



# Exploring possession games in women's football: A multidimensional approach

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## Abstract

Possession games are among the most commonly used training drills by women's association football coaches worldwide. However, they overlook a relevant feature of the game: directionality. This study compares the effects of introducing scoring targets in possession games on the game's dynamics, the players' tactical and physical performance, and their enjoyment and perceived competence. Eighteen female footballers (age:  $17.0 \pm 1.4$  years; playing experience:  $9.8 \pm 2.1$  years) from the third team of a Spanish women's first division club played three  $3 \times 5$ -minute nine-a-side possession games on a 52 m long  $\times$  33 m wide pitch with no, two and four scoring objects. Game dynamics (total effective playing time and duration of ball possessions) from observational analysis, tactical (central tendency and entropy measures of collective and individual pitch-positioning-derived variables and synchronisation) and physical (total distance travelled and distances at different speeds) responses from GPS data, and players' perceptions of enjoyment and competence were assessed. The main findings indicate that the effective playing time and average duration of ball possession did not vary between the training scenarios ( $p > 0.05$ ); the inclusion of four targets led players to occupy less space ( $p < 0.05$ ; Cohen's  $d > 1.12$ ), positioning themselves near the targets, and to play in a more synchronised manner longitudinally ( $p < 0.05$ ; Cohen's  $d = 0.61$ ) than in the non-directional game; and the physical demands and players' perceptions of enjoyment and competence did not differ between the possession games ( $p > 0.05$ ). Placing targets to provide possession games with directionality encourages players to occupy less space and play more centred and synchronised, without impairing game dynamics, external load or their perceptions of enjoyment and competence.

**Keywords:** team sports, soccer, observational analysis, tactical behaviour, external load, motivation



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## Introduction

Association football is a collective duel played with a ball, so there are two game phases: in possession of the ball and out of possession. The principles associated with each phase

are different (Castellano, 2008; Gréhaigne & Godbout, 1995). The team with the ball tries to keep it, play on the move and create and exploit available space. The defending team aims to regain possession, stop the opponent's progression and de-

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fend the target. Possession games – playing-form activities with no goals (i.e. no directionality), in which the primary intention is for one team to keep possession of the ball from another team – are one of the training drills most commonly employed for focusing on principles like keeping the ball or playing on movement (Roca & Ford, 2020). For example, elite and academy female footballers spend over 20% and 10% of their training time on possession games, respectively (Emmonds et al., 2023), so the impact of these drills on this population is worth investigating. Possession games, however, ignore a relevant feature of football: goals. The absence of goals or scoring targets (e.g. scoring zones or objects) removes the game's directionality and leaves players without spatial references to help them position themselves on the pitch (Coutinho et al., 2024).

Football task design implies manipulating the relevant features of the game's internal logic (i.e. relationships to space, the ball, time, and other participants; Parlebas, 2013) while accounting for the consequences of these changes on players' performance. Thus, coaches can set scoring targets to provide direction for the game. While scholars have studied the acute effects of adding regular and mini goals in small- and large-sided games in men's football (Castellano et al., 2013; Clemente et al., 2019; Coutinho et al., 2024; Santos et al., 2024), studies conducted with women are still lacking. Assessing the impact of scoring targets on female footballers' performance may assist practitioners in planning their practice based on scientific evidence. Placing scoring objects inside the pitch, such as poles to knock down, can give the game a sense of direction, while still making scoring difficult enough to encourage players to prioritise the main objective of the task: retaining possession of the ball.

This study adopted a multidimensional approach (Folgado et al., 2019) to compare player performance in directional vs. non-directional possession games. The recording of effective playing time and possession duration can explain the dynamics of possession games with and without targets (Castellano, 2008). From a tactical perspective, variables derived from pitch position, such as surface area (SA, m<sup>2</sup>), length-per-width ratio (lpwratio, arbitrary units), as well as stretch (SI, m) and spatial exploration (SEI, m) indices can provide practitioners with key insights to understand players' collective (i.e. SA) and individual (i.e. SEI) use of space or their dispersion on the pitch (i.e. SI) in different training scenarios (Coito et al., 2022). In addition, entropy and synchronisation measures can provide relevant information on behavioural regularity and coordination between teammates (Low et al., 2020). From a physical point of view, assessing the total distances travelled and the distances in different speed zones can reveal whether the game's directionality affects the external load of female footballers (de Dios-Álvarez et al., 2022). Perceptual variables, such as enjoyment and competence, can account for the subjective experience of players during possession games (Clemente, 2025; Papaioannou et al., 2006).

