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The role of performance pressure during shootouts in soccer

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This study aimed to investigate multiple situational and individual constraints as stressors during penalty kick shootouts in professional soccer. To this end, we replicated and extended previous studies by Jordet et al. (2007), Jordet and Hartman (2008), and Jordet (2009). The constraints previously identified to predict the outcome of penalty kicks were revisited to confirm that the earlier findings still hold. The extension was twofold; 1) a three times larger dataset was used, and 2) all potential predictors and covariates included in the former three studies were analysed in one encompassing binary logistic regression. The results showed that tournament level, kick round, and kick valence significantly predicted kick outcome, although the full model only had limited predictive power. In contrast to Jordet (2009), there was no support that high public status predicted performance. Overall, the current study largely supports earlier observations and interpretations that situational constraints via appraisal and coping influence performance pressure, which influences players' performance during shootouts.

KEY WORDS: Kick outcome, Performance pressure, Situational constraints, Shootout, Soccer.

Introduction

Shootouts in soccer are undeniably stressful events for players (Jordet & Elferink-Gemser, 2012), yet the degree to which this manifests itself in performance depends on the individual's appraisal of and coping with situational constraints (Lazarus & Folkman, 1984; Folkman, 1997; Biggs et al., 2017). Consider the penalty kick Mbappé took during the quarterfinals of the European Championships in 2021. France, as favorites, saw a 3-1 lead turn into a 3-3 draw in the final 10 minutes of regular playing time. A shootout ensued to decide the winner of the match. Before Mbappé set out to take his

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penalty kick, all other nine players had scored. Jordet (2021) later commented: "Mbappé personified years of our penalty shootout research tonight". According to that research, kick performance for must-score decisive kicks is less successful, with superstars missing more often (Jordet & Hartman, 2008; Jordet, 2009). Must score, because if Mbappé missed the kick, France would lose the match. Mbappé kicked the ball mid-high to the left corner of the goal and the Swiss keeper Sommer made the save. Arguably, not only the standings but also the perceived high expectations for being a player with high public status, made it all-important for Mbappé not to miss. In Lazarus' transactional model of stress, the level of stress or performance pressure depends on how an athlete appraises the interactions with the situation (Biggs et al., 2017). In the primary appraisal the stressors of a situation are evaluated in terms of personal importance or relevance, that is, whether they present a threat, danger, challenge, or opportunity. In the secondary appraisal, the athlete considers whether they have the resources to cope with the stressors. These interactive dynamic appraisal processes determine the level of stress or performance pressure (Biggs et al., 2017). According to Baumeister (1984, p. 610), performance pressure is "any factor or combination of factors that increase the importance of performing well on a particular occasion". High levels of performance pressure can lead to what is known as 'choking under pressure', causing performance decrements relative to situations with low pressure (Baumeister, 1984; Mesagno & Beckmann, 2017). Typically, it is proposed that these performance decrements are induced by an attentional shift (Christensen et al., 2015; Mesagno & Beckmann, 2017). According to the self-focus model, performance pressure leads to reinvestment of consciousness in task aspects that are normally automatized (Baumeister, 1984; Beilock & Carr, 2001; Masters & Maxwell, 2008). Conversely, the distraction model posits that attention shifts to aspects that are irrelevant to the task (Eysenck et al., 2007; Oudejans et al., 2017).

Jordet et al. (2007) were one of the first to investigate which stressors or constraints contribute to performance pressure in shootouts, and consequently, affect penalty kick outcomes in soccer, presuming that increased pressure is associated with less successful kicking. They collected data from 409 penalty kicks from all 41 shootouts in the World Cup, the European Championship, and the Copa America between 1976 and 2004. They found that kicks taken during the World Cup were converted less often than penalty kicks in other tournaments. They also reported that a successful penalty kick became less likely in later rounds of the shootout. According to the researchers, these observations imply that appraisal or perceived or valued 'event importance' significantly impacts penalty outcome (via performance

pressure). They also showed that positional role, age, and play time were not significantly related to the outcome of the penalty kick.

