CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
J0113

Project Title
A New Spin on Things

Abstract

Objectives/Goals
I play club volleyball and wanted to see how using an old volleyball vs. a new one, would affect play. I narrowed my question to "How does the roughness of a volleyball affect the volleyball's amount of spin in a given space?" My original hypothesis was the older volleyballs would spin less in the allotted space due to friction's effect on their motion through a fluid. I believed friction or "drag" would be the main cause for the slower motion of these volleyballs. After further observations I modified my hypothesis: The newer volleyballs, with more defined and rougher ridges, will spin more in the allotted space because of the hand's increased moment of inertia on the volleyball, transferring a greater amount of energy.

Methods/Materials
13 feet and 7 inches of 1- inch PVC pipe, 33 and 3/4 inches of 3/4-inch PVC pipe, three latex rubber gloves, one metal round-clamp, four 1-inch PVC shoulders, 1 42-inch plastic Tupper-ware tank, 1 3/4 -inch PVC T, two 1-inch PVC Ts, 614 grams sand, two 1-inch threaded PVC Ts, protractor, Sony Digital-8 videocam. I built a pendulum with a base around a tank of water. The swinging pendulum arm containing a sand-filled rubber glove to simulate the hand and serving motion in volleyball; the tank with water provided a stable fluid environment to model behavior in air. A volleyball was placed on a stand in the water, and the pendulum arm released. All trials were recorded on video for viewing in slow motion. I performed one hundred trials, twenty on each of five balls ranging in age and wear. After viewing all trials I recorded the ten closest in range and easiest to view trials for graphing purposes. I measured and recorded the number and actual degrees of rotation of each ball in a logbook.

Results
As predicted, the measurements of rotation for each of the balls decreased with the change to older, worn balls. The majority of the measurements were within a close range, showing that the data was conclusive and the results weren't random.

Conclusions/Discussion
My modified hypothesis was confirmed by the data. The newer, more pristine appearing volleyballs spun more than those that were dirty and worn. It was the newer balls that in fact had the more defined ridges and slightly sticky texture which caused their increased transferred energy and increased spin. The difference in spin between the newer and worn balls is enough to affect the serving patterns of a volleyball player.

Summary Statement
This project examines how surface texture affects "spin" or rotation of a volleyball in a fluid (air or water).

Help Received
Mom and Dad provided financial support and took pictures. Volleyball coach provided materials. Dad supervised assembly.