General Information

Source: NBC Learn  
Creator: Lester Holt  
Resource Type: Video Science Explainer  
Copyright: NBCUniversal Media, LLC.  
Event Date: 12/08/2009  
Air/Publish Date: 12/08/2009  
Copyright Date: 2009  
Clip Length 00:04:08

Description

The physics behind the awesome, gasp-worthy tricks snowboarders do in the half-pipe? Gravity, friction, and energy (potential and kinetic), as explained by NSF-funded scientists Paul Doherty at The Exploratorium in San Francisco and Deborah King, from the Dept. of Exercise and Sports Sciences at Ithaca College.

Keywords

Citation

MLA

APA

CHICAGO MANUAL OF STYLE

Transcript
Snowboarding
LESTER HOLT, Anchor:
The stakes are high for the snowboarders in Vancouver, as they try to master new tricks to unseat the star of Torino, American Shaun White. But to get “max air” off the half-pipe without losing their balance, they might want to check out this experiment that one NSF scientist has cooked up, using a skateboard and a glass of water.
HOLT: Ever since snowboarding made its Olympics debut twelve years ago, it's taken off worldwide.
INTERVIEWER: So tell me in Italian, “I’m going snowboarding.”
SILVIA ZUCCIATTI, Burton Snowboard School: [in Italian] I'm going snowboarding.
HOLT: The lingo that American snowboarders use might still sound like a foreign language to some.
HANNAH TETER, Gold Medalist: I dropped into a crippler to a back three, and after that I was like, “Whoo whoo!”
HOLT: But the science that these boarders use to do tricks on the half-pipe couldn't be simpler: The Laws of Gravity. Building Speed. And especially balance.
At the Exploratorium Museum in San Francisco, Senior Staff Scientist Paul Doherty knows a thing or two about the physics of snowboarding.
DR. PAUL DOHERTY, The Exploratorium:
What really interests me about the half pipe is it's an example of dynamic balance. The snowboarder has to realize that when they're in motion in this half pipe, the balance that they keep is quite different than if they were standing still on a steep slope.
HOLT: He even created a model to show how snowboarders can keep their balance in the half-pipe…stay upright, without taking a spill.
DOHERTY: If I’m building up my motion in the half pipe, back and forth, I can go all the way up to the rim and the water stays level in the glass. A snowboarder has to remember that when they’re in the half pipe. They have to feel not only gravity straight down, but the forces of the snow on them, which change angle as they move.

HOLT: As gravity pulls snowboarders down the half pipe, they gain speed. But at the very same time, they're being pushed against the sides of the half pipe by contact forces from the surface of the snow.

DOHERTY: That snowboarder feels like they're being crushed against the surface.

HOLT: Even 2006 Gold Medalist Sean White has felt the power that friction can exert on his board.

SHAUN WHITE, U.S. Olympic Snowboarder: There's actually like g-force when you're going up, and it's sucking you against the wall.

HOLT: Snowboarders push back against these G-Forces – and build more speed – by “pumping” their legs up and down.

KEVIN PEARCE, snowboarder:
Every time you see someone in the half-pipe who's going fast and big, they're pumping.

ANNOUNCER: “…She lands so high, and is able to pump as hard as she can, across the flatbottom.”

HOLT: By standing up against those extra forces in the curve, snowboarders add to their kinetic energy, the energy of motion. And that gives them the speed they need to get air.

KEVIN PEARCE, U.S. Snowboarding Team: So the whole idea is to go as fast as possible, because the faster you go, the higher you go. And the higher you go, the more points you get and the better tricks you can do.

HOLT: One more factor in achieving maximum speed is the height of the half-pipe. The taller the pipe, the more gravitational energy a snowboarder stores at the top. Potential energy: that’s what gives matter the potential to move. When a snowboarder launches down the ramp, that potential energy gets converted into kinetic energy.

DR. DEBORAH KING, Ithaca College: When they take off the ground, they are generating a lot of velocity, so they have kinetic energy. As they go up in the air, gravity is slowing them down, so they are actually losing kinetic energy and it's being converted to potential energy. When they are at the top of their jump, and they are at their highest, they have the most potential energy.

HOLT: That potential energy will come in handy in Vancouver, where the new in-ground “superpipe” created for the 2010 Olympics will be the biggest one ever, rising 22 feet high. At that height, we'll see some awesome tricks, and the boarders will have more time to hang out ... in the air.