Evolution of Technical-Tactical Performance Indicators in College Men's Football Players (U.S. NCAA Division I)

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ABSTRACT

Background: Players, through the different stages of their development, increase their performance due to their maturation process, training, and the increase in their experiences. The college competition in the US allows players to train and compete in a stable context over 4 years in their transition from U18 to senior level. **Objective:** 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 men's players. **Methodology:** The sample was 52,852 Division I National Collegiate Athletic Association (NCAA) players of the United States (2010-2021 seasons). The study design was retrospective non-experimental. The variables studied were games played, games as a starter, points, goals, assists, shot attempts, shots on goal, effectiveness of attempts, effectiveness of shots on goal, fouls, yellow cards, and red cards. To establish the evolution between players from top and bottom teams, one-way ANOVA was used. To analyse the differences according to the top and bottom teams, a T-test and discriminant analysis were performed. **Results:** The older, more experienced, and trained players were, the more they participated in the game, both in terms of games played and in terms of game actions (assists, shots, and goals). The increase in the effectiveness of shots and shots on goal shows that the evolution in training and experience leads to higher player skill. **Conclusion:** These findings highlight the importance of experience, training, and maturity in the performance of U-23 male football players.

Key words: Team Sports, Football, Athletic Performance, Motor Skills

INTRODUCTION

Sport training is a complex process that depends on the interaction of multiple factors (Berber et al., 2020). In football, the development of players depends on technical, tactical, psychological, sociological, and physical aspects among others (Skābardis et al., 2019). The training process aims to prepare the player for competition. Match analysis can provide information on technical-tactical performance indicators and how these evolve throughout the player's training process. These indicators provide quantitative data that help to analyse strengths, weaknesses, and patterns of play. Game statistics vary according to the competition, age and playing position of the players (Saward et al., 2019). Throughout the training process, players increase their performance due to their maturation process, training, and the increase in their experiences. On a physical level, the transition from U16 to U18 is where the greatest changes are evident in the physical actions performed by players in matches (total distance

covered, sprinting, high-speed running distance) (Smalley et al., 2022). Studies analysing player development and transition to high performance football are limited. The transition from U18 to senior level involves a move from the training phase to the performance phase (Bishop et al., 2021).

In the review carried out, the research studies on the training process of the player focus on physical abilities. Considering the physical maturity of the players, studies show significant differences between the U16 and U23 categories. U23 players are significantly faster in speed tests (Bishop et al., 2021) and in strength tests (Kobal et al., 2014) than U16 players. U23 players have a higher load during matches than U18 players due to the longer sprint distance and the intensity of their speed actions (Reynolds et al., 2021; Smalley et al., 2022). Regarding collective behaviours, from U-16 to U-23, there is an increase in the game's use of central areas and a reduction in the stretch of the play area (Nieto et al., 2024). U23 teams have also the ability to realize deeper attack actions (Nieto et al., 2024). The transition process from

U23 to elite level represents a challenge for players due to the increased physical, technical, tactical, and psychosocial demands (Haugaasen & Jordet, 2012; Izzo et al., 2019).

The college competition in the US (National Collegiate Athletic Association, NCAA) allows players to training process in a stable context over 4 years. This training model is different from the academy model. However, its analysis can provide insight into the evolution of U23 players and serve as a guide for the training and development of players at this stage. Previous studies have shown that creating environments that protect plates in this sensible stage of their development can be beneficial (Calero & del Corral, 2014; Özaydın & Aksu, 2019). This work seeks to provide information to assess the development of U23 players and their performance in competition according to their age. The hypothesis of the present study is that there will be a progressive increase in the number of actions (game participation) done by players and their efficacy throughout their years at college statistics of players due to an increase in age, training, and experience. The objective of the study was to analyse the evolution of game statistics as a function of the year of the university of NCAA Division I male players.

METHOD

Participants

The sample was 52,852 NCAA Division I male players from teams in the United States. The sample included all play-ers from all teams that played in season 2010-2011 through 2020-2021 seasons. To calculate the total players included in the study, players that played several seasons were only counted once. Players 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. Player data were obtained from the publicly accessible statistics page of the official NCAA website (https://stats.ncaa.org/) See Table 1.

