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**Dissertation Proofreading**

## **Chapter Two: Literature Review exert**

### **Striker Strategies**

In the modern-day, elite-level athletes have adopted various styles of striking penalty kicks, whether it is Italian and Chelsea FC midfielder Jorginho utilising a slow approach with a leap before striking or England and Tottenham Hotspurs striker Harry Kane's power shot that typically is targeted into the low corner of the net. Penalty kicks have continued to be an intriguing and developing area of research, leading to studies identifying two dominant striker shooting strategies implemented when attempting to deceive a goalkeeper (Weigelt & Memmert, 2012). Such strategies were initially introduced by Khun (1988), who titled the approaches as either the 'keeper-dependent' or the 'keeper-independent' strategies. Khun investigated the factors associated with the adoption of each strategy and revealed that player intuition was often a key factor which has been further noted in further studies (Bar-Eli & Azar, 2009). However, further studies have noted that the adoption of the strategies can be impacted by players preferences and small random perturbations (Chiappori et al., 2002). The keeper-independent strategy sees a striker choose where to place the ball before the run-up and holds to choose during the run-up and kick. This strategy sees the penalty kick taker ignore any behaviour from the goalkeeper (Navarro et al., 2013). This strategy has been suggested to be utilised and made effective based on a penalty kick bias, knowledge of the opposing goalkeeper's preferences or the goalkeeper's starting position (van der Kamp, 2006). Studies have suggested that the use of the keeper-independent strategy is the superior method as it is the best provider of approximation of co-ordinated visuomotor control as well as the player maintaining a greater amount of control by focusing on where the ball should be placed to beat the goalkeeper before striking the ball (Wood & Wilson, 2010).

In contrast, The Keeper-dependent strategy sees a player attempt to kick the ball to the side opposing the keepers dive. This strategy sees a player attempt to anticipate the goalkeeper's movement by obtaining advanced cue information from the goalkeeper (Navarro, et al., 2013). Although the penalty kick taker will leave it until the point of no return, a temporary location will be selected in advance but is not finalised until the moment before foot to ball contact (van der Kamp, 2006). During his study, Khun (1988) suggested that this approach is commonly adopted, with an estimated 70-75% of football players adopting this strategy. However, additional studies (see. Van der Kamp, 2006; Wood & Wilson, 2010; Noel & van der Kamp, 2012) have later noted that this approach is less effective than Khun initially suggested.

However, there are still several benefits regarding the implementation of the keeper-dependent strategy. Firstly, Wood and Wilson (2010) note that the strategy requires a lesser degree of accuracy when the striker successfully anticipates the goalkeepers dive and place the ball to the opposite side. However, Navarro et al. (2013) noted that for the strategy to be successful, a striker must receive and correctly interpret information from the goalkeeper regarding which way they will be diving during the run-up to the strike. Several studies have argued that there is an association between the goalkeepers action and the strategy adopted by the striker, specifically when a striker is adopting a keeper dependent strategy. This has led to the suggestion that a coupling link may be a possibility whereby both the striker and goalkeeper function as a dyadic system during the penalty kick scenario (Savelsbergh et al., 2005; van der Kamp, 2006; Morya et al., 2003; Lopes et al., 2008).

While the research has strongly supported the presence of two strategies, a further study from McGarry and Franks (2003) has suggested that a third strategy may be utilised. Specifically, the study suggests that some strikers utilise both the keeper-independent and keeper-dependent strategies. This strategy sees the striker change strategy based upon the position of the goalkeeper in the goal. Further studies have noted the influence of the goalkeeper's starting position on the striker's decision making, with such studies demonstrating that goalkeepers could manipulate a striker's ball placement decision by standing slightly off centre in the goal (Weigelt & Memmert, 2012; Weigelt, et al., 2012; Masters, et al., 2007).

Debate continues to arise on the ability for a strike to ignore, or in essence, not be distracted by a goalkeeper which is one element that has led to the determination of the keeper-independent being the favoured strategy. Previous studies, including Wegner (1994), suggested that a deliberate attempt to ignore a thought or action may have an adverse effect and cause a decline in performance by the performer engaging in the very thought or action they are trying to avoid. Such suggestions are largely supported in the literature by several studies that have found that strikers who choose to ignore the goalkeeper experience a detrimental effect on their performance (McGarry & Franks, 2000; Kerwin & Bray, 2006; Bar-Eli & Azar, 2009; Franks & Hanvey, 1997; Palacios-Huerta, 2003; Wilson et al., 2009; Savelsbergh et al., 2005; Dicks et al., 2011). Consider the study from Dicks et al. (2011), who found that goalkeepers benefit from collecting late information from the initiation of the strikers kicking action at approximately 450 ms before foot to ball contact is made as this can reduce the keepers vulnerability to deception. As such, this suggests that if a striker understands what a goalkeeper

is observing and how they can utilise this for their own benefit, this can provide them with an opportunity to further collect information from the goalkeeper regarding the information they are collecting.

Similarly, the study from Bar-Eli et al. (2005) reported that there is an action bias present in the penalty kick action. In this sense, the study suggests that a goal scored yields worse feelings for the goalkeeper when they remain in the center of the goal than the completion of an action such as jumping, which leads to a bias for action. In this sense, this suggests that if a striker ignores the goalkeeper's action in terms of their desire to act, this can leave a distinct lack of information, leading to a successful penalty kick.

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