# Examining The Relationship Of Altitude Sickness And Psychological Wellbeing: Implications For Military Personnel

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**KEYWORDS**
High-altitude, Stress, Effective coping strategies, Military Personnel

**ABSTRACT**
The Indian Army, renowned for its valour and resilience, operates in diverse terrains, including high-altitude regions such as the Himalayas and the Siachen Glacier. High altitude stress is the physiological and the psychological stress level that can be a consequence of the extremely low levels of temperature at the high-altitude areas where our military personnels are deployed for the safety, security and smooth running of our own country. This is a correlational study. A total of 60 participants within the age range of 22-year-old to 50-year-old participated in this study. The High-Altitude Stress (HAS) questionnaire was used to assess the variables. The scale consists of 25 items with responses marked on a 5point Likert scale. The data was analysed using One-Way ANOVA analysis for proving the rst hypothesis and the Pearson product moment correlation was performed for proving the second hypothesis. The results indicated that a highly signi cant difference between stress levels in extreme weather conditions ($F(1, 116) = 2942.47$, $p < 0.001$). The correlation between age and coping strategies was also − 0.10 ($r = -0.10$), but it was not statistically signi cant ($p = 0.003$), suggesting a small negative relationship between age and the use of coping strategies. The hypothesis that extreme weather conditions signi cantly impact stress levels during deployments in high-altitude areas is accepted. There were no strong correlations among the age and effective coping strategies, indicating that the second hypothesis was rejected.

## Introduction

The Indian Army, renowned for its valour and resilience, operates in diverse terrains, including high-altitude regions such as the Himalayas and the Siachen Glacier. These areas pose formidable challenges due to their extreme weather conditions, treacherous terrain, and oxygen-deprived atmosphere. Despite these adversities, the Indian Army remains steadfast in safeguarding the nation's borders and preserving its sovereignty.

High-altitude environments present unique challenges that can signi cantly affect individuals, particularly those engaged in demanding occupations such as military service. The physiological and psychological stressors associated with high altitudes can have profound implications for the well-being and performance of military personnel deployed to such regions (Smith et al., 2018; Hennis et al., 2020). Understanding the impact of high- altitude stress on military personnel is crucial for developing effective strategies to mitigate its adverse effects and enhance operational readiness. This study also makes an effort towards understanding the interplay of physical, physiological and psychological stressors of high-altitude areas on military personnels.

At high altitudes, individuals are exposed to lower levels of oxygen, decreased air pressure, extreme temperatures, and unpredictable weather conditions. These environmental factors can lead to altitude sickness, characterized by symptoms such as headaches, nausea, dizziness, fatigue, and insomnia. Moreover, prolonged exposure to high-altitude environments during military deployments can exacerbate these symptoms and contribute to heightened levels of stress among personnel. Extreme weather conditions further compound the challenges faced by military personnel in high-altitude areas. Harsh weather phenomena such as blizzards, high winds, and sudden temperature uctuations can exacerbate stress levels and jeopardize mission effectiveness.

Rajesh et al. (2021) mentioned in his study, “Deployment at extremely high-altitude areas for even three months produces signi cant psychological morbidity among troops.” Since, they are exposed to

harsh weather conditions like very low temperature, high degree of solar ultra violet radiation and strong winds especially in the western Himalayas and the terrain is extremely di cult and hostile, leading to several physical and psychological stresses.

To evaluate these hypotheses, a comprehensive survey instrument was developed to assess various dimensions of high-altitude stress among military personnel. The survey includes questions related to the frequency of altitude sickness symptoms, the impact of extreme weather conditions on stress levels, the utilization of coping strategies, perceived social support, and overall well-being during deployments in high altitude areas.

In summary, the impact of high-altitude stress on military personnel is a multifaceted phenomenon that warrants comprehensive investigation. By understanding the interplay between physiological, psychological, and environmental factors, we can develop evidence-based strategies to mitigate the adverse effects of high-altitude stress and optimize the performance and readiness of military forces deployed to such regions. This research seeks to contribute to the body of knowledge in this area and provide actionable insights for military organizations and policymakers tasked with safeguarding the health and effectiveness of personnel operating in high altitude environments.

