CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
J2021

Project Title
Slipper Stick: A Study on the Coefficient of Static Friction

Abstract

Objectives/Goals
The purpose of this experiment was to study the coefficient of static friction created by ballet, tap, jazz, lyrical and hip hop shoes and three common dance floor treatments: rosin, hairspray and Coke. This experiment then calculated the frictional force required to overcome the identified coefficients.

Methods/Materials
A measuring instrument was designed and built to measure the slip angle and slip height of a shoe as it began to slide down the plank. The average slip angle was then calculated from five trials. Using the formula: coefficient of static friction = tangent of the angle, the coefficients of static friction for each shoe and floor type were determined. The frictional force was then calculated with comparison made between the individual shoes and floor treatments. Five different shoe types were individually tested. Three different floor treatments were applied and tested with a standard ballet shoe.

Results
The results from my experiment partially supported my hypothesis. The coefficient of static friction for the hip hop shoe was 1.25 and the frictional force (Ff) was calculated to 7.5 Newtons (N). The ballet shoe was next with a coefficient of .56 and a Ff of 2.45 N. The jazz shoe followed with a coefficient of .49 and a Ff of 2.23 N, then the tap shoe with a coefficient of .37 and a Ff of 2.26 N. Finally, the lyrical shoe had the least coefficient of .31 with a Ff of 1.24 N. Of the three floor treatments studied, hairspray had the greatest coefficient value at 1.04 with a Ff of 4.4 N. Followed by Coke with a coefficient of .9 and Ff of 3.8 N. Next came the rosin at a 0.7 coefficient and Ff of 3.0 N. Lastly, having no treatment on the plank demonstrated the least coefficient value at .53 and a Ff of 2.24 N.

Conclusions/Discussion
My conclusion is that the hip hop shoe had the highest coefficient of static friction and the lyrical shoe had the least. The floor treatment with the highest coefficient of static friction was hairspray and no floor treatment had the least. It is important for dancers to be aware of frictional forces at play during their dance performances. A shoe or floor type with a low coefficient of static friction may not be safe for a dancer because of the possibility of slipping and injury. A higher coefficient may provide the dancer with the friction needed to turn beautifully.

Summary Statement
This experiment looked at the frictional force required to overcome the identified coefficients of static friction for various dance shoes and floor treatments.

Help Received
My grandpa helped with building the measuring slip angle instrument. My mom explained the math required for this experiment.