# Limitations of human visual system hinders goalkeepers from predicting free kicks

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Professional goalkeepers fail to stop free kicks because of shortcomings in their visual system, according to new research by Cathy Craig and colleagues, from Queen's University Belfast, Northern Ireland. The projected trajectory of a ball following a curved flight path is more difficult to judge because our visual system is not sensitive enough to gauge a change of direction at speed, mid-flight.

The research is published in Springer-Verlag's journal *Naturwissenschaften*[1].

Free kicks are now important goal-scoring opportunities, with specialist free kick takers often choosing to make the ball spin in order to curve the ball into the goal. Because of the size of the goalmouth, goal keepers need to anticipate the direction of the ball before they take action. Cathy Craig and team looked at whether the lateral deflection of a ball's trajectory, caused by sidespin[2], affects professional footballers' perception of where the ball is heading.

Eleven professional footballers (attackers, mid-fielders and defenders) and nine goalkeepers from AC Milan, Olympique de Marseille, Bayer Leverkusen and Schalke 04 were asked to judge whether a range of simulated free kicks would end up in the goal or not, using a virtual reality system. The viewpoint was fixed in the centre of the goal. When there was no spin, balls arriving directly opposite the goal were consistently judged to be entering the goal.

When the ball was spinning clockwise, the resulting trajectories – from the point of view of the goalkeeper – unfolded on the right-hand side of the no-spin trajectory, resulting in a goal only if the striker shot from left of the central position in front of the goal. For conditions where the ball was spinning counter-clockwise, the balls landed in the goal only when they – from the view of the striker – were kicked from the right-hand side of the no-spin trajectory. There was no difference between the judgements of the field players and goalkeepers.

Players appear to be using current ball heading direction to make their judgements about whether the free kick will end up in the goal or not, rather than accurately predicting the effects of lateral acceleration on the ball's trajectory. Craig and colleagues conclude that these "perceptual effects find their origin in inherent limitations of the human visual system in anticipating the arrival point of an object subjected to an additional accelerative influence….The depth of experience of our participants does not seem to be able to compensate for these shortcomings in visual perception."

Notes:

1. Craig CM et al (2006). Judging where a ball will go: the case of curved free kicks in football. *Naturwissenschaften*; 93:97-101.

2. The Magnus force, created by a ball spinning around an axis, gives rise to an acceleration that is perpendicular to the direction of the ball. This causes a lateral deviation in the ball's trajectory.

Source: Springer