CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
S0201

Project Title
Does Altering the Mass Distribution of a Drumstick Affect Its Rebound off a Snare Drum?

Abstract

Objectives/Goals
The purpose of this experiment was to see if there was a measurable difference between the rebound heights of drumsticks on a snare drum according to how the mass distribution of the drumstick was altered. Rebound contributes to the speed of play and effort required by the drummer. The hypothesis was that if weights were added to the butt of the stick, then the balance point would be closer to the axis of rotation, resulting in higher rebound.

Methods/Materials
An apparatus that mimicked the way a drummer holds a stick and hits a drum was designed and built. The force was measured with a Newton spring scale. The torque was 0.24 Nm for trials 1-5, 0.43 Nm for trials 6-10, and 0.53 Nm for trials 11-15. The mass distribution of the drumsticks was altered by drilling out the center of the butt end of the stick, then either filling the hole with weights or leaving it unweighted. The rebound heights of the drumsticks were measured against a backdrop of graph paper using a camcorder.

Results
The drumstick with the greatest rebound was the stick that was weighted in the butt. This is because the center of mass was altered to be closer to the chosen axis of rotation. The negative torque due to gravity was extremely small, but contributed to higher rebound in the weighted sticks.

Conclusions/Discussion
In conclusion, my hypothesis was correct. Newton's 2nd Law for rotation states that the resistance to change, i.e. moment of inertia, is less the closer the center of the mass is to the axis of rotation, and so the more freely the object will be able to move. This is why the weighted sticks had greater rebound compared against the undrilled drumsticks and the drilled/unweighted drumsticks. I intend to finalize my patent with this information.

Summary Statement
Altering the mass distribution of a drumstick to make the center of mass coincide with the axis of rotation improves its rebound, thereby allowing faster and easier playing.

Help Received
My school's woodshop teacher drilled the drumsticks. My neighbor used his drill press and helped me build the apparatus with my dad. My dad assisted during the testing. My mom proofread my work and helped with the display.