Anxiety and attentional control in football penalty kicks: A mechanistic account of performance failure under pressure

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: ……*G. Wood*……..

Abstract

Football penalty kicks are having increasing influence in today's professional game. Despite this, little scientific evidence currently exists to ascertain the mechanisms behind performance failure in this task and/or the efficacy of training designed to improve penalty shooting. In a football penalty kick it has been reported that the majority of kickers do not look to the area they wish to place the ball; preferring to focus on the 'keeper and predict anticipatory movements before shooting. Such a strategy seems counterproductive and contradictory to current research findings regarding visually guided aiming. Coordination of eye and limb movements has been shown to be essential for the production of accurate motor responses. A disruption to this coordination not only seems to negatively affect performance, but subsequent motor responses seem to follow direction of gaze. Thus, where the eyes lead actions tend to follow. In study 1, ten participants were asked to kick a standard sized football to alternate corners of a goal, whilst looking centrally and whilst looking where they intended to hit. This disruption of eye-limb coordination brought about a 15% reduction in kicking accuracy. When participants were asked to fixate centrally, their shots hit more centrally (17cm) than when they were allowed to look where they intended to hit. These results were in spite of no significant differences between the number of missed shots, preparation time and ball speed data across conditions. We concluded that centrally focused fixations dragged resultant motor actions inwards towards more central target locations. Put simply, where the eyes looked shots tended to follow. The second study sought to test the predictions of attentional control theory (ACT) in a sporting environment in order to establish *how* anxiety affects performance in penalty kicks. Fourteen experienced footballers took penalty kicks under low- and high-threat counterbalanced conditions while wearing a gaze registration system. Fixations to target locations (goalkeeper and goal area) were determined using frame-by-frame analysis. When anxious, footballers made faster first fixations and fixated for significantly longer toward the goalkeeper. This disruption in gaze behaviour brought about significant reductions in shooting accuracy, with shots becoming significantly centralized and within the goalkeeper's reach. These findings support the predictions of ACT, as anxious participants were more likely to focus on the "threatening" goalkeeper, owing to an increased influence of the stimulus-driven attentional control system. A further prediction of ACT is that when anxious, performers are more likely to be distracted, particularly if the distracter is threat related. When facing penalty kicks in football (soccer), goalkeepers frequently incorporate strategies that are designed to distract the kicker. However, no direct empirical evidence exists to ascertain what effect such visual distractions have on the attentional control, and performance, of footballers. In the third study, eighteen experienced footballers took five penalty kicks under counterbalanced conditions of threat (low vs. high) and goalkeeper movement (stationary vs. waving arms) while wearing eye-tracking equipment. Results suggested that participants were more distracted by a moving goalkeeper than a stationary one and struggled to disengage from a moving goalkeeper under situations of high threat. Significantly more penalties were saved on trials when the goalkeeper was moving and shots were also generally hit closer to the goalkeeper (centrally) on these trials. The results provide partial support for the predictions of attentional control theory and implications for kickers and goalkeepers are discussed. The previous studies showed that anxiety can disrupt visual attention, visuomotor control and subsequent shot location in penalty kicks. However, optimal visual attention has been trained in other far aiming skills, improving performance and resistance to pressure. In study 4, we therefore asked a team of ten university soccer players to follow a quiet eye (QE; Vickers, 1996) training program, designed to align gaze with aiming intention to optimal scoring zones, over a

seven week period. Performance and gaze parameters were compared to a placebo group (ten players) who received no instruction, but practiced the same number of penalty kicks over the same time frame. Results from a retention test indicated that the QE trained group had more effective visual attentional control; were significantly more accurate; and had 50% fewer shots saved by the goalkeeper than the placebo group. Both groups then competed in a penalty shootout to explore the influence of anxiety on attentional control and shooting accuracy. Under the pressure of the shootout the QE trained group failed to maintain their accuracy advantage, despite maintaining more distal aiming fixations of longer duration. The results therefore provide only partial support for the effectiveness of brief QE training interventions for experienced performers. This series of studies are the first to explore the gaze behaviour of football penalty takers in a quest to uncover and understand anxiety's negative influence on attentional control and performance. They are also the first to explore the efficacy of goalkeeper distractions and training in improving performance from both the goalkeeper's and kicker's perspective. The results of these studies conclude that when anxious, penalty takers show an attentional bias toward the 'threatening' goalkeeper that can be increased and utilised by a goalkeeper employing distraction techniques and that penalty takers do benefit, to some extent, from a gaze-based pre-shot routine.

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Contents