## Literature Review

Rajesh et al. (2021) conducted a “Study of psychological effects of deployment at extreme high-altitude areas on soldiers.” In this study, two screening tools were administered on the military troops namely, the General Health Questionnaire-12 (GHQ-12) and Armed Forces Medical College Life Events Scale (AFMC LES) to assess their mental health status. The 334 troops selected for deployment at extremely high-altitude areas during the second half of 2017 were selected for this study. It was observed that within 3 months, the scores on both the tools showed signi cant increase indicating deterioration in the military troops’ psychological health status.

McLaughlin, Skabelund, and George (2017) provide a comprehensive review titled "High-Altitude Impact on Military Operations: Physiological Changes, Disease Implications, and Medical Evacuation Challenges," which addresses the unique challenges posed by high-altitude environments in military settings. The authors aim to summarize the physiological changes occurring at altitude, examine altitude-related diseases' impact on the military population, and assess the challenges of high-altitude exposure during medical evacuation of combat trauma. Recent ndings underscore the signi cance of high-altitude exposure on mission readiness, with reports indicating its potential risk to mission success. Altitude-related diseases such as high-altitude headache and acute mountain sickness have affected war ghters in various operational contexts, prompting the use of prophylactic measures like acetazolamide and dexamethasone to alleviate symptoms. Despite inherent risks, studies suggest that long-range high-altitude transport of critically ill patients is both safe and effective. The primary driver of altitude-induced physiological effects is hypobaric hypoxia, which adds complexity to caring for critically ill patients in high-altitude environments. Heightened awareness of altitude-related diseases is essential for optimizing healthcare delivery to wounded warriors, highlighting the need to integrate altitude considerations into medical protocols for both altitude-related and non-altitude-related illnesses.

In their study titled "Syndrome of Acute Anxiety Among Marines After Recent Arrival at High Altitude," Sracic et al. (2014) investigate the occurrence of acute anxiety syndrome in Marines shortly after their arrival at high-altitude locations. The study reveals a signi cant prevalence of this syndrome among Marines, highlighting the need for early identi cation and proactive management strategies to mitigate its impact on individual Marines and unit readiness. By addressing the psychological challenges associated with altitude exposure in military settings, the study underscores the importance of comprehensive psychological support and resilience training to enhance servicemembers' readiness and well-being in high-altitude environments.

Sharma and Chaube (2013) conducted “A Study of the Psychological State of Military Personnel Working in Extreme Environmental Conditions.” In this review paper, they mainly focused on factors like cold weather environment, hot weather environment, water adequacy, workload correlation

(Workload or training activities must be adapted to environmental heat stress conditions), rest periods, Salt intake (Sodium intake must be maintained in hot weather) and humidity. They also reviewed a few studies in order to draw conclusion on the research problem. On the basis of the studies and literature available, it was concluded that the extreme weather conditions and distance from family results in feelings of loneliness and depression in military personnel. This loneliness affects their physical and emotional health which impacts their work performance also.

Lemos, Antunes, dos Santos, Lira, Tu k, and de Mello (2012) investigate the effects of high-altitude exposure on sleep patterns, mood, and cognitive functions. Their study highlights that such exposure leads to impairments in these crucial domains, indicating a signi cant challenge for individuals operating at high altitudes, including military personnel, mountaineers, and aviation professionals. The ndings underscore the importance of understanding and mitigating the adverse effects of altitude on sleep, mood, and cognitive performance to ensure the well-being and operational effectiveness of individuals in high-altitude environments. This study contributes valuable insights to the existing literature, emphasizing the need for targeted interventions and strategies to support individuals exposed to high altitude in maintaining optimal sleep, mood, and cognitive functions.

Jayaswal et al. (2001) conducted a study on, "Health and Performance of Military Personnel in the Cold Climatic Environment of the Western Himalayas." It focuses on aspects of military life like isolation, monotonous terrain, constant threat from environment and enemy and lack of communication are some of the major factors leading to psychological stresses in troops. It was also observed that exposure to hypoxia had shown to bring about minor reductions in cognitive ability and short-term memory recall, which was completely reversible on return to lower altitude within a few weeks. Intervention strategies were also applied which helped them in coping with stressors that encouraged healthy group interactions, satellite phone facilities, recreational facilities etc. the data for this study was obtained through comparing the variables in peace time and operational time over 10 years.

