

# Curling Science

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A set of curling stones rests on the ice. Each stone weighs about 41 pounds.  
Credit: DoD.gov | William D. Moss

Since becoming an official Winter Olympic sport in 1996, the sport of curling has draws a surprisingly large TV audience for an event that features slick-shoed competitors sweeping brooms in front of stones sliding across the ice. But it's far more complex than just an icy version of shuffleboard.

Researchers are examining the sport in an effort to identify the techniques that improve an athlete's performance, asking questions similar to what most spectators likely ponder when watching the sport: "what does good look like in curling?"

That question is dear to John Bradley, an exercise physiologist who has worked with both the Irish and Scottish Institutes of Sport. He recently

published a paper in the [Journal of Sports Science and Medicine](#) explaining the science of curling.

Each member of a four-player team slides two stones per round, or "end." As each teammate sends a roughly 41 pound stone down the ice, two others sweep in front of the stone to heat and melt the ice, and another teammate gives directions to guide the sweeping.

The object of the game is to place one or more of your team's stones closest to the target, known as the "house." Sweeping helps the stone slide faster and farther. The direction the stone is spun as it is released, as well as the location of the sweeping, will influence the force of friction and therefore the amount that the stone curls.

Curling requires athletes to perform a set of unique activities.

"The big physical demand within curling is the sweeping," said Bradley. Although not every stone requires vigorous sweeping, and only two players per team sweep at any one time, the sport requires both intense physical output and intense concentration.

Vigorous bouts of sweeping can raise the [heart rate](#) to 170-200 beats per minute, and over the course of a long tournament fatigue can accumulate.

"You can imagine maybe playing a round of golf and maybe having to run up a steep hill every third hole and then still be able to play your game and keep your form," Bradley said.

But most golf tournaments last 3-4 days. Each curling team at the Winter Olympics will play nine matches in eight days, each lasting longer than two hours. Medal-round competitors will play two more. Training to avoid fatigue is one reason why physical conditioning is now a much bigger part of curling, noted Bradley.

That's not to suggest that curlers are fit enough to dominate extremely fatiguing sports such as water polo.

"Since most of the curlers in the world are in colder climates, you're not going to see bronzed, beach physiques curling very often," said Jonathan Reeser, a sports injury epidemiologist and the chair of the institutional review board at the Marshfield Clinic in Wisconsin.

Much of Reeser's research focuses on volleyball injuries, but when he moved to Wisconsin in 1997 he joined a curling club. He searched for medical research examining injuries in curling. Finding few studies on the topic, he launched his own effort.

He asked curlers at two major U.S. tournaments to fill out questionnaires about their injuries. It turned out that the results were fairly intuitive.

"In the study we documented that most people had problems with their knees and their back and their shoulders and their hips," said Reeser. "They are usually overuse injuries."

Reeser found that very few curlers, even at the nationally-competitive level, had developed injuries that stopped them from curling -- nothing like the torn ligaments or broken bones that keep athletes in other sports out of competition for months.

Maybe that is why if you Google "curling injuries" you'll learn less about the sport and more about the dangers of the hot metal objects used to curl hair.

Recent research plays a big part in helping curlers improve their technique. "It's beginning to allow us to tailor the game and tailor the conditioning of the curlers for the game," said Bradley. "Now there's a greater emphasis on the physical conditioning as well as the technical

and tactical aspects of curling which are a real pivotal part of the sport."

That research used an instrumented curling brush. Known to researchers as a "sweep ergometer," it enabled them to track the effort used while sweeping and develop scientific answers to strategic questions.

Bradley's research showed that the speed of the stone suggested the best way to sweep. The most important factor is the temperature of the ice when the stone glides over it. When the stone is traveling faster it is more effective to sweep faster because it enables sweepers to cover the same spot of ice more than once and raise its temperature higher.

"And if the stone's traveling slower then you can begin to put more downward pressure into the ice because it's easier to cover the same area of ice more than once," said Bradley.

All this effort does not necessarily mean that the sport will soon be overrun by hulking athletes with football-player physiques.

"Physical conditioning is still only a part of curling," said Bradley. "It's a significant but not the most significant factor in curling. The tactical aspects of curling play are still very, very important."

"It's a simple sport to learn, but it's a very challenging sport to master," said Reeser. "Getting the stone to go where you want it to go with the proper weight and trajectory is maddeningly difficult."

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