

The responses of a group of 10 to 11 year old children swimming in cold water

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The physiological responses of adults to immersion in cold water are well understood (1). Extensive research has assessed the respiratory, cardiovascular and metabolic responses to initial and prolonged immersion (2,3). It has long been recognised that children differ from adults; physically, physiologically and psychologically and are considered more susceptible to cold-related illness and hypothermia (4,5). However, there is a lack of data on cooling rates in children swimming in cold water and of any evidence of a 'cold shock response' on initial immersion. Given that these are considered critical to an adult's chances of survival following immersion in cold water (6), it seems inadequate that the current understanding, management, and safety guidelines associated with paediatric immersion and cold-water-induced hypothermia remain largely theoretical or extrapolated from adult studies. With a cohort of children volunteering to train for a cross-Channel relay-swim, this project provided the unique opportunity for data collection in this area.

Following ethical approval, 17 volunteers recruited from applicants to the Bristol Channel English Swim Team (BEST), aged 10 to 11 years, who had had some previous exposure to cold water, were immersed in 15°C water for an initial five minute static period, after which 10 participants went on to swim for up to 40 minutes. Anthropometric profiles were taken of all participants. Measurements of deep body temperature (gastrointestinal radio pill), heart rate, respiration and oxygen uptake were taken throughout, and thermal comfort and sensation were recorded. On initial immersion, mean (SD) respiratory frequency in minutes 1, 2 and 3 was 34 (10), 32 (12) and 29 (12) breaths.minute⁻¹ respectively, with corresponding heart rates of 109 (14), 99 (13) and 98 (15) beats.minute⁻¹. This compares to a mean resting respiratory rate of 16 (2) breaths.minute⁻¹ and heart rate of 80 (8) beats.minute⁻¹ recorded during the participant's pre-test medical. The 10 subjects who went on to swim, showed a mean deep body cooling rate of 2.5 (3.1) °C.h⁻¹ in the latter part of their swim.

Six of the participants successfully completed the 21-mile relay swim from Dover to Cap Gris Nez in 13.5 hours on September 4th 2010, becoming the youngest team to swim the English Channel. Through further data analysis, we hope to provide a better understanding of accidental and non-accidental injuries resulting from cold water immersion in children. This work also provides advice for the recruitment of children into open water swimming as a competitive sport, as well as the risk assessment of any projects involving paediatric immersion in cold water.

References

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