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The influence of situational constraints on in-game penalty kicks in soccer

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ABSTRACT

This study examined the influence of situational constraints on professional soccer players' in-match penalty kick performance. Both pre-game and in-game situational constraints were considered. To this end, data on 7,199 penalty kicks from 5 European national leagues between 2008–2009 and 2021–2022 were collected. Hierarchal binary logistic regression analyses were conducted with nine situational factors to predict the kick outcome while controlling for three individual factors. The results revealed that penalty kicks were scored more often in the less prestigious league (Eredivisie). Furthermore, teams who were leading in the second half and players who observed a successful penalty kick from the opponent's team scored their penalty kicks more often. Finally, players who scored a field goal earlier in the game scored less often. However, the explained variance of logistic regression models was small. The fact that players are hardly affected by situational constraints seems to indicate that there is a successful selection of who is going to take the penalty kick. The conclusion was supported by the supplemental finding that players who took more penalty kicks outperformed the other players. More research into the interplay of situational, individual, and task constraints is needed to predict the outcome of in-game penalty kicks better.

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Soccer; in-match penalty kicks; performance pressure; situational constraints; observational study

1. Introduction

A penalty kick in soccer is a set play situation that arises either during regular playing time or as part of a so-called shootout at the end of the game, most prominently during international tournaments. With a high conversion rate, the penalty kick strongly impacts the game outcome (Dalton et al., 2015). Accordingly, for the kicker the penalty kick is considered to result in high levels of performance pressure (Jordet & Elferink-Gemser, (2012); Baumeister, 1984). Scientists from disciplines as diverse as economics, psychology, and sports have attempted to identify the factors that induce high pressure

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and how they influence penalty kick performance. In fact, research from these various disciplines enabled authors to provide evidence-based recommendations on how to prevail in penalty kick situations (Memmert et al., 2013; van der Kamp & Savelsbergh, 2014; Wood et al., 2015). However, these recommendations are mostly based on out-of-match experimental studies and, only rarely, observational studies of shootouts (cf. Barbero et al., 2023). The dynamics of an in-game penalty kick strongly diverge from circumstances in experimental studies (Christensen et al., 2015), and arguably also differ from penalty shootouts. In shootouts, it is not just a single player taking one kick, but players from both teams alternately take kicks, directly deciding the game's outcome. These differing circumstances may cause performance pressure to vary between in-game penalty kicks and shootouts. However, there is still a dearth of large observational studies on in-game penalty kicks. This paper tries to fill this gap by focusing on situational constraints of in-game penalty kicks that may induce high-performance pressure and, therefore, influence the outcome.

In-game penalty kicks are governed by rules described in the *Laws of the Game* (The International Football Association Board, 2018). A penalty kick is awarded when an offence is committed inside the penalty area. The ball needs to be placed stationary on the penalty mark. The player taking the penalty must be clearly identified and is allowed to score directly from the kick. The goalkeeper must remain on the goal line until the player has kicked the ball. In 2019, it was further stipulated that the goalkeeper needs at least one foot on, or in line with, the goal line (The International Football Association Board, 2019). Because the penalty mark is only 11 metres from the goal and the ball can reach a speed of 28 m/s the penalty kick is considered a great opportunity to score (Chiappori et al., 2002; Memmert et al., 2013; van der Kamp et al., 2018).

Research on in-game penalty kicks has used a classification of three types of factors to predict the outcome of the kick: individual, situational, and performance factors (Almeida & Volossovitch, 2023; Almeida et al., 2016; Horn et al., 2020; Jamil et al., 2020). Although the definitions of these factors are not always unambiguous, the classification aligns with Newell's (1986) distinction in constraints. He described three types of constraints: organismic or performer constraints (i.e. individual factors such as shooting strategy), environmental constraints (i.e. situational factors such as playing home or way), and task constraints (i.e. factors that reflect the goals of the task such as the rules governing the game). The performance outcome emerges from the dynamic interaction between these three types of constraints. In the current study, we investigate the effect of several situational constraints while attempting to control for some individual constraints. Situational constraints refer to the current event (i.e. the penalty kick) which are external to the individual (i.e. the penalty kicker). We consider two types of situational constraints: pre-game constraints (e.g. playing home or away) and second, in-game constraints (e.g. running score). Individual constraints reside in or are attributes of the individual penalty kicker (e.g. positional role).

