Do Professionals Choke in the Face of Pressure and Distraction?

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Abstract

We ask whether facing partisan audiences affects the execution of a highly-skilled task. Our setting is penalty shootouts in the high-stakes setting of elite professional football (soccer). In this context, performers take penalties under intense pressure, while facing a subset of the crowd behind the goal who may attempt to distract them through visual and auditory tactics. Using data on 1,207 penalties taken in the later rounds of major English cup competitions from 1992 to 2025, we find no evidence that having supportive allied spectators behind the goal provides a strategic advantage. This implies that elite professionals in this domain can effectively screen out crowd-induced distractions when performing under extreme stress.

Keywords: performance; distraction; penalty kicks; football
JEL codes: D01, D91, L83, Z20

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1. Introduction

Understanding how social influence exerts pressure on agents is important to economics. These forces have implications for issues such as prosocial preferences (Bénabou and Tirole, 2006), public good provision (Daughety and Reinganum, 2010), and identity formation (Akerlof and Kranton, 2000, 2010). Empirical research has documented the effects of such pressure across a range of settings including voting (Schram and Van Winden, 1991), charitable giving (DellaVigna et al., 2012), favouritism (Butler et al., 2025; Dawson and Dobson, 2010; Sutter and Kocher, 2004), norm compliance (Battiston and Gamba, 2016), and – the topic of this paper - task performance (Dohmen, 2008). Increasingly, it has been recognised that social pressure can act as a non-monetary incentive, shaping individual motivations and behaviour (Scoppa, 2021).

Penalty kicks in football (soccer) have proven a particularly valuable setting for isolating the effects of social pressure (Palacios-Huerta, 2014, 2025). We appeal to this setting for reasons that are now well-established. The task offers a clean, natural, and high-stakes context to test economic theory and psychological factors influencing performance (Apesteguia and Palacios-Huerta, 2010; Balafoutas et al., 2019; Bar-Eli et al., 2020; Krumer, 2020; Palacios-Huerta, 2014, 2023; Vandebroek et al., 2018). Our focus is on shootouts, which are especially advantageous, as these penalties are taken in an even more precisely structured environment and strip away match-level contextual factors.

In a notable contribution, Dohmen (2008) provides evidence that social environments significantly affect the execution of penalty kicks in football. Dohmen (2008) observes that players are more prone to choking under pressure by missing the goal entirely, when playing in their home stadium, although higher stakes do not induce such effects. This analysis, based on 3,619 penalties in Germany, is limited by the absence of information on the fan composition within the stadia, especially behind the goal where the kick was taken. Thus, we extend this line of inquiry by analysing a new observational dataset of penalty kicks, which allows the identification of crowd allegiance behind the goal where the penalties were taken. It is reasonable to suspect that these fans could mediate the social pressure and distraction felt by the players.

The novelty of our test also lies in considering the implications of the first coin toss of a penalty shootout, which determines the goal and fans (stadium end) potentially most influencing the penalty task.[1] We investigate how multisensory stimuli from partisan spectators - engaging in targeted distraction tactics - affect individuals carrying out a pressurised skill-based task. This question is motivated by an extensive history of psychological theory and lab experimentation testing whether perceptual and auditory distractions can impair task execution (e.g., Baddeley

[1] To our knowledge, all behavioural research to date has focused on the implications of the second coin toss before a penalty shootout - the flip which determines the sequence of kicks in a shootout (Kassis et al., 2021; Pipke, 2025; Santos, 2023).

and Hitch, 1974; Corbetta and Shulman, 2002; Eysenck et al., 2007; Kahneman, 1973; Lavie, 1995, 2005, 2010; Treisman, 1964; Wickens, 1980).

Beyond extending Dohmen (2008), our analysis complements Ferraresi and Gucciardi (2021), who examine 545 penalty kicks and observe that the likelihood of missing a penalty increased for home teams playing behind closed doors (in empty stadiums). Their results contrast with Dohmen (2008), implying that supportive audiences may enhance task performance. However, similar to Dohmen (2008), Ferraresi and Gucciardi (2021) lack fan identity data prior to the COVID-19 pandemic. To our knowledge, only Park et al. (2022) have examined the impact of specific audience subsets, placing an emphasis on how it influences goalkeeper positioning before penalties are taken.

