

Evolution of technical-tactical performance indicators based on the year of college of the male goalkeepers of the NCAA Division I of the United States

-  **Sergio Andrés Caicedo-Parada**  . Faculty of Administrative and Social Sciences. Higher Institute of Rural Education. Pamplona, Colombia.
Department of Physical Activity and Sport. Faculty of Sport Science. Regional Campus of International Excellence "Campus Mare Nostrum." University of Murcia. Murcia, Spain.
-  **Enrique Ortega-Toro**. Department of Physical Activity and Sport. Faculty of Sport Science. Regional Campus of International Excellence "Campus Mare Nostrum." University of Murcia. Murcia, Spain.
Sport Performance Analysis Association. Murcia, Spain.
-  **José Palao**. Department of Health, Kinesiology and Sport Management. University of Wisconsin–Parkside. Wisconsin, United States of America.
Sport Performance Analysis Association. Murcia, Spain.

ABSTRACT

The objective of the study was to analyse the evolution of game statistics as a function of the year of college of NCAA Division I male goalkeepers. The sample was all 43,079 goalkeeper's participations (average of 3916 goalkeeper's participations of 405 goalkeepers per season) from 202 male teams from Division I of the National Collegiate Athletic Association (NCAA) of United States (2010-2021 seasons). A retrospective non-experimental design was used. The variables studied were goalie games played, percentage of goalie games started, goals allowed, goalkeeper's goals-against average, saves, saves percentage, shutouts, combined shutouts, yellow cards, and red cards. A one-way ANOVA was used to study the evolution between goalkeepers from top and bottom teams. To analyse the differences according to top and bottom teams, a T-test and a discriminant analysis were performed. As goalkeepers gain experience, their participation in games played and games started increases significantly (second, third- and fourth-year goalkeepers) and their effectiveness increases (decrease in goals allowed and increase in shutouts). These findings highlight the importance of experience, training, maturity in goalkeeper performance and the differences in recruitment between teams.

Keywords: Performance analysis, Team sports, Football, Athletic performance, Motor skills, Goalkeeper.

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Corresponding author. Faculty of Administrative and Social Sciences. Higher Institute of Rural Education. Pamplona, Colombia.

E-mail: sergiocaicedo.docente@iser.edu.co

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INTRODUCTION

In football, the goalkeeper is responsible for protecting the goal, coordinating the defence, and initiating the attack phase (Shamardin & Khorkavy, 2015). The goalkeeper's performance is influenced by multiple aspects, such as technical, tactical, psychological, sociological, or physical factors (Otte et al., 2022). The development process of a goalkeeper is long. Most performance goalkeepers reach their peak performance later than field players (Jamil & Kerruish, 2020). During their development process, goalkeepers improve their performance thanks to their maturation, accumulation of experiences, and the increase in specialized training (Otte et al., 2020). The study of the evolution of players throughout their training process has focused mainly on field players and absolute performance categories (Sarmiento et al., 2018). There are a small number of studies that analyse the evolution of the goalkeeper and his transition through the different stages of his training (Tienza-Valverde et al., 2023). The transition from the development stage to the performance stage (U-18 to U-23) is a particularly critical stage in this process. Knowing how goalkeepers develop and obtaining benchmarks for their development can help to better understand their development process and guide their development and training at this stage.

Most published research on soccer goalkeepers has prioritized the study of physical and physiological aspects. These aspects are influenced by the team's playing style and their participation in the game (Otte et al., 2020; White et al., 2018). Most of the studies on technical-tactical performance indicators in soccer goalkeepers have focused on the goalkeeper's contribution in defensive actions during the game, in set pieces, or in penalty kicks (e.g., Furley et al., 2017; Sainz De Baranda et al., 2008; Tienza-Valverde et al., 2023). In offensive terms, different works have analysed the role of the soccer goalkeeper in initiating the construction of the team's offensive play, and maintaining possession of the ball (e.g., Casal et al., 2023; Mikikis et al., 2021).

Technical-tactical actions have also been analysed based on contextual aspects, such as playing at home or away (Liu et al., 2015) or based on the level of the teams (Sainz de Baranda et al., 2019). These works show how the level of the teams influences the performance of the goalkeeper. Goalkeepers from higher-level teams make fewer saves, touches of the ball, passes, interceptions, and clearances compared to goalkeepers from lower-level teams (Sainz de Baranda et al., 2019). In the review carried out, works have been found that analyse the evolution in this age group (U23) in field players. Players from higher level teams show greater development, participation in matches and shots on goal, compared to players from lower-level teams (Caicedo-Parada et al., 2024). In the review carried out, no information was found on the development process of U23 goalkeepers at a technical-tactical level.

