OPEN WATER – EFFECTS OF SWIMMING IN COLD AND WARM WATER

Stoychev, Petar
Doctoral student, Aquatic Chair,
National sports Academy "V. Levski"

INTRODUCTION

In cold water, the cold shock response on initial immersion includes a gasp response, uncontrollable hyperventilation, tachycardia, hyperventilation and an increase in circulating levels of stress hormones. The response is initiated by the dynamic response of the peripheral cold receptors; it peaks in the first 30 s of immersion and adapts over the first 2 min. The loss of control of breathing on immersion can be a precursor to drowning. That most of the deaths during open water swimming are thought to be due to cardiac problems raises interesting questions concerning the mechanisms associated with these deaths and why they tend to occur in competition or events rather than open water training or non-competitive swimming.

During resting immersions in cold water, a conductive gradient between the deep body tissues and the skin is established down which heat flows. In this situation, the deep body tissues always have a higher temperature than deep and superficial muscles which remain at a higher temperature than the skin.

At the end of a cold-water swim and for a period after it, the deep body temperature of a swimmer may continue to fall due to thermal gradients established during the swim. Thus, this post-immersion period deserves attention in terms of the supervision of swimmers who, on finishing their race, may have the lowest deep body temperature they have experienced whilst unsupervised and travelling home.

The effector responses of the human thermoregulatory system evolved to function in thermo neutral dry air (26°C–28°C) in which sweat evaporation and cutaneous vasodilatation are efficient effector responses for off-loading heat from the body to the environment. When swimming in warm water the negation of the primary effector response for cooling, the evaporation of sweat, can be compensated for by the fact that the body is immersed in a fluid with much better physical characteristics for removing heat. However, as the skin temperature-water temperature gradient narrows, less and less heat can be transferred to the water.

Little is known about the physiological responses to high-intensity endurance swimming in warm water, even though its popularity is increasing. Many 5–10-km events, which require athletes to be in the water for up to 2 h or more, are being held in locations such as the Middle East and South China Sea where water temperatures are up to 32°C. At rest, such temperatures represent a comfortable aquatic environment for humans, a little below the thermo neutral range. However, the effects of exercising at high metabolic rates in these conditions on thermoregulation (both behavioral and autonomic) are largely unknown, but the increase in metabolic heat production coupled with perceptions of comfort in these warm water environments appears to have the potential to induce 'insidious hyperthermia' in exercising athletes

METHODS

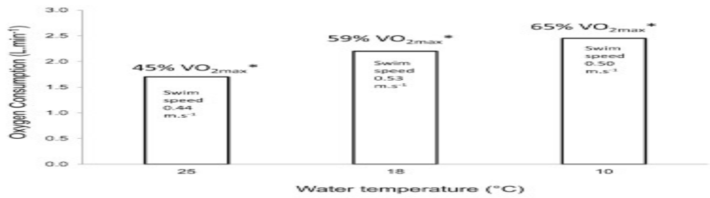
This article explored in depth major scientific articles, studies, and publications regarding the effect of the water temperature on swimmer body. The effects of cold and warm water on the body should be known in order to avoid the risks associated with swimming in an extreme environment.

DISCUSSION

Open water swimming is an increasingly popular sport that takes place in water temperatures that can present an additional risk to those already inherent in the sport and mass participation in it. More information on the responses to immersion in cold and warm water, the causes of the individual variation in these responses and the precursors to the cardiac events that appear to be the primary cause of death in open water swimming events will help make this enjoyable sport even safer.

ILLUSTRATIONS AND FIGURES

Fig. 2



TABLES AND LEGENDS

Figure 2. Mean oxygen consumption during 90 min swims in different water temperatures (n=5). * Note the increase in oxygen consumption when swimming in colder water is due to the super-imposition of shivering on swimming metabolism. All VO_{2max} data obtained in water at 25°C. From Tipton et al (9).

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Tables, graphs and picture

Long course swimming at Summer Olympics

Rank	Nation	Gold	Silver	Bronze	Total
1	Netherlands (NED)	3	0	0	3
2	Hungary (HUN)	1	0	0	1
	Russia (RUS)	1	0	0	1
	Tunisia (TUN)	1	0	0	1
5	Great Britain (GBR)	0	2	1	3
6	Germany (GER)	0	1	1	2
	Italy (ITA)	0	1	1	2
8	Greece (GRE)	0	1	0	1
	United States (USA)	0	1	0	1

CONCLUSION

The effects of cold and warm water on the body should be known in order to avoid the risks associated with swimming in an extreme environment.