An Optimazation of Breaststroke

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The project studies the forces of a breaststroke swimmer. This includes the force that the swimmer generates, the resultant force and the drag. Because water has a bigger density than air the drag becomes much bigger than moving through thin air. This also means that drag has a bigger impact in swimming than other sports. To examine the forces that apply to the swimmer I have made two video recordings of a breaststroke swimmer. The videos are tracked in the physics program LoggerPro. The first video is normal breaststroke. On the basis of this video the velocity, acceleration and resultant force can be determined. For the second video the swimmer has a big rubber band tied around the waist and fastened to the wall. Based on the second video the forward-acting force that the swimmer generates can be determined. The project focuses on spots in video where the swimmer's velocity is zero. When the swimmer does not have a velocity the drag should be non-existing. By comparing the resultant force in particular spots in the breaststroke cycle the drag is determined. Based on the analysis of the breaststroke it can be concluded that the magnitude of the drag has a big influence on the velocity. When the drag is little and the forward-acting force is big the swimmer has the biggest velocity. The drag varies a lot throughout the cycle and it can be concluded that position of the legs and arms have an outstanding influence on the size of the drag. The drag can be reduced if the swimmer alternates her position in the water. In the recordings the swimmers thighs and upper body is in an angel of 90 degrees. This creates a lot of drag, because this movement causes a turbulent flow. The flow can be more laminar if the angel between the legs and upper body is bigger.