T. B (1973) conducted a study on, "Psychological Problems Affecting Troops at High Altitude." It focused on i) Psychophysiological Stressors such as altitude hypoxia, low environment temperature, sleep deprivation, and sensory deprivation, ii) Psychosocial stressors such as isolation and psychosexual problems. The statistical analyses of this study are not revealed in the paper due to con dentiality terms. The results were summarized and it was found that depression was the most common clinical syndrome encountered. The analysis also revealed fear of disease and domestic stressors such as socio-economic issues of the troops' families, isolation etc. The major psychological problems affecting troops were of psychophysiological and psychosocial in nature.

## Methodology

### Hypotheses

Extreme weather conditions signi cantly impact stress levels during deployments in high-altitude areas.

There is a signi cant positive correlation between age and use of effective coping strategies.

### Sample

A total of 60 participants were within the age range of 22-year-old to 50-year-old with an average age of 33.6 years. The average years of service of the participants is 12.7 years.

### Variables

Criterion variables: Effective coping strategies and Stress levels.

Predictor variables: Extreme weather conditions and Age.

### Tools

The High-Altitude Stress Questionnaire (HAS) was used to assess the high-altitude stress levels, coping mechanisms and weather conditions of the participants. The test consisted of 25 items with

responses marked on a 5-point Likert scale ranging from Strongly Agree to Strongly Disagree. Some items were positively scored and some were reversely scored on a range of 1 to 5. The highest possible score is 125.

**Procedure**

The High-Altitude Stress (HAS) questionnaire was circulated through a google form among the military service population. Total 60 participants of various designations in the armed forces solved the questionnaire. The scoring of the obtained data was done among 3 domains: Effective coping strategies, altitude sickness and stress levels. The total score was also obtained for all the 25 items. The data was then analysed using One-Way ANOVA analysis for proving the rst hypothesis and the Pearson product moment correlation was performed on the age range and the effective coping strategies scores for proving the second hypothesis.

**Statistical Analysis**

The data was analysed using One-Way ANOVA analysis for proving the rst hypothesis and the Pearson product moment correlation was performed on the age range and the effective coping strategies scores for proving the second hypothesis.

**Research Design**

The present study uses the correlational research design.

**Results And Discussion**

One-way ANOVA analysis was performed to prove the rst hypothesis. The one-way ANOVA results indicate a highly signi cant difference between stress levels in extreme weather conditions ($F(1, 116) = 2942.47$, $p < 0.001$). Since the p-value is much smaller than the signi cance level ($p < 0.05$), the null hypothesis can be rejected.

Therefore, the hypothesis that extreme weather conditions signi cantly impact stress levels during deployments in high-altitude areas is accepted.

The Pearson product-moment correlation was performed on the reported coping strategies scores and the mentioned age-range of the participants. The mean age of participants was 33.71 years ($SD = 7.34$), with a range from 25 to 65 years. The mean score on the stress scale was 47.92 ($SD = 5.15$), and the mean score on the coping strategies scale was 30.71 ($SD = 2.98$).

The correlation matrix for all variables included in the analysis. As shown, there were no strong correlations among the variables, indicating that the second hypothesis was rejected.

The Pearson correlation coe cient (r) between age and stress level was found to be -0.02, indicating a negative correlation. However, this correlation was not statistically signi cant ($p = 0.003$). Similarly, the correlation between age and coping strategies was also − 0.10 ($r = -0.10$), but it was not statistically signi cant ($p = 0.003$), suggesting a small negative relationship between age and the use of coping strategies.

**Conclusion**

The study aims to identify the psychological stress levels and coping strategies that may or may not be acquired with age for the military population considering the high-altitude weather conditions. High Altitude weather conditions can impact the physical, physiological and psychological health of the militants deployed in such regions. It's important to understand the stressors and focus on effective coping strategies for the same.

Through the rst hypothesis, the study aims to identify the impact of extreme weather conditions on the stress levels. One-way ANOVA analysis of the obtained data showcases a highly signi cant difference between stress levels in extreme weather conditions ($F(1, 116) = 2942.47$, $p < 0.001$). Thus, it can be concluded that extreme weather conditions have a signi cant impact on the stress levels of

the militants deployed in high-altitude areas. With the results of the statistical analysis, the rst hypothesis was proven to be accepted.