The results of Jordet et al. (2007) suggested two situational constraints that influence the perceived importance of the kick. Penalties during higher tournament levels (i.e., World Cup) and later kicking rounds may more likely be appraised as important. However, the authors also formulated alternative explanations to explain why these constraints negatively relate to kick outcome. First, higher tournament levels may involve players (and keepers) of higher skill levels. And secondly, higher skilled penalty takers may be more likely selected to kick first in a shootout, while the less skilled remain to take kicks after the first five rounds. In this respect, the relatively high conversion rate in the fifth round of kicks found by Jordet et al. (2007) can possibly also be explained by the selection of a higher skilled penalty taker who concludes the shootout.

In a subsequent study, in which 359 kicks from all 36 shootouts from the World Cup, European Championship, and the UEFA Champions League between 1976 and 2006 were analyzed, Jordet and Hartman (2008) found that positive valenced penalty kicks are scored more often than negative valenced kicks. A positive valenced penalty kick is a kick that would result in an immediate win when scored, whereas a negative valenced kick would imply an immediate defeat when missed. Kicks that are not immediately decisive are referred to as neutral valenced. Jordet and Hartman (2008) identified 34 negative valenced, 25 positive valenced, and 300 neutral valenced kicks. The authors argued that positive and negative valenced kicks are appraised differently and promote approach and avoidance motivation, respectively. Indeed, video analysis of the penalty takers' self-regulated behaviors showed that negative valenced kicks were taken more hastily with less response time and with the players engaging in more avoidance looking in comparison to positive valenced kicks. However, although response time and looking behavior were indeed related to kick valence, they did not significantly mediate the kick outcome.

Finally, Jordet (2009) found that players who had received an individual international award (i.e., current-status players) showed worse penalty kick performance outcomes than players who would later receive an individual award (i.e., future-status players). Jordet argued that this difference could be explained by ego threat. As discussed by Leary et al. (2009), ego threat is a rather broad construct. For the penalty takers in Jordet's (2009) study, it seems to be primarily about a threat to their public image. Due to their higher public status, current-status players would be more prone to appraise the situation as threatening their ego (i.e., they feel they have more

to lose), which is associated with increased performance pressure and decreases in performance (Baumeister, 1997). Jordet (2009) reported a lower performance among current-status players compared to future-status players but did not find evidence for a relationship between self-regulated behaviors (i.e., response time and looking behavior) and the status of the player. For this research, Jordet had considered all 37 shootouts from the World Cup, European Cup, and the Champions League up to 2007. He analyzed the kicks of 41 players who won an award and took a total of 67 kicks, 40 of which were by current-status players and 27 by future-status players. No-status players took a total of 299 kicks.

In summary, the three observational studies seem to indicate that kick outcome is related to interacting situational and individual stressors or constraints, which potentially affect performance pressure. The results suggest that stressors that impact the perceived importance of converting the kick are especially relevant. Event importance (i.e., tournament level and kick round) and potential threat to public image (i.e., current-status players) adversely affect kick outcome. In addition, video analysis of coping behaviors suggests kick valence as a significant stressor. Negative valenced kicks could possibly trigger avoidance motivation, which makes it harder to cope with the pressure, and, in turn, impact penalty outcome.

The current study aims to (partly) replicate and extend the studies by Jordet et al. (2007), Jordet and Hartman (2008), and Jordet (2009) to identify which situational and individual constraints relate to penalty kick performance. There are two important reasons to do so. First, in the previous studies, the sample sizes were relatively small because each study only considered a subsample of the most important tournaments in soccer. The current study includes the same high-level tournaments but combines all four in one study and adds shootouts from the predecessor of the UEFA Champions League. In addition, the current data set is further enlarged by including shootouts from the last 15 years. Doing so aligns with calls to replicate studies, especially when the original studies have a relatively small sample size and low statistical power (Button et al., 2013; Open Science Collaboration, 2015; Camerer et al., 2018). The second reason is that the original studies did not control for intercorrelations between the situational and individual constraints that relate to performance pressure, because they were addressed in separate studies. We combine them into one model with covariates to increase the internal validity of the model and rule out spurious correlations, if any. Nonetheless, the current study is not a full replication, since we did not include video analysis of the penalty takers' coping behaviors (cf. Jordet & Hartman, 2008; Jordet, 2009).

