



# Context is Key: The Effect of Match-Related Variables on Technical and Physical Performance of the UEFA Champions League Goalkeepers

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## Abstract

The majority of studies investigating contextual variables (CV) and match performance (MP) excluded goalkeepers, limiting insights into CV effects on goalkeepers' MP. Therefore, this study aimed to evaluate goalkeepers' MPs according to CV. Data were collected from all UEFA Champions League (UCL) matches during the season 2022/23. The MPs, including physical and technical performance, were classified according to the match outcome, match location, team quality, and opponent quality. When winning, goalkeepers faced less shots against (Cohen's  $d$  ( $d$ ) = 1.39), had less conceded goals ( $d$  = 2.13) and more exits ( $d$  = 0.37), and made less saves ( $d$  = 0.52) and reflex saves ( $d$  = 0.50) than when losing. When played at home, goalkeepers had less conceded goals ( $d$  = 0.23) and exits than when playing away ( $d$  = 0.25). When played in high-quality level teams, goalkeepers had less conceded goals ( $d$  = 0.48), total ( $d$  = 0.35) and accurate passes beyond own third ( $d$  = 0.35), saves ( $d$  = 0.42) and reflex saves ( $d$  = 0.33) than when played in low-quality level teams. When played against high-quality level opponents, goalkeepers had more conceded goals ( $d$  = 0.48), passes beyond own third ( $d$  = 0.28), shots against ( $d$  = 0.67), saves ( $d$  = 0.55), reflex saves ( $d$  = 0.57) than when played against low-quality level opponents. These findings demonstrated that UCL goalkeepers' technical performance was influenced by match outcome, teams' and opponents' quality levels. Therefore, CV should be taken into account in decision-making processes for structuring elements of training and subsequent match preparation.

**Keywords:** match outcome, match location, opponent quality, team quality, soccer



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CONTEXTUAL VARIABLES AND GOALKEEPERS' MATCH PERFORMANCE

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## Introduction

Team sports, such as competitive soccer, require a complex mix of technical, tactical, and physical qualities (França et al., 2023; Modric et al., 2022; Wagner et al., 2023). It is widely recognized that one of the most distinct roles in soc-

cer is the goalkeeper's position (West, 2018). A comprehensive understanding of this role requires evaluation of match performance (MP) through the match analysis, focusing on both physical and technical-tactical demands (White et al., 2018). This evaluation of goalkeepers' MPs is crucial for

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designing specific training programs that address the physical and technical demands encountered during match-play (Serrano et al., 2019). However, research investigating MPs in soccer shows their high variability, hampering their interpretation and application in practice (Šunjić et al., 2024).

Empirical evidence demonstrated that myriad contextual variables (CV) such as team formation, playing surface, competition type, match location, team quality, opposition quality, and match outcome strongly affect MPs (Freire et al., 2022; Jerkovic et al., 2022; Kutnjak et al., 2025; Liu, Gómez, et al., 2015). However, the majority of studies that analyzed the influence of CV on MPs in soccer excluded goalkeepers. To the best of our knowledge, only a limited number of studies analyzed goalkeepers' MPs according to the CV so far (Liu, Gómez, et al., 2015; Ruiz-Solano et al., 2022).

Briefly, Ruiz-Solano et al. analyzed English Premier League goalkeepers and reported differences among teams' levels in terms of successful passes, goals received inside the box, and successful long ball distribution (Ruiz-Solano et al., 2022). Liu et al. investigated Spanish La Liga goalkeepers and found saves to be the only indicator that differed for goalkeepers of all team levels (Liu, Gómez, et al., 2015). Seaton et al. researched different levels of Spanish goalkeepers and discovered better ball distribution performances as their level of competition increased (Seaton & Campos, 2011). Serrano et al. examined Spanish La Liga goalkeepers' MP and identified a reduction in saves over six seasons (Serrano et al., 2019). Kubayi studied the 2016 European Football Championships and detected losing teams' goalkeepers covered the greatest distance sprinting and drawing teams' goalkeepers with the most passes (Kubayi, 2020).