Taken generally, this research lies across two strands of literature. First, it contributes to the growing body of work employing penalty kicks data as a 'natural laboratory' to test behavioural theories. For example, prior research has appealed to this context to consider the effects of pressure (Arrondel et al., 2019), choking (Dohmen, 2008), momentum (Krumer, 2021), and hastening behaviour (Veldkamp and Koning, 2023). Second, our analysis speaks to a volume of studies examining audience effects (e.g., Bryson et al., 2021; Reade et al., 2022; Scoppa, 2021), offering a new angle by asking whether a specific subset of the crowd influences performance. As this literature develops, there is a growing interest in how the exact fan composition within stadia affects outcomes (Colella et al., 2024; Humphreys et al., 2022).

The paper continues as follows: Section 2 describes the setting and appeals to theoretical and empirical research which inform possible outcomes; Section 3 describes the methods; Section 4 outlines our data; Section 5 presents the results; and Section 6 concludes the paper.

2. Setting and Anticipated Effects

Penalty shootouts are a tie-breaking procedure used to determine the winner when a football match remains level after regulation or extra time. Each team takes penalty kicks, in alternating sequence from a spot marked 12 yards from the goal line, to decide the winner.[2] Only the opposing goalkeeper defends the kick.

At the start of the 2016/17 season, the International Association Football Board (IFAB) introduced a rule requiring an additional coin toss before the start of a shootout. The new rule stated that, "unless there are other considerations, the referee tosses a coin to decide the goal at which the kicks will be taken which may only be changed for safety reasons or if the goal

[2]If the score remains tied after five kicks each, then the shootout proceeds to 'sudden death' rounds, in which teams continue to alternate until one scores and the other fails to convert within the same round. All players that were on the field at the end of the match must take a penalty before anybody on their team takes a second penalty. The exception to this is if teams have an unequal number of players at the end of the match due to a dismissal, in which case the team with more players nominate a player not to participate in the shootout.

or playing surface becomes unusable" (The International Football Association Board, 2016, p. 71). Previously, the decision was at the referee's discretion.[3]

The consequence of the referee's first coin toss prior to a shootout is that one set of penalty-takers face into a supporter subset who engage in antagonistic distraction tactics. This is a mixture of visual (e.g. banner and hand waving) and audio (e.g. heckling, taunts, shouting) distractions. The other set of kickers face a supportive - often quiet and motionless - audience, as the allegiances of fans behind the goal align with the objectives of the performer. The same principle applies to goalkeepers; they make decisions with or without nuisance from the nearby audience. This meets a distraction criteria as the performers are not required to, and cannot attend to, any disturbance - but must complete a task under pressure.

In this scenario, what are the expected effects of a partisan crowd subset on penalty performance? First, it is reasonable to speculate that external distractions could increase the complexity of the task. For example, the executive functions of performers could be by inhibited by stress and heightened anxiety (Eysenck et al., 2007). Attentional control may require additional processing resources. Thus, opposition fans impairing a performer could diminish the probability of accomplishing a task. While it is not possible to distinguish between the levels of hostility from crowds behind a goal, both the visual and auditory stimuli witnessed in this setting would be high load relative to everyday distractions.

No extraneous load is borne by performers facing their own fans and a second expectation is plausible; taking penalties facing supportive (typically silent or encouraging) fans may increase pressure on players and lower the probability of successful task completion. This expectation appeals to a broad theory of choking (Baumeister, 1984), and could be framed as performers facing a relatively low visual and auditory load, but one where the shooter is monitored by an expectant audience. A body of evidence supports choking effects using data from professional sport in skill-based tasks (Böheim et al., 2019; Bühren et al., 2024; Cohen-Zada et al., 2017; Dohmen, 2008). In short, one could propose that the absence of stimuli - or low level supportive arousal - induces choking.

Third, it is reasonable to anticipate a null effect based on theory and evidence. These performers are often 'superstars' and are remunerated as such (e.g., Bryson et al., 2014; Scarfe et al., 2021). They are highly trained performers and accustomed to managing intensive performance demands, one of which is persistent efforts from supporters to interfere. Additionally, players get ample opportunity to practice the penalty task, albeit not under perfectly analogous (noisy) conditions or levels of pressure. Prior research also shows that the psychological profiles underlying footballers' human capital is exceptional relative to the general population (Bonetti et al., 2025). To summarise this third plausible outcome, the exceptionalism of the performers,

[3]While we test the robustness of our results to this rule change, we acknowledge that prior to 2016/17, a coin toss was most often used informally to determine which end was chosen, and thus which group of fans was positioned behind the goal.

coupled with learning opportunities, would imply that they could be resilient or immune to visual and audio stressors.