Unlike for in-match penalty kicks, there is considerable research that has explored the effects of situational constraints in penalty shootouts. Jordet et al. (2007) reported that two key constraints, tournament level (i.e. pre-game) and kick round (i.e. in-game), significantly impacted kick outcomes. They are both associated with perceived event importance. Penalty kicks in the World Cup carry more weight than kicks in other, less prestigious tournaments, and kicks in later rounds in a shootout are more often decisive,

increasing performance pressure and reducing kick success. This initiated further investigations into situational constraints that affect a kicker's psychological state. Jordet et al. (2012) noted that teams with previous shootout losses had lower success rates, a pre-game constraint. Other research focused on in-game constraints. Jordet and Hartman (2008) found that positive valenced shots (which, if scored, win the game) were converted more frequently than negative valenced shots (which, if missed, lose the game). Additionally, Jordet et al. (2009) reported that players waiting longer for a referee's signal experienced performance declines, while Moll et al. (2010) discovered that celebrations after scoring negatively affected the next kick for the opposing team. Jordet and Elferink-Gemser (2012) identified different situational stressors associated with various shootout stages. Finally, Apesteguia and Palacios-Huerta (2010) found an advantage for the team taking the first kick, although this was contested by Kocher et al. (2012), Arrondel et al. (2019), and Santos (2023). A recent large-scale replication study by van Hemert and van der Kamp (2024) confirmed tournament level (pre-game), kick round, and shot valence (in-game) as effective situational constraints in shootouts.

The identified situational constraints for shootouts, however, do not directly translate into in-game penalty kicks. Hence, generalisation is not straightforward. Yet, research on situational constraints for in-game penalties is rare. One notable exception is by Dohmen (2008), who used 40 years of penalty kicks from the Bundesliga and found that players from the home team (versus playing away) showed an increased risk of missing the target. This finding is in line with the social pressure hypothesis (Dohmen, 2008; Zheng et al., 2023). According to the social pressure hypothesis, playing at home increases performance pressure, because of the social expectations, and perhaps requirements, from the home crowd. However, attendance size, running score (i.e. goal difference between the teams), and the interaction between running score and match phase did not influence or predict kick outcome (Dohmen, 2008). Almeida et al. (2016) analysed data from five seasons of the UEFA Champions League and five seasons of the UEFA Europa League and found that match location (i.e. home versus away), competition phase (i.e. play-offs, group stage, and knockout phase), running score, match phase did not significantly affect the penalty kick outcome. Further to this point, Almeida and Volossovitch (2023) used data from eight seasons of the Portuguese Premier League and again confirmed that match location, running score, match phase, player status (i.e. starter versus substitute), and team quality (i.e. ranking at the season's league table relative to the opponent) were not related to kick outcome. Finally, Horn et al. (2020) collected data from ten seasons of in-game penalty kicks taken in the English Premier League. Once again, no significant effects of match location, running score, and match phase were found on kick outcome.

In summary, besides the initial observation of home disadvantage observed in the German Bundesliga (Dohmen, 2008), there is no evidence that other pre-game (i.e. attendance, competition phase, and relative team quality) or in-game situational constraints (i.e. running score, match phase, starter or substitute) influence the outcome of in-game penalty kicks. By contrast, research on shootouts identified significant effects for several situational constraints. Kuss et al. (2007) hypothesised that this discrepancy is due to a more stringent selection for deciding which player takes the in-game penalty kicks, with players who better cope with high pressure being preferred. Accordingly, situational constraints may have

less impact on these players. This is in line with arguments by Christensen et al. (2015). They argue that to understand choking, it is pertinent to not only uncover the different situational constraints but also to reveal the individual constraints that induce different ways of coping with varying situational constraints. Consequently, the difference between in-game penalty kicks and shootout penalty kicks would not only result from different situational constraints but also from differences in how players interpret or cope with these constraints.