Although these studies provided valuable information about the influence of CV on goalkeepers' MPs, it should be noted that most of them analyzed data obtained from only one country (Liu, Gómez, et al., 2015; Ruiz-Solano et al., 2022; Serrano et al., 2019). Therefore, the results were undoubtedly influenced by geographical, cultural, historical, and social aspects of the observed competition (Sapp et al., 2018). In addition, studies mostly studied goalkeepers' technical performance according to the CV (Liu, Gómez, et al., 2015; Ruiz-Solano et al., 2022), while there is a lack of studies to examine goalkeepers' physical performance and CV (Serrano et al., 2019). Consequently, the knowledge about the influence of CV on goalkeepers' physical performance is still limited. Moreover, previous studies investigating MPs according to the CV exclusively evaluated goalkeepers' technical performance through simplistic variables such as clean sheets (Gavião et al., 2021), number of goals conceded (Ruiz-Solano et al., 2022), and total saves (Liu, Gómez, et al., 2015; Serrano et al., 2019). This approach can obscure the true difficulty of a goalkeeper's saves or whether the goals conceded were unstoppable because they don't consider factors like shot distance, angle, speed, and accuracy, and therefore may not be fully suitable for evaluation of goalkeepers' technical performance (Otte et al., 2023). For this reason, a more complex approach when assessing this performance is needed (Baron et al., 2024).

Considering all previous limitations, we believe that new research analyzing complex indicators of technical performance together with physical performance among goalkeepers from multiple teams from different countries

is warranted. One of the most elite competitions that includes teams from different countries is the UEFA Champions League (UCL) (Lago-Peñas et al., 2011). Analyzing goalkeepers' complex technical and physical performances according to CV from such competition may provide novel findings enabling a better understanding of natural match-to-match variability in goalkeepers' MPs (Yi et al., 2018). This may be crucial for soccer practitioners to develop specific game strategies and training designs among elite goalkeepers (Serrano et al., 2019). Therefore, this study aimed to evaluate the UCL goalkeepers' MPs according to CV.

## Materials and methods

### *Participants and design*

In this observational study, the MPs of goalkeepers ( $n = 49$ ) were obtained from all UCL matches ( $n = 125$ ) in the 2022/23 season. No matches included extra times. Only the MPs of those goalkeepers who participated in the whole match were analyzed. As a result, the final sample included 242 observations of all 49 goalkeepers. The MPs were classified according to the match outcome (win;  $n = 96$ , draw;  $n = 49$ , loss;  $n = 97$ ), match location (home;  $n = 122$ , away;  $n = 119$ ), teams' quality (high-quality level team;  $n = 158$ , low-quality level team;  $n = 84$ ), and opponents' quality (high-quality level opponent;  $n = 158$ , low-quality level opponent;  $n = 84$ ). Players' identities were anonymized following the principles of the Declaration of Helsinki to ensure confidentiality. The investigation was approved by the local university ethics board (approval number: 2181-205-02-05-19-0020).

### *Procedures*

The MP consisted of physical and technical performance. The physical performance was collected using an optical tracking system Player & Ball Tracking System (Hawk-Eye Innovations Limited, Basingstoke, England). The system's reliability was previously assessed using the official Fédération Internationale de Football Association (FIFA) test protocol for Electronic and Performance Tracking Systems (EPTS). This evaluation involved comparing the data with the Vicon system (Vicon Motion Systems, Oxford Metrics, UK) across five velocity bands (0–7 km/h, 7–15 km/h, 15–20 km/h, 20–25 km/h, and 25+ km/h). The system successfully passed this test protocol (authorization number: 1015068), indicating a high level of reliability (Modric et al., 2024). The technical performance data was registered using WyScout® (Wyscout, Chiavari, Italy), a computerized multiple-camera tracking validated analysis tool. The procedure of data collection has been previously described in detail (Pappalardo et al., 2019).

### *Variables*

The CV variables included match outcome, match location, team quality, and opponent quality. The match outcome was assessed as “win”, “draw” or “loss”. Match location was recorded as “home” when the team played at home and “away” when the team played away from home. As suggested previously, teams and opponents were classified as “high-quality” or “low-quality” based on UEFA season club coefficients (Liu, Yi, et al., 2015). All the physical and technical performance variables with their associated definitions are presented in Table 1.