This paper analyses the development of goalkeepers aged 18 to 22 years and seeks to provide reference values for this stage of their training process. The study analyses the four-year period of American goalkeepers playing in the NCAA Division I. The training model through school and university teams used in the United States differs from the performance academies paradigm used in other countries. However, their analysis can provide information on the evolution of goalkeepers in the U23 category.

The hypothesis of the present study was that participation in the game and the effectiveness of the actions of goalkeepers in the U23 categories increases with increasing age, years of training, and experience. The objective of the study was to analyse the evolution of game statistics as a function of the year of college of NCAA Division I male goalkeepers.

METHOD

Sample

The sample was all 43.079 goalkeeper's participations (average of 3916 goalkeeper's participations of 405 goalkeepers per season) from 202 male teams from Division I of the National Collegiate Athletic Association (NCAA) of United States. The sample was from season 2010-2011 through 2020-2021 seasons. Goalkeepers were classified according to their year in college: a) 1st year or freshman, b) 2nd year or sophomore, c) 3rd year or junior, and d) 4th year or senior. Goalkeeper's data were obtained from the publicly accessible statistics website of the official NCAA website (<https://stats.ncaa.org/>).

Design

A retrospective non-experimental design was used. The variables studied were goalie games played, percentage of goalie games started, goals allowed, goalkeeper's goals-against average ($GAA = (\text{Goals allowed} \times 90) \div \text{minutes played}$), saves, saves percentage, shutouts, combined shutouts, yellow cards, and red cards. The unit of analysis was the season. The variables were recorded in absolute values per season and recalculated in relative values for the total number of matches played for each player (absolute value of the variable, divided by the number of matches played by the player in the season). Players were classified into top and bottom based on the team's winning coefficient in each season (win was giving a score of 1, a tie was given a score of .5, and a loss was scored as 0). Top teams had a winning coefficient above 0.500 and bottom teams had a winning coefficient below 0.500.

Data of the variables obtained were collected for the summation of the match reports of each team in each season. To establish the reliability of the match report, a researcher observed five matches from different seasons. The observer had a master's degree in Sport Science and more than five years of experience with sports analytics in football. The observation was done using the software Lince Plus (Soto-Fernández et al., 2022). The rater reliability was calculated using Cohen's Kappa for the categorical variables and an Interclass Correlation Coefficient (ICC) for the continuous variables. All the variables studied had a value of 1.

Procedure and statistical analysis

A one-way ANOVA was used to study the evolution between goalkeepers from top and bottom teams. To analyse the differences according to top and bottom teams, a T-test and a discriminant analysis were performed. Structural coefficients (SC) were used to discriminate top and bottom teams (SC above 0.30) (Tabachnick & Fidell, 2013). Significance level was set at $p < .05$. The effect size was established with the eta square. The following scale was used to assess Effect Size: N = No effect (<0.20) S = Small (0.20 - 0.49) M = Medium (0.50 - 0.79) L = Large (0.80 - 1.19) XL = Extra Large (>1.2) (Sawilowsky, 2009). All analyses were conducted using the Statistical Package for the Social Sciences (SPSS, version 28.0.0.0., IBM, Boston, IL, USA). Tables with the absolute values of the variables studied can be found in Tables 4, 5 and 6.

RESULTS

In the analysis of the evolution of the goalkeepers both at a general level and differentiating between the top and bottom teams (Table 1 and 2), it is observed that the more experience and training the goalkeepers have, the more their values increase in the variables "*goalie games played*" and "*goalie games started*". The variable saves percentage increases from the 2nd to the 3rd year. The variables goals allowed, goalkeeper's goals-against average, saves, combined shutouts, yellow cards, and red cards changed between the different years in top and bottom teams. The variable saves percentage shows an increase over the years of

Table 1. Evolution of the relative values of participation and game statistics as a function of the player's year in top level college men's football goalkeepers (Division I - NCAA, U.S. [season 2010 to 2021]).