Design

A retrospective non-experimental design was used. The variables studied were games played, games started as a starter, points, goals, assists, shot attempts, shots on goal, percentage effectiveness of attempts, percentage effectiveness of shots on goal, fouls, yellow cards, and red cards. The variable points was obtained from dividing goals per game by goals per game multiplied by the total number of games played. 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

Table 1. Teams and players that played each season in the soccer Division I competition of the US NCAA (season 2010-2011 through 2020-2021 seasons)

Season	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Teams	204	204	204	204	204	204	204	204	204	204	203
Players	5420	5411	4615	4590	4712	4759	4759	4777	4862	4818	4129

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

Variables	1st year (Freshman)		2nd year (Sophomore)		3rd year (Junior)		4th year (Senior)		Differences between yrs
	M	SD	M	SD	M	SD	M	SD	
Game played	0.751	0.477	0.864	0.462	0.936	0.448	1.00	0.426	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Game started	0.445	0.465	0.597	0.502	0.701	0.508	0.801	0.501	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Points	0.145	0.240	0.178	0.275	0.212	0.308	0.246	0.335	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Goals	0.049	0.100	0.060	0.112	0.072	0.126	0.085	0.136	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Assists	0.045	0.085	0.056	0.095	0.066	0.101	0.076	0.111	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots attempts	0.487	0.591	0.588	0.704	0.678	0.775	0.761	0.832	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots on goal	0.094	0.217	0.110	0.253	0.125	0.279	0.144	0.308	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Efficacy attempts	0.089	0.149	0.091	0.141	0.092	0.133	0.098	0.131	1st yr. < 4th yr. & 3rd yr. < 4th yr.
Eff Shots on goal	0.233	0.284	0.239	0.276	0.235	0.257	0.234	0.249	-
Fouls	0.091	0.256	0.102	0.277	0.104	0.276	0.110	0.282	1st yr. < 3rd yr. & 4th yr.
Yellow Cards	0.061	0.099	0.071	0.101	0.080	0.102	0.085	0.101	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Red Cards	0.003	0.022	0.004	0.028	0.004	0.019	0.004c	0.021	1st yr. < 3rd yr. < 4th yr.

Relative values were calculated in relation to the number of matches in which players participate; Statistical differences were analysed using an ANOVA test

0.500 and bottom teams had a winning coefficient below 0.500.

Procedure

Data on the variables obtained were collected for the summation of each team's match report. To establish the reliability of the match report, the researchers 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 Lince Plus software (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, except possession time, which had an ICC of 0.942.

Statistical Analysis

A one-way ANOVA was used to study the evolution between players from top and bottom teams. To analyse the differences between the top and bottom teams, an independent T-test was used to discriminate between top and bottom teams. The significance level was set at $p<0.05$. The effect size was established with the Cohen d. 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 the Appendix See Table 6, 7, 8, 9.

RESULTS

Players with more training and experience had significant higher games played [$F_{(3, 51966)} = 715.380$, $p < 0.001$], games started [$F_{(3, 51966)} = 715.380$, $p < 0.001$], points [$F_{(3, 50486)} = 352.577$, $p < 0.001$], goals [$F_{(3, 50552)} = 206.742$, $p < 0.001$], assistances [$F_{(3, 50552)} = 214.908$, $p < 0.001$], shot attempts [$F_{(3, 50486)} = 328.231$, $p < 0.001$], shots on goal [$F_{(3, 50552)} = 112.575$, $p < 0.001$], yellow cards [$F_{(3, 52032)} = 133.985$, $p < 0.001$], and red cards [$F_{(3, 50486)} = 10.210$, $p < 0.001$] (Table 2). The effectiveness attempts, increase significantly from 1st and 3rd year to 4th year [$F_{(3,38469)} = 6.876$, $p < 0.001$]. The percentage effectiveness attempts [$F_{(3, 50486)} = 10.475$, $p < 0.001$] and fouls [$F_{(3, 50486)} = 10.475$, $p < 0.001$] were higher in the last year of the university players. The fouls increased significantly from 1st to 3rd and 4th year [$F_{(3, 50486)} = 10.475$, $p < 0.001$]. All variables except the variable shots effectiveness on goal showed an increase over the years of experience as a university player.