**Table 1.** Match performance variables and their definitions

| Physical performance-related variables (m)                  |                                                                                                                           |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Total distance (TD)                                         | Total distance covered in the match.                                                                                      |
| Low-intensity running (LIR)                                 | Distance covered at speed <14.3 km/h                                                                                      |
| Moderate-intensity running (MIR)                            | Distance covered at speed 14.4-19.7 km/h                                                                                  |
| High-intensity running (HIR)                                | Distance covered at speed >19.8 km/h                                                                                      |
| Technical performance-related variables (#)                 |                                                                                                                           |
| Total passes (TP)                                           | Total number of attempts to pass the ball to a teammate                                                                   |
| Accurate passes (AP)                                        | Total number of accurate passes                                                                                           |
| Passes beyond own third (PBOT)                              | Total number of passes (including goal kicks) that went outside own third                                                 |
| Accurate passes beyond own third (APBOT)                    | Total number of accurate passes (including goal kicks) that went outside own third                                        |
| Shots against (SA)                                          | Total number of shots on target faced by the goalkeeper                                                                   |
| Conceded goals (CG)                                         | Total number of goals conceded                                                                                            |
| Saves (S)                                                   | A successful attempt from the goalkeeper to prevent a shot from being scored                                              |
| Reflex saves (RS)                                           | A save from a shot from near distance, where the goalkeeper has to react immediately, using his reflexes to save the ball |
| Saved penalties (PS)                                        | Total number of penalties saved                                                                                           |
| Exits (EX)                                                  | Total number of goalkeepers exits                                                                                         |
| Post-Shot expected conceded goals (xCG)                     | The sum of expected conceded goals (xCG) values of all shots against on target                                            |
| Post-Shot expected conceded goals – Conceded goals (xCG-CG) | The sum of expected conceded goals (xCG) values of all shots against on target minus the total number of conceded goals   |

### Statistics

The normality of the distributions was tested by the Kolmogorov–Smirnov test and the data are presented as the means  $\pm$  standard deviations. Homogeneity was checked by Levene's test. Preliminary, k-means cluster analyses were performed to identify a cut-off value of the UEFA season club coefficient and to classify teams and opponents as “high-quality level” or “low-quality level”. Later, differences in MP according to the CVs were analyzed by one-way ANOVA or Kruskal–Wallis, depending on the normality of distributions. To assess specific differences in MPs among match outcomes, post-hoc Scheffe's test or comparisons of mean ranks were used based

on the normality of distributions. Effect sizes (ES) were evaluated by Cohen's  $d$  (>0.20 is small; >0.50 is medium; >0.80 is large ES). For all analyses, Statistica 14.0 (TIBCO Software Inc., Greenwood Village, CO, USA) was used, and  $p < 0.05$  was applied.

### Results

For team quality, the results identified cluster 1 (high-quality level team) with  $102.71 \pm 22.26$  (range of 77 – 145;  $n = 158$ ) and cluster 2 (low-quality level team) with  $46.75 \pm 15.71$  (range of 13 – 72;  $n = 84$ ). For opponent quality, the results identified cluster 1 (high-quality level opponent) with 119.92

