REVIEW





Psychological factors associated with deployment in Arctic areas: a narrative review of the relevant literature

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Abstract - Today, more than ever, the Arctic is a destination for people, research, territories and interests; over the years, several explorers have set out for these regions, as well as many international powers seeking to dominate these territories. The aim of this work is to provide a literary overview of the psychological factors involved in the employment of personnel, including military personnel, in the Arctic. The research was conducted through a narrative review of the literature; this method involves a subjective selection of the primary studies most relevant to the area of interest found in various databases. The research has made it possible to highlight some of the psychological aspects that characterise employment in Arctic contexts; these emerge from various studies conducted mainly on civilian population samples. It is therefore important to take these aspects into account by implementing a series of interventions in the pre-deployment phase of personnel working in various capacities in Arctic contexts, as well as targeted interventions during deployment.

Keywords: Psychological Readiness; Armed Forces; Cognitive Decline.

Key messages:

- Pre-deployment interviews in Arctic environments would positively influence the correct deployment of military personnel
- Adequate training is one of the tools for self-management of risks or adverse events for personnel deployed in Arctic environments.

Introduction

As part of the research activities undertaken for the deployment of units to Arctic areas, it was considered important to provide a literary contribution on the possible psychological aspects that characterise such a deployment, to conduct a literature review on the subject and to propose a training guide for personnel. When operating in the Arctic, Canadian rangers are accustomed to using the word 'Inuktitut - ihuna', which can be translated as wisdom, reason and knowledge, aspects which they consider essential to the acquisition of individual skills for survival in the Arctic, as well as the ability to lead others in this particular environment (1).

The Arctic context is generally considered to be a 'hostile' environment in which to operate professionally requires adequate training that takes into account both psychological and military behavioural aspects, the latter analysed by Goldemberg (2) who describes the military as the sum of human behaviour. The foreword to Directive 7021 'Training of Commands and Units in the Three-Year Period 2022 - 2024, Ed. 2022', the Chief of the Army Staff states: 'If we reflect on the profound meaning of being a soldier, we will find at the core that our reason for existing is that we are called to respond. And in order to respond, we must be trained, prepared and ready. Another important aspect referred to in the above-mentioned Directive is the creation in the soldier of the appropriate mental attitude and coping skills needed to consciously face and manage real operational events.

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It is therefore important to bear in mind that during training and military operations in Arctic contexts, exposure to extreme stressors such as temperature and humidity can induce levels of physiological tension and stress that degrade cognitive and physical capabilities, threaten health and safety, and affect behaviour and performance (3).

Stress, in its positive form of eustress, is beneficial to performance; however, there is a line that should not be crossed as it represents the boundary between a functional and a dysfunctional response (4). Exceeding this limit risks undermining both individual work and group functioning, an aspect that must be taken into account particularly in the military context, where teamwork is a key element (5).

Materials and Methods

The purpose of this article is to present the state of the art in the analysis of the psychological and behavioural impact on military personnel operating in Arctic contexts, places where climatic factors, environmental constraints, and interpersonal relationships determine daily life and influence the operational readiness of each soldier.

A narrative review of the literature was conducted as a synthesis method to provide an overview of the psychological factors that characterise the deployment of military personnel in an Arctic environment. The review was conducted through a subjective selection of the primary studies most relevant to the area of interest found in the databases.

Once the research question had been identified, the PICO method was applied in order to focus and correctly analyse the possible content to be reviewed.

The review was carried out by consulting

the AGU, APA; Cambridge University; Press; The Lancet; PubMed; ScienceDirect databases using the following keywords: "polar expeditions"; "psychological effects"; "military"; "personality"; "isolated"; "psychological studies" and Boolean AND/OR operators. Articles in Italian, English and Spanish were included in the search, and both experimental and non-experimental studies were considered according to the research topic. Most of the available studies were conducted on samples from the civilian population; in fact, there are few and very old studies on the phenomenon in the military sphere; furthermore, the review method used is characterised by a high risk of bias (6) due to the use of non-peer-reviewed research criteria.

Results

The PICO model is used to report and analyse the relevant studies in a structured way. *(Tab. 1).*

A total of 25 (twenty-five) articles were identified within the above databases on the basis of the keywords entered and combined.

An analysis of the included literature shows that the majority of the articles deal with civilian personnel working in the Arctic, while there are only a few studies dealing with the topic from a military perspective.

Focusing the analysis in the military context, as described in a number of articles, including Nunneley, S. A., & Stribley, R. F. in 1979, and the psychological resilience of a military member, which combined with his or her level of training, experience, physiological fitness, behaviour, equipment and leadership effectiveness, influence the ability to cope with operational stress. For the military, success means not just surviving, but adapting to the cold to maintain effectiveness.

Among the studies carried out in the military, it is important to recall the study by Gunderson, E., & Kapfer, E. in 1966, who, using as a study sample 600 American sailors and scientists deployed on Arctic missions, demonstrated how conducting a targeted interview of participants in military operations in Arctic contexts can be a good way to understand whether the individual is adequate for that specific activity, being the right person to be placed in the right place.