Therefore, this study assessed the impact of introducing scoring targets in possession games on female footballers' game dynamics, tactical and physical performance, and their perceptions of enjoyment and competence. We hypothesised that the addition of internal targets would lead players to use less space, play more synchronously and run less, without affecting their playing time or perceptions of enjoyment and competence.

## Materials and methods

### Participants

Eighteen Basque female footballers (age: 17.0±1.4 years; playing experience: 9.8±2.1 years) belonging to the third team of a Spanish women's first division club participated in the study during the first half of the 2023/2024 season. All available outfield players (i.e. without health problems, injuries or just returning to play) took part, while goalkeepers underwent specific training with the goalkeeper coach. Participants trained three times per week (on Tuesdays, Thursdays and Fridays) and usually competed on Saturdays. Training sessions typically included collective passing drills, small- and large-sided games with and without regular and mini goals, as well as build-up and finalisation actions. The team competed in the Basque league, ending the season in 7<sup>th</sup> place out of 18 teams. Given that they received structured and regular training, developed their playing skills in a professional academy environment and competed in the first autonomous league, they were placed in the third tier of the participant classification framework (McK-ay et al., 2022): highly trained/national level.

All participants and, where appropriate, their legal guardians/next of kin, team coaches and club management were fully informed of the purpose and procedures of the study before giving written informed consent for voluntary participation. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013) and ethical approval was obtained from the Ethics Committee for Research Involving Human Beings (GIEB in Basque) of the University of the Basque Country UPV/EHU (approval number: M10\_2021\_328; approval date: 25 November 2021).

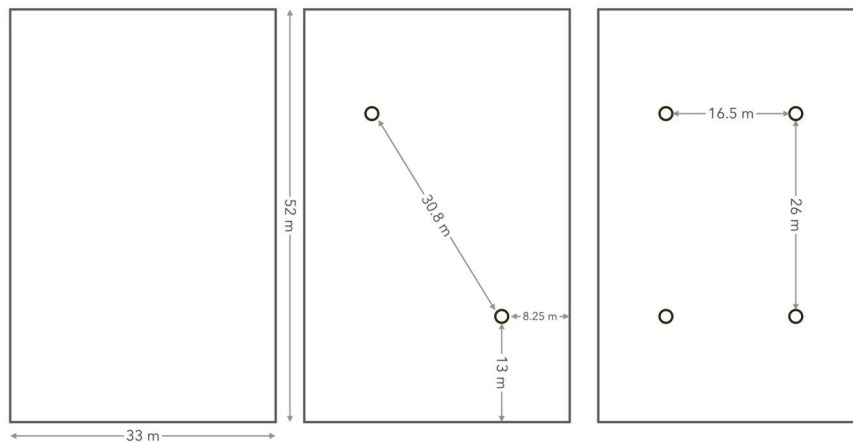
### Design

The study was conducted over three training sessions on non-consecutive days (Tuesdays and Thursdays) at the participants' usual training venue (i.e. artificial turf pitch) and time (i.e. 19:30). A rest period of at least 48 hours was allowed between sessions and before or after the match. Each of the three sessions began with a standard 10-minute warm-up. The team coach then formed two balanced groups, dividing the players according to their level and position (Gonzalez-Artetxe et al., 2022), to face each other in three 3 × 5-minute nine-a-side possession games on a 52 m long × 33 m wide pitch (95 m<sup>2</sup> × player; length/width relation: 1.6), with a 3-minute break between sets.

Figure 1 illustrates each possession game and how the scoring conditions were manipulated: (a) NO, possession game with no scoring targets, where players could score a point by completing ten consecutive passes; (b) 2T, possession game with two shared scoring objects (poles), where players could score a point by knocking down either pole; and (c) 4T, possession game with four shared scoring objects (poles), where players could score a point by knocking down any of the four poles. One experimental condition was implemented per session in a randomised order: 4T, NO, and 2T. Continuity of play was ensured by placing several balls around the pitch to allow for quick ball replacement when the ball went out. Coach intervention was minimised to that of the referee so as not to influence player conduct through feedback (Gonzalez-Artetxe et al., 2022).