**Table 2.** Differences in match performances of goalkeepers according to match outcome

|                                                   | LOSS                 | DRAW                 | WIN                  | F/H    | p    |
|---------------------------------------------------|----------------------|----------------------|----------------------|--------|------|
| Total distance                                    | 5179.00 $\pm$ 586.81 | 5360.73 $\pm$ 520.38 | 5218.96 $\pm$ 574.61 | 1.70   | 0.19 |
| Low-intensity running                             | 5025.02 $\pm$ 554.64 | 5229.27 $\pm$ 502.26 | 5090.42 $\pm$ 556.97 | 2.28   | 0.10 |
| Moderate-intensity running*                       | 131.52 $\pm$ 120.13W | 110.29 $\pm$ 50.74   | 110.38 $\pm$ 93.59L  | 7.34   | 0.03 |
| High-intensity running*                           | 22.46 $\pm$ 19.00    | 21.18 $\pm$ 20.71    | 18.17 $\pm$ 16.22    | 3.33   | 0.19 |
| Total passes                                      | 30.45 $\pm$ 10.51    | 30.90 $\pm$ 11.31    | 31.10 $\pm$ 9.12     | 0.10   | 0.90 |
| Accurate passes                                   | 26.26 $\pm$ 9.07     | 26.94 $\pm$ 9.65     | 27.31 $\pm$ 8.00     | 0.35   | 0.70 |
| Passes beyond own third*                          | 12.85 $\pm$ 6.29     | 13.39 $\pm$ 6.70     | 11.46 $\pm$ 5.59     | 2.38   | 0.30 |
| Accurate passes beyond own third*                 | 9.37 $\pm$ 4.88      | 10.10 $\pm$ 5.16     | 8.27 $\pm$ 4.28      | 3.45   | 0.18 |
| Shots against*                                    | 6.81 $\pm$ 3.00D, W  | 4.00 $\pm$ 2.47L     | 3.32 $\pm$ 1.89L     | 74.85  | 0.01 |
| Conceded goals*                                   | 2.82 $\pm$ 1.41D, W  | 0.88 $\pm$ 0.83L     | 0.46 $\pm$ 0.68L     | 144.28 | 0.01 |
| Saves*                                            | 3.99 $\pm$ 2.45W     | 3.12 $\pm$ 2.20      | 2.86 $\pm$ 1.84L     | 11.55  | 0.01 |
| Reflex saves*                                     | 2.69 $\pm$ 1.94W     | 2.02 $\pm$ 1.82      | 1.83 $\pm$ 1.48L     | 11.43  | 0.01 |
| Saved penalties*                                  | 0.03 $\pm$ 0.17      | 0.10 $\pm$ 0.31      | 0.04 $\pm$ 0.20      | 3.69   | 0.16 |
| Exits*                                            | 0.93 $\pm$ 1.04W     | 1.47 $\pm$ 1.65      | 1.34 $\pm$ 1.20L     | 7.81   | 0.02 |
| Post-Shot expected goals against*                 | 2.44 $\pm$ 1.18D, W  | 1.05 $\pm$ 0.83L     | 0.90 $\pm$ 0.71L     | 98.21  | 0.01 |
| Post-Shot expected goals against – Conceded goals | -0.38 $\pm$ 1.00D, W | 0.17 $\pm$ 0.78L     | 0.44 $\pm$ 0.64L     | 24.47  | 0.01 |

\*denotes variables where non-parametric test was used

$\pm 16.85$  (range of 96 – 145;  $n = 84$ ) and cluster 2 (low-quality level opponent) with  $64.63 \pm 21.57$  (range of 13 – 91;  $n = 158$ ).

Table 2 presents differences in goalkeepers' MPs according to the match outcome. With regard to physical performance, goalkeepers covered more MIR in lost compared to won matches ( $d = 0.20$ ). Concerning technical performance, goalkeepers had fewer SA ( $d = 0.94$  and  $1.39$ , respectively) and CG ( $d = 1.56$  and  $2.13$ , respectively) in drew and won compared to the lost matches. Also, in drew and won matches goalkeepers

had lower xCG ( $d = 1.29$  and  $1.58$ , respectively) and greater xCG-CG ( $d = 0.59$  and  $0.98$ , respectively) than in lost matches. In addition, goalkeepers performed more S ( $d = 0.52$ ) and RS ( $d = 0.50$ ) in lost compared to the won matches. On the other hand, goalkeepers had more EX in won compared to lost matches ( $d = 0.37$ ).

Table 3 presents differences in goalkeepers' MPs according to match location. Goalkeepers had more CG ( $d = 0.23$ ) and EX ( $d = 0.25$ ) when played away compared to at home.