In 2019, Martin, K., McLeod, E., Périard, J., Rattray, B., Keegan, R., & Pyne, D. B., conducted a study highlighting the existence of both improvements and deteriorations in cognitive performance due to cold weather. The same study showed that performance in military activities, such as target detection, is not negatively affected by cold weather.

Discussion

These include the work of Marrao (10), Makinen (11), Adam (12), Spitznagel (13), Muller (14) and Taylor (15), who have shown how exposure to excessively cold temperatures can affect the cognitive processes required to perform simple and/or complex functions.

The polar environment is characterised by isolation and confinement; depending on the location and time of year, personnel may be isolated from the outside world, with darkness and weather conditions restricting movement.

The study conducted by Muller (16) has allowed the analysis of cold stress in a number of work contexts, including the military; further studies on the subject by Patil (17), Palinkas (18) and Flouris (19)

Autore	Titolo dell'Articolo	Fonte
Adam G. E., C. R.	Hydration effects on cognitive performance during military tasks in temperate and cold environments.	Physiol. Behav., 748-756.
Ellis,H. D.	The Effects of Cold on the Performance of Serial Choice Reaction Time and Various Discrete Tasks.	Human Factors, 589-598.doi: 10.1177/001872088202400509
Enander	Effects of moderate cold on performance of psychomotor and cognitive tasks.	Ergonomics, 1431-1445.doi: 10.1080/00140138708966037.
Flouris AD, W. D.	Thermal balance effects on vigilance during 2-hour exposures to -20 degrees C	Aviat Space Environ Med., 673-679.PMID: 17679564
Goldenbe G. I.	Military behavioural sciences: An introduction.	In A. Sookermany (Ed.),Handbook of mili- tary sciences.
GundersonE. &.	The Predictive Validity of Clinical Ratings for an Extreme Environment.	The British Journal Psychiatry,405- 412doi:10.1192/bjp.112.485.405
Hodgdon JA, H. R.	Norwegian military field exercises in the arctic: cognitive and physical performance.	Arctic Med Res., 132-136.PMID: 1811568
Kavanagh.	Stress and Performance A Review of the Literature and its Applicability to the Military.	apps.dtic.mil/sti/citations/ADA439046
Lajeuness E, A. &.	Canadian Armed Forces Arctic Operations, 1941-2015 Lessons Learned, Lost, and Relearned.	Gregg Centre.
Lawrence A Palinkas, P. S.	Psychological effects of polar expeditions.	The Lancet, 371(9607), 153-163.doi: 10.1016/S0140-6736(07)61056-3
Mäkinen T. M., P. L.	Effect of repeated exposures to cold on cognitive performance in humans.	Physiol. Behav, 166-176.doi: 10.1016/j.physbeh.2005.09.015
Marrao C., T. P.	Physical and cognitive performance during long-term cold weather opera- tions.	Aviat. Space Environ. Med, 744-752.
Martin, K. M.	The Impact of Environmental Stress on Cognitive Performance: A System- atic Review.	Human Factors, 1025- 1246.doi:10.1177/0018720819839817
Muller M. D., G. J.	Acute cold exposure and cognitive function: evidence for sustained impairment.	Ergonomics, 792- 798.doi:10.1080/00140139.2012.665497
Nunneley, S. A.	Heat and acute dehydration effects on acceleration response in man	Journal of Applied Physiology, 197-200.
Palinkas L. A., M. T.	Influence of seasonally adjusted exposure to cold and darkness on cogni- tive performance in circumpolar residents.	Scand J Psychol, 239- 246.doi:10.1111/j.1467-9450.20
Palinkas, L. A.	Going to extremes: the cultural context of stress, illness and coping in Antarctica.	Social Science & Medicine, 651-664.
Patil PG, A. J.	Effects of a cold-water stressor on psychomotor and cognitive functioning in humans.	Physiol Behavdoi:10.1016/0031- 9384(95)02071-3.
Rosen L, K. K	Prevalence of seasonal affective disorder among U.S. Army soldiers in Alaska.	Mil Med, 581-584. PMID: 12125852
Shurley JT, P. C.	Sleep and activity patterns at South Pole station. A preliminary report	Arch Gen Psychiatry, 385-9.doi:10.1001/ archpsyc.1970.01740290001001
Spitznagel M. B., U. J.	Cognitive function during acute cold exposure with or without sleep deprivation lasting 53 hours. Aviat. Space Environ	Med. , 703-708. doi:10.3357/ASEM.2
Sullivan-Kwantes, W. C	Environmental Stress in Military Settings. In: Sookermany, A.M. (eds) Handbook of Military Sciences	Springer, Cham. doi:10.1007/978-3-030- 02866-4_107-1
Taylor L, W. S.	The Impact of Different Environmental Conditions on Cognitive Function: A Focused Review	Physiol. 6:372.doi: 10.3389/fphys.2015.00372
Taylor L., F. N.	Exposure to hot and cold environmental conditions does not affect the decision making ability of soccer referees following an intermittent sprint protocol	Physiol., 5:185.doi:10.3389/fphys.2014.00185
Teichner, W. H.	Reaction time in the cold	Journal of Applied Psychology, 54- 59.doi:https://doi.org/10.1037/h0049145