Through the second hypothesis, the study aims to prove a signi cant positive correlation between age and use of effective coping strategies. The Pearson product-moment correlation was performed to prove the second hypothesis. The results of the analysis showcased the Pearson correlation coecient (r) between age and stress level to be -0.02, indicating a negative correlation. However, this correlation was not statistically signi cant (p = 0.003). The results do not identify any stronger correlations among the variables and thus, the second hypothesis was not accepted.

Though the aim of the study was ful lled, some suggestions can be made for further studies in this area.

Declarations

**Acknowledgments**

No funding was received for this study.

**Disclosure**

The author declares that they have no con icts of interest in this work.

**Informed Consent**

Participants' consent was gathered by informing them about the study and obtaining their agreement using the following statement:

"By agreeing to participate, you con rm that you have read and understood the information provided. You voluntarily agree to take part in the study. Your consent will be recorded, and your data will be kept con dential and used anonymously for this research purpose only." Ethical Guidelines

The present study was conducted in accordance with all the guidelines

**Data Availability Statement**

The data is available on Mendeley on the below link

DOI: 10.17632/g63nk8zw3b.1

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**Table 1 One-way ANOVA of stress levels and extreme weather conditions.**

| Source of Variation | SS | df | MS | F | P-Value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 44986.6 | 1 | 44986.6 | 2942.47 | 2.86E-84 | 3.92 |
| Within Groups | 1773.5 | 116 | 15.29 | | | |
| Total | 46760.07 | 117 | | | | |

**Table 2 One-way ANOVA summary.**

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Stress Levels | 59 | 2827 | 47.91 | 26.56 |
| Extreme Weather Conditions | 59 | 523 | 8.86 | 4.01 |

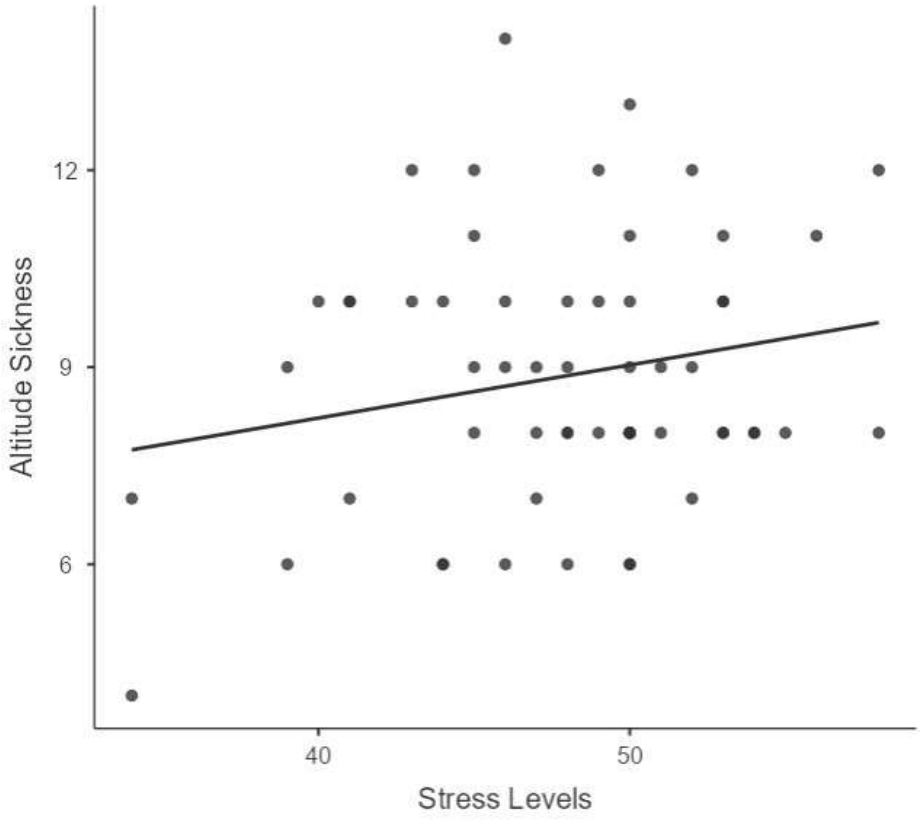
**Table 3 Descriptive Statistics.**

| Variables | Mean | Standard Deviation |
|---|---|---|
| Age | 33.71 | 7.34 |
| Stress Levels | 47.92 | 5.15 |
| Coping Strategies | 30.71 | 2.98 |

**Table 4 Correlation Matrix**

| | Stress Levels | Coping Strategies |
|---|---|---|
| Age | -0.02 | -0.10 |
| Stress Levels | | 0.55 |

**Figures**




Graphical representation of the One-way ANOVA results of reported stress levels and Extreme Weather Conditions.