Methods

Data

Data were collected for all penalty shootouts ever held in the World Cup, European Championship, Copa America, and UEFA Champions League up to and including 2022. In comparison to Jordet et al. (2007), Jordet and Hartman (2008), and Jordet (2009), we combined the data from all four tournaments in all the analyses, including data from the European Cup (the predecessor of the UEFA Champions League held between 1971-1972 and 1991-1992), and we added all data beyond the 2006-2007 season. The differences between the samples are summarized in Table I. In total, we collected data on 1186 penalty kicks and 122 shootouts. This is about three times the number of kicks in previous studies.

Data were collected manually by the first author from transfermarkt.com and cross-checked by the same author with the use of soccerway.com. In case of inconsistencies or uncertainties, a third match report was used to verify the information. Data on the personal characteristics of the players were taken from transfermarkt.com.

Variables

The dependent variable in this study was *kick outcome*. It was measured as a categorical variable (i.e., goal = 1, no goal = 0). For the first two situational factors, we created similar dummy variables as in Jordet et al. (2007). The *tournament level* was included using four dummy variables (i.e., World Cup, European Championship, Copa America, and UEFA Champions League) and for *kick round* six dummy variables were used. Five variables for rounds 1 through 5 and a sixth variable for kicks 6 and higher.

Table I
Comparison of the Samples

	Jordet et al. (2007) 1976-2004	**Jordet and Hartman (2008) 1976-2006**	**Jordet (2009) 1976-2007**	**Current sample 1976-2022**
World Cup	153 (16)	186 (20)	186 (20)	320 (35)
European Championship	123 (11)	123 (11)	123 (11)	232 (22)
Copa America	133 (14)			280 (29)
UEFA Champions League (start: 1992-1993)		50 (5)	57 (6)	166 (16)
European Cup (start: 1970-1971)				188 (20)
	409 (41)	359 (36)	366 (37)	1186 (122)

Note. The table provides the number of penalty kicks per tournament and the number of shootouts (in parenthesis) for the different studies. The last tournament included in the current sample was the World Cup 2022.

Jordet and Hartman (2008) measured the situational factor of *kick valence* with three dummy variables. The first variable was neutral valence. This means that the kick outcome could not have been decisive for the outcome of the game. The second variable was negative valence. Here, a miss would mean that the shootout, and thus the game, was over and lost. The third variable was positive valence, which indicated that a score would result in a direct win. The same approach was used in the current study.

Also, the measurement of the individual factor of *public status* was replicated from Jordet (2009). All winners of five international awards were used to measure this construct: the FIFA World Player of the Year (places 1-3), the Ballon d'Or (places 1-3), the UEFA Club Footballer of the Year, the World Cup Golden Ball, Silver Ball, Bronze Ball, and the South American Footballer of the Year.[1] If a player did not receive an award during his career, he was labeled a no-status player. If he had received an award (at the time of the shootout), it was a current-status player, and if he received an award later in his career, he was categorized as a future-status player. Therefore, public status was measured with three dummy variables.

Finally, the variables that Jordet and colleagues investigated in addition to those used to measure tournament level, kick round, kick valence, and public status were included as covariates. These potential confounders were *positional role*, which was measured as defender (including goalkeepers), midfielder, or forward; *age* measured by creating three age groups of 18-22 years, 23-28 years, and 29-38 years; and finally, *play time,* which was measured using three categories: 1-30 minutes of play time, 31-90 minutes, or more than 90 minutes.

Methods

Data Analysis

First, the initial set of analyses followed the approach in previous research. The first analysis replicated Jordet et al. (2007) and determined with binary logistic regression analysis (Enter method) whether tournament level and kick round predict kick outcome (positional role, age, and play time were added as covariates). The second and third univariate analyses involved separate binary logistic regression analyses following Jordet and Hartman (2008) and Jordet (2009) which investigated whether kick valence and public status are related to kick outcome, respectively. Second, a final, encompassing analysis was carried out using a binary logistic regression analysis (Enter method), which combined all the previous predictors and covariates in one model. This model was tested for signs of bias (Field, 2015, p. 791). The standardized residual was used to test for outliers. One outlier was identified but not removed. To test for influential cases, Cook's Distance was used which revealed none. Finally, tests for the assumption of collinearity indicated that multicollinearity was not a concern because tolerance levels were above 0.2 and VIF values were smaller than 5 (Field, 2015, p. 795). The odds ratio (OR) was used as the relative measure of effect. The statistical analyses were performed using SPSS (version 28). The level of significance was set at 0.05.