**Table 3.** Differences in match performances of goalkeepers according to match locations

|                                                   | Home                 | Away                 | F/H  | p    |
|---------------------------------------------------|----------------------|----------------------|------|------|
| Total distance                                    | 5225.44 $\pm$ 586.04 | 5239.63 $\pm$ 559.34 | 0.04 | 0.85 |
| Low-intensity running                             | 5086.50 $\pm$ 563.30 | 5099.82 $\pm$ 537.03 | 0.04 | 0.85 |
| Moderate-intensity running*                       | 117.24 $\pm$ 87.87   | 120.64 $\pm$ 110.15  | 0.15 | 0.70 |
| High-intensity running*                           | 21.70 $\pm$ 19.78    | 19.17 $\pm$ 16.79    | 0.21 | 0.65 |
| Total passes                                      | 30.48 $\pm$ 9.70     | 31.13 $\pm$ 10.60    | 0.25 | 0.61 |
| Accurate passes                                   | 26.52 $\pm$ 8.26     | 27.10 $\pm$ 9.30     | 0.27 | 0.61 |
| Passes beyond own third*                          | 12.18 $\pm$ 5.94     | 12.62 $\pm$ 6.38     | 0.06 | 0.80 |
| Accurate passes beyond own third*                 | 8.84 $\pm$ 4.51      | 9.31 $\pm$ 4.99      | 0.11 | 0.74 |
| Shots against*                                    | 4.45 $\pm$ 2.66      | 5.27 $\pm$ 3.23      | 3.42 | 0.06 |
| Conceded goals*                                   | 1.32 $\pm$ 1.52      | 1.67 $\pm$ 1.52      | 5.10 | 0.02 |
| Saves*                                            | 3.13 $\pm$ 2.03      | 3.60 $\pm$ 2.40      | 1.69 | 0.19 |
| Reflex saves*                                     | 2.10 $\pm$ 1.64      | 2.33 $\pm$ 1.93      | 0.55 | 0.46 |
| Saved penalties*                                  | 0.06 $\pm$ 0.23      | 0.04 $\pm$ 0.20      | 0.30 | 0.58 |
| Exits*                                            | 1.05 $\pm$ 1.16      | 1.36 $\pm$ 1.35      | 4.18 | 0.04 |
| Post-Shot expected goals against*                 | 1.38 $\pm$ 1.05      | 1.71 $\pm$ 1.32      | 2.91 | 0.09 |
| Post-Shot expected goals against – Conceded goals | 0.06 $\pm$ 0.96      | 0.04 $\pm$ 0.84      | 0.06 | 0.81 |

\*denotes variables where non-parametric test was used

Table 4 presents differences in goalkeepers' MPs according to teams' level. Goalkeepers from low-quality level teams had more PBOT ( $d = 0.35$ ), APBOT ( $d = 0.35$ ), SA ( $d = 0.57$ ), S ( $d = 0.42$ ), and RS ( $d = 0.33$ ) compared to

high-quality level teams. Also, low-quality level teams' goalkeepers had larger xCG ( $d = 0.38$ ) and more CG ( $d = 0.48$ ), but lower xCG-CG ( $d = 0.30$ ) compared to high-quality level teams' goalkeepers.

