CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
S1805

Project Title
The Notion of Motion

Abstract

Objectives/Goals
Our objective was to discover how the varying radius of a softball pitcher#s arm affects the angular momentum of that particular pitch.

Methods/Materials
We conducted our experiment by filming five different softball pitchers as they threw various pitches and then reviewing the pitches in an iMovie editing program to calculate the exact time of the pitcher#s arm circle, before converting into radians/seconds (angular velocity). All data was recorded into a spreadsheet where the radius, which was measured from their shoulder to the middle of their palm, was also recorded. To calculate the rotational inertia, we massed a softball and used the measured radius from a particular pitch as our changing variable.

Results
After carefully evaluating the data, we discovered that as the rotational inertia increased, so did the angular momentum; the riseball had the smallest radius (.5363m) and the least angular momentum at (.8517 N*m/s) while the fastball had the greatest radius (.6066m) along with the greatest angular momentum (1.168 N*m/s). The trend found was that as the radius increases, so does the angular momentum.

Conclusions/Discussion
After looking over the angular momentum equation, it became clear that the angular velocity generally remained a constant; therefore, the rotational inertia was the changing factor in the equation. For angular momentum to be conserved, the angular velocity must also be a changing variable; however, in this case the pitcher was providing the constant external force (what we used as angular velocity) which allowed for no vacillation in number. Because the softball#s mass was also a constant, the radius was the major fluctuating variable. This allowed us to prove that by increasing the radius of a pitcher#s arm motion, the angular momentum would also increase. We also learned that though the angular momentum equation is a widely accepted and trusted method of calculation, it might not be the correct equation to apply to this particular type of physical motion. While we didn#t identify a better or more accurate equation to apply to the pitching motion, we take heart because we#re sure it took Isaac Newton many years and many tries to perfect his laws of motion.

Summary Statement
The purpose of this experiment was to determine how angular momentum affected different pitches in softball by directly applying the principles of physics to live pitching.

Help Received
Pitchers helped by volunteering their time to participate in the experiment; Physics teacher helped solidify conceptual elements of the experiment.