3. Estimation

Consistent with much of the literature modelling penalty outcomes (e.g., Dohmen, 2008), we specify probit regression models to estimate the effects of fans behind the goal on the probability of a player missing entirely or scoring a penalty kick, controlling for a range of potential confounding factors.

The basic models we estimate are given by:

$$\Pr(\text{Miss}_i = 1 \mid \text{FBG}_i\ , \text{Home}_i\ , \mathbf{x}_i) = \Phi(\alpha + \beta_1 \text{FBG}_i + \beta_2 \text{Home}_i + \beta_3 \text{FBG}_i \times \text{Home}_i + \mathbf{x}_i' \boldsymbol{\lambda})\ , \quad (1)$$

$$\Pr(\text{Score}_i = 1 \mid \text{FBG}_i\ , \text{Home}_i\ , \mathbf{x}_i) = \Phi(\mu + \delta_1 \text{FBG}_i + \delta_2 \text{Home}_i + \delta_3 \text{FBG}_i \times \text{Home}_i + \mathbf{x}_i' \gamma)\ , \quad (2)$$

where $\Phi(\cdot)$ denotes the cumulative distribution function (CDF) of the standard normal distribution.

The dependent variable in Equation (1) gives the probability that kick i is off target, missing the goal completely, aligning with the main focus in Dohmen (2008) and Ferraresi and Gucciardi (2021). In Equation (2), the dependent variable represents whether the kick was scored, with the complement including both missed and saved kicks. The variable $FBG_i = 1$ (Fans Behind Goal) indicates that the kicker performed the penalty with supportive fans behind the goal, while $Home_i = 1$ if the kick occurred in the player's home stadium. We also include the interaction between FBG_i and $Home_i$. Accordingly, β_3 and δ_3 allow us to test whether any effects of kicking in a home stadium and the affiliation of the supporters behind the goal are independent on average. Given the interaction terms and the non-linear nature of the probit specification, we present and interpret our main results using predicted probabilities, evaluated at the sample means, for all explanatory variables.

We also include a broad set of control variables in Equations (1) & (2), contained within the vector $\mathbf{x}_i$. To account for yearly trends in penalty kick success, we include dummy variables for each season. To address contextual variation in pressure or other plausibly exogenous factors influencing the kicker, we include controls commonly used in the literature: the natural logarithm of the stadium attendance; dummy variables for the competition and the round (e.g., final vs semi-final); and a dummy for whether the kick was potentially decisive (i.e., would end the shootout if scored or missed). Additional controls in $\mathbf{x}_i$ relate to the identities of the kicker or goalkeeper: linear terms for the kicker's age, the goalkeeper's age, the minutes played by the kicker in the previous season and during the current match, and the goalkeeper's height; dummy variables for the kicker's primary position (e.g., midfielder); and indicators for whether the kicker regularly takes penalties outside of shootouts and whether the goalkeeper is the team's regular 'first choice'. Standard errors are clustered at the shootout level.

4. Data

Our dataset comprises 1,207 penalty kicks taken during 123 shootouts in the two elite English domestic cup competitions - The English Football League (EFL) Cup and The Football Association (FA) Cup. Notably and relevant for statistical power, this sample is around a third the total size of that studied by Dohmen (2008) (3,619 kicks) but involves more different kick takers (936 vs. 704). Our sample is over twice as large as in Ferraresi and Gucciardi (2021) (545 kicks). The setting is well-suited to examining our research question, as the competitions typically feature a substantial presence of away fans in stadia. Ticket allocations for travelling supporters in English cup competitions are generally increased relative to league matches by 10–15% (Butler, 2019). Information on shootout environments and outcomes is obtained from archival footage, primarily hosted on `YouTube.com`. Data on match attendances and player characteristics are sourced from `11v11.com` and `FbRef.com`.

The data cover penalty shootouts from the third round onward through to the finals, for both competitions, from the 1992-1993 to 2024-2025 seasons. Elite teams enter at the third-round stage, and we obtained publicly available footage of shootouts during this period to manually verify the allegiances of fans behind the goal and the corresponding penalty outcomes.[4] Fan allegiance is classified straightforwardly by observing jersey colours and the reactions of supporters to penalty outcomes (Park et al., 2022). From viewing the recordings, an almost universal behavioural pattern emerges: fans behind the goal engage in visual and auditory distractions during opposition penalties, while remaining largely silent or offering encouragement to their own team's kickers. Supporters celebrate according to the outcome and often exchange gestures with players when results align with their preferences. Scoring players and saving goalkeepers frequently interact jubilantly with their own fans positioned behind the goal.