| Variables | 1st year (Freshman) | | 2nd year (Sophomore) | | 3rd year (Junior) | | 4th year (Senior) | |
|---------------|----------------------|-------|----------------------|-------|----------------------|-------|----------------------|-------|
| | M | SD | M | SD | M | SD | M | SD |
| Goalie GP | 0.544 ^{bcd} | 0.439 | 0.644 ^{acd} | 0.493 | 0.744 ^{abd} | 0.499 | 0.813 ^{abc} | 0.507 |
| Goalie GS (%) | 72.2 ^{cd} | 36.7 | 75.5 ^{cd} | 36.3 | 80.8 ^{ab} | 33.3 | 82.0 ^{ab} | 32.8 |
| G. allowed | 1.73 | 2.35 | 1.76 | 2.99 | 1.66 | 2.31 | 1.65 | 2.45 |
| GAA | 1.55 | 1.34 | 1.54 | 1.83 | 1.42 | 1.23 | 1.42 | 1.93 |
| Saves | 4.14 | 5.94 | 4.3 | 6.97 | 4.26 | 5.37 | 4.34 | 6.04 |
| SV_Pct | 0.659 | 0.229 | 0.657 ^c | 0.237 | 0.685 ^b | 0.208 | 0.68 | 0.221 |
| Shutouts | 0.236 | 0.493 | 0.276 | 0.603 | 0.295 | 0.594 | 0.301 | 0.589 |
| Comb_sho | 0.02 | 0.156 | 0.015 | 0.148 | 0.019 | 0.173 | 0.02 | 0.172 |
| Yellow cards | 0.016 | 0.075 | 0.02 | 0.062 | 0.022 | 0.064 | 0.022 | 0.055 |
| Red cards | 0.002 | 0.024 | 0.004 | 0.051 | 0.002 | 0.019 | 0.002 | 0.017 |

Note. Statistical differences were analysed using an ANOVA test; a Significantly different from 1st year (Freshman); b Significantly different from 2nd year (Sophomore); c Significantly different from 3rd year (Junior); d Significantly different from 4th year (Senior). Goalie GP: Goalie Games Played, Goalie GS (%): Percentage Goalie Games Started, G. Allowed: Goals Allowed, GAA: Goalkeeper's goals-against average, SV_Pct: Saves Percentage, Comb_Sho: Combined Shutouts.

Table 2. Evolution of the relative values of participation and game statistics as a function of the player's year in bottom level college men's football goalkeepers (Division I - NCAA, U.S. [season 2010 to 2021]).

| Variables | 1st year (Freshman) | | | | 2nd year (Sophomore) | | | | 3rd year (Junior) | | | | 4th year (Senior) | | | |
|---------------|----------------------|-------|----------------------|-------|----------------------|-------|---------------------|-------|---------------------|-------|---------------------|-------|---------------------|-------|----------------------|-------|
| | Top 50 | | Bottom 50 | | Top 50 | | Bottom 50 | | Top 50 | | Bottom 50 | | Top 50 | | Bottom 50 | |
| | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD |
| Goalie GP | 0.563 ^{bcd} | 0.486 | 0.528 ^{bcd} | 0.395 | 0.664 ^{acd} | 0.538 | 0.623 ^{ad} | 0.441 | 0.820 ^{ab} | 0.539 | 0.659 ^{ad} | 0.436 | 0.873 ^{ab} | 0.537 | 0.740 ^{abc} | 0.458 |
| Goalie GS (%) | 70.1 ^{cd} | 39.2 | 73.9 ^{cd} | 34.5 | 72.6 ^{cd} | 39 | 78.5 | 33 | 80.3 ^{ab} | 35.4 | 81.4 ^a | 30.9 | 80.7 ^{ab} | 35 | 83.7 ^a | 29.7 |
| G. allowed | 1.23 | 1.59 | 2.13 | 2.75 | 1.3 | 2.09 | 2.25 | 3.65 | 1.28 | 1.79 | 2.08 | 2.72 | 1.32 | 1.72 | 2.05 | 3.06 |
| GAA | 1.19 | 1.2 | 1.85 | 1.39 | 1.2 | 1.64 | 1.9 | 1.95 | 1.09 | 1.19 | 1.78 | 1.17 | 1.22 | 2.35 | 1.68 | 1.18 |
| Saves | 3.38 | 5.36 | 4.75 | 6.32 | 3.67 | 5.61 | 4.96 | 8.12 | 3.9 | 5.26 | 4.67 | 5.46 | 3.87 | 4.97 | 4.92 | 7.09 |
| SV_Pct | 0.666 | 0.258 | 0.653 | 0.202 | 0.660 ^c | 0.271 | 0.655 | 0.196 | 0.705 ^b | 0.229 | 0.662 | 0.179 | 0.684 | 0.241 | 0.674 | 0.193 |
| Shutouts | 0.301 | 0.608 | 0.185 | 0.368 | 0.351 | 0.755 | 0.196 | 0.366 | 0.377 | 0.696 | 0.203 | 0.436 | 0.382 | 0.696 | 0.202 | 0.402 |
| Comb_sho | 0.031 | 0.207 | 0.01 | 0.095 | 0.024 | 0.194 | 0.006 | 0.071 | 0.028 | 0.221 | 0.01 | 0.091 | 0.028 | 0.213 | 0.01 | 0.102 |
| Yellow cards | 0.017 | 0.081 | 0.016 | 0.07 | 0.021 | 0.071 | 0.019 | 0.051 | 0.019 | 0.053 | 0.025 | 0.074 | 0.02 | 0.046 | 0.024 | 0.064 |
| Red cards | 0 | 0.008 | 0.004 | 0.032 | 0.005 | 0.058 | 0.002 | 0.042 | 0.002 | 0.015 | 0.004 | 0.022 | 0.001 | 0.011 | 0.004 | 0.021 |