**Table 4.** Differences in match performances of goalkeepers according to teams' quality level

|                                                   | High-quality level team | Low-quality level team | F/H   | P    |
|---------------------------------------------------|-------------------------|------------------------|-------|------|
| Total distance                                    | 5188.51 $\pm$ 587.37    | 5312.80 $\pm$ 532.22   | 2.62  | 0.11 |
| Low-intensity running                             | 5048.54 $\pm$ 566.05    | 5174.65 $\pm$ 506.50   | 2.92  | 0.09 |
| Moderate-intensity running*                       | 119.39 $\pm$ 116.99     | 117.79 $\pm$ 51.28     | 2.21  | 0.14 |
| High-intensity running*                           | 20.58 $\pm$ 17.25       | 20.36 $\pm$ 20.37      | 0.46  | 0.50 |
| Total passes                                      | 31.15 $\pm$ 10.56       | 30.15 $\pm$ 9.27       | 0.52  | 0.47 |
| Accurate passes                                   | 27.37 $\pm$ 9.13        | 25.76 $\pm$ 7.98       | 1.86  | 0.17 |
| Passes beyond own third*                          | 11.69 $\pm$ 5.85        | 13.75 $\pm$ 6.47       | 5.18  | 0.02 |
| Accurate passes beyond own third*                 | 8.51 $\pm$ 4.49         | 10.17 $\pm$ 5.04       | 5.94  | 0.01 |
| Shots against*                                    | 4.29 $\pm$ 2.76         | 5.93 $\pm$ 3.08        | 17.68 | 0.01 |
| Conceded goals*                                   | 1.24 $\pm$ 1.33         | 1.96 $\pm$ 1.75        | 10.04 | 0.01 |
| Saves*                                            | 3.05 $\pm$ 2.10         | 3.96 $\pm$ 2.35        | 9.93  | 0.01 |
| Reflex saves*                                     | 2.01 $\pm$ 1.62         | 2.60 $\pm$ 2.01        | 4.69  | 0.03 |
| Saved penalties*                                  | 0.05 $\pm$ 0.22         | 0.05 $\pm$ 0.21        | 0.01  | 0.92 |
| Exits*                                            | 1.16 $\pm$ 1.13         | 1.29 $\pm$ 1.49        | 0.01  | 0.97 |
| Post-Shot expected goals against*                 | 1.39 $\pm$ 1.16         | 1.84 $\pm$ 1.23        | 8.98  | 0.01 |
| Post-Shot expected goals against – Conceded goals | 0.15 $\pm$ 0.76         | -0.12 $\pm$ 1.11       | 5.16  | 0.02 |

\*denotes variables where non-parametric test was used

Table 5 presents differences in goalkeepers' MPs according to opponents' team level. Goalkeepers had more PBOT ( $d = 0.28$ ), SA ( $d = 0.67$ ), S ( $d = 0.55$ ), and RS ( $d = 0.57$ ) when played against higher-quality level opponents com-

pared to lower-quality level opponents. Also, goalkeepers had larger xCG ( $d = 0.62$ ) and more CG ( $d = 0.48$ ) when played against higher-quality teams, compared to lower-quality teams.

**Table 5.** Differences in match performances of goalkeepers according to opponents' quality level

|                                                   | High-quality level opponent | Low-quality level opponent | F/H   | P    |
|---------------------------------------------------|-----------------------------|----------------------------|-------|------|
| Total distance                                    | 5245.38±567.70              | 5224.22±574.16             | 0.08  | 0.78 |
| Low-intensity running                             | 5082.54±541.72              | 5097.61±553.58             | 0.04  | 0.84 |
| Moderate-intensity running*                       | 138.79±154.72               | 108.03±44.14               | 0.20  | 0.65 |
| High-intensity running*                           | 24.05±21.29                 | 18.58±16.29                | 3.73  | 0.05 |
| Total passes                                      | 32.01±11.25                 | 30.15±9.42                 | 1.88  | 0.17 |
| Accurate passes                                   | 27.56±9.61                  | 26.41±8.27                 | 0.96  | 0.33 |
| Passes beyond own third*                          | 13.52±6.43                  | 11.80±5.91                 | 4.59  | 0.03 |
| Accurate passes beyond own third*                 | 9.84±5.14                   | 8.68±4.48                  | 3.70  | 0.05 |
| Shots against*                                    | 6.09±3.19                   | 4.19±2.62                  | 22.35 | 0.01 |
| Conceded goals*                                   | 1.95±1.71                   | 1.24±1.36                  | 11.57 | 0.01 |
| Saves*                                            | 4.14±2.42                   | 2.95±2.00                  | 16.39 | 0.01 |
| Reflex saves*                                     | 2.86±1.87                   | 1.87±1.64                  | 18.85 | 0.01 |
| Saved penalties*                                  | 0.02±0.15                   | 0.06±0.24                  | 1.88  | 0.17 |
| Exits*                                            | 1.21±1.19                   | 1.20±1.31                  | 0.11  | 0.74 |
| Post-Shot expected goals against*                 | 2.01±1.32                   | 1.30±1.05                  | 19.48 | 0.01 |
| Post-Shot expected goals against – Conceded goals | 0.06±1.04                   | 0.05±0.82                  | 0.01  | 0.97 |

\*denotes variables where non-parametric test was used

## Discussion

This study aimed to evaluate goalkeepers' MPs according to CV in the UCL. Results indicated that match outcome, teams' and opponent's level influenced goalkeepers' technical performance, while the effect of match location on goalkeepers' technical performance can be considered trivial. On the other hand, herein analyzed goalkeepers' physical performance was similar irrespective of the match outcome, location, and the teams' and opponents' level. These findings show that CVs influenced goalkeepers' offensive and defensive technical performance, including effective passing and shot-saving abilities.

