CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
S0218

Project Title
Performance Cycling: Factors of Efficiency

Abstract

Objectives/Goals
This project is an insight into the world of bicycle performance and variability. Bicycles are the most efficient and common self-propelled vehicle, and can be seen in innumerable applications around the world for travel, work, recreation, and sport. In all of these applications, efficiency plays a major role in defining the extent of a bicycle#s utilization. A bicycle#s efficiency is determined by the amount of resistance that is present against the direction of its movement. This resistance is caused by many factors: surface area (wind resistance), fixed weight, spinning weight, and tire pressure (rolling resistance). The goal of this project is to determine which of these factors has the greatest effect on a bicycle#s performance and efficiency under varying conditions of speed and terrain.

Methods/Materials
The experiment was set up using a bicycle trailer as the test body, to be towed behind a car using a sliding hitch, which connects the trailer to a scale (for reading resistance) while stabilizing it and keeping it from side-to-side and vertical movement. Each of the afore mentioned variables, surface area, fixed weight, spinning weight, and tire pressure, was tested at 5 and 15 mph on a level and inclined surface for a distance of ¼ of a mile, with a variation of 300% from the value that was used for the control.

Conclusions/Discussion
According to my results, I concluded that that increased surface area has the greatest overall effect on the efficiency of and work required for a bicycle#s movement at higher speeds; but on an incline, or at low speeds, fixed weight has the greatest effect. Fixed weight has a greater effect with lower tire pressure and is significantly affected by movement on an incline. Spinning weight does not have as great of a direct effect as fixed weight because of its drastically smaller quantity, but, proportionally, it has a greater effect on the efficiency of a bicycle#s movement.

Summary Statement
This project is an insight into the world of bicycle performance and efficiency.

Help Received
Father helped in physical aspects of testing: moving heavy trailer load, driving vehicle, etc.