    When analysing the teams according to their winning coefficient, similar trends were found when in both groups in teams. In top teams (table 3), the more experience and training the players had, they had more games played [$F_{(3, 27699)} = 466.926$, $p < 0.001$], games started [$F_{(3,}$

26099$) = 726.538$, $p < 0.001$], points [$F_{(3, 26805)} = 169.525$, $p < 0.001$], goals [$F_{(3, 26805)} = 122.262$, $p < 0.001$], assistances [$F_{(3, 26805)} = 139.779$, $p < 0.001$], shot attempts [$F_{(3, 26805)} = 187.336$, $p < 0.001$], shots on goal [$F_{(3, 26805)} = 44.974$, $p < 0.001$], and yellow cards [$F_{(3, 26805)} = 73.489$, $p < 0.001$]. The variables fouls [$F_{(3, 26805)} = 5.463$, $p < 0.001$] and red cards [$F_{(3, 26805)} = 2.611$, $p < 0.001$] changed between the different years. All variables except the variable percentage effectiveness shots on goal increased over the years of experience as a university player [$F_{(3,20517)} = 2.354$, p = 0.070]. In bottom teams (table 4), the more experience and training the players had, players had more games played [$F_{(3, 24263)} = 235.528$, $p < 0.001$], games started [$F_{(3, 2367)} = 425.582$, p = $p <$ 0.001], points [$F_{(3,2367)} = 92.087$, p=$p <$0.001], goals [$F_{(3,2367)} = 70.344$, p=$p <$0.001], assistances [$F_{(3,2367)} = 57.345$, p=$p <$0.001], shot attempts [$F_{(3, 2367)} = 130.097$, p = $p < 0.001$], shots on goal [$F_{(3, 2367)} = 32.870$, p = $p < 0.001$], and yellow cards [$F_{(3, 2367)} = 66.229$, p = $p < 0.001$]. All variables except the variable percentage effectiveness shots on goal showed an increase over the years of experience as a university player [$F_{(3, 17948)} = 3.953$, p = $p < 0.008$].

    Players from teams with higher competitive levels have significantly higher values than teams with lower competitive levels in variables games played, games started, points, goals, assistances, shot attempts, shots on goal, and yellow cards (table 3). No differences were found between players from top and bottom teams in fouls. The effect size of change between years of experience was very large in the variable shot attempts, medium in the variables goals, assistances and yellow cards and low in the variables games played, points, shots on goal, percentage effectiveness shots on goal, fouls and red cards.

DISCUSSION

The objective of this study was to analyse the evolution of game statistics as a function of the year of college of NCAA Division I male players. The results show that the number of games played and games as a starter increased for second-, third-, and fourth-year players, respectively. The older, more experienced, and more trained players have a higher participation in the game, both in terms of games played and game actions (assists, shots, and goals). The increase in the percentage of effective shots and shots on goal shows that the evolution in training and experience leads to a higher level of skill in the players. As players gain experience in matches and competitions, they probably develop greater confidence in their skills, which reflects more shots with greater accuracy and efficiency. However, the low effect size of this evolution shows that this progression is slow from year to year. The size of the change is average when comparing total games, games played as a starter and shots on target between first year and fourth year players. Defensive indicators such as fouls, yellow cards and red cards show a progressive increase over the four years. One of the possible causes could be that as players approach their final year, they become more intense and competitive. The pressure to perform well and stand out may lead to more aggressive play

Table 3. 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 players (Division I - NCAA, U.S. [season 2010 to 2021])