The present study investigates the influence of multiple situational constraints on the outcome of in-game penalty kicks, while also taking certain individual constraints into account. We consider three pre-game constraints: location, attendance, and league. According to the social pressure hypothesis (Dohmen, 2008), playing at home and having a larger audience increases performance pressure and the likelihood of unsuccessful penalty kicks. Additionally, associated with perceived event importance (Jordet et al., 2007), more prestigious leagues (e.g. the English Premier League compared to the Dutch Eredivisie), increase performance pressure and the likelihood of unsuccessful penalty kicks.[1] We also examine six in-game constraints, two of which are associated with perceived event importance. That is, running score as well as match phase likely influence performance pressure. For a kicker from a team that leads when a penalty kick is awarded, the kick is less decisive. Hence, they are expected to perceive less performance pressure, resulting in more successful kicks. Penalty kicks taken later in the match would increase its importance and thus pressure and the likelihood of an unsuccessful outcome. These two may interact and therefore we examine whether the running score becomes more critical in the second half of the match (Dohmen, 2008). Finally, we considered alternative in-game constraints based on the theory of self-efficacy (Jordet et al., 2012). Self-efficacy refers to the belief in the ability to perform (Schunk & DiBenedetto, 2021). Increased self-efficacy is thought to influence performance positively. It derives from personal performance accomplishments and the perception of positive accomplishments by others (Schunk & DiBenedetto, 2021). Conversely, failure or seeing others fail reduces self-efficacy. As such, self-efficacy is not an exclusively individual attribute but extends to earlier events in the match. Hence, a scored field goal or penalty kick earlier in the match is expected to increase self-efficacy, which would reduce performance pressure and the likelihood of a successful outcome, while a penalty kick missed earlier in the match is expected to decrease self-efficacy, increase pressure and the likelihood of an unsuccessful outcome. Perceiving penalty kicks taken by teammates or opponents may similarly impact self-efficacy, with positive accomplishments boosting confidence and negative ones diminishing it.

Taken together, we investigate the effects on penalty kick outcome for a set of nine situational constraints that are associated with performance pressure during in-game penalty kicks. To this end, we use a very large data set that includes all the in-game penalty kicks awarded during matches of 5 different European national leagues across 14 subsequent seasons. This study is larger and more diverse – to our knowledge – than any soccer penalty kick study conducted thus far.

2. Methods

2.1. Data

Data on penalty kicks from five European leagues were collected: the Dutch Eredivisie, the English Premier League, the Italian Serie A, the Spanish Primera Division, and the German Bundesliga. Data were collected by the first author online via soccerway.com and checked by the same author with data from transfermarket.com. The data was cross-checked for all nine situational factors using both sites to ensure data quality. In case of missing data, inconsistencies, or uncertainty, a third, independent report of the match was used to verify the information. In addition, data on the positional role and age of the player were taken from transfermarket.com. We obtained the data of all 7199 penalty kicks from 14 seasons (2008–2009 till 2021–2022). A total of 1442 players (average age = 28.3 years; SD = 3.9) were included, of which 488 players took one kick and 156 took more than 15 kicks. On average, a player took 5.0 kicks (SD = 7.0). The positional roles of the penalty takers were distributed as follows: 396 defenders, 2110 midfielders, and 4692 attackers.

2.2. Variables

To measure *performance*, the dependent variable kick outcome was used. Only penalties scored in the first instance were considered successful, that is, rebounds were not (goal = 1, no goal = 0). Nine situational factors were used to predict shot performance, three pre-game factors, and six in-game factors. The first pre-game factor was *match location*, which refers to the player taking the kick at the home field ("1") or away from home ("0"). The second factor is *attendance*, it is measured with 4 dummy variables: no attendance (i.e. ghost games during COVID-19 restrictions), low attendance (i.e. games with at least one standard deviation less attendance than the average game), medium attendance (i.e. games with an attendance that differed from the average attendance by less than one standard deviation) and high attendance (i.e. games with at least one standard deviation more attendees than an average game).[2] The third factor is the *league*, for which 5 dummy variables were used: Eredivisie (the Netherlands), Premier League (England), Serie A (Italy), Primera Division (Spain), and Bundesliga (Germany).

