The Eyes Have It!

The psychology of success and failure for penalty takers

By Greg Wood and Dr. Mark Wilson

As we begin another year of top-flight soccer, it is inevitable that penalty kicks will play a major factor in the outcome of some important matches. In fact, the frequency of this set piece has steadily increased in major international tournaments (Aramats, Giannakos, & Hatzimouli, 2007). Despite the expected advantage to the kicker, a surprisingly high percentage of penalty kicks are missed in games of this magnitude. Three recent European Champions League finals were decided by penalty shootouts (2001, 2003, and 2005), and a relatively high percentage of kicks were missed (14 out of 31 shots, 45 percent).

Because of the magnitude of such performance failure, sport psychologists have tried to explore what contributes to suboptimal performance in this task. In a recent study, Jordet, Hartman, Visscher, C, & Lemmink (2007) explored the effect of stress, fatigue, skill level and luck on the outcome of penalty kicks and found that only stress could significantly account for performance failure. This is not surprising—anxiety’s negative influence on performance is well known. But the precise mechanisms behind such effects on penalty kicking performance are still unclear. How does anxiety disrupt performance? At the University of Exeter in the United Kingdom, we have been exploring the eye-behaviors and attentional control of penalty takers shooting under low- and high-anxiety conditions using eye-tracking technology. We hoped that anxiety’s effect on the eye-behaviors of penalty takers might shed some light on this important question.

Shooting Strategies

One of the first studies on penalty kicks to make suggestions about the eye behaviors of shooters was carried out by Kuhn (1988). In this study, a sample of 66 penalty kicks from European soccer was assessed via video analysis to explore what players were looking at prior to kicking. The author proposed two kicking strategies: keeper-dependent and keeper-independent. The keeper-dependent strategy sees kickers focus on the goalkeeper prior to shooting in an attempt to monitor the keeper’s anticipatory movements and then shooting in the opposite direction. The keeper-independent strategy sees kickers ignore the movements of the goalkeeper and instead look where they intend to aim. As these strategies were defined using video observations, no actual eye-behavior data was collected and as such, the kicking strategies identified remain an approximation at best.

In a series of studies (see Wood & Wilson, in press), we attempted to explore the effectiveness of penalty takers utilizing a keeper-dependent strategy. For this, 14 male experienced university soccer players wore eye-tracking equipment while looking at the center of the goal but attempting to hit areas just inside the posts of a five-a-side soccer goal. Results suggested that participants hit significantly closer to the center of the goal when they looked centrally while trying to hit optimal areas inside of each post, compared with when they looked at the optimal areas and tried to shoot to these. In essence, when the eyes were constrained centrally, the shots became more centralized.

In a followup study, penalty takers took a series of shots with a goalkeeper present to explore if the kicking strategies outlined by Kuhn were actually utilized by penalty takers. We also explored how effective each strategy was in generating successful shots (i.e. those fartherthest from the goalkeeper). As Kuhn suggested, the keeper-dependent strategy was used most frequently. However, we uncovered a previously undocumented strategy that we went on to label the opposite-independent strategy. This strategy sees kickers look to one direction and shoot to the other in an obvious attempt to deceive the goalkeeper. The results of this second study again illustrated that a centrally focused gaze strategy (keeper-dependent) brought about shots that hit closer to the goalkeeper, making them more likely to be saved. Furthermore, worse-performing kickers were more reliant on the keeper-dependent strategy, and better performers used the keeper-independent strategy, looking where they intended to hit.

Why it’s important to look where you’re shooting

Intuitively, it seems obvious that in most aiming-based sports, you need to look where you intend to shoot. For example, it would be absurd to expect an archer to hit the bulls-eye while not focusing on the target or a basketball player to take free throws while looking into the crowd. Yet for some reason soccer players do seem to adopt a suboptimal strategy when attempting to hit accurate shots.

In aiming, the eyes play a crucial role in providing information that is required in the planning and production of accurate responses (e.g., force and direction). It could be argued that because of the size of the target area in soccer, the level of accuracy is not as critical as archery or basketball. This is especially the case if the goalkeeper dives early, leaving most of the goal unprotected. However, adopting such an approach undoubtedly relinquishes some control over the situation from the kicker to the goalkeeper. For example, what if the keeper doesn’t dive and remains stationary? What if they guess the way you intend to shoot at the last minute?

In a recent high-profile example from the English FA Cup semifinal, Dimitar Berbatov hit a feeble shot directly at the keeper in the penalty shootout and explained his miss as follows: “I was looking for the goalkeeper and in the last moment he took the angle I was going for, so he saved it” (Berbatov, 2009). From a psychological viewpoint, relinquishing control in this manner is seen as counterproductive. In fact, those kickers that feel they are not in control of the outcome of penalty kicks are found to be significantly more susceptible to performance failure (Jordet, Ellerink-Gemse, Lemmink & Visscher, 2006).