Figure 1 represents the dataset, showing the number of penalty kicks taken (and % scored) in front of either home or away supporters. The greater frequency of shootouts in later years reflects two rule changes: the elimination of replays in the FA Cup for tied matches and the removal of additional/extra time. Both modifications increased the likelihood that matches would be decided by penalty shootouts. Table 3 provides descriptive statistics for the dataset and summarises all variables used in the estimations. On average, 74% of kicks are scored, 9% are off-target, and 49% were taken in front of the kicker's own fans. The average stadium attendance for these kicks is 33,984, with the maximum of 89,041 reported for Wembley Stadium semi-finals and finals.

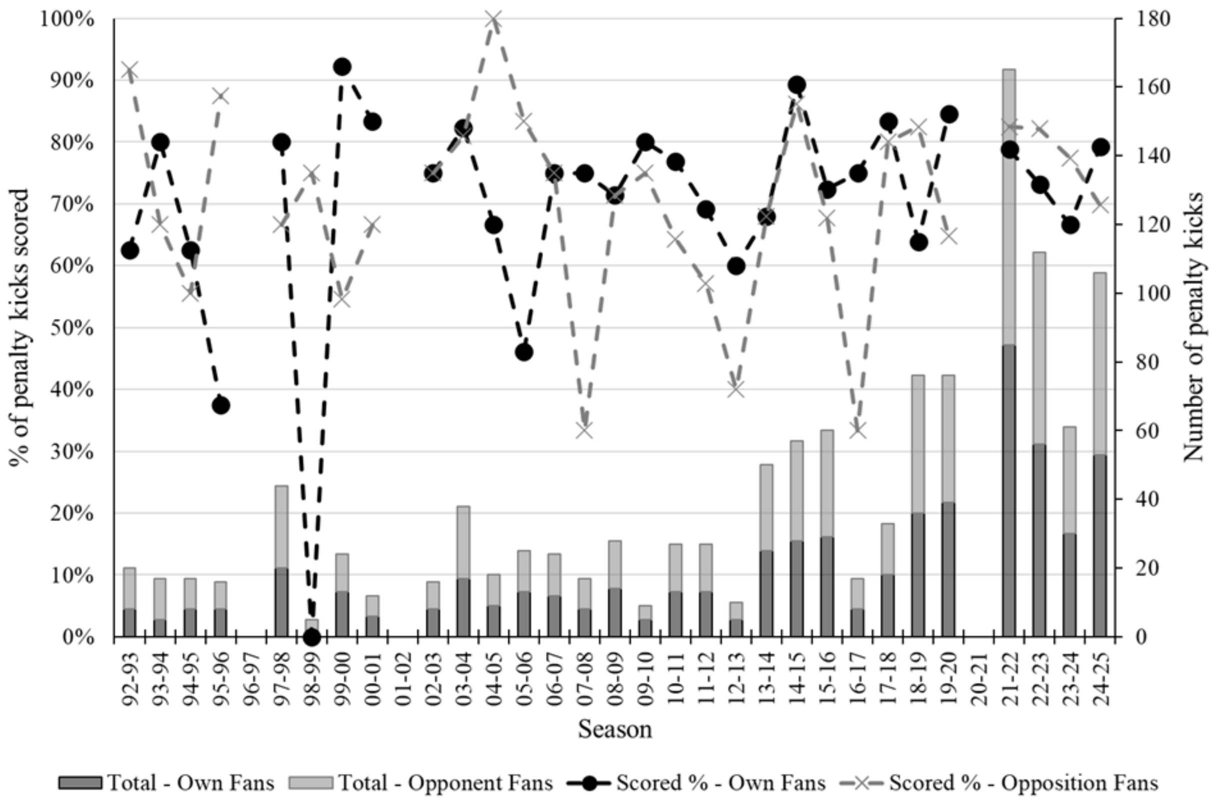
[4]No footage is available for 38 shootouts within this sampling window. For 11 earlier shootouts, the composition of fans is ambiguous, and these are therefore omitted from the analysis. A further 7 shootouts are omitted because they occurred behind closed doors during the COVID-19 pandemic. All videos are publicly accessible primarily via `YouTube.com`. A minority of matches are accessible via `Facebook.com` and other streaming platforms. Data and video links are available on request.

