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To Cool, But Not Too Cool: That Is the Question-Immersion Cooling for Hyperthermia.

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INTRODUCTION:: Patient cooling time can impact upon the prognosis of heat illness. Although ice-cold-water immersion will rapidly extract heat, access to ice or cold water may be limited in hot climates. Indeed, some have concerns regarding the sudden cold-water immersion of hyperthermic individuals, whereas others believe that cutaneous vasoconstriction may reduce convective heat transfer from the core. It was hypothesized that warmer immersion temperatures, which induce less powerful vasoconstriction, may still facilitate rapid cooling in hyperthermic individuals. METHODS:: Eight males participated in three trials and were heated to an esophageal temperature of 39.5 degrees C by exercising in the heat (36 degrees C, 50% relative humidity) while wearing a water-perfusion garment (40 degrees C). Subjects were cooled using each of the following methods: air (20-22 degrees C), cold-water immersion (14 degrees C), and temperate-water immersion (26 degrees C). RESULTS:: The time to reach an esophageal temperature of 37.5 degrees C averaged 22.81 min (air), 2.16 min (cold), and 2.91 min (temperate). Whereas each of the between-trial comparisons was statistically significant ($P < 0.05$), cooling in temperate water took only marginally longer than that in cold water, and one cannot imagine that the 45-s cooling time difference would have any meaningful physiological or clinical implications. CONCLUSION:: It is assumed that this rapid heat loss was due to a less powerful peripheral vasoconstrictor response, with central heat being more rapidly transported to the skin surface for dissipation. Although the core-to-water thermal gradient was much smaller with temperate-water cooling, greater skin and deeper tissue blood flows would support a superior convective heat delivery. Thus, a sustained physiological mechanism (blood flow) appears to have countered a less powerful thermal gradient, resulting in clinically insignificant differences in heat extraction between the cold and temperate cooling trials.

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