When winning, UCL goalkeepers faced less SA (large ES), had less CG (large ES) and made less S (moderate ES), and RS (moderate ES) than when losing. Considering the high standard of the UCL teams (Lago-Peñas et al., 2011) which almost certainly dominate in ball possession when winning (Farias et al., 2020), opponent attackers possibly had fewer opportunities to take shots (Szwarc et al., 2010). Also, goalkeepers' xCG, a metric used to assess the likelihood of scoring for every shot on target made in the game (Barthélémy et al., 2024), was lower when winning compared to losing (large ES), suggesting poor quality of shots by opponent. For this reason, UCL goalkeepers' saving performance were most likely lower when winning compared to losing. Such findings are in the line with study of Liu et al. who reported that La Liga goalkeepers had variables related to goal saving lower when winning (Liu, Gómez, et al., 2015) than when losing. On the other hand, one study revealed that in the European Championship goalkeepers had a similar number of saves irrespective of the match outcome (Kubayi, 2020). These inconsistencies were most likely the consequence of different samples analyzed, suggesting that the association between goalkeepers' technical per-

formance and match outcome may be competition-specific.

Analyzing goalkeepers' goal-preventing performance, our results showed that goalkeepers had more EX (small ES) when winning than when losing. This may suggest that preventing shots by exiting the line of goal may be an efficient strategy for reaching positive match outcome (Mitrotasios et al., 2022), especially as similar findings of preventing shots were noticed by Kubayi where goalkeepers had a greater percentage of aerial duels when winning than losing (Kubayi, 2020). However, due to the small effect size value found in our study, such consideration should be taken with caution. On the other hand, it is more important to emphasize that goalkeepers had higher xCG-CG (large ES) when winning than when losing. The higher value of this metric is typically associated with a greater quality of goalkeeper (Berri et al., 2024), therefore suggesting that UCL goalkeepers helped prevent more goals than expected. All these findings clearly suggest that goalkeepers' technical performance in UCL was highly influenced by match outcome.

Further analysis of goalkeepers' technical performance when playing at home or away showed quite the opposite trend. Specifically, when played at home, UCL goalkeepers had slightly less CG and EX than when playing away (both small ES). However, considering similar values in all other technical performances irrespective of playing home or away, our results suggest that UCL goalkeepers' technical performance was not greatly influenced by match location. Given the consistent findings in previous research, our results may look surprising. For example, Ruiz-Solano et al. analyzed the English Premier League and found lower values of saves, clearances, total and goals received inside the box at home compared to away matches (Ruiz-Solano et al., 2022). Similar results were also found in the study of Liu et al. who investi-

gated Spanish La Liga goalkeepers and reported differences in their technical performances (i.e., clearances, saves and catches) in home and away matches (Liu, Gómez, et al., 2015). However, we believe that our findings are influenced by the unique characteristics of the observed competition (i.e., the UCL). Specifically, the UCL is a most elite soccer club competition featuring the world's top goalkeepers (Modric et al., 2024). These athletes are highly professional and their performance is likely consistently high, which almost certainly leads to stable technical execution regardless of match location.

Such considerations that better performance can be expected with increased playing standards may be directly supported by further analysis in the current study. Specifically, our results showed that goalkeepers from high-quality level teams had less CG, lower xCG, and higher xCG-CG (all small ES), indicating their increased quality of goalkeeping performance compared to their counterparts from low-quality level teams. It should be also mentioned that goalkeepers from high-quality level teams had less PBOT (small ES), APBOT (small ES), SA (medium ES), S (small ES), and RS (small ES) than goalkeepers from low-quality level teams. Such lower goalkeeping activities when playing in superior teams (i.e., high-quality level teams) are expected (Liu, Gómez, et al., 2015). Although similar trends were observed in previous research which also reported lower goalkeeping activities when playing in higher standard teams (Serrano et al., 2019), it should be considered that small effect size values indicate limited practical relevance.