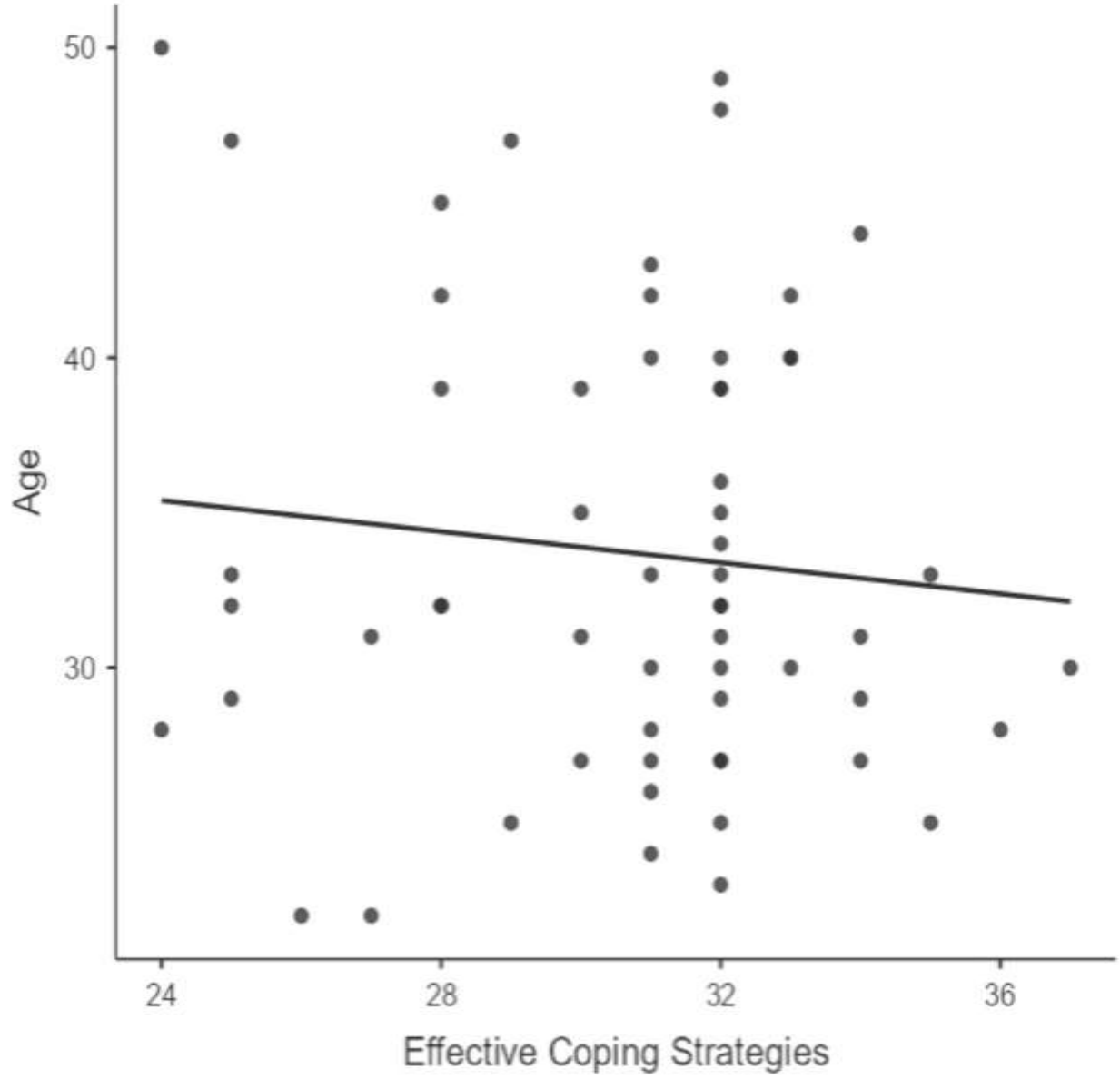



Figure 2
Graphical representation of the Pearson product moment correlation between age of the participants and reported effective coping strategies