Tab. 1 - Results from articles based on the PICO model.



have shown how reductions in ambient temperature can have a negative impact cognitive functions, reducing on memory, reaction time and vigilance. At the 'core' of this phenomenon is the traditional theory of cold-induced cognitive impairment (20, 21, 22, 16) and the distraction theory (20), which explains how exposure to cold provides alternative stimuli to interrupt the concentration that would otherwise be fixed on the cognitive task at hand; specifically, attention is focused on the sensation of cold rather than on completing the cognitive task at hand.

An article published in THE LANCET in 2008 entitled "Psychological effects of polar expeditions" by Lawrence A. Palinkas (23) lists the most common symptoms experienced by people on polar expeditions, including sleep disturbance, impaired cognitive performance, affective difficulties and interpersonal conflicts. Considering the relevance of the literature on this topic, it is important to bear in mind that military personnel involved in Arctic activities may also experience the above-mentioned phenomena, the effects of which can only be mitigated by adequate training correlated with primary (educational) and secondary (supportive) psychophysical prevention.

The literature on sleep disturbances in Arctic expeditions is very extensive; Shurley (24) points out that there are difficulties in falling asleep and/or staying asleep; moreover, the studies referred to have generally shown a significant reduction in sleep and its quality. These problems are linked in all the studies analysed to the disruption/alteration of circadian rhythms in both summer and winter due to increased exposure to light/darkness. In addition to theories of cognitive

impairment and distraction, research has found a localised deficit only on certain tasks of a memorising nature, increased suggestibility and the occurrence of spontaneous escape states. In the military field, research by Hodgdon (14) on a sample of military personnel in the Norwegian Army, investigating the retention of certain skills in the Arctic environment, including rifle shooting and cognitive performance, found that shooting performance was not affected, while there was a detectable deficit only in memory on cognitive tests.

Research conducted and referred to in the article (25) suggests that affectivity, anxiety and irritability are some of the common aspects of those who find themselves operating in Arctic contexts.

In a study conducted on the American Army stationed in Alaska, Rosen (26) analysed the existence of 'Seasonal Affective Disorder' in soldiers deployed in the area and her results show an incidence of comorbidity with depression in the onset of the disorder.

Specifically, Seasonal Affective Disorder (SAD) was first defined by Norman E. Rosenthal in 1984 and is now described in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as recurrent major depressive disorder with a seasonal pattern.

Melrose noted in 2015 the symptoms of the winter form of the disorder, which focus on sad mood and asthenia. Sufferers of seasonal affective disorder may feel sad, irritable and cry frequently; they are tired and lethargic, have difficulty concentrating, sleep more than normal, lack energy, decrease their activity level, avoid social situations, crave carbohydrates and sugar, and tend to gain weight through overeating. In contrast, symptoms of the less common summer pattern of the disorder include loss of appetite with weight loss, insomnia, restlessness, anxiety, irritability and even episodes of aggressive behaviour. This raises the possibility that use in Arctic contexts may increase the incidence of depressive symptoms, in association with sleep disturbance, psychosocial stress of the context and exposure to long periods of cold/darkness.

The literature on this subject focuses on the conflictual aspect due to the atypical activity of workers in arctic contexts and the age of the work group formed for this requirement (18).

This situation, already known in the military field, will hopefully be overcome by adequate training of the operating personnel, as required by the relevant directives, in order to create the 'amalgam' necessary for joint and synergistic cooperation in operations.

Conclusions

There are several responses we can offer to combat cold stress, from the most common, behavioural ones, such as lighting a fire or using professional thermal equipment, to more specific ones, such as taking supplements like tyrosine and caffeine to combat the negative effects of cold.

To combat and prevent the effects of cold on the psycho-physical functions of personnel during military operations, it is necessary to take into account more specific factors such as sleep deprivation, the onset of emotional difficulties and the specific aspects of the context in which they operate.

These conditions require an analysis of the context in which they occur in order to be able to act in a targeted manner in the field. Equally important is the selection of operators, their education and



training on these issues of a psychophysiological nature; in this respect, the study conducted by (Kavanagh, 2005) provides important insights to help personnel recognise the signs/symptoms of overexertion due to the Arctic environment and initiate behavioural changes themselves to mitigate these phenomena. It is therefore considered that in addition to considering and designing specific interventions to support and accompany personnel working in Arctic contexts, it is equally important to provide adequate preparation through specific training sessions to enhance specific training aimed at better preparing personnel.

Disclosures:

The Author declares that he has no relationships relevant to the contents of this paper to disclose.

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