Variables	1st year (Freshman)		2nd year (Sophomore)		3rd year (Junior)		4th year (Senior)		Differences between yrs
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	
Game played	0.760	0.511	0.899	0.493	0.985	0.470	1.05	0.448	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Game started	0.439	0.496	0.623	0.542	0.747	0.546	0.851	0.531	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Points	0.168	0.264	0.209	0.306	0.250	0.341	0.288	0.371	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Goals	0.057	0.110	0.070	0.124	0.085	0.138	0.098	0.150	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Assists	0.054	0.094	0.067	0.105	0.080	0.113	0.091	0.124	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots attempts	0.510	0.628	0.626	0.746	0.718	0.821	0.817	0.887	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots on goal	0.099	0.231	0.118	0.267	0.137	0.302	0.153	0.333	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Efficacy attempts	0.099	0.153	0.098	0.137	0.102	0.134	0.105	0.130	-
Eff Shots on goal	0.254	0.288	0.257	0.276	0.255	0.254	0.251	0.249	-
Fouls	0.088	0.247	0.098	0.274	0.100	0.272	0.106	0.281	1st yr. < 3rd yr. & 4th yr.
Yellow Cards	0.058	0.097	0.067	0.096	0.075	0.095	0.081	0.095	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Red Cards	0.002	0.018	0.003	0.028	0.003	0.016	0.003	0.016	-

Relative values were calculated in relation to the number of matches in which players participate; Statistical differences were analysed using an ANOVA test

Table 4. 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 players (Division I - NCAA, U.S. [season 2010 to 2021])

Variables	1st year (Freshman)		2nd year (Sophomore)		3rd year (Junior)		4th year (Senior)		Differences between yrs
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	
Game played	0.742	0.438	0.824	0.421	0.877	0.412	0.936	0.388	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Game started	0.452	0.431	0.569	0.452	0.648	0.455	0.738	0.451	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Points	0.121	0.212	0.143	0.231	0.167	0.256	0.193	0.273	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Goals	0.042	0.089	0.049	0.096	0.058	0.108	0.068	0.114	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Assists	0.037	0.075	0.044	0.081	0.050	0.082	0.056	0.089	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots attempts	0.464	0.550	0.545	0.651	0.631	0.713	0.689	0.750	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots on goal	0.088	0.202	0.101	0.236	0.112	0.250	0.131	0.272	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Efficacy attempts	0.079	0.145	0.083	0.145	0.081	0.130	0.089	0.131	1st yr. < 3rd yr. & 4th yr.
Eff Shots on goal	0.211	0.278	0.219	0.276	0.211	0.258	0.213	0.248	-
Fouls	0.095	0.264	0.108	0.281	0.109	0.281	0.115	0.284	1st yr. < 3rd yr. & 4th yr.
Yellow Cards	0.064	0.101	0.075	0.106	0.085	0.109	0.089	0.109	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Red Cards	0.003	0.026	0.004	0.028	0.004	0.021	0.006	0.027	1st yr., 2nd yr. & 3rd yr. < 4th yr

Relative values were calculated in relation to the number of matches in which players participate; Statistical differences were analysed using an ANOVA test

and, consequently, to an increase in fouls and cards. These results are consistent with previous studies indicating that more experienced and trained players tend to have a superior ability to make quick and accurate decisions during the game (Práxedes et al. 2018). These results show that it is necessary to adapt the technical-tactical objectives throughout the different years of the players in college programs. The values of this work provide a reference of the average evolution throughout the training process.

When considering the ranking of the teams (winning coefficient), players of the teams with better ranking have higher values in the participation in the game and show a higher efficiency in the quality of their actions. In relation to the evolution, the players of the teams with the best ranking increased more their participation in matches and the number of shots on goal they took. The differences between the evolution of players from the highest and lowest ranked teams were larger (mean effect size) in the number of games started and shots on goal for the second- and third-year players (sophomore and junior). These results are consistent with previous studies indicating that higher-ranked teams are more effective in maintaining possession longer, generating

