

Science and the mind game of the penalty

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Chelsea goalkeeper Petr Cech dives to save a penalty by Bayern Munich's Ivica Olic during the shootout at the end of the Champions League final in Munich on May 19. So many tournaments these days are decided by penalties that scientists now play a key role in figuring out the best way to score or save from the spot.

With just one kick, you will be remembered forever as a hero. Or as an utter choker.

Few things in sport are as dramatic as football's [penalty](#) shootout, where huge prizes and [self-image](#) are at stake.

Indeed, so many tournaments these days are decided by penalties that scientists now play a key role in figuring out the best way to score or save from the spot.

In theory, taking a penalty is a no-brainer.

Professional footballers trained to make 50-metre (54-yard) passes to the feet of a teammate have to whack in a ball from 11 metres (12 yards) out, with just the goalie in front of them.

But the mental pressure lies entirely with the penalty taker, not the keeper, who won't get blamed if the ball goes in -- and will be covered in glory if he keeps it out.

"Penalties are a lottery," former England manager Fabio Capello said in 2009.

"I remember some very important players that didn't take penalties because they didn't feel sure they would score."

British expert Greg Wood says "the mind games" in penalty-taking are legion.

Watch out for the goalie with the shuffling feet and the wobbly legs, wearing outsized gloves and a red or fluorescent jersey with bat sleeves, designed to make him look bigger and more threatening when he stretches out his arms.

Watch out, too, for the keeper who takes time to sportingly salute his [opponent](#) before the kick or picks up the ball and strokes it, slyly putting it back slightly off the penalty spot.

It's designed to ruffle the taker, to spoil his control of the situation, to mess up his routine.

Above all, it says: LOOK AT ME.



Bayern Munich midfielder Bastian Schweinsteiger reacts after missing his penalty during the shootout after the Champions League final against Chelsea in Munich on May 19. So many tournaments these days are decided by penalties that scientists now play a key role in figuring out the best way to score or save from the spot.

"Anything that the [goalkeeper](#) can do to capture the penalty taker's attention, to make him look at him, to make him the target area, is all to his advantage," said Wood, of the Department of Sport and Health Sciences at Britain's University of Exeter.

"That's because there's a close link -- where we look is where our actions tend to follow. For instance, if you are driving a car and you follow something out of the window to your left, your steering will also drift off to the left.

"What this means is that if you are looking centrally at the goalkeeper, your shot will also be more central. Watch how many penalties go right down the centre, it's just unbelievable."

The perfect penalty, according to mathematicians at Liverpool's John Moores University, is a ball that is struck high and in the corner at between 90 and 104 kilometres (56-65 miles) per hour.

Anything faster than this boosts the risk of inaccuracy, and anything slower helps the goalie intercept it.

Little tips on body movement can help both sides in the penalty duel.

Some experiments have found that looking at the striker's hips just before the kick gives a steer as to which side the ball will be struck.

Others suggest that looking at the goalkeeper's knees helps the striker. The knee that is the most extended is the one that is used to brace the keeper so that he can jump in the opposite direction.

To cope with mental pressures, psychology is crucial, said Wood.

Players must filter out extraneous stuff -- the noise from the crowd, the distraction of the goalie, thoughts of what would happen if they score or fail -- and focus just on kicking the ball right.

It's a matter of training, according to Wood.

He and colleague Mark Wilson devised an experiment in which university-level footballers were given "quiet-eye training," meaning that over seven weeks they were taught a ritual of gazing at a target spot -- the top left and right corners of the goal -- before stepping up for the kick.

The ritual not only made their kicks more accurate, it also helped them to shut out anxiety. In a penalty competition that put up 100 pounds (150 dollars) as bounty, 50 percent fewer of their kicks were saved compared with shots by counterparts who had not received the training.

As Euro 2012 is likely to show, penalty cultures vary widely from country to country.

"Germany seems to be amazing at it, they've got something like an 82-percent success rate in penalty takes, where England I think is as low as 18, 19 percent," said Wood.

"There definitely seems to be something there, either in their approach to penalty-taking or whether they believe in their own hype.

"It could be that they feel more in control of their situation, they feel less anxious and expect to do well, whereas England have got all those expectations on their shoulders -- they've got past failures which they allow to prey on the mind."

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