Design for Improving Stroke Efficiencies in Competitive Swimming Training

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Abstract

Swimming is a versatile activity that can serves variety of purpose, from recreation and sports, exercise and therapy to Olympic Competition. Training for swimming for different level competitions involves building body strength, endurance, speed, and most importantly, proper technique. In water, resistance refers to the ability of a material or an object to resist the penetration of water to some degree, and since water has a higher density than air by approximately 800-1000 times (Laughlin 2004). Therefore, water resistance is significantly greater than air resistance for the same object moving at the same speed.

Competitive swimmers undergo a rigorous training regimen that includes pool work, dryland exercises, mental preparation, and proper nutrition. However, one of the most crucial aspects of training, besides reducing swimmers' water drag, is improving stroke efficiency, which allows swimmers to increase their speed with the same level of power output. It is generally agreed that the arms provide more than 85% of the total thrust in the crawl stroke (Toussaint et al., 2023).

This research project aims to study the use of new tools to modify the form and posture of stroke for the swimmers, as well as to analyze the forms of stroke in four disciplines of competitive swimming (freestyle – crawl stroke, butterfly, backstroke and breaststroke). The goal is to design a product with water pressure sensor system and data analysis capabilities in order to maximize the potential for improving stroke power efficiency. The mechanics of propulsion in human swimming and the fluid dynamic mechanisms of propulsion will be tested and analyzed using data collected by the newly designed device. Members of a competitive swimming team with regular training will participate in the testing and analysis. The results of this research study will contribute to the future development of the swimming training industry.