Table 5. 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 players (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	0.018	2.36	0.021	0.477	0.075	8.34	<0.001	0.461	0.108	10.9	<0.001	0.444	0.114	10.8	<0.001	0.423
Game started	-0.013	-2.96	0.109	0.465	0.054	8.66	<0.001	0.501	0.099	13.2	<0.001	0.506	0.113	13.2	<0.001	0.497
Points	0.047	27.9	<0.001	0.239	0.066	31.5	<0.001	0.273	0.083	33.2	<0.001	0.305	0.095	32.9	<0.001	0.332
Goals	0.015	26.3	<0.001	0.100	0.021	30.0	<0.001	0.111	0.027	31.7	<0.001	0.125	0.030	30.6	<0.001	0.135
Assists	0.017	31.4	<0.001	0.085	0.023	34.3	<0.001	0.094	0.030	37.5	<0.001	0.100	0.035	38.4	<0.001	0.110
Shots attempts	0.046	9.01	<0.001	0.590	0.081	12.9	<0.001	0.703	0.087	12.1	<0.001	0.774	0.178	21.7	<0.001	0.830
Shots on goal	0.011	11.1	0.005	0.217	0.017	14.4	<0.001	0.253	0.025	18.2	<0.001	0.279	0.022	14.3	<0.001	0.307
% Eff_Atte	0.020	20.2	<0.001	0.149	0.015	15.3	<0.001	0.141	0.021	20.5	<0.001	0.133	0.016	15.2	<0.001	0.131
% Eff_SoG	0.043	16.9	<0.001	0.283	0.038	14.7	<0.001	0.276	0.044	17.2	<0.001	0.256	0.038	15.1	<0.001	0.248
Fouls	-0.007	-7.95	0.100	0.256	-0.010	-10.2	0.035	0.277	-0.009	-9.0	0.064	0.276	-0.009	-8.49	0.113	0.282
Yellow Cards	-0.006	-10.3	<0.001	0.099	-0.008	-1.19	<0.001	0.101	-0.010	-13.3	<0.001	0.101	-0.008	-9.87	<0.001	0.101
Red Cards	-0.001	-50	0.007	0.022	-0.001	-33.3	0.010	0.028	-0.001	-33.3	0.003	0.019	-0.003	-100	<0.001	0.021

Sig: Statistical differences were analysed using an Independent T-test. ES: Effect size (Cohen d); significant values are marked in bold

Table 6. Evolution of the absolute values of participation and game factors as a function of the player's year in college in men's football players (Division I - NCAA, U.S. [seasons 2010 to 2021])

Variables	1st year (Freshman)		2nd year (Sophomore)		3rd year (Junior)		4th year (Senior)		Differences between yrs.
	M	SD	M	SD	M	SD	M	SD	
Game played	10.5	6.68	12.1	6.47	13.1	6.27	14.0	5.97	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Game started	6.24	6.51	8.37	7.03	9.83	7.12	11.2	7.01	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Points	2.15	3.76	2.83	4.70	3.46	5.37	4.10	5.94	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Goals	0.74	1.50	0.97	1.87	1.19	2.14	1.42	2.37	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Assists	0.68	1.26	0.89	1.53	1.08	1.71	1.26	1.88	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots attempts	7.05	10.1	9.09	12.4	10.8	14.0	12.4	15.2	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots on goal	1.28	3.26	1.59	3.95	1.89	4.60	2.23	5.14	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Efficacy attempts	0.089	0.149	0.091	0.141	0.092	0.133	0.098	0.131	1st yr. < 4th yr.
Eff Shots on goal	0.233	0.284	0.239	0.276	0.235	0.257	0.234	0.249	-
Fouls	1.05	3.04	1.24	3.55	1.32	3.60	1.45	3.81	1st yr. < 2nd yr. & 3rd yr. < 4th yr.
Yellow Cards	0.77	1.22	1.00	1.38	1.17	1.46	1.29	1.50	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Red Cards	0.04	0.202	0.05	0.227	0.06	0.244	0.07	0.270	1st yr. < 2nd yr. < 3rd yr. < 4th yr.

