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Assessment of Heat Stress Exposure Using WBGT Index and Physiological Responses Among Military Reserve Cadets

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Structured Abstract

Background: Heat stress in military settings pose significant health and performance risks due to hot and humid environments, compounded by strenuous physical activities and protective clothing. The study aimed to evaluate heat stress exposure among university military reserve cadets using Wet Bulb Globe Temperature (WBGT) index and monitor physiological responses, including core body temperature, heart rate, blood pressure and body weight, and also to recommend mitigation measures.

Methods: A cross-sectional study was conducted with 106 cadet members aged 18 - 25 years, participating in military reserve cadet training sessions. WBGT measurements were taken using a calibrated WBGT meter during peak heat hour. Physiological responses were recorded before and after training sessions using standard methods: Tympanic ear thermometer for core body temperature, blood pressure monitor for heart rate and blood pressure, and digital weighing scales for body weight. Paired t-test was performed to compare pre- and post-training physiological changes.

Results: This study shows that WBGT readings frequently exceeded the Threshold Limit Value (TLV) and Action Limit (AL) for heavy work of 50% recommended by ACGIH, with average outdoor WBGT at 32.0°C which falls under high risk of getting heat stress. Physiological parameters indicated significant increases in core body temperature (37.55°C ±0.24) and heart rate (103.75 ±14.26 bpm) and significant decreases in systolic (108.17 ±11.99 mmHg) and diastolic (71.50 ±4.93 mmHg) blood pressure and body weight decreased by 0.89% after the training. These results suggest cadets were exposed to substantial heat stress, risking heat-related illnesses.

Conclusion: The WBGT index is an effective tool for assessing heat stress exposure. WBGT index values (average of 32.0°C) revealed that cadet members fall at high risk of getting heat stress. Significant changes in physiological parameters highlight the physical strain induced by intense activities under hot and humid conditions. Structured interventions including hydration protocols, training schedule adjustment, work-rest cycles and acclimatization program, are recommended to mitigate risks. These recommendations can enhance the safety and performance of military cadets during training in extreme environmental conditions.

Keywords: Heat Stress, WBGT Index, Physiological Responses, Military Cadets, Heat Mitigation

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