

高温環境下における飲水と局所冷却による効果

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Effects of Head Cooling and Water Ingestion on Thermoregulation in a Hot Environment

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ABSTRACT

In the present study, we examined subjective evaluation and physiological responses to heat stress for the purpose of finding out an effective thermoregulatory method to prevent heat stroke and deterioration of work performance during sports activity in a hot environment. Subjects were five healthy male students. They were exposed to a hot environment at the ambient temperature of 37 °C and relative humidity of 60 % for 60 minutes. In that environment they rested in sitting position for 10 minutes and performed bicycle exercise for 20 minutes twice separated by a 10 minutes rest interval. In the cold water intake test, they took 250 ml of

cooled sports drink (7) 30 minutes after the beginning of the exposure. In the head cooling test, the forehead and vertex were continuously cooled by the cold water of 10 . In the combination test of water intake and head cooling, subject's forehead was cooled and the 250 ml of sports drink was consumed. During the hot environment exposure, the body temperature and heart rate were increased, suggesting that thermoregulatory mechanism was well functioning. In the no water intake test, the increase in tympanic temperature was the largest, and the perspiration rate was almost twice as much as observed in other conditions. In the water intake test, the increase in rectal temperature could not be suppressed but the increase of mean skin temperature was suppressed. In the head-cooling test, the difference of cooling site did not show any difference in thermoregulatory function. The combination test of water intake and head cooling suppressed the increase in tympanic temperature.

要 旨

本研究では、高温下のスポーツ活動中に伴う熱中症などの予防および運動パフォーマンスの能力低下を防止するための有効な体温調節法を検討するために、主観的評価および体温などの生理反応の違いを実験検討した。

5名の健常な男子学生を被験者として、環境温 37 , 60 % R.H.に設定した人工気候室で10分間の座位安静に続いて20分間の自転車エルゴメータ運動を高温暴露60分間で2回行った。飲水群では7 のスポーツ飲料を高温暴露の30分後に250ml摂取した。頭部冷却群では前頭部と頭頂部をそれぞれ冷却し、併用群では前頭部冷却を行いながら、スポーツ飲料を摂取した。

高温暴露中、体温、心拍数などが上昇し、体温調節機能が活発に働いた。とくに、無飲水群では鼓膜温の上昇が他の実験群より大きく、発汗量も他の実験群の2倍であった。また飲水群は直腸温の上昇を抑制できないが、平均皮膚温の上昇抑制の効果が認められた。頭部冷却群では冷却部位の違いによる体温調節反応の違いは認められなかった。頭部冷却と飲水を併用することで鼓膜温の上昇を抑制できることを確認した。