A total of six in-game factors were used. The first factor was *running score*, which was measured with a dummy variable indicating the score in the match when the penalty kick was awarded (when the team was leading "1", when not in front "0"). The second factor is the *match phase*, which refers to the playing half at which the penalty was taken. A dummy variable was used to distinguish the first half ("0") of the game from the second ("1"). The third and fourth factors assessed the player's in-game performance accomplishments. First, *field goals* were measured with a dummy variable which indicated if the player scored a field goal in the match ("1") or not ("0"). Second, *penalty performance* was measured with three dummy variables: previous score, previous miss, and no previous attempt. Finally, the last two factors measured observation of others' performance. First, the *teammate performance* encompassed dummy variables for teammate scored, teammate missed, and no performance teammate. The final factor, *performance opponent*, was measured similarly to the teammate's performance, except that it

considered the penalty kicks of the opponent (opponent scored, opponent missed, and no performance opponent).

Three individual factors were used to control for individual constraints. These factors were *positional role*, *age* (i.e. the year the second half of the season was played minus the year of birth of the player), and *designated kicker*. The positional roles were measured with three dummy variables: defender (including the goalkeepers), midfielder, and attacker, while age was measured by three dummy variables by taking the mean and one standard deviation on either side of the mean.[3] Designated kicker was measured by a dummy variable which indicated that the penalty kicks were taken by players who took at least 12 penalty kicks – within the current sample – which is at least one standard deviation more than the average player.

2.3. Data analysis

To examine the association between the predictor variables and the outcome variable, means were compared, and a hierarchical binary logistic regression analysis (Enter method) was used. The individual and situational variables were the predictors and kick outcome the dependent variable. Three models were tested. In the first model, the individual factors of positional role, age, and designated kicker were added as covariates. In the second model, the variables related to pre-game factors were added. Finally, the in-game factors were added in the third model including an interaction term for running score and match phase. The third and final model was tested for signs of bias. The standardised residual was used to test for outliers and Cook's Distance was used to test for influential cases (Field, 2015, p. 791). One outlier was detected but not removed and no influential cases were detected. Tests for the assumption of collinearity indicated multicollinearity was not a concern because tolerance levels were above 0.2 and VIF values were smaller than 5 (Field, 2015, p. 795). Odds ratios (OR's) were used as the relative measure of effect. The statistical analysis was performed using SPSS (version 24). The level of significance was set at 0.05.

3. Results

The total number of penalty kicks in the Eredivisie, Premier League, Serie A, Primera Division, and the Bundesliga is 7199, and 5597 of these kicks were converted (Table 1), resulting in an average conversion rate of 77.7%. Most penalty kicks were awarded in the Serie A even when considering the number of teams participating in the league (i.e. 20

Table 1. Number of penalty kicks and players per league.

League	Number of penalties	Number of players
Eredivisie	1186	322
Premier League	1356	294
Serie A	1844	324
Primera Division	1646	345
Bundesliga	1167	288
Total	7199	1442

Because some players were active in multiple leagues, the total number of players in the complete data set is lower than the summation of players per league.

Table 2. Descriptive statistics on the situational variables and kick outcome.

Variable	Number of penalties	Kick outcome (% goal)
Pre-game factors		
Match location		
Away	2897	77.3
Home	4302	78.0
Attendance		
Ghost game	783	80.0
Low attendance	832	79.0
Medium attendance	4522	77.1
High attendance	1062	78.2
League		
Eredivisie	1186	79.8
Premier League	1356	78.4
Serie A	1844	77.2
Primera Division	1646	76.5
Bundesliga	1167	77.6
In-game factors		
Running score		
Drawn or behind	5256	77.4
Leading	1943	78.8
Match phase		
First half	3018	78.0
Second half	4181	77.6
Interaction running score and match phase		
Drawn or behind, first half	2465	78.4
Drawn or behind, second half	1390	76.5
Leading, first half	553	76.1
Leading, second half	1390	79.9
Field goals		
Not a goal-scorer	6483	77.9
Goal-scorer	716	76.0
Penalty performance		
No previous attempt	6930	77.6
Previous score	236	81.4
Previous miss	33	87.9
Teammate performance		
No performance teammate	6992	77.8
Teammate scored	144	78.5
Teammate missed	63	73.0
Performance opponent		
No performance opponent	6618	77.5
Opponent scored	478	81.2
Opponent missed	103	75.7

