

[Home](#) [Table of Contents](#) [Feedback](#) [Subscribe](#) [Help/About](#) [Archives](#) [Search](#)



THE WEEKLY NEWSMAGAZINE OF SCIENCE



[Print Article](#)

[E-mail Article](#)

Week of Nov. 13, 2004; Vol. 166, No. 20

## The Iced Foot Effect

Ivars Peterson

It was a dramatic finale. Only 9 seconds remained in the National Football League's 2004 Super Bowl, which pitted the New England Patriots against the Carolina Panthers. The score was tied. The Patriots kicker Adam Vinatieri was set to kick a game-winning, 40-yard field goal.

At that crucial moment, the Panthers called a timeout. The team hoped that this extra time would "ice" Vinatieri, getting him to think more about the situation he was in—and making him more likely to miss. The kicker had to wait 2 minutes before making his attempt. He made the kick, and the Patriots won the Super Bowl.

Football teams continue to call timeouts at such moments, always hoping to increase the chances that the opposing kicker will miss after the delay. Basketball teams apply a similar strategy when they call a timeout just before an opposing player attempts a free throw.

"Does making the kicker think about his field goal attempt for an extra 2 minutes alter his probability of success?" statisticians Scott Berry and Craig Wood ask in the current issue of *Chance*. In other words, does "icing" work?

To find out, Berry and Wood analyzed data about field goal attempts during the 2002 and 2003 NFL seasons (including playoffs). They recorded the kicker, the length of the kick, the score of the game, the time left in the game, and whether a timeout was called by the defense before the kick. They even noted whether the field was grass or artificial turf and the weather conditions (sun, clouds, rain, snow, average wind speed, temperature—unless the games were indoors).

In these two seasons, there were 52 different field goal kickers, combining for a total of 2,003 attempts. Of these kicks, 1,565 (78.1 percent) were successful.

Berry and Wood then looked at what they defined as "pressure" kicks—those that occurred with 3 minutes or less remaining in the game (or overtime) and would create a lead or a tie for the team

[Archives](#)

[New Science News pdf Archive, 1995-2000](#)

[Subscriber Login](#)  
Access to full contents

[Sign In](#) [Help](#)

Login problems?  
[Click here.](#)

[Online Features](#)

- **Math Trek**  
The Iced Foot Effect
- **Food for Thought**  
Vegetable Soup Fights Cell Damage
- **Science Safari**  
Elephant Voices
- **TimeLine**  
70 Years Ago in Science News

attempting the kick.

There were 139 such pressure kicks, and 101 (73 percent) were successful. The defense called a timeout 38 times before the pressure kick, and 24 (63 percent) of these kicks succeeded.

To take a closer look at the data and take into account any physical factors that could affect the outcome, the statisticians created a mathematical model representing the probability of a successful kick.

In general terms, a successful kick depends largely on the distance. It's also useful to incorporate a factor that accounts for performance differences among different kickers. Weather may also influence the result.

Using this model, Berry and Wood obtained results using the 2-season data that matched certain expectations. A kick made indoors is more likely to be successful. Clouds also have a small beneficial effect on kicks. Rain or snow, on the other hand, reduces the chances of success. High winds also reduce the probability of success, but not as much as rain or snow.

In pressure situations, the odds of success change very little (a mean decrease of 1.8 percent). However, icing the kicker in such a situation has a pretty strong negative effect.

Using their model, Berry and Wood calculate that, for an average kicker, the estimated probability of a successful 40-yard kick in sunny weather is 0.759. The estimated probability under the same conditions for an average kicker who has been iced is 0.659.

"Reducing the probability of a successful kick from 0.759 to 0.659 is a very important difference," Berry and Wood report.

So, is calling a timeout a good defensive strategy? "The evidence is not overwhelming, but it is compelling," Berry and Wood conclude.

"Icing a field goal kicker on a pressure kick may decrease the probability of success," they add. "This implies that a psychological effect of pressure exists, and is compounded by more time to dwell on the kick."

Statisticians and fans have long argued about whether there is such a thing as a "hot-hand" effect in sports, where a player, such as basketball shooter, has streaks during which he's more successful than expected. Now, there appears to be evidence of a "cold-foot" effect!

### Puzzle of the Week



Sophie bought \$5 worth of postage stamps of three kinds: 50-cent stamps, 10-cent stamps, and 1-cent stamps—100 stamps in all.

How many stamps of each kind did she buy?

For the answer, go to

<http://www.sciencenewsforkids.org/articles/20041103/PuzzleZone.asp>.

 References and sources for this article

**References:**

Berry, S., and C. Wood. 2004. The cold-foot effect. *Chance* 17(No. 4):47-51.

Peterson, I. 1996. Cracking the myth of ball control. *Science News Online* (May 25). Available at [http://www.sciencenews.org/pages/sn\\_arch/5\\_25\\_96/mathland.htm](http://www.sciencenews.org/pages/sn_arch/5_25_96/mathland.htm).

To learn more about the hot-hand effect and hot-hand research see <http://www.hs.ttu.edu/hdfs3390/hothand.htm> and <http://skepdic.com/clustering.html>.

\*\*\*\*\*

A collection of Ivars Peterson's early *MathTrek* articles, updated and illustrated, is now available as the Mathematical Association of America (MAA) book *Mathematical Treks: From Surreal Numbers to Magic Circles*. See <http://www.maa.org/pubs/books/mtr.html>.

Comments are welcome. Please send messages to Ivars Peterson at [ip@sciserv.org](mailto:ip@sciserv.org).

Ivars Peterson is the mathematics/computer writer and online editor at *Science News* (<http://www.sciencenews.org>). He is the author of *The Mathematical Tourist*, *Islands*



of *Truth*, *Newton's Clock*, *Fatal Defect*, and *The Jungles of Randomness*. He also writes for the children's magazine *Muse* (<http://www.musemag.com>) and is working on a book about math and art.

NEW! NEW! NEW! *Math Trek 2: A Mathematical Space Odyssey* by Ivars Peterson and Nancy Henderson. For children ages 10 and up. New York: Wiley, 2001. ISBN 0-471-31571-0. \$12.95 USA (paper).

 Recently on MathTrek

[Football's Overtime Bias \(Nov. 6, 2004\)](#)

[Squaring Circles \(Oct. 30, 2004\)](#)

[Young Gauss \(Oct. 23, 2004\)](#)



[Home](#) | [Table of Contents](#) | [Feedback](#) | [Subscribe](#) | [Help/About](#) | [Archives](#) | [Search](#)

Copyright ©2004 [Science Service](#). All rights reserved.  
1719 N St., NW, Washington, DC 20036 | 202-785-2255 | [scinews@sciserv.org](mailto:scinews@sciserv.org)