TABLE 1: Summary Statistics for penalty kicks taken during a shootout in the English FA Cup or EFL Cup, seasons 1992/93-2024/25

Variable	**Definition**	**Mean/Share**	**St. dev.**	**Min.**	**Max.**
Goal scored	1 = Successful penalty, 0 = Unsuccessful penalty	0.74			
Missed, off-target	1 = Missed target, 0 = On target	0.09			
Kicker's fans behind goal	1 = If fans behind the goal are supporting the kicker's club, 0 = otherwise	0.49			
Home	1 = If the kicker is taking the penalty at their home stadium	0.45			
Attendance	Recorded stadium attendance	33,984	23,065	2,810	89,041
Competition	1 = FA Cup, 0 = EFL Cup	0.38			
Deciding penalty	1 = If the penalty decides the outcome, 0 = otherwise	0.19			
Kicker age	Age of the kicker	26.72	4.04	17.61	40.14
Goalkeeper	1 = If kicker is a goalkeeper	0.01			
Defender	1 = If kicker is a defender	0.32			
Midfielder	1 = If kicker is a midfielder	0.31			
Forward	1 = If kicker is a forward	0.35			
Last season minutes	Number of league minutes kicker played in previous season	1,881	1,041	1	4,140
PK specialist	1 = if the kicker takes in-play penalties in the current or previous season or is a strategic sub	0.20			
Match minutes	The number of minutes the kicker played in the match	90.86	41.67	1.00	120.00
Goalkeeper age	Age of the goalkeeper	28.51	4.47	19.81	42.48
First choice goalkeeper	1 = If the goalkeeper is the first choice, 0 = otherwise	0.62			
Goalkeeper height	Height in centimetres of the goalkeeper	190	4.21	176	203

Notes: 1,207 penalty kicks from 123 shootouts, with fan allegiance behind the goal determined by the authors using archive footage, primarily via YouTube.com..

FIGURE 1: Percentage of shootout penalty kicks scored and total number taken in front of own or opposition fans, by season of the FA Cup and EFL Cup, 1992/93-2024/25



Notes: 1,207 penalty kicks from 123 shootouts, with fan allegiance behind the goal determined by the authors using archive footage, primarily via YouTube.com.

5. Results

Table 2 summarises the results from Equation (1), with the coefficient estimates and standard errors in Panel A and corresponding predicted probabilities in Panel B. Column (1) presents estimates omitting all covariates except the home dummy. On average, there is effectively no difference in the frequency of a penalty being missed between kicks taken at a player's home stadium and those taken elsewhere ($H_0 : \beta_2 = 0$; p-value$= 0.990$). In column (2), we introduce the 'fans behind goal' (FBG) indicator. The results suggest that kicks at home in front of away fans are missed most often, consistent with the idea that majority home support in the wider stadium may generate social pressure on home players (Dohmen, 2008), while the presence of away fans directly behind the goal may amplify pressure and add distraction. However, none of the model coefficients are statistically significant from zero ($H_0 : \beta_1 = 0$; p-value$= 0.299$ and $H_0 : \beta_2 = 0$; p-value$= 0.558$). Column (3) adds the interaction between the home and FBG variables, which is also not significant ($H_0 : \beta_3 = 0$; p-value$= 0.706$). As we sequentially include additional controls in columns (4) and (5), and when we split the sample before and after the 2016 rule change described earlier, the qualitative pattern of results remains unchanged.

TABLE 2: Probit model estimates for the likelihood of a penalty kick being ***missed*** (off target) during a shootout in the English FA Cup or EFL Cup, seasons 1992/93-2024/25