Note. Statistical differences were analysed using an ANOVA test; a Significantly different from 1st year (Freshman); b Significantly different from 2nd year (Sophomore); c Significantly different from 3rd year (Junior); d Significantly different from 4th year (Senior). Goalie GP: Goalie Games Played, Goalie GS (%): Percentage Goalie Games Started, G. Allowed: Goals Allowed, GAA: Goalkeeper's goals-against average, SV_Pct: Saves Percentage, Comb_Sho: Combined Shutouts.

Table 3. Differences as a function of team level in relative participation values and game statistics as a function of player year in college in men's football goalkeepers (Division I - NCAA, U.S. [season 2010 to 2021]).

| Variables | 1st year (Freshman) | | | | 2nd year (Sophomore) | | | | 3rd year (Junior) | | | | 4th year (Senior) | | | |
|------------------|---------------------|-------|-----------------|--------------------------|----------------------|-------|-----------------|--------------------------|--------------------|-------|-----------------|--------------------------|--------------------|-------|-----------------|--------------------------|
| | Top 50 - Bottom 50 | | | | Top 50 - Bottom 50 | | | | Top 50 - Bottom 50 | | | | Top 50 - Bottom 50 | | | |
| | Differ | % | Sig. | ES | Differ | % | Sig. | ES | Differ | % | Sig. | ES | Differ | % | Sig. | ES |
| Game played | 0.035 | 6.21 | .228 | 0.438^s | 0.041 | 6.17 | .156 | 0.493^s | 0.161 | 19.6 | <.001 | 0.493^s | 0.133 | 15.2 | <.001 | 0.503^M |
| Game started (%) | -3.8 | -5.42 | .113 | 36.7 | -5.9 | -8.12 | .005 | 36.2^{XL} | -1.1 | -1.36 | .559 | 33.3 | -3 | -3.71 | .133 | 32.8 |
| Goals allowed | -0.9 | -73.1 | <.001 | 2.30^{XL} | -0.95 | -73 | <.001 | 2.96^{XL} | -0.8 | -62.5 | <.001 | 2.28^{XL} | -0.73 | -55.3 | <.001 | 2.42^{XL} |
| GAA | -0.01 | -0.84 | <.001 | 1.3 | -0.7 | -58.3 | <.001 | 1.8 | -0.69 | -63.3 | <.001 | 1.18 | -0.46 | -37.7 | .568 | 1.91 |
| Saves | -1.37 | -40.5 | <.001 | 5.91^{XL} | -1.29 | -35.1 | .002 | 6.95^{XL} | -0.77 | -19.7 | .017 | 5.36^{XL} | -1.05 | -27.1 | .005 | 6.02^{XL} |
| SV_Pct | 0.013 | 1.95 | .414 | 0.229 | 0.005 | 0.75 | .697 | 0.237 | 0.043 | 6.09 | <.001 | 0.207^s | 0.01 | 1.46 | .438 | 0.221 |
| Shutouts | 0.116 | 38.5 | <.001 | 0.490^s | 0.155 | 44.1 | <.001 | 0.599^M | 0.174 | 46.1 | <.001 | 0.587^M | 0.18 | 47.1 | <.001 | 0.582^M |
| Comb_sho | 0.021 | 67.7 | .057 | 0.155 | 0.018 | 75 | .052 | 0.147 | 0.18 | 642.8 | .078 | 0.173 | 0.018 | 64.2 | .094 | 0.172 |
| Yellow cards | 0.001 | 5.88 | .966 | 0.075 | 0.002 | 9.52 | .705 | 0.062 | -0.006 | -31.5 | .077 | 0.064 | -0.004 | -20 | .228 | 0.055 |
| Red cards | -0.004 | 0 | .02 | 0.024^s | 0.003 | 60 | .409 | 0.051 | -0.002 | -100 | .08 | 0.019 | -0.003 | -300 | .01 | 0.017^N |