### Data collection

Effective playing time and average duration of ball possession and set pieces were quantified by video recording (GoPro HERO9, GoPro Inc., San Mateo, California, USA) using an ad



**Figure 1.** Representation of possession games with no (left), two (middle) and four (right) scoring objects.

hoc observation tool in LINC PLUS (version 3.2.4 for macOS; Soto-Fernández et al., 2022). The criteria established by Castellano (2008) were used to determine when the ball was in play and which team was in possession. The same arbitrarily chosen set of a randomly selected experimental condition (11% of the sample) was observed twice, with 10 days between observations, and the intra-observer agreement, calculated using Cohen's kappa, was perfect (100%) for the alignment and almost perfect (97%) for the duration of ball possessions and set pieces.

Tactical and physical responses were assessed using positional data collected with a valid and reliable global positioning system (WIMU PRO, RealTrack Systems, Almeria, Spain) at a sampling frequency of 10 Hz (Bastida-Castillo et al., 2019). Tactical performance was assessed through central tendency and normalised approximate entropy (NAPen; Fonseca et al., 2012) measures of SA, lpwratio, SI and SEI. Entropy quantifies behavioural regularity: less entropy indicates greater regularity and vice versa. Longitudinal (Y-axis) and lateral (X-axis) synchronisation were also measured using the relative phase of the centroid, which was computed via the Hilbert transform. Players' external load was assessed by total distances travelled (m) and walking (below 2.00 m/s), jogging (2.00–3.46 m/s), high-speed running (3.46–5.29 m/s), very high-speed running (5.29–6.26 m/s) and sprinting (above 6.26 m/s) distances (m) travelled (Park et al., 2019). These speed thresholds were established specifically for senior female footballers by Park et al. (2019) and confirmed by Harkness-Armstrong et al. (2022). All calculations were performed in MATLAB (version 2018a for macOS, The MathWorks Inc., Natick, MA, USA).

Using the enjoyment and perceived competence scale validated by Arias-Estero et al. (2013) and previously used in women's football (Los Arcos, Gonzalez-Artetxe, Bayer-Perez, et al., 2025; Los Arcos, Gonzalez-Artetxe, Lombardero, et al., 2025), players rated how much they enjoyed each of the three possession games along with how they thought they had played. This 5-point Likert scale has three statements relating to enjoyment (2, 4 and 6) and four relating to perceived competence (1, 3, 5 and 7). The players responded individually for five minutes after the final set of each possession game, in silence and at least 2 metres from each other, to avoid peer influence on their ratings.

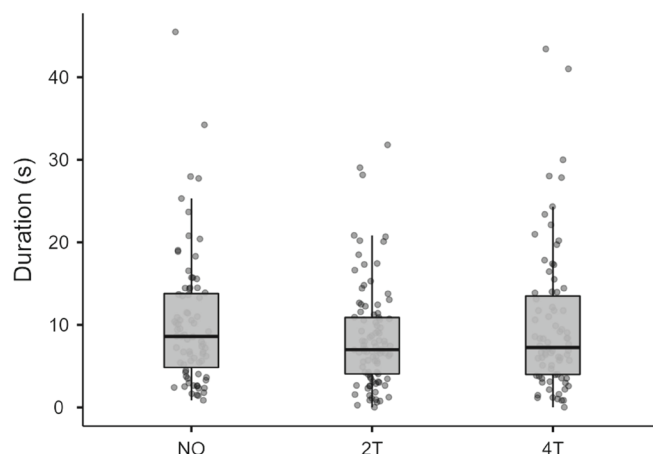
#### Analysis

The results are presented as the means  $\pm$  standard deviations. First, a sensitivity power analysis was conducted using G\*Power

