CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J0120

Project Title
What a Drag!

Abstract

Objectives/Goals
The objective of this project was to determine how different types of surface materials covering an object affect drag as water moves past the object. It was hypothesized that the smoother the surface material covering an object, the lower the drag will be as water moves past the object.

Methods/Materials
The five experimental groups and one control group tested how different types of surface materials covering an object affected drag as a stream of water flowed past the object. The object covered was a plastic egg with a diameter of 5cm. The independent variables for the five experimental groups were the following five different surface coverings: 1) tight-fitting 80% nylon / 20% lycra fabric, 2) Speedo Fast Skin fabric, 3) 100% polyester synthetic hair, 4) loose-fitting cotton fabric, and 5) Vaseline. The control group was the uncovered plastic egg. The dependent variable measured for each of the five experimental groups and the control was the resistance in grams, as measured by a spring scale, while a constant stream of water was pumped past the covered or uncovered plastic egg. There were 20 trials for each experimental group and control.

Results
The average resistance measured for each of the experimental groups and control group was as follows: the uncovered plastic egg (control) - 7.06g, Vaseline - 8.3g, Fast Skin - 9.31g, 80% nylon / 20% lycra - 10.93g, loose-fitting cotton - 13.39g, and 100% polyester synthetic hair - 16.19g.

Conclusions/Discussion
The differences in resistance measured in this experiment were due to differences in surface friction, or drag. The results indicate that the hypothesis was true and that choice of swimwear could make significant improvements in a swimmer's speed. The Fast Skin, shark skin mimic, would seem to be the best choice since it produced even less drag than the 80% nylon / 20% lycra covering which is the fabric found in traditional racing suits. If swimming a fraction of a second faster is important, this fabric which is supposed to mimic the dermal dentacles on a shark's skin may provide the extra speed by reducing drag. The loose-fitting cotton suit would be the poorest choice in swimwear since it produced greater drag. Swimmers have debated whether head and body shaving can increase a swimmer's speed. Since the synthetic hair covering in this experiment produced the greatest drag, it suggests that shaving may be helpful in increasing speed.

Summary Statement
The project tested how different types of coverings, which might be found on swimmers in racing situations, affect drag in water.

Help Received