	92/93-24/25					92/93-15/16	16/17-24/25
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Coefficient estimates							
Kicker's fans behind goal (FBG) (β_1)		−0.132	−0.088	−0.116	−0.105	−0.272	0.025
		(0.127)	(0.186)	(0.199)	(0.207)	(0.345)	(0.242)
Home (β_2)	0.001	0.074	0.125	0.079	0.153	0.457	−0.150
	(0.104)	(0.127)	(0.166)	(0.171)	(0.172)	(0.286)	(0.251)
FBG × Home (β_3)			−0.098	−0.009	−0.084	−0.459	0.241
			(0.259)	(0.287)	(0.277)	(0.422)	(0.347)
Ln(Attendance)					-0.198^{**}	-0.498^{***}	-0.188^{*}
					(0.091)	(0.180)	(0.111)
FA Cup					-0.393^{***}	-0.539^{***}	-0.376^{**}
					(0.124)	(0.200)	(0.176)
Constant (α)	-1.329^{***}	-1.299^{***}	-1.309^{***}	-0.967^{**}	4.877^{*}	4.237	4.967^{*}
	0.0754	(0.079)	(0.084)	(0.446)	(2.737)	(5.320)	(2.815)
Pressure-Context controls					✓	✓	✓
Kicker-Keeper controls					✓	✓	✓
Season effects				✓	✓	✓	✓
Panel B. Predicted probabilities (at sample means)							
Kicker's fans behind goal:							
0		0.103	0.105	0.097	0.092	0.140	0.053
1		0.081	0.083	0.078	0.070	0.059	0.069
Home:							
0	0.092	0.086	0.088	0.082	0.073	0.078	0.062
1	0.092	0.098	0.101	0.094	0.090	0.119	0.059
FBG × Home:							
0 × 0		0.097	0.095	0.091	0.081	0.099	0.061
0 × 1		0.110	0.118	0.105	0.106	0.203	0.045
1 × 0		0.076	0.081	0.073	0.066	0.060	0.064
1 × 1		0.087	0.085	0.084	0.075	0.059	0.076
N: kicks	1,207	1,207	1,175	1,175	1,175	561	646

Notes: Coefficient estimates and predicted probabilities of the probit model given by Equation (1), with whether the penalty kick was missed (off-target) as the dependent variable. Other 'Pressure-Context' control variables not displayed are dummy variables for each round of competition and an indicator for whether the kick was potentially decisive (i.e., ending the shootout if missed/scored). 'Kicker-goalkeeper' controls are continuous linear terms for the age of the kicker, the age of the goalkeeper, the minutes the kicker played in the previous season, the minutes they played during the match, and the height of the goalkeeper, as well as dummy variables for each regular major position of a player (e.g., midfielder), and indicators for whether the kicker regularly took penalty kicks outside of shootouts and if the goalkeeper is the team's regular 'first choice'.
***, **, * indicate significance from zero of the model coefficients at the 1%, 5% and 10% levels, respectively, two-sided tests, and standard errors in parentheses that account for clustering at the level of a shootout (123 for columns 1-5). The sample size drops in columns (3-7) compared with Table 3 because no penalty kicks are missed in the sample during the 98/99, 04/05 and 09/10 seasons. None of the displayed predictive margins for any model are pairwise significantly different, at the 5% level, using the Delta Method with the cluster-robust variance matrix.

Overall, we find that the probability of missing is independent of whether the kick is taken at home or in front of the kicker's own supporters - this speaks to the third anticipated outcome discussed in Section 2. Interestingly, overall stadium attendance is negatively and significantly associated with the likelihood of an off-target kick (column (5): p-value$= 0.030$), though this may reflect the fact that higher attendances tend to involve stronger teams and better players.

Table 3 reports our estimates of Equation (2) for the probability that a penalty is scored, with the equivalent model specifications to Table 2. On average, kicks are scored more frequently by players in their home stadium, when facing the opposition's fans behind the goal. In column (5), which includes all controls, the model predicts that a kick taken by a player at home and in front of their own supporters has the highest probability of success (78%), while a kick taken by a home player in front of away supporters has the lowest (66%). This difference is statistically significant (p-value$= 0.036$). In general, these results neither mirror the patterns observed for off-target kicks in Table 2, nor align with the results from Dohmen (2008).

Recent evidence from Uribe et al. (2025) suggests that elite penalty takers tend to aim for the extremities of the goal less frequently than optimal play under von Neumann's (1928) Minimax theorem would predict[5] – consistent with risk aversion and the fear of 'losing face' from the high chances of a completely off-target attempt when aiming outside the keeper's reach (who normally starts in the middle of the goal). With this evidence in mind, our findings, when taken together, could be consistent with the view that home-team support, and the presence of home fans behind the goal, may help to relatively calm kickers' nerves, increase their willingness to take more optimal shots that are riskier in terms of missing, and improve overall performance. Pressure and distraction from away supporters has the opposite effects.