Note. Statistical differences were analysed using an Independent T-test. TE = Effect Size: N = No effect (<0.20) S = Small (0.20 - 0.49) M = Medium (0.50 - 0.79) L = Large (0.80 - 1.19) XL = Extra Large (>1.2). Goalie GP: Goalie Games Played, Goalie GS (%): Percentage Goalie Games Started, GAA: Goalkeeper's goals-against average, SV_Pct: Saves Percentage, Comb_Sho: Combined Shutouts.

Table 4. Evolution of the absolute values of participation and game statistics as a function of the player's year in top level college men's football goalkeepers (Division I - NCAA, U.S. [season 2010 to 2021]).

| Variables | 1st year (Freshman) | | 2nd year (Sophomore) | | 3rd year (Junior) | | 4th year (Senior) | |
|--------------|---------------------|-------|----------------------|-------|---------------------|-------|---------------------|-------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Goalie GP | 7.62 ^{bcd} | 6.14 | 9.02 ^{acd} | 6.9 | 10.4 ^{abd} | 6.99 | 11.3 ^{abc} | 7.1 |
| Goalie GS | 6.75 ^{bcd} | 6.43 | 8.28 ^{acd} | 7.23 | 9.75 ^{abd} | 7.38 | 10.7 ^{abc} | 7.52 |
| G. allowed | 10.1 ^{bcd} | 9.52 | 11.5 ^{acd} | 10.1 | 12.6 ^{abd} | 9.59 | 13.7 ^{abc} | 10.1 |
| GAA | 1.55 | 1.34 | 1.54 | 1.83 | 1.42 | 1.23 | 1.42 | 1.93 |
| Saves | 26.2 ^{bcd} | 25.8 | 31.3 ^{acd} | 28.3 | 36.4 ^{abd} | 29 | 40.6 ^{abc} | 30.7 |
| SV_Pct | 0.659 | 0.229 | 0.657 ^c | 0.237 | 0.685 ^b | 0.208 | 0.68 | 0.221 |
| Shutouts | 1.68 ^{bcd} | 2.35 | 2.20 ^{acd} | 2.72 | 2.73 ^{abd} | 3.02 | 3.10 ^{abc} | 3.16 |
| Comb_sho | 0.06 | 0.358 | 0.05 | 0.313 | 0.05 | 0.307 | 0.05 | 0.282 |
| Yellow cards | 0.16 ^{bcd} | 0.492 | 0.23 ^a | 0.52 | 0.26 ^a | 0.582 | 0.29 ^a | 0.597 |
| Red cards | 0.03 | 0.163 | 0.02 | 0.162 | 0.03 | 0.179 | 0.04 | 0.198 |

Note. Statistical differences were analysed using an ANOVA test; a Significantly different from 1st year (Freshman); b Significantly different from 2nd year (Sophomore); c Significantly different from 3rd year (Junior); d Significantly different from 4th year (Senior). Goalie GP: Goalie Games Played, Goalie GS: Goalie Games Started, G. Allowed: Goals Allowed, GAA: Goalkeeper's goals-against average, SV_Pct: Saves Percentage, Comb_Sho: Combined Shutouts.

Table 5. Evolution of the absolute values of participation and game statistics as a function of the player's year in bottom level college men's football goalkeepers (Division I - NCAA, U.S. [season 2010 to 2021]).

