Exercise physiology and physical characteristics of water
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I would introduce the knowledge that the physiological response could benefit water exercise, and would explain the practical and the theory. The principle: heart rate during water exercise is very low when compared to land at given oxygen demand, especially low exercise intensity. The theory: it could increase the benefit of venous return, depending on the lower exercise intensity. The principle: Systolic blood pressure is lower during exercise in water than on land, while diastolic blood pressure is lower during recovery in water than on land. The theory: The water pressure and the vascular elasticity could affect systolic blood pressure. A capillary vessel would be expanded after exercise in water. Changes in blood pressure of the young men during exercise in water and on land at the same exercise intensity. The principle: The change of volume of venous return is dependent on exercise intensity. The theory: It could pool the blood of return current in the abdominal vena cava, and could control the quantity of return current to the pulmonary artery. During water exercise at 40%VO₂ max, the cross-sectional area of abdominal vena cava was immediately decreased from onset of exercise. However, the decreased cross-sectional area during water exercise was significantly greater than on land. Physical characteristics of water could provide greater benefit assessed by physiological indexes for exercise physiology.

Key words: water exercise, health promotion, water pressure, water temperature, buoyancy, viscosity

Potentials and Limitations of VO₂ max, Heart Rate, and RPE as Indices for Exercise Prescription and Training
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VO₂ max indicates the magnitude of energy output and is optimal as an objective index of the endurance capacity. However, it has one disadvantage: It is difficult to measure. In contrast, the HRmax can be easily estimated. Moreover, as the coefficient of variation of HR reactions during exercise is small in each person, it is useful for each individual to have knowledge of his/her HR reactions and use the HR for self-monitoring of the exercise intensity. A wristwatch type HR (pulse) monitor is effective for this purpose. Recently, as the importance of the role of the cerebrum during exercise has been reported, the value of the RPE as an index of exercise intensity has been increasingly recognized. On using the RPE, a combination of the whole-body RPE (RPE-overall) with RPEs of the legs (RPE-Legs) and chest (RPE-Chest) is recommended.

Conclusion: It is important to clarify the relationships (interchangeability) among the %VO₂ max, %HRmax, and RPE as indices of exercise intensity and use them appropriately according to the exercise characteristics.