As a robustness check, we confirm that excluding shootouts in neutral stadiums has no meaningful bearing on our results. Following Dohmen (2008), we also verify that the results are robust to the possibility that players alter their strategies according to the environment of the kick, by including control variables for shot placement.[6] Finally, Table 4 demonstrates that our main findings remain robust when restricting the sample to non-specialist penalty takers, addressing the potential selection concern highlighted by Dohmen (2008) that individuals most adept at handling pressure may be selected into taking penalties.

[5]See Depoorter et al. (2025) for an up-to-date summary of the state of the literature on testing the Minimax theorem in professional sports.

[6]Not shown; results available on request. This aligns with prior studies modelling and testing the mixed-strategy play of football players during penalty kicks (e.g., Chiappori et al., 2002; Palacios-Huerta, 2003).

TABLE 3: Probit model estimates for the likelihood of a penalty kick being ***scored*** during a shootout in the English FA Cup or EFL Cup, seasons 1992/93-2024/25

	92/93-24/25					92/93-15/16	16/17-24/25
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Coefficient estimates							
Kicker's fans behind goal (FBG) (β_1)		-0.051	-0.131	-0.186	-0.276^{*}	-0.125	-0.268
		(0.092)	(0.128)	(0.141)	(0.155)	(0.273)	(0.188)
Home (β_2)	0.109	0.137	0.023	-0.027	-0.055	0.191	-0.041
	(0.083)	(0.096)	(0.148)	(0.165)	(0.172)	(0.253)	(0.259)
FBG $\times$ Home (β_3)			0.199	0.297	0.415	0.093	0.355
			(0.210)	(0.248)	(0.265)	(0.427)	(0.339)
Ln(Attendance)					0.110	0.100	0.141
					(0.080)	(0.137)	(0.093)
FA Cup					0.243^{**}	0.108	0.304^{**}
					(0.104)	(0.147)	(0.148)
Constant (α)	0.605^{***}	0.617^{***}	0.637^{***}	0.778^{***}	-3.652	1.621	-7.988^{**}
	(0.060)	(0.064)	(0.068)	(0.274)	(2.308)	(3.240)	(3.450)
Pressure-Context controls					✓	✓	✓
Kicker-Keeper controls					✓	✓	✓
Season effects				✓	✓	✓	✓
Panel B. Predicted probabilities (at sample means)							
Kicker's fans behind goal:							
0		0.751	0.741	0.743	0.749	0.745	0.776
1		0.735	0.728	0.727	0.719	0.717	0.742
Home:							
0	0.727	0.723	0.717	0.718	0.712	0.696	0.739
1	0.762	0.767	0.756	0.756	0.760	0.773	0.781
FBG $\times$ Home:							
0×0		0.732	0.738	0.748	0.756	0.716	0.781
0×1		0.774	0.745	0.739	0.739	0.777	0.769
1×0		0.715	0.694	0.685	$0.662^{\dagger}$	0.672	0.694
1×1		0.759	0.767	0.774	$0.782^{\dagger}$	0.767	0.794
N: kicks	1,207	1,207	1,207	1,207	1,207	561	646

Notes: Coefficient estimates and predicted probabilities of the probit model given by Equation (2). Other 'Pressure-Context' control variables not displayed are dummy variables for each round of competition and an indicator for whether the kick was potentially decisive (i.e., ending the shootout if missed/scored). 'Kicker-goalkeeper' controls are continuous linear terms for the age of the kicker, the age of the goalkeeper, the minutes the kicker played in the previous season, the minutes they played during the match, and the height of the goalkeeper, as well as dummy variables for each regular major position of a player (e.g., midfielder), and indicators for whether the kicker regularly took penalty kicks outside of shootouts and for whether the keeper is the team's regular 'first choice'.

***, **, * indicate significance from zero of the model coefficients at the 1%, 5% and 10% levels, respectively, two-sided tests, and standard errors in parentheses that account for clustering at the level of a shootout (123 for columns 1-5).

† indicates predictive margins that are pairwise significantly different from one another, at the 5% level, using the Delta Method with the cluster-robust variance matrix.

