Energy Saving SwimFin: Developing the Optimal Fin for Faster and Efficient Swimming

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An “Energy Saving SwimFin” was developed aiming to increase propelling speed while reducing energy consumption and decreasing load on the feet. Developing a model system comprised of a miniature fin (blade) attached to an electric motor, a float and a water tank, two sets of data were analyzed. First, the propulsion speed was tested by measuring the speed of the vertical float transported by the flow. The water flow was also visualized with adding tracer particles via slow-motion-video. Second, the electric power consumption of the motor was analyzed. An increase in propulsion is caused by the structure of the blade, specifically the 30% of the tip of the blade was made to be flexible. To decrease the load on the fin by the water, a valve was worked into the main structure which allows water to pass over the blade, decreasing load and further increasing water flow. By adding rough lines that run in the direction of water flow over the blade, a further increase in propulsion speed occurred. When these 3 elements (Blade structure, valve and rough lines) are combined, the speed of the float is increased by 280% and the power consumption is reduced by 24% compared to the standard fin. By integrating these results, the prototype “Energy Saving SwimFin” was created. With the prototype, a swimming found less load on swimmer’s feet and a decrease in their overall swim time by 31% in testing (n=4). The result can be applied to a new propulsion mechanics without cavitation.