

暑熱環境下における熱中症予防のための クーリング方策に関する研究

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Cooling Method for Preventing Heat Strokes in Hot Environments

by

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ABSTRACT

In this study, to develop a simple and practical cooling method for hot environments, a vest was designed by incorporating a highly absorbent batting material and a moisture-permeable and waterproof fabric as the cover fabric. The authors have named this vest as the “cooling vest.” Three types of clothing styles were examined: T-shirts (sample T), T-shirts and a jacket with two small fans (sample TA), and T-shirts, the cooling vest, and a jacket with two small fans (sample TVA). Five female subjects aged 21-27 years were engaged for the study. The experiments were performed in an environment having a temperature of 32°C. Following parameters were measured

through the wearing experiments: sweating rate, clothing temperature and humidity, oral temperature, skin temperature, and heart rate. Obtained results indicate that compared to the other samples, skin temperature, clothing temperature, and sweating rate tend to be lower in the case of sample TVA. The effect of sample TVA on heart rate and oral temperature could not be observed because the duration of wearing time was very short (15 min). Additionally, subjective evaluation suggests that sample TVA is comfortable to wear and feels cool. These results can be attributed to the release of water vapor from the cooling vest and enhanced evaporation caused by the fans. Furthermore, while conducting the wearing experiments, clothing humidity increased owing to the evaporation of water vapor from the cooling vest, but the corresponding evaluation score for humid sensation didn't decrease. Hence, it can be concluded that by employing the cooling vest along with a jacket having fans, the loss of latent heat can be increased without causing excessive sweating.

要 旨

暑熱下における簡便で実用的なクーリング方策を提案することを目的として、本研究では、透湿防水布を側地として、中綿に高吸収素材を用いた冷却ベストを作製し、衣服内温湿度および生理反応に及ぼす影響を検討した。

冷却ベストの上にファン付きウェア（着衣TVA）を着用したとき、発汗量はほとんど確認されなかったが、皮膚温および衣服内温度が低下した。これらの結果は、高吸水素材から透湿防水布を通して水蒸気が放出し、ファンによって蒸発が促進されたことによるものであり、主観評価においても涼しくて快適であると評価された。一方、高吸水素材から発生した水蒸気のため、衣服内湿度は高くなったが、これによる湿潤感の低下はみられなかった。

以上のことから、ファン付きウェアに冷却ベストを併用する方法は、汗に頼らない潜熱放散が可能となり、簡便で効率的なクーリング方策であることがわかった。