TABLE 4: Probit model estimates for the likelihood of a penalty kick being ***missed*** (off target) or scored during a shootout in the English FA Cup or EFL Cup, seasons 1992/93-2024/25: Only non-specialist penalty kick takers

	Missed		Scored	
	(1)	(2)	(3)	(4)
Panel A. Coefficient estimates				
Kicker's fans behind goal (FBG) (β_1)	-0.165	-0.155	-0.122	-0.159
	(0.212)	(0.218)	(0.345)	(0.166)
Home (β_2)	0.008	0.069	-0.008	-0.047
	(0.205)	(0.219)	(0.193)	(0.204)
FBG $\times$ Home (β_3)	0.155	0.096	0.105	0.147
	(0.305)	(0.298)	(0.271)	(0.281)
Ln(Attendance)		-0.202^{**}		0.148^{*}
		(0.099)		(0.087)
FA Cup		-0.329^{**}		0.242^{**}
		(0.130)		(0.112)
Constant (α)	-0.793^{**}	4.184	0.5777^{***}	-5.187^{*}
	(0.400)	(3.253)	(0.194)	(2.663)
Pressure-Context controls		✓		✓
Kicker-Keeper controls		✓		✓
Season effects	✓	✓	✓	✓
Panel B. Predicted probabilities (at sample means)				
Kicker's fans behind goal:				
0	0.101	0.096	0.742	0.747
1	0.085	0.078	0.717	0.716
Home:				
0	0.087	0.079	0.724	0.729
1	0.101	0.098	0.738	0.736
FBG $\times$ Home:				
0×0	0.100	0.091	0.743	0.753
0×1	0.102	0.103	0.740	0.738
1×0	0.074	0.068	0.702	0.700
1×1	0.100	0.093	0.735	0.734
N: kicks	896	896	956	956

Notes: See columns (IV) & (V) of Tables 2 & 3 for the equivalent model estimates using the kicks by all players in the sample.
***, **, * indicate significance from zero of the model coefficients at the 1%, 5% and 10% levels, respectively, two-sided tests, and standard errors in parentheses that account for clustering at the level of a shootout. None of the displayed predictive margins for any model are pairwise significantly different, at the 5% level, using the Delta Method with the cluster-robust variance matrix.

6. Conclusion

We explored a natural setting where it is possible to test the impact of pressure and salient visual and auditory distraction on task performance. Prior research on penalty kicks has produced mixed evidence regarding the influence of crowds. We address a gap in the literature by constructing a new dataset that captures an omitted variable pertinent to the penalty environment. The relevance of this is underlined by rules mandating a random selection of the audience closest to the shootout. We find no statistically significant evidence that a subset of supportive or antagonistic fans directly behind the goal alters scoring probabilities. This finding contributes to the literature on the social effects of crowds. It also complements the behavioural literature that employs the penalty-kick context to examine behavioural theories of performance under pressure.

Does the absence of systematic crowd effects necessitate a re-evaluation of policies on goal-end selection or require any changes from administrators? We would argue not. While we find no evidence that the first-coin toss, and linked fan behaviour, has a strong effect on penalty outcomes, the toss remains valuable in maintaining perceptions of fairness. This serves to mitigate potential claims of referee bias. Are there other practical implications from these results? This topic already draws media attention; commentators often claim bias and advocate for policy change based on their perception that facing one's own fans offers an advantage (e.g., Keys, 2025). This widely held media view is not borne out by the evidence here and thus the results could serve to inform an oft-held debate.

Can general inferences be drawn from these results? Our context is unique both in terms of the degree of pressure and stakes, as well as the psychological characteristics of performers. The ability of professional footballers to deal with adversity induced by pressure and noise is likely to be different from that of a typical employee. Thus, wider inferences and cross-context applicability are limited. Nonetheless, it is reassuring that skilled professionals can perform complex, technical tasks under intense stressors. While the exact type of distraction of course differs, airline pilots, surgeons or military personnel are examples of professions who must perform critical tasks optimally under heightened levels of workplace distraction.

Our data are hand collected and required manual viewing of individual shootouts, imposing high costs on data compilation. Future research could replicate and extend our analysis using larger samples if automated data-gathering processes enable fan composition identification behind the goal. Notably, our findings diverge from Ferraresi and Gucciardi (2021) once the sample size is expanded.

Several other limitations remain. Although we attempt to control for self-selection into penalty-taking, by accounting for specialist and strategic substitutions, some degree of selection bias may persist. Only on occasion do players lack agency in whether to take a penalty. Furthermore, information on the number, proximity, and exact behaviour of supporters behind the goal is inaccessible. Our analysis is also restricted to two national cup competitions in England and Wales, which may limit external validity. Finally, we assume that the winners of the first coin toss always opt to kick toward their own supporters; this is a highly plausible but unverified assumption.

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