 0.038$ ). Brazilians are more likely to be motivated in this way to wintering than representatives of other nations. While divided by Arctic and Antarctic station profiles, there was an observable difference in curiosity and exploration motive ( $X^2 = 7.457$ ,  $p = 0.024$ ) – highest in Arctic polar station workers and performance of job in extreme contexts ( $X^2 = 9.223$ ,  $p = 0.216$ ) – more significant for those who wintered in both contexts. Division by civilian and military station profile revealed further differences. Challenge and adventure ( $X^2 = 5.466$ ,  $p = 0.019$ ) and scientific experience ( $X^2 = 4.022$ ,  $p = 0.045$ ) were motivations more specific for civilian station workers. Personal development ( $X^2 = 7.674$ ,  $p = 0.022$ ) and contributing to a greater cause ( $X^2 = 4.338$ ,  $p = 0.037$ ) are motives that characterize, to a greater extent, employees of the military-profiled stations. For a detailed summary of the chi-squared test, see the OSF repository.

## Discussion

The current study is exploratory in nature and was designed to answer the five formulated questions. The thematic analysis of the polar explorers' motivations for wintering was performed. The results of the qualitative research were also presented in a quantitative form to illustrate the phenomenon that was explored more widely. We fully recognize that this is a practice only some qualitative researchers share (Harding 2013). There should always be caution in making interpretations about the frequency of occurrence of a phenomenon; the fact of frequency of appearance does not imply validity (Saldaña 2012; Creswell 2013).

**Question 1. What factors motivate people to work in polar stations?** The current study revealed various motivations for wintering in polar stations. People tend to look for professional experiences (performance of a job, professional development, performance of a satisfying job, performance of a job in extreme contexts). For some, it is related with scientific experiences; for others, the financial aspect of work plays a crucial role. Also, a job in a polar station can be perceived as an opportunity to contribute to a greater cause. Many polar expeditioners are drawn to wintering by curiosity and the will to explore, the possibility of gaining a unique life experience, or the possibility of life in a specific context. For some, it is an opportunity for personal development and fulfillment of a dream. Frequently, polar explorers are motivated by direct experience of polar natural phenomena. It also happened that people had a favorable social context of engaging in polar expedition, or they had a previous positive experience with short-time stays in the Arctic or Antarctica. The motivations that were discovered in this study, although named slightly differently, are in line with the reflections of Bakhmutov (2023), who

distinguishes spiritual, social, and material motivations, and Miroshnychenk *et al.* (2020), who indicated a desire for self-education and self-improvement as lead motivations.

Considering the results of the current study, challenges and adventure appear to be the most frequent motivation categories. This result coincides with Domuschieva-Rogleva and Iancheva's (2017) research findings, where one of the most commonly identified motivations among polar explorers was thrill-seeking. Thrill-seeking comes with openness to experience, a personality trait that predicts the adaptation of people who direct themselves to extreme environments (Palinkas and Suedfeld 2021). Moreover, the adventure implicit in a polar experience attracts people with curiosity, who often return to expeditions more than once (Reid and Kampman 2020). However, it is important to highlight the contrast between expectations and the real experience. Work in the polar station has some exciting moments, but sometimes, it is not as challenging as imagined. Still, the experience becomes unique when talking about time on the ice.

**Question 2. Do the motivations of expeditioners from different countries differ?** Regardless of the country of origin, the most frequently identified theme in respondents' statements is challenge and adventure. This motivation dominates among respondents from Poland, the US and other countries. However, it is not so common for Brazilians. For them, personal development is a dominant theme. When citing Maslow's theory of needs, we understand culturally independent reasons for placing challenges and adventure and personal development before satisfying professional aspects, external pressures or even financial needs (Aldao and Mihalic 2020). As Domuschieva-Rogleva (2016) previously observed, intrinsic motivation can even be connected with the general well-being of polar expeditioners.