Comparison of means of the average kick outcome (goal) for the nine situational factors.

teams compete in the Serie A, Premier League, and Primera Division, while in the Eredivisie and the Bundesliga 18 teams participate).

Table 2 shows the situational variables and the corresponding percentage of penalty kicks converted into a goal. Table 3 shows the results of the three binary logistic regression analyses. The first model with the individual variables was significant (omnibus chi-square is 39.9, df = 5, $p < .001$) as was the addition of the pre-game situational variables in model 2 (omnibus chi-square 18.4, df = 8, $p = .018$), and the addition of in-game situational variables in model 3 (omnibus chi-square 19.8, df = 10, $p = .031$). Despite these significant results, the final model only accounted for 1.1% (Cox & Snell) to 1.7% (Nagelkerke) of the total variance in kick outcome.

The pre-game factor of match location did not provide a significant result in model 2 or model 3 (Table 3). The descriptives in Table 2 show that home teams were awarded

Table 3. Binary logistic regression analyses predicting kick outcome.

	Model 1	Model 2	Model 3
Covariates			
Positional role			
Defender	1.000 (Ref.)	1.000 (Ref.)	1.000 (Ref.)
Midfielder	1.046 (.727)	1.073 (.591)	1.079 (.561)
Attacker	1.027 (.832)	1.072 (.581)	1.089 (.499)
Age			
Age 18-24	1.000 (Ref.)	1.000 (Ref.)	1.000 (Ref.)
Age 25-32	1.055 (.481)	1.099 (.218)	1.100 (.216)
Age 33-41	0.999 (.999)	1.053 (.618)	1.057 (.591)
Designated kicker			
No designated kicker	1.000 (Ref.)	1.000 (Ref.)	1.000 (Ref.)
Designated kicker	1.433 (<.001)	1.495 (<.001)	1.498 (<.001)
Pre-game factors			
Match location			
Away		1.000 (Ref.)	1.000 (Ref.)
Home		1.044 (.461)	1.038 (.527)
Attendance			
Ghost game		1.000 (Ref.)	1.000 (Ref.)
Low attendance		0.977 (.850)	0.982 (.883)
Medium attendance		0.852 (.097)	0.856 (.109)
High attendance		0.842 (.150)	0.842 (.150)
League			
Eredivisie		1.000 (Ref.)	1.000 (Ref.)
Premier League		0.831 (.072)	0.838 (.087)
Serie A		0.752 (.003)	0.757 (.004)
Primera Division		0.730 (.001)	0.731 (.001)
Bundesliga		0.842 (.104)	0.844 (.112)
In-game factors			
Running score			
Drawn or behind			1.000 (Ref.)
Leading			0.883 (.276)
Match phase			
First half			1.000 (Ref.)
Second half			0.892 (.094)
Interaction running score and match phase			
Leading*Second half			1.427 (.010)
Field goals			
Not a goal-scorer			1.000 (Ref.)
Goal-scorer			0.809 (.033)
Penalty performance			
No previous attempt			1.000 (Ref.)
Previous score			1.149 (.423)
Previous miss			2.167 (.150)
Teammate performance			
No performance Teammate			1.000 (Ref.)
Teammate scores			1.082 (.706)
Teammate misses			0.845 (.560)
Performance opponent			
No performance opponent			1.000 (Ref.)
Opponent scores			1.299 (.034)
Opponent misses			0.910 (.686)
R^2 Cox & Snell and Nagelkerke	.006 and .008	.008 and .012	.011 and .016