[1] This also included the successors of the FIFA World Player of the Year award and the UEFA Club Footballer of the Year award.

Results

The results of the first analysis, which replicated the binary logistic regression used by Jordet et al. (2007), are shown in Table II. It shows that the conversion rates in the European Championship and Copa America were higher than in the World Cup (i.e., European Championship, OR = 1.500, p = .044

TABLE II
Replication of Jordet et al. (2007)

Tournament level	N	Conversion	OR	P
European Championship	232	76.7	1.500	.044
Copa America	280	76.4	1.476	.040
UEFA Champions League	354	70.1	1.038	.829
World Cup	320	69.4	1.000	Ref.
Kick round				
Kick 1	244	73.8	1.431	.221
Kick 2	244	75.8	1.656	.084
Kick 3	244	74.2	1.522	.148
Kick 4	231	68.0	1.111	.715
Kick 5	147	74.2	1.469	.222
Kick >5	76	65.8	1.000	Ref.
Positional role				
Forward	419	74.7	1.447	.038
Midfielder	449	74.4	1.385	.053
Defender	318	67.6	1.000	Ref.
Age				
18 – 22 years	154	77.9	1.328	.219
23 – 28 years	651	71.3	0.884	.404
29 – 38 years	381	73.0	1.000	Ref.
Play time				
1 – 30 min	85	69.4	0.795	.369
31 – 90 min	241	71.8	0.807	.218
91 – 120 min	860	73.3	1.000	Ref.

Note. This replication tested the influence of event importance on kick outcome. Results of the binary logistic regression show the relationship between the dependent variable kick outcome and tournament level and kick round while controlling for positional role, age, and play time. The odds ratio (OR) indicates the influence on kick outcome in comparison with the reference (Ref.).

and Copa America, OR = 1.476, p = .040). In addition, the analysis showed that the conversion rate in the UEFA Champions League was almost similar to the conversion rate in the World Cup. The second predictor was kick round. In comparison to kicks 6 through 9 (Table II), only round 2 provided evidence for a positive, significant relationship, but only marginally so (OR = 1.656 and p = .084). Of the covariates, only the variables related to the positional role were significantly related to kick outcome. Forwards (OR = 1.447 and p = .038) and midfielders (OR = 1.385 and p = .053) (marginally) outperformed defenders. Age and play time were not significantly related to kick outcome.

The results of the two univariate analyses, which followed Jordet and Hartman (2008) and Jordet (2009), are depicted in Tables III and IV. Table III shows that neutral valenced kicks (OR = 1.630 and p < .022) and positive valenced kicks (OR = 3.604 and p < .001) were scored more frequently than negative valenced kicks. Table IV shows that future-status players had the highest conversion rate but that this conversion rate was not significantly different (OR = 1.296 and p = .509) compared to the current-status players. The no-status players' conversion rate was also not significantly

TABLE III
Replication of Jordet and Hartman (2008)

Valence	N	Conversion	OR	P
Positive	96	85.4	3.604	< .001
Neutral	985	72.6	1.630	.022
Negative	105	61.9	1.000	Ref.

Note. This replication tested the influence of kick valence on kick outcome. Results of the binary logistic regression show the relationship between positive, neutral, and negative kick valence and kick outcome. The odds ratio (OR) indicates the influence on kick outcome in comparison with the reference (Ref.).

TABLE IV
Replication of Jordet (2009)

Public status	N	Conversion	OR	P
Future-status	65	80.0	1.296	.509
No-status	1027	72.0	0.831	.459
Current-status	94	75.5	1.000	Ref.

Note. This replication tested the influence of public status on kick outcome. Results of the binary logistic regression show the relationship between players' public status (measured by individual international awards) and kick outcome. The odds ratio (OR) indicates the influence on kick outcome in comparison with the (Ref.).

different from the conversion rate of the current-status players (OR = 0.831 and p = .459).