Notwithstanding the above similarities, some motivations for wintering are identified according to the polar explorer's country of origin. Among Poles, the frequently indicated motivation is scientific experience, which is not reflected among polar explorers from the US and Brazil. Those from the US and countries other than Poland and Brazil are proportionately more likely to indicate performance of job as a motivation. Brazilians are distinguished from other nations by their aforementioned desire for personal development through wintering. These results indicate national characteristics that are probably also related to the profiles of the stations managed. Interestingly, considering only the occurrence of a given theme and not its saturation by categories, the contributing to a greater cause theme turns out to be the only significant difference between the national groups highlighted in the study. This theme most strongly distinguishes Brazilians from other nations.

Another aspect worth noticing is that the full range of motivations can be identified among Polish polar station workers. In contrast, the US winterers did not mention scientific experience, curiosity and exploration, life in a specific context, or job performance in extreme contexts even once. The Brazilian group also reveals a unique motivational profile. There were no indicated themes such

as the experience of polar natural phenomena, previous experience, social context, life in a specific context, performance of the satisfying job, or performance of the job in extreme contexts. Research on the impact of national culture on how people adapt to living and working in polar stations has already been conducted, *e.g.*, by Palinkas *et al.* (2004) and Nicolas *et al.* (2016). Cross-cultural differences are definitely an area worth further exploration in the context of polar expeditions. They can influence pre-expedition training and provide support during the expedition.

**Question 3. Do the motivations of polar personnel staying in the Arctic or Antarctica differ?** The polar context is perceived as environmentally exceptional. The unique and, for many, last opportunity, considering the effects of climate change, is attractive and motivates people to reach the Arctic or Antarctica (Frost and Frost 2022). However, when the motivations are analyzed from the perspective of work in polar stations, the polar contexts of the north or south, some differences between the Arctic and Antarctica are striking. Those who wintered in Antarctica and both locations are, proportionally, most frequently motivated by the challenge and adventure. Maybe, it is because Antarctica is a continent, the last to be discovered by human civilization on Earth and the only one without native populations, which differs it from the Arctic in countless ways (Hughes *et al.* 2021). Polar stations or forms of human habitats share characteristics, such as installations that guarantee heating to withstand the extreme cold and that support the strong winds in both regions (Tafforin 2015), but the geographical proximity and ease of navigation in the Arctic may create different imagination of the place for those heading for wintering there. The most saturated themes for those who wintered only in the Arctic were challenges and adventure, but not as high a percentage of indications as in the Antarctic and both location cases, curiosity and exploration, and scientific experience. Interestingly, there were no motivations as financial issues, contributing to a greater cause, and performance of job in extreme contexts indicated. The range of answers is even more limited for those who have wintered in both contexts.

Considering only the occurrence of a given theme and not its saturation by categories, there are only two significant differences. Winterers from the Arctic are more often driven by curiosity and exploration, and those who wintered in both polar regions are more frequently motivated by the performance of job in extreme contexts. Those who have wintered in both places likely associate professional work with this activity. Moreover, they have probably adapted well to polar conditions (Reid and Kampman 2020). Perhaps the relatively greater accessibility of the Arctic (Frost and Frost 2022) allows the need for curiosity and exploration to be realized there, more so than in remote Antarctica.

**Question 4. Do the motivations of workers of civilian and military polar stations differ?** The motivations are even more different when evaluating responses compared to civilian and military station workers populations. Considering theme saturation, civilians reported challenges and adventure more



frequently than military stations personnel. For those in the armed forces, notably in Brazil, the most significant motivating factor is personal development, followed by a unique experience and work performance. Military station workers indicated proportionally more frequently financial issues and contributing to a greater cause as a motive. These results are also in line with earlier studies by Leon (1991), who pointed to the important role of achievement motivation in polar explorers. Also, it is consistent with intrinsic motivation as the leading theory of this proposal, as it consists of a search for fulfillment, even in the professional or financial sphere. Mehta and Chugh's (2011) studies further show that those, who were achievement-orientated, were also derived by extrinsic motivators such as earnings or job promotions. However, this extrinsic application suggests the mediation of self-determination to achieve the career objective.