Legend: Relative values were calculated in relation to the number of matches in which players participate; Statistical differences were analysed using an ANOVA test

Table 7. 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 players (Division I - NCAA, U.S. [seasons 2010 to 2021])

Variables	1st year (Freshman)		2nd year (Sophomore)		3rd year (Junior)		4th year (Senior)		Differences between yrs.
	M	SD	M	SD	M	SD	M	SD	
Game played	10.6	7.16	12.5	6.91	13.7	6.59	14.7	6.27	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Game started	6.15	6.94	8.72	7.59	10.4	7.64	11.9	7.44	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Points	2.6	4.35	3.49	5.48	4.26	6.20	4.99	6.78	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Goals	0.88	1.73	1.18	2.18	1.45	2.47	1.71	2.70	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Assists	0.83	1.44	1.12	1.77	1.35	1.98	1.56	2.15	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots attempts	7.71	11.2	10.2	13.8	12.1	15.5	14.0	16.8	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots on goal	1.41	3.61	1.81	4.43	2.19	5.21	2.49	5.79	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Efficacy attempts	0.099	0.153	0.098	0.137	0.102	0.134	0.105	0.130	-
Eff Shots on goal	0.254	0.288	0.257	0.276	0.255	0.254	0.251	0.249	-
Fouls	1.05	3.10	1.26	3.73	1.34	3.75	1.46	3.96	1st yr. < 2nd yr. & 3rd yr. & 4th yr. 2nd yr. < 4th yr.
Yellow Cards	0.75	1.23	0.99	1.39	1.17	1.46	1.31	1.52	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Red Cards	0.04	0.193	0.04	0.210	0.05	0.241	0.06	0.244	1st yr. & 2nd yr. < 3rd yr. & 4th yr.

Legend: Relative values were calculated in relation to the number of matches in which players participate; Statistical differences were analysed using an ANOVA test

more offensive actions and finishing on goal (Correia da Silva et al., 2019). A possible cause behind these differences could be that higher ranked teams are often more able to recruit and attract the most talented players. This tendency has been observed in professional teams with better ranking and more known have more success on getting players with more value or potential than the rest of the teams (Mourao, 2016). Other possible causes are that these teams have better coaches, better sports facilities, and resources for player development. Players in higher ranked teams have more internal competition among the players. The presence of talented players in the team creates a greater challenge for the players and effort to play. Young players have a greater spectrum of growth in experience and participation in competitions. This

Table 8. Evolution of the absolute participation values of participation and game statistics as a function of the player's year in bottom level college men's football players (Division I - NCAA, U.S. [seasons 2010 to 2021])

Variables	1st year (Freshman)		2nd year (Sophomore)		3rd year (Junior)		4th year (Senior)		Differences between yrs.
	M	SD	M	SD	M	SD	M	SD	
Game played	10.3	6.14	11.5	5.90	12.2	5.77	13.1	5.44	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Game started	6.33	6.04	7.98	6.33	9.08	6.37	10.3	6.31	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Points	1.71	2.99	2.10	3.48	2.51	3.97	2.97	4.41	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Goals	0.59	1.20	0.73	1.40	0.88	1.63	1.06	1.81	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Assists	0.53	1.03	0.64	1.15	0.76	1.25	0.86	1.36	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots attempts	6.39	8.81	7.82	10.5	9.31	11.8	10.4	12.5	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Shots on goal	1.16	2.86	1.35	3.32	1.54	3.73	1.89	4.15	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Efficacy attempts	0.079	0.145	0.083	0.145	0.081	0.130	0.089	0.131	1st yr. & 3rd yr. < 4th yr.
Eff Shots on goal	0.211	0.278	0.219	0.276	0.211	0.258	0.213	0.248	-
Fouls	1.05	2.98	1.22	3.34	1.30	3.43	1.44	3.62	1st yr. < 2nd yr. & 3rd yr. & 4th yr. 2nd yr. < 4th yr.
Yellow Cards	0.79	1.22	1.00	1.36	1.16	1.45	1.27	1.47	1st yr. < 2nd yr. < 3rd yr. < 4th yr.
Red Cards	0.04	0.212	0.06	0.244	0.06	0.247	0.09	0.300	1st yr. < 2nd yr. & 3rd yr. < 4th yr

Legend: Relative values were calculated in relation to the number of matches in which players participate; Statistical differences were analysed using an ANOVA test

allows them to achieve greater development of technical skills and knowledge of the game (Sevil et al., 2017).