Next, we extended previous work by integrating the three above models into one binary logistic regression analysis to control for intercorrelation between the predictor variables and possible confounders. The full model significantly predicted kick outcome (omnibus chi-square = 39.5, df = 18, p = .002) and accounted for between 3.3% (Cox & Snell) and 4.7% (Nagelkerke) of the variance in kick outcome. The results are depicted in Table V and are similar to the foregoing analyses except for two factors. First, in this model, kick round provided one significant effect and one marginally significant effect in comparison with kicks in rounds 6 through 9. The results from the second kick (OR = 1.929 and p = .038) and the third kick (OR = 1.778 and p = .067) indicated that kick outcome decreased during the shootout. The other difference was for neutral valenced kicks. These kicks were no longer significantly different from negative valenced kicks (OR = 1.202 and p = .485), while positive valenced kicks still were different (OR = 3.446 and p = < .001). Similar to the above analyses, tournament level did predict kick outcome while public status did not (Table V).

An additional and explorative analysis was performed to investigate possible confounders of the relationship between kick round and kick outcome. In this respect, Jordet et al. (2007) referred to the player's penalty-taking skill. They hypothesized that for the first and fifth kick round the most skilled players would be selected. A Spearman correlation coefficient was computed to test whether the players in kick rounds 1 and 5 were different from the other players involved in the shootout (the level of significance was set at 0.05, two-tailed). The current sample seems to confirm that player selection was indeed biased. Attackers (r = .082, p = .005), players aged between 29-38 (r = .065, p = .025) and current- or future-status players (r = .129, p < .001 and r = .079, p = .006) more often took the penalty in round 1. Kick round 5 was also more likely to involve players aged 29-38 (r = .065, p = .026).

Discussion

This study aimed to verify the observations in previous studies by Jordet and colleagues (Jordet et al., 2007; Jordet & Hartman, 2008; Jordet, 2009) that had identified multiple situational and individual constraints as stressors in soccer penalty shootouts during international competitions. In these studies, Jordet and colleagues identified tournament level and kick round, kick valence, and the kicker's public status as stressors that via appraisal and

TABLE V
Extending the Earlier Research: Integrating the Previous Three Models to Predict Kick Outcome

Variable	Kick Outcome	
	OR (p-value)	**95% CI for OR**
Tournament level		
European Championship	1.527 (.038)	[1.024; 2.275]
Copa America	1.491 (.038)	[1.023; 2.171]
UEFA Champions League	1.081 (.654)	[0.769; 1.521]
World Cup	1.000 (Ref.)	
Kick round		
Kick 1	1.637 (.122)	[0.876; 3.058]
Kick 2	1.929 (.038)	[1.037; 3.589]
Kick 3	1.778 (.067)	[0.961; 3.289]
Kick 4	1.227 (.494)	[0.683; 2.206]
Kick 5	1.308 (.413)	[0.687; 2.492]
Kick >5	1.000 (Ref.)	
Valence		
Positive	3.446 (< .001)	[1.714; 6.930]
Neutral	1.202 (.485)	[0.717; 2.013]
Negative	1.000 (Ref.)	
Public status		
Future-status	1.221 (.621)	[0.554; 2.693]
No-status	0.883 (.635)	[0.528; 1.477]
Current-status	1.000 (Ref.)	
Positional role		
Forward	1.398 (.065)	[0.980; 1.994]
Midfielder	1.348 (.079)	[0.966; 1.881]
Defender	1.000 (Ref.)	
Age		
18-22 years	1.335 (.220)	[0.841; 2.120]
23-28 years	0.875 (.372)	[0.652; 1.174]
29-38 years	1.000 (Ref.)	
Play time		
1 – 30 minutes	0.801 (.392)	[0.482; 1.332]
31 – 90 minutes	0.852 (.364)	[0.603; 1.204]
91 – 120 minutes	1.000 (Ref.)	

Note. The odds ratio (OR) indicates the influence on kick outcome in comparison with the reference (Ref.). CI = confidence interval. Omnibus chi-square = 39.5, df = 18, p = .002. R^2 = .033 (Cox & Snell) .047 (Nagelkerke).

coping can increase performance pressure, which increases the likelihood of choking under pressure (Jordet et al., 2007; Jordet & Hartman, 2008; Jordet, 2009). We (partly) replicated these studies using a three times larger and more recent data set and confirmed evidence for the impact of tournament level and kick valence and weak support for kick round, but not for public status. In addition, we combined all predictors and covariates into one (multivariate) analysis, thus controlling for intercorrelations, similarly resulting in significant support for tournament level, kick valence, and kick round.