Considering only the occurrence of a given theme and not its saturation by categories, there are a few significant differences in motivations. It is confirmed that civilian employees are more motivated by challenges and adventures, as well as personal development and contributing to a greater cause, the latter being more characteristic of military personnel. There is also a difference in scientific experience, as this motivation is more significant for civilian station workers. As Kjærgaard *et al.* (2013) point out, the main goals of military teams are based on work rather than adventure and achievement. For understandable reasons, in the current study, the military does not consider the scientific experience as a motivation for wintering, as they are a logistical staff, nor do they mention the natural polar experience of the phenomenon or the interest in the social context, life in a specific context and the performance of a satisfying job. However, the differences between civilian and military personnel at polar stations should be considered, for example, when developing support and intervention programs.

**Question 5. Do the motivations of female and male polar expeditioners differ?** In the studied group, female and male participants were equally frequently motivated by challenge and adventure. Mostly, motivations to winter over in polar stations revealed by both sexes are comparable; however, some differences can be identified. Male participants are more frequently hired in polar stations in scientific positions, so they look for scientific experience more often. Also, personal development and professional development are more characteristic motives for men. What is also striking is that female polar expeditioners have not even once indicated financial issues as a motivation. The proportion of respondents mentioning experience of polar natural phenomena is higher in the women group than among men. Most importantly, differences between female and male polar workers appear only when saturation of themes is analyzed. Considering only the occurrence of a given theme, no single significant difference was indicated. This indicates that the male and female groups may be more similar in terms of wintering motivation than previously assumed.

Some differences between female and male participants of polar expeditions are natural consequences of physiological aspects (Strewe *et al.* 2019). Other

differences are inextricably linked to the social perception of gender roles and attributed to those behaviours and expectations. Although heterogeneous groups are recommended for adaptation, the issue of sexual harassment, discussed mainly in recent years after the global #metoo movement, has been a problem since the insertion of women in the polar context (Nash 2021). Findings show that single-sex and gender-mixed expedition groups function differently. The presence of women can cause competition, frustration, or increased sexual tension (Sandal *et al.* 2006). Understanding the similarities and differences in the factors that motivate men and women to participate in polar expeditions can help manage gender-mixed groups. It can also be an excellent point to start from during the introduction of equality, diversity, and inclusion training.

## Conclusions

The declaration of the Sixth International Geographical Congress in 1895 began the era of polar expeditions, which was fueled by the desire to explore territories such as the Arctic and Antarctica. Although more than a century has passed, people are still interested in living and working in the polar regions, including the experience of polar winter. The purpose of this study was to answer the question of what exactly motivates people to stay in polar stations year-round. Obtaining an answer to such a question is of great practical importance. It can translate into the appropriate selection of expedition participants, better profiling of pre-expedition psychological training and the creation of intervention programs for people staying at polar stations.

The current study found various motives that attracted people to work at polar stations, although the most common category was challenge and adventure. The nationality of polar explorers and, to some extent, their gender also seems to matter. Although many similarities were found, people classified according to the two above categories also differ in motivational aspects. This knowledge is particularly important when managing mixed-gender and mixed-nationality teams. Also, some differences in the motivation to participate in an expedition are observed between people working in the Arctic and Antarctica, as well as in stations with a civilian and military profile. Awareness of these differences can allow even better profiling of employment offers or job advertisements so that employees are more adequately matched to the context in which they are to carry out professional tasks.

Of course, the present study is not free of limitations. In the future, it would be worth reaching out to an even broader population of respondents and striving for intergroup comparisons conducted on equal populations. It would also be worthwhile to include even more representatives of different nationalities and to measure motivational aspects quantitatively, not only qualitatively.

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