

Winter Olympics Science Notes: Skate Blades

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The slightly curved blades attached to figure skates help balance the skater's weight over the ball of their foot. Credit: © VANOC/COVAN | TM/MC

The skates matter. The figure skaters competing in the women's long program tonight at the 2010 Vancouver Winter Olympics would never be able to complete the jumps and spins needed to win gold if they wore speed skates.

Any spectator can see that the boots are different -- speed skates look a bit like athletic shoes, while hockey and figure skates have stiff, high boots that lace higher up the leg. In fact, the ice skates used in the [Olympic Games](#) are specialized for each sport.

"We're trying to get the science to catch up with the art," said Sean Maw, a sports engineer at Mount Royal University in Alberta, Canada. His speedskating research includes everything from studying the features of skates to designing the skintight uniforms, and even the safety pads around the track perimeter.

Skaters use the edges of their skate [blades](#) to push against the ice, which then pushes back against the skater to provide forward movement. That's the most basic interaction going on. More blade pushing against the ice means the skater can apply more force against it -- and the more force, the faster the skater can go.

The physical length of hockey and figure skate blades are shorter than those used in short track speedskating, which are shorter than those used by long-track speedskaters.

No matter how smoothly a hockey player speeds past the defense, it's not fair to assume that player could easily keep up with short-track speedskaters without the longer blades designed specifically for speed.

However, the blades are not just flat pieces of metal -- just like kitchen knives, they are cut in specific shapes according to their intended use.

Blades are shaped to curve gently along the bottom edge, which is called the rocker. Figure skates have a toe pick in the front to help grip the ice and launch skaters high into the air for jumps.

The rocker determines how much of the blade is in contact with the ice, with a longer arc indicating that more of the blade comes in contact with the ice. The length of the arc is longest for long-track speed skating.

"There's significant differences between the blades of a hockey versus a figure versus a speed skate," said Kelly Lockwood, a sports scientist at

Brock University in Ontario, Canada.

Not only are blades shaped differently, they are also sharpened differently.

The blades are ground flat for speedskating, like thin rectangles, and grooved, with a hollow running down the middle, for hockey and figure skating. The hollow creates an inside and outside edge.

Different hockey positions tend to use different hollows, trading maneuverability and agility for speed.

"The idea is to stay on top of the ice, not dig through it," said Lockwood. "Deep hollows will give you more bite."

"Hockey blades give you much more agility and maneuverability," said Maw. "[Speedskating] blades give you the ability to go fast, but you can't turn on a dime."

The features and measurements used to shape blades, so important to skating, have not been fully examined scientifically.

"You start out by saying, 'let's confirm practice,' let's confirm why we do what we do and move from there," said Lockwood. "How can we tweak it just a little bit more?"

"Our initial study suggests that if you look at two hockey blades, their rockers can be completely different if they're not done by a high level professional skate technician," said Maw. "In hockey, you could have totally different blade profiles and that certainly can't be helping the skater."

Maw said that educating the coaches and athletes themselves about

better blade shaping is the next step. An additional portion of his research is attempting to standardize the methods of measurement so profiles can be computerized and easily understood.

For any of these sports the goal is to use the skates as a tool to improve performance.

"The bottom line is the point of contact with the ice," said Lockwood. "All of the power that is created by the body, it's translated into performance or movement, you want it to be translated through the blade."

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