| Variables | 1st year (Freshman) | | | | 2nd year (Sophomore) | | | | 3rd year (Junior) | | | | 4th year (Senior) | | | |
|--------------|---------------------|-------|---------------------|-------|----------------------|-------|--------------------|-------|--------------------|-------|--------------------|-------|--------------------|-------|---------------------|-------|
| | Top 50 | | Bottom 50 | | Top 50 | | Bottom 50 | | Top 50 | | Bottom 50 | | Top 50 | | Bottom 50 | |
| | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD | M | SD |
| Goalie GP | 7.89 ^{bcd} | 6.81 | 7.40 ^{bcd} | 5.53 | 9.30 ^{acd} | 7.53 | 8.73 ^{ad} | 6.18 | 11.4 ^{ab} | 7.55 | 9.24 ^{ad} | 6.1 | 12.2 ^{ab} | 7.52 | 10.3 ^{abc} | 6.41 |
| Goalie GS | 7.07 ^{bcd} | 7.15 | 6.48 ^{bcd} | 5.76 | 8.60 ^{acd} | 7.92 | 7.95 ^{ad} | 6.43 | 10.8 ^{ab} | 8.01 | 8.52 ^{ad} | 6.38 | 11.5 ^{ab} | 7.99 | 9.78 ^{abc} | 6.77 |
| G. allowed | 8.12 ^{cd} | 7.93 | 11.7 ^{bcd} | 10.3 | 9.53 ^{cd} | 8.77 | 13.5 ^{ad} | 11 | 11.4 ^{ab} | 8.6 | 13.9 ^{ad} | 10.4 | 12.1 ^{ab} | 8.61 | 15.8 ^{abc} | 11.4 |
| GAA | 1.62 | 8.84 | 1.85 | 1.39 | 1.2 | 1.64 | 1.9 | 1.95 | 1.09 | 1.19 | 1.78 | 1.17 | 4.18 | 72.9 | 2.28 | 13.4 |
| Saves | 24.1 ^{bcd} | 25.7 | 27.9 ^{bcd} | 25.9 | 29.4 ^{acd} | 27.9 | 33.3 ^{ad} | 28.5 | 37.6 ^{ab} | 29.2 | 35.2 ^{ad} | 28.9 | 40.1 ^{ab} | 30.4 | 41.2 ^{abc} | 31 |
| SV_Pct | 0.666 | 0.258 | 0.653 | 0.202 | 0.660 ^c | 0.271 | 0.655 | 0.196 | 0.705 ^b | 0.229 | 0.662 | 0.179 | 0.684 | 0.241 | 0.674 | 0.193 |
| Shutouts | 2.35 ^{cd} | 2.98 | 1.12 ^{bcd} | 1.45 | 2.90 ^{cd} | 3.23 | 1.45 ^{ad} | 1.78 | 3.75 ^{ab} | 3.46 | 1.60 ^a | 1.89 | 4.13 ^{ab} | 3.54 | 1.83 ^{ab} | 2.01 |
| Comb_sho | 0.1 | 0.486 | 0.03 | 0.191 | 0.07 | 0.405 | 0.02 | 0.164 | 0.08 | 0.401 | 0.02 | 0.133 | 0.07 | 0.358 | 0.02 | 0.134 |
| Yellow cards | 0.15 ^{cd} | 0.45 | 0.16 ^{cd} | 0.525 | 0.24 | 0.53 | 0.21 | 0.509 | 0.26 ^a | 0.588 | 0.26 ^a | 0.576 | 0.30 ^a | 0.614 | 0.28 ^a | 0.575 |
| Red cards | 0.01 | 0.109 | 0.04 | 0.196 | 0.03 | 0.191 | 0.02 ^d | 0.123 | 0.2 | 0.154 | 0.04 | 0.203 | 0.03 | 0.165 | 0.05 ^b | 0.232 |

Note. Statistical differences were analysed using an ANOVA test; a Significantly different from 1st year (Freshman); b Significantly different from 2nd year (Sophomore); c Significantly different from 3rd year (Junior); d Significantly different from 4th year (Senior). Goalie GP: Goalie Games Played, Goalie GS: Goalie Games Started, G. Allowed: Goals Allowed, GAA: Goalkeeper's goals-against average, SV_Pct: Saves Percentage, Comb_Sho: Combined Shutouts.

Table 6. Differences as a function of team level in absolute participation values and game statistics as a function of player year in college in men's football goalkeepers (Division I - NCAA, U.S. [season 2010 to 2021]).