*The odds ratio indicates the influence on kick outcome in comparison with the reference group (Ref.). The omnibus chi-square was 39.9, df = 5, $p < .001$ for the first model. And the change in the omnibus chi-square was respectively 18.4 (df = 8, $p = .018$), and 19.8 (df = 10, $p = .031$) for the second and third model.

more penalty kicks (4302 versus 2897) and converted more kicks (78.0% versus 77.3%) but this difference was not significant in the final model (OR = 1.038 and $p = .527$). The different attendance levels also did not produce significant results. Although the penalty kicks in the ghost games were scored most often (80.0%, $n = 783$) in comparison to the other levels (e.g. high attendance is 78.2%, $n = 1062$) none of these differences were significant (e.g. high attendance is OR = 0.842 and $p = .150$) in the third model. The pre-game factor that did provide a significant result is league. In comparison to the Eredivisie, the conversion rates in the other leagues were all lower and range between 79.8% (Eredivisie, $n = 1186$) and 76.5% (Primera Division, $n = 1646$). In the third model, the differences between the Eredivisie and the Serie A (OR = 0.757 and $p = .004$) and the Eredivisie and the Primera Division (OR = 0.731 and $p = .001$) were significant.

Table 2 shows descriptive statistics for six in-game factors that were included in the third binary logistic regression analysis (Table 3). The first factor is running score. When the team was leading 78.8% ($n = 1943$) of the penalty kicks were being scored compared to 77.4% ($n = 5256$) when the team was behind or the score was drawn. Penalty kicks from the second half of the game were scored less often (77.6%, $n = 4181$) than penalty kicks from the first half of the game (78.0%, $n = 3018$). Both variables were not significant but the interaction term was. When the team was in leading in the second half the odds of a goal increased with 42.7% ($p = .010$).

The in-game factor of field goals provided a significant result, but in the opposite direction as hypothesised. In 716 penalty kicks, the kicker already scored a field goal during the game and these players converted 76.0% of the kicks. Players who did not score a field goal during the games scored 77.9% of their penalty kicks ($n = 6483$), which was a significant difference in the third model (OR = 0.809, $p = 0.033$). Players who earlier in the match had scored (81.4%, $n = 236$) or missed (87.9%, $n = 33$) a penalty kick outperformed players who did not, but these differences did not reach significance (OR = 1.149, $p = .423$ and OR = 2.167, $p = .150$). The other factors related to self-efficacy showed conversion rates that were in line with the predictions. If a teammate or an opponent had previously scored a penalty kick, the conversion rates were highest (78.5%, $n = 144$ and 81.2%, $n = 478$), and when the teammate or the opponent missed these percentages were the lowest (73.0%, $n = 63$ and 75.7%, $n = 103$). Nevertheless, only penalty kicks taken when an opponent had scored earlier in the match in comparison with the opponent not being awarded a penalty kick were significant. The odds ratio increased with 29.9% ($p = .034$).

The results in Table 3 indicate that positional role and age did not significantly predict kick outcome. Designated kickers (81.1% and $n = 3240$) did score significantly more penalty kicks than the players who were not designated kickers (75.0% and $n = 3959$). The results from the third model indicate that the odds ratio increases by 49.7% ($p < .001$) for kicks taken by a designated kicker.

4. Discussion

This study investigated the effect of different pre-game and in-game situational constraints on the kick outcome of in-game penalty kicks in soccer. The contribution of this research is twofold. First, the used dataset to investigate in-game penalty kicks is large

and diverse. Second, in the analyses we used a unique set of pre-game and in-game situational factors while controlling for three individual constraints.

Among the pre-game factors, only the league provided significant differences. Penalty kicks are scored more often in the Eredivisie. Possibly, playing in the least prestigious competition (which the Eredivisie is according to the UEFA) lowers perceived event importance and therefore decreases performance pressure. A second indication that perceived event importance makes a difference comes from an in-game factor. The interaction term between the running score and match phase is significant in this study. A penalty kick taken when the team is leading in the second half of the game is scored more often, possibly because it is perceived as less decisive, that is, having less event importance due to the team's advantageous position.