The truth is, in penalty kicks, the kicker has the most control over the outcome. If a shot is struck at a sufficient pace and hit accurately just inside of either post then a goalkeeper will have insufficient time in order to react and save it. Furthermore, research examining the visual search strategies of keepers in penalty shots suggests that they use information sources from the lower body (legs and hips) to predict shot direction, not where the kicker is looking (e.g., Savelbergh, Williams, van der Kamp, & Ward, 2002). So utilizing a ‘target-focused’ strategy should not give any clues to the keeper regarding shot location. Research here and elsewhere consistently shows that the optimal strategy for kickers to adopt is a target-focused one, independent of the goalkeeper.

Anxiety induced attentional disruptions

In study 1, when participants were asked to hit each corner of the goal, all participants aligned their eyes with where they intended to hit. It was only in study 2, when a goalkeeper was introduced that other attentional strategies (keeper-dependent or opposite-independent) were employed. Therefore, it seems that the mere presence of a goalkeeper disrupted the optimal attentional outlook of soccer players taking penalty kicks. Why?

When we are anxious, we show an attentional bias to threatening stimuli in the environment. In a penalty kick scenario, the goalkeeper is the primary threatening source in the environment. His actions heighten the level of uncertainty with regard to the outcome and threaten the potential success of the kicker. In a further study (see Wilson, Wood & Vine, 2009) we tested this hypothesis by having soccer players take kicks under low- and high-anxiety conditions and monitoring how they attended to the goalkeeper. We were especially interested in how anxiety-induced changes in their eye movements affected their shooting accuracy. Results showed that when anxious, soccer players showed a predisposition to look at the goalkeeper earlier and for longer periods of time. Furthermore, and consistent with previous studies, such centralization disruptions in eye movements also resulted in shots being hit closer to the goalkeeper. Put simply, where the eyes look, shots tended to follow.
Implications for Goalkeepers
In a followup study, we explored the implications of these findings from a goalkeeper's perspective. Research from mainstream cognitive psychology would suggest that anxious individuals are more distractible, especially when threatening stimuli are present. Therefore, an actively distracting goalkeeper may be more likely to draw the attention of an anxious penalty taker. There is again some anecdotal evidence from professional soccer that may support this. Former Liverpool F.C goalkeeper, Bruce Grobbelaar, rationalized his distracting behavior in an infamous shootout as follows:

"The biggest memory I have is the 1984 European Cup final against Roma and my 'spaghetti legs' routine during the penalty shootout that won us the trophy. People said I was being disrespectful to their players, but I was just testing their concentration under pressure. I guess they failed that test." (Jackson, 2005).

We asked 18 university soccer players to take penalty kicks under high- and low-anxiety conditions to stationary or distracting goalkeepers (waving his arms), comparing the effect on attentional control and performance. We found that when anxious, participants looked at the distracting goalkeeper earlier and for longer periods of time. Yet again, these disruptions in gaze behavior made shots more likely to hit centralized locations and also increased the likelihood that participants would fail to score the kick (saved or missed shot). From this it seems that distracting techniques of this kind may have real benefits for goalkeepers.

Implications for Penalty Takers and Coaches
So what can players and coaches do about this? First, a penalty kicking strategy that is fundamentally linked to the actions of the goalkeeper should be discouraged. This strategy relinquishes control of the situation and is likely to increase the anxiety of the kicker. This strategy is effective only if the keeper dives early, whereas, if he remains stationary or dives late, an inaccurate centralized shot is probable.

Instead, coaches should encourage penalty takers to practice penalty kicking routines that encompass a target-focused strategy, providing the performer with the optimal target information to generate an accurate shot. Training that focuses on guiding the performer to targets or optimal goal locations should serve to strengthen eye-shot coordination and also enable the eyes to provide the brain with the necessary visual information for accurate shooting. It is likely that such training will not only enable the taker to utilize the best shooting strategy, but also empower the kicker to claim more control over the situation, making disruptions in gaze behavior, and choking under pressure less likely.

References

Greg Wood is a third-year Ph.D. student at the School of Sport and Health Sciences, University of Exeter, UK. His thesis examines the attentional control of soccer penalty takers under pressure. Dr. Mark Wilson is a chartered psychologist and a senior lecturer in experimental psychology at the School of Sport and Health Sciences, University of Exeter. His research examines the cognitive processes underlying the learning and skilled performance of visually guided tasks.