| Variables | 1st year (Freshman) | | | | 2nd year (Sophomore) | | | | 3rd year (Junior) | | | | 4th year (Senior) | | | |
|---------------|---------------------|-------|-------|-------|----------------------|-------|-------|-------|--------------------|-------|-------|-------|--------------------|-------|-------|-------|
| | Top 50 - Bottom 50 | | | | Top 50 - Bottom 50 | | | | Top 50 - Bottom 50 | | | | Top 50 - Bottom 50 | | | |
| | Differ | % | Sig. | ES | Differ | % | Sig. | ES | Differ | % | Sig. | ES | Differ | % | Sig. | ES |
| G. G. played | 0.49 | 6.21 | .228 | 6.14 | 0.57 | 6.12 | .156 | 6.9 | 2.16 | 18.9 | <.001 | 6.9 | 1.9 | 15.5 | <.001 | 7.04 |
| G. G. started | 0.59 | 8.34 | .162 | 6.43 | 0.65 | 7.55 | .12 | 7.23 | 2.28 | 21.1 | <.001 | 7.29 | 1.72 | 14.9 | <.001 | 7.47 |
| G. allowed | -3.58 | -44 | <.001 | 9.35 | -3.97 | -41.6 | <.001 | 9.95 | -2.5 | -21.9 | <.001 | 9.51 | -3.7 | -30.5 | <.001 | 10 |
| GAA | -0.01 | -0.84 | <.001 | 1.3 | -0.7 | -58.3 | <.001 | 1.8 | -0.69 | -63.3 | <.001 | 1.18 | -0.46 | -37.7 | .568 | 1.91 |
| Saves | -3.8 | -15.7 | .029 | 25.8 | -3.9 | -13.2 | .017 | 28.2 | 2.4 | 6.38 | .166 | 29 | -1.1 | -2.74 | .578 | 30.7 |
| SV_Pct | 0.013 | 1.95 | .414 | 0.229 | 0.005 | 0.75 | .697 | 0.237 | 0.043 | 6.09 | <.001 | 0.207 | 0.01 | 1.46 | .438 | 0.221 |
| Shutouts | 1.23 | 52.3 | <.001 | 2.27 | 1.45 | 50 | <.001 | 2.63 | 2.15 | 57.3 | <.001 | 2.82 | 2.3 | 55.6 | <.001 | 2.95 |
| Comb_sho | 0.07 | 70 | .008 | 0.356 | 0.05 | 71.4 | .008 | 0.312 | 0.06 | 75 | <.001 | 0.305 | 0.05 | 71.4 | .001 | 0.28 |
| Yellow cards | -0.01 | -6.66 | .929 | 0.493 | 0.03 | 12.5 | .333 | 0.52 | 0 | 0 | .889 | 0.582 | 0.02 | 6.66 | .633 | 0.597 |
| Red cards | -0.03 | -300 | .028 | 0.163 | 0.01 | 33.3 | .096 | 0.162 | -0.02 | -10 | .072 | 0.179 | -0.02 | -66.6 | .041 | 0.198 |

Note. Statistical differences were analysed using an Independent T-test. TE = Effect Size: N = No effect (<0.20) S = Small (0.20 - 0.49) M = Medium (0.50 - 0.79) L = Large (0.80 - 1.19) XL = Extra Large (>1.2). Goalie GP: Goalie Games Played, Goalie GS (%): Percentage Goalie Games Started, GAA: Goalkeeper's goals-against average, SV_Pct: Saves Percentage, Comb_Sho: Combined Shutouts.

experience in both top and bottom teams. The variables saves and goalkeeper's goals-against average were higher in the last year of university goalkeepers at university.

Regarding the differences between the top and bottom teams (Table 3), the top teams have a significantly higher number of goals allowed, saves and scoreless games than the teams with a lower competitive level in all the analysed years of experience as a university goalkeeper. The effect sizes for change across years in college were small for the variables saves percentage (3rd year) and red cards (1st year), medium for the variables game played (4th year), shutouts (2nd, 3rd, 4th year), and extra-large for the variables game started (2nd year), goals allowed and saves across years.

DISCUSSION AND CONCLUSIONS

The aim of this study was to analyse the evolution of game statistics based on the year of college of male goalkeepers in the NCAA Division I in the United States. The results confirm the working hypothesis and show an increase in the number of games played and games played as a starter for second-, third- and fourth-year goalkeepers, respectively. As goalkeepers increase in age, experience, and years of training, there is an increase in game participation, save frequency, and save percentage. The increase in saves and shutouts shows the evolution thanks to training and the increase in their experience. These improvements lead to a higher level of skill of the goalkeepers which reduces the goals allowed throughout their training process. These results show that goalkeepers evolve throughout the training process. This improvement means that the technical-tactical objectives in training and competition must be adjusted.

The defensive indicators related to infringements show a progressive increase in yellow cards over the four years. One of the possible causes could be an increase in the level of intensity and competitiveness of goalkeepers as their experience increases or when they are in their final year. Goalkeepers who are in a defensive position within the goal area are exposed to risky situations and receive warnings, especially if they increase the intensity and competitiveness of their actions (Ruiz-Solano et al., 2022). These results are consistent with previous studies in this age group, evolution of NCAA Division I male field players (Caicedo-Parada et al., 2024). With increasing age, training, and accumulated experience, there is an improvement in game participation and an increase in the intensity of their actions (e.g., infractions, such as yellow and red cards).

