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# Occupational Heat Stress and Thermal Discomfort Among Stockroom Workers in an Enclosed Retail Store Environment

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**Structured Abstract**

**Background:** Occupational heat stress is an emerging occupational safety and health concern, particularly in hot and humid regions such as Malaysia. While heat-related risks are commonly associated with outdoor and industrial settings, indoor service-based workplaces, including retail stockrooms, are often overlooked. Enclosed stockroom environments are typically characterised by limited ventilation, inadequate cooling, high relative humidity, and physically demanding tasks such as lifting, unloading, and stocking goods. These conditions may impair heat dissipation, leading to thermal discomfort. This study aimed to evaluate occupational heat stress, thermal discomfort, and associated physiological responses among stockroom workers in an enclosed retail store environment.

**Methods:** A cross-sectional observational study was conducted among 40 stockroom workers from two departments in an enclosed retail store in Melaka, Malaysia. Environmental heat stress was assessed using the Wet Bulb Globe Temperature (WBGT) index in accordance with ISO 7243 standards. Thermal discomfort was evaluated using the Predicted Mean Value (PMV) and Predicted Percentage of Dissatisfied (PPD) indices based on ISO 7730 and ASHRAE Standard 55. Physiological parameters, including core body temperature, heart rate, and blood pressure, were measured before and after work shifts. Descriptive statistics summarised data, while Spearman correlation analysis examined relationships between heat stress, thermal discomfort, and physiological responses.

**Results:** All adjusted WBGT values across six sampling points were below the Action Limit (26 °C) and Threshold Limit Value (29 °C) recommended by ACGIH, indicating low occupational heat stress risk. Most PMV values were within the acceptable range of −0.5 to +0.5, although one sampling point recorded a marginally higher value (+0.51). PPD values remained below 10% across both departments, indicating generally acceptable thermal comfort. Physiological measurements showed slight post-shift increases in heart rate and core body temperature within normal ranges. Weak to moderate correlations were observed between environmental heat indices, thermal discomfort parameters, and selected physiological responses.

**Conclusion**: Stockroom workers were generally exposed to acceptable levels of occupational heat stress and thermal comfort. However, localized marginal discomfort and mild physiological changes highlight the importance of continuous monitoring and basic preventive measures, such as improved ventilation, localized cooling, and appropriate work–rest practices.

**Keywords:** Occupational heat stress; Thermal comfort; Physiological responses; Retail workers

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