Although the numerical data tended to suggest that players with high public status scored less than future-status players, these results were not significant.

The results are consistent with the notion that individual differences in the appraisal of and or coping with the penalty situation increase performance pressure and negatively affect kick outcome. Situational constraints that likely lift the perceived importance of the kick, that is, a kick at the most important tournament (i.e., World Cup), in the last kicking rounds (i.e., rounds 6 to 9), and can lead to an immediate defeat (i.e., negative valenced kicks) reduce the probability of a successful outcome. Although the results confirm previous observations by Jordet and colleagues, it must be recognized that, except for kick valence, the effect sizes are rather small, with the full model only explaining a fraction of the total variance in kick outcome.

The public status of the penalty taker was not established as a predictor of kick outcome. This suggests that the previous observation by Jordet (2009) may have been a false positive due to the limited number of observations. We did not confirm the finding with a threefold sample size, and public status also did not significantly enter into our final model. Jordet (2009) proposed that players with high public status would experience greater ego threat (i.e., they have more to lose), which, in turn, would increase performance pressure. As is the case for the other stressors, the relation between public status and performance pressure is thus indirect and may depend on the individual appraisal of the situation. Perhaps, some players with high public status may indeed experience a high ego threat resulting in additional performance pressure (i.e., like perhaps Mbappé did), but other high public status players may relish the situation, not feeling additionally pressured at all. Alternatively, coping resources may compensate primary appraisals of high ego threat, perhaps especially among high public status players.

The limitations of this research are rather similar to those of the previous research. Although this research addressed several situational and individual stressors and constraints that potentially relate, either directly or indirectly, to kick outcome, it is improbable they are complete, and particularly constraints related to the skill and experience of the players remain unobserved. In this respect, an even larger dataset would allow for a within-subjects design to verify whether the tournament level and kick round, and the assumed differences in pressure per se, rather than the penalty taker's skill level is the more important predictor of the outcome of the penalty kick. This threat to internal validity seems important because our additional exploratory analysis showed that the players who took the penalty kick in the first and fifth rounds had systematically different, probably skill – or experienced – related characteristics (i.e., more often attackers, current or future-status players,

and/or relatively senior in age) than kickers in the other rounds. Another limitation is that appraisal, coping and performance pressure were not measured directly, but can only be theoretically and logically inferred from the effective situational and individual stressors. Although the observed relationships are in line with the hypotheses, the interpretations in these terms must be treated with caution. This is also true for the interpretations of the impact of kick valence, which had the strongest relation with kick outcome, and which Jordet and Hartman (2008) interpreted in terms of coping strategy. Video analysis and post-match or retrospective interviews are recommended to identify the exact psychological processes underpinning the observed differences in kick success related to kick valence.

The most important limitation seems to be that the full model in this study only predicts the outcome of the penalty kick to a small extent. This indicates that the current study misses out on other critical (interacting) constraints that explain the outcome of a penalty kick. Surely, one of these constraints is the skill and strategy of the goalkeeper (Baumann et al., 2011; Savelsbergh et al., 2002; Wood & Wilson, 2010; Zheng et al., 2021; Zheng et al., 2024). In particular, video analyses of penalty kicks in professional competitions showed that goalkeepers who use distraction or deception can increase the probability of saving by 8 to 10% (Furley et al., 2017; Zheng et al., 2024). Other possible (interacting) constraints are national culture (Billsberry et al., 2008), playing at home or away (Dohmen, 2008; Zheng et al., 2023), different situational constraints related to the running score (Arrondel et al., 2019), and a team's history in shootouts (Jordet et al., 2012).

In conclusion, the present study investigated the association between situational and individual constraints and penalty kick performance during shootouts in the most important tournaments in soccer. In building upon research from Jordet and colleagues and using a larger dataset and a more encompassing model it found evidence for the involvement of three situational constraints as potential stressors. Tournament level, kick round, and kick valence predicted kick outcome which suggests the importance of performance pressure in shootouts. The current study did not find evidence to support the previously suggested relationship between public status and kick outcome. The present findings point practitioners to augment customary penalty trying by creating so-called 'vignettes' training that mimic the psychological demands of the significant situational stressors in a shootout (Headrick et al., 2015). An example would be to include scenarios that simulate negative valenced kicks.

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