The second in-game factor that significantly impacts the outcome is field goals, the results indicate that players who previously scored a field goal are less successful in taking a penalty kick. This contradicts the prediction that was founded upon self-efficacy theory. There are at least two alternative explanations. First, having already scored can lead to additional ego threat. According to Baumeister (1997) "[t]he prototype of [ego] threat would be receiving an unfavorable evaluation on some previous dimension previously marked by a relatively favorable self-appraisal" (p.146). Second, players who have already scored are possibly more often allowed to take the penalty kick even though they are not necessarily the best player to do so (Bar-Eli et al., 2006). Self-efficacy theory, however, also holds that after the observations of others' positive accomplishments, success becomes more likely and the findings did support this prediction. The results indicated that after having seen a successful penalty kick from the opponent's team, a converted penalty kick indeed became more likely.

An important finding is that, although significant, the final model only explains a very modest part of the total variation of kick outcome (i.e. less than 2%). This indicates that the influence of the situational factors is very small at best. In that sense, the argument from Kuss et al. (2007) that in-game penalty kicks are taken by players who can cope with situational constraints finds support and can certainly not be discredited. The fact that designated kickers, players who took at least 12 penalty kicks within the current sample, convert more penalty kicks than players who took fewer penalty kicks is supportive of their argument. This finding suggests that there is indeed a strong (and successful) selection of players who take the in-game penalty kicks. Further research is needed to understand what these players have in common. For example, they may pay less attention to the goalkeeper and/or better cope with the deceptive actions of goalkeepers (Furley et al., 2017; Zheng et al., 2024), or they could adopt more effective penalty kick strategies (Noël et al., 2015).

A strength of the current study is the large and diverse dataset that is used to investigate a unique set of pre-game and in-game situational constraints. However, also two important limitations should be reported. First, we assumed that the pre-game and the in-game constraints influence performance pressure. The effect of these situational constraints is explained by the social pressure hypothesis, the theory of event importance, and the theory of self-efficacy. Although these relationships are embedded in the literature, more qualitative research into first-hand experiences is needed to strengthen the internal validity of these claims (see e.g. Jordet and Elferink-Gemser, 2012). The second notable weakness of this study is that the actions of the goalkeeper are not taken into

account. Penalty kicks are not one-sided play, but interactive. Baumann et al. (2011) and Zheng et al. (2024) found that the skills and behaviours of the goalkeeper are important predictors of the outcome of the penalty kick. More research is needed on how situational constraints interact with the performance of goalkeepers.

In conclusion, this study showed that four situational constraints (one pre-game constraint and three in-game constraints) influence the kick outcome of in-game penalty kicks in soccer. The pre-game constraint league showed that penalty kicks were scored more often in the less prestigious league. Furthermore, when a team was leading in the second half, the odds of a goal increased. The in-game constraint of field goals was also significantly related to the odds of a goal but in the opposite direction as hypothesised, indicating that players who previously scored a field goal were less successful in taking a penalty kick. Finally, after a successful penalty kick from the opponent's team, the odds of a goal increased. The results, however, show that the effects of situational constraints are small. It is therefore recommended to investigate individual constraints and task constraints, and the interplay between the different types of constraints in future studies.

Notes

1. One way to measure league prestige is by the UEFA coefficients for the soccer associations (UEFA, 2024). In 2008/2009 England ranked first, followed by Spain, Italy, and Germany. The Netherlands ranked 8th with a coefficient less than half of that of England. The ranking in 2021/2022 was the same, except for the fact that the Netherlands ranked 7th.
2. The average attendance rate – when not taking into account the ghost games – is 29.292 (SD = 18.106). Low attendance games had a minimum of 100 spectators and a maximum of 11.183. High attendance games had a minimum of 47.400 spectators and a maximum of 96.509.
3. The average age is 28.3 years (SD = 3.9) with a minimum age of 18 and a maximum age of 41. Taking one standard deviation from the mean resulted in three dummy variables (age 18–24, age 25–32, and age 33–41).

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