When analysing the ranking of teams according to their win coefficient, goalkeepers from higher-level teams show better values. Freshman goalkeepers from higher-level teams show fewer red cards (small effect size). Sophomore goalkeepers from higher level teams have a higher number in game started (extra-long effect size). Sophomore, junior, and senior goalkeepers on higher-level teams perform a greater number of shutouts (small effect size). Senior goalkeepers from higher level teams have fewer goals allowed and more saves, and game played (medium effect size, except game played with small effect size). These results show that goalkeepers from the teams with the best ranking significantly increased their participation and showed greater effectiveness in their actions. This may be because goalkeepers on higher ranked teams have better training and preparation in more demanding environments with better resources. This helps them improve their skills and techniques. Other possible causes include higher-ranked teams drafting goalies with more potential for improvement, better sequencing goalie rotations on their rosters, or employing goalie analysis and evaluation strategies to help goalies improve. These causes may be behind the differences in the evolution of goalkeepers between teams with better and worse rankings in various variables throughout their years of experience.

The goalkeeper's development cycle, from his integration into the team to his consolidation as a starter, depends on participation, competitive experience, and adaptation to the game. Goalkeepers in higher-ranked teams progress more due to the technical and competitive demands of the environment. Accumulated experience and exposure to a higher competitive level facilitate these improvements. In the case of senior year goalkeepers, compared to first year goalkeepers, a medium improvement is observed in the variable of games without conceding goals, which indicates a continuous evolution and a refinement of skills over time. This could be because senior goalkeepers have accumulated more playing time, allowing them to better anticipate plays and make more effective decisions (Clemente et al., 2020). These differences respond to individual factors, training level, and team dynamics that influence the evolution of goalkeepers according to their team's ranking. These results are consistent with previous studies indicating that goalkeepers from higher-ranked teams make fewer saves compared to those from lower-ranked teams (Liu et al., 2015; Sainz De Baranda et al., 2008). On the other hand, in first-year goalkeepers a small effect size is evident, compared to goalkeepers from older years, with no significant effect on variables such as red cards. This could be due to a lack of experience in high-pressure situations at this level of competition. Less experienced goalkeepers tend to be more cautious and less likely to engage in risky plays that result in fouls. The findings highlight the need to set specific goals based on the level of competition and the academic year at the university. These values can serve as reference points and should be supplemented with statistics from previous seasons of the team and goalkeeper in each conference and level of competition. This will allow you to evaluate progress and adjust motivational and training strategies effectively.

Analysis of the evolution of game statistics in NCAA Division I men's goalkeepers reveals that as goalkeepers gain experience, their participation in games played and games as starters (second, third- and fourth-year goalkeepers) significantly increases. For higher-ranked teams, the decrease in goals allowed and the increase in shutouts indicate an improvement in defensive capabilities and strategic decision-making. In contrast, lower-ranked teams have a higher number of cards and goals allowed, evidencing limitations in technical training and less efficient tactics over the years. These findings highlight the importance of experience, training, maturity in goalkeeper performance and the differences in recruitment between teams. As college goalkeepers progress through their college careers, there is an increase in the number of fouls and yellow cards received, possibly due to a greater assumption of responsibility and the competitive pressure faced. Maturity and the development of psychological skills also play a crucial role in their overall performance and in managing high-pressure situations (Matthews et al., 2021).

This study provides information on the evolution of goalkeepers and establishes reference values according to their year and the level of their team. However, it has certain limitations by focusing only on general game variables. This work does not analyse individual actions with or without the ball, physical aspects or specific team playing styles. For a deeper understanding of goalkeeper development in the transition stage from U18 to senior category, future research is needed that addresses physical, tactical, and cognitive aspects. This would allow for a more detailed analysis and deeper understanding of the factors that influence the development of college goalkeepers.

AUTHOR CONTRIBUTIONS

The concept for this study was developed by the second and third authors (Enrique Ortega and José M. Palao), and the experiment was designed by the first and third authors (Sergio Caicedo and José M. Palao). Data acquisition and reduction for the analysis were performed by the first author (Sergio Caicedo). All three authors participated in the data analysis and contributed to the writing of the article for this publication.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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