Analyzing goalkeepers when playing against low and high-level opponents revealed their technical performance to be opponent-dependent. Specifically, goalkeepers had more PBOT (small ES), SA (moderate ES), S (moderate ES) and RS (moderate ES) when played against high-quality level opponents compared to low-quality level opponents. Moderate magnitudes of differences suggest that opponent quality was an important factor distinguishing goalkeepers' saving performance (i.e., SA, S, and RS). As suggested previously, playing against strong opposition typically leads to a loss of ball possession (Lago, 2009). This enables the opponent team more attacking activities (i.e., shots), consequently requiring more saving performance among goalkeepers when playing against higher-quality level opponents. Most likely for the same reason goalkeepers had greater CG (small ES) and xCG (moderate ES) when played against higher-quality opponents compared to lower-quality opponents. These findings are in contrast to the study of Liu et al. who indicated that national-level goalkeepers had more saves against low- compared to high-quality opponents (Liu, Gómez, et al., 2015). Such inconsistencies are most likely a consequence of differences in playing standards of the UCL teams and national-level teams.

In contrast to the goalkeeper's technical performance which can be identified as affected by CV, the physical performance of UCL goalkeepers was poorly influenced by either match outcome, match location, team quality, or opponent quality. Specifically, goalkeepers covered less MIR (small ES) when lost compared to won matches, while all other indicators of physical performances were similar irrespective of winning or losing, playing at home or away, playing in high or low-quality level teams, and playing against higher or lower-quality opponents. This may look controversial as the physical performance of field players is typically highly influenced by CV (Modric et al., 2024). However, the phys-

ical performance of goalkeepers does not resemble those of the field players during a competitive match (Di Salvo et al., 2008), and therefore different effects of CV on their physical performance were expected. Interestingly, previous studies have reported that goalkeepers' physical performance could be influenced by CV to some extent. For example, Serrano et al. observed more sprints in La Liga in low- compared to high-quality teams (Serrano et al., 2019), while Kubayi found in the European Championship that losing teams' goalkeepers covered greater sprint distance than winning (Kubayi, 2020). Therefore, it seems that the effect of CV on physical performance is competition-dependent.

Several limitations should be considered when interpreting the findings of this research. Firstly, the current data are reflective of the paradigms and practices of UCL clubs; consequently, the results might only be generalizable to similar cohorts. Secondly, physical performance was assessed only with total distance and distances covered in different speed zones. For in-depth insight into the influence of CV on physical performance, goalkeeping-specific parameters related to physical performance (i.e., number of dives, jumps, and explosive efforts) should be analyzed. Thirdly, due to the limited sample, teams and opponents were classified into only two categories: "high-quality level" and "low-quality level". Therefore, future studies should analyze a larger sample with MP classification in more categories. This will enable a more detailed understanding of the effect of team and opponent quality on MP. Finally, analysis of MPs according to the other match-related variables such as team formation, ball possession percentage, playing style, or effective playing may enable a more comprehensive understanding of the effect of CV on the goalkeepers' MP.

## Conclusions

The technical performance of UCL goalkeepers was influenced by match outcome, teams' and opponents' quality level but not by match location. On the other hand, the physical performance of goalkeepers remained similar irrespective of the match outcome and location as well as teams' and opponents' quality level. These findings demonstrated that goalkeepers' technical performance was influenced by CV more than their physical performance. Soccer practitioners should account for CV in decision-making processes for structuring the elements of training and subsequent match preparation. For example, as goalkeepers had more exits in won matches, soccer coaches should incorporate scenarios in training that improve defending crosses by exiting the line. This may encourage players to take exits during the game with more confidence, which can increase the chances of winning. Also, when playing in low-quality level teams or against high-quality level teams, due to their increased match demands (i.e., saves, reflex saves) goalkeepers may require extended periods of recovery or supplementary practices (e.g., ice submersions, massage, etc.).

## Conflicts of Interest

The authors declare no conflict of interest.

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