This study presents information regarding the evolution of players as well as reference values according to the players' year and their team's level. The differences found between players top and bottoms and their different evolution show the importance of recruitment for teams in this competition. The results show more participation and efficacy of players as their training and experience increases. As with all studies, this study has certain limitations given that it focuses only on general variables related to the game. This study did not analyse individual actions (with or without the ball), physical aspects, or specific playing training styles. This study did not analyse the training conditioning, resources or other aspects that could influence players' development. The findings show the progression of players through their college training and experience. The change in the game statistics reflects the importance of using reference values that are specific for each level of competition and each year at university when coaches set technical-tactical goals or when they evaluate their players. These values can serve as a benchmark and can be complemented with the values of previous seasons for each team.

CONCLUSION

The analysis of the evolution of game statistics in NCAA Division I men's football players reveals that as teams gain experience over the years, there is an increase in their offensive game participation values. This highlights the importance of experience, training, and maturity on player performance. Additionally, as players progress through their college career, they experience an increase in infractions, yellow cards, and red cards. One possible reason may be that as players mature and gain more experience in their final years at university, they become more intense. This study presents information regarding the evolution of players as well as reference values according to the players' year and their team's level. Future research should address additional facets of player training (e.g. physical, tactical, or cognitive). This would facilitate a more thorough examination and help to yield a deeper understanding of the evolution of the player in the transition stage from U18 to the senior level.

Table 9. Differences as a function of team level in absolute participation values and game factors as a function of player year in college in men's football players (Division I - NCAA, US [seasons 2010 to 2021])

Variables	1st year (Freshman) Top 50 - Bottom 50				2nd year (Sophomore) Top 50 - Bottom 50				3rd year (Junior) Top 50 - Bottom 50				4th year (Senior) Top 50 - Bottom 50			
	Differ	%	Sig.	ES	Differ	%	Sig.	ES	Differ	%	Sig.	ES	Differ	%	Sig.	ES
Game played	0.30	2.83	<0.001	6.68	1.00	8.00	<0.001	6.45	1.50	10.9	<0.001	6.22	1.60	10.8	<0.001	5.92
Game started	-0.18	-2.92	<0.001	6.51	0.74	8.48	<0.001	7.02	1.32	12.6	<0.001	7.08	1.60	13.4	<0.001	6.97
Points	0.89	34.2	<0.001	3.73	1.39	39.8	<0.001	1.85	1.75	41.0	<0.001	5.30	2.02	40.4	<0.001	5.86
Goals	0.29	32.9	<0.001	1.49	0.45	38.1	<0.001	1.51	0.57	39.3	<0.001	2.13	0.65	38.0	<0.001	2.35
Assists	0.30	36.1	<0.001	1.25	0.48	42.8	<0.001	4.64	0.59	43.7	<0.001	1.69	0.70	44.8	<0.001	1.85
Shots attempts	1.32	17.1	<0.001	10.1	2.38	23.3	<0.001	12.4	2.79	23.0	<0.001	13.9	3.60	25.7	<0.001	15.1
Shots on goal	0.25	17.7	<0.001	3.26	0.46	25.4	<0.001	3.95	0.65	29.6	<0.001	4.59	0.60	24.0	<0.001	5.14
% Eff_Atte	0.20	202.0	<0.001	0.149	0.01	15.3	<0.001	0.141	0.02	20.5	<0.001	0.133	0.01	15.2	<0.001	0.131
% Eff_SoG	0.04	16.9	<0.001	0.283	0.03	14.7	<0.001	0.276	0.04	17.2	<0.001	0.256	0.03	15.1	<0.001	0.248
Fouls	0.00	0.00	0.982	3.04	0.04	3.17	0.482	3.55	0.04	2.98	0.475	3.60	0.02	1.36	0.850	3.81
Yellow Cards	-0.04	-5.33	0.058	1.22	-0.01	-1.01	0.807	1.38	0.01	0.85	0.607	1.46	0.04	3.05	0.142	1.50
Red Cards	0.00	0.00	0.035	0.202	-0.02	-50	0.001	0.226	-0.01	-20	0.164	.244	-0.03	-50	0.001	0.270

Legend: Sig: Statistical differences were analysed using an Independent T-test. ES: Effect size (Cohen d)

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