(version 3.1.9.6 for macOS; Faul et al., 2007) to determine the minimum detectable effect size for a repeated measures ANOVA with three conditions: NO, 2T and 4T. With an  $\alpha$  of 0.05, a power of 0.80, and a sample size of 18, the analysis indicated a minimum detectable effect size of  $f = 0.31$  (medium effect size, according to Cohen, 1988) for the main effect across conditions. This analysis guided the interpretation of the results. Observational analysis was implemented to contextualise the dynamics of the game. As the data did not meet the assumptions of normality and homoscedasticity, a non-parametric Kruskal–Wallis ANOVA test was used to compare the average duration of ball possession between the three training scenarios. The central tendency and NAPen measures of SA and lpwratio were compared between possession games as 'unrelated' because they are collective variables, while those of SI and SEI, as well as distances travelled, were compared as 'related' because of their individual nature. As the tactical variables were normally distributed and equal variances were confirmed, a one-way ANOVA and repeated measures ANOVA were used to analyse collective (central tendency and NAPen measures of SA and lpwratio) and individual (central tendency and NAPen measures of SI and SEI) variables, respectively. Synchronisation measures, physical variables and players' perceptions of enjoyment and competence were also compared between possession games using a repeated measures ANOVA, except for sprinting distances travelled, which did not follow a normal distribution, so the Friedman test was used. Practical differences were assessed using Cohen's  $d$  (trivial,  $<0.20$ ; small,  $0.50$ ; medium,  $0.80$ ; and large,  $\geq 0.80$ ) and eta squared ( $\eta^2$ : trivial,  $<0.01$ ; small,  $0.06$ ; medium,  $0.14$ ; and large,  $>0.14$ ) effect sizes with 95% confidence intervals (CI) for parametric and non-parametric comparisons, respectively (Cohen, 1988). Statistical significance was set at  $p < 0.05$  and all analyses were performed using jamovi software, version 2.4.14 for macOS (The jamovi project, 2024, retrieved from <https://www.jamovi.org>).

#### Results

The effective playing time of the three possession games was 91%, and the mean duration (and amount) of set pieces was  $3.3 \pm 1.9$  s (25 set pieces),  $2.4 \pm 1.5$  s (34 set pieces) and  $3.1 \pm 2.2$  s (33 set pieces) for NO, 2T and 4T scenarios respectively. There were no significant differences ( $p > 0.05$ ) in the mean duration of ball possession between the possession game scenarios (Figure 2).



**Figure 2.** Duration of ball possessions among highly trained female footballers (means  $\pm$  standard deviations and quartiles) for pairwise comparisons playing possession games with no (NO, 79 ball possessions), two (2T, 97 ball possessions) and four (4T, 79 ball possessions) scoring objects.

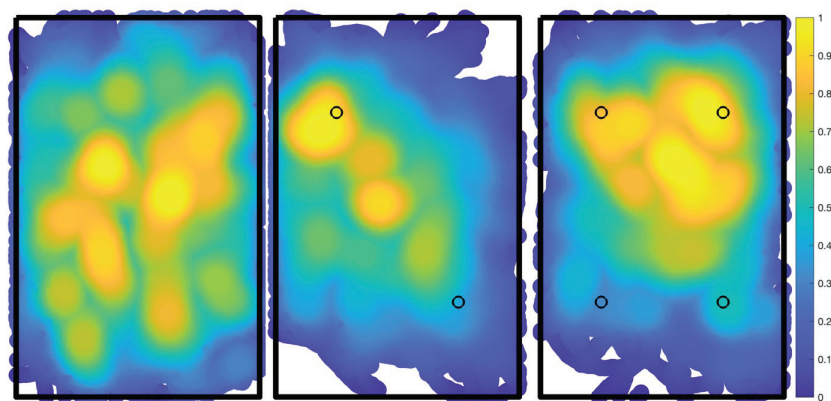
Table 1 shows the tactical and physical performance of highly trained female footballers and their perceptions of enjoyment and competence in the three possession games. Players occupied much less space when playing with four targets than when playing with no targets or two targets ( $p < 0.05$ ; Cohen's  $d > 1.12$ ). They were also more synchronised longitudinally when playing with four targets than when playing with none ( $p < 0.05$ ; Cohen's

$d = 0.61$ ). No significant differences ( $p > 0.05$ ) were found between possession games in players' physical performance, nor in their perceptions of enjoyment and competence. Figure 3 illustrates the density of player positioning during each possession game, considering the different target locations or lack thereof. There is a clear tendency for players to remain closer to the targets when these were included.

**Table 1.** Highly trained female footballers' tactical and physical performance and perceptions of enjoyment and competence (means  $\pm$  standard deviations) and effect sizes with 95% confidence intervals (CI) for pairwise comparisons playing possession games with no (NO), two (2T) and four (4T) scoring targets.

	Possession game conditions			Effect size (95% CI)		
	NO	2T	4T	NO vs 2T	NO vs 4T	2T vs 4T
<b>Tactical performance</b>						
SA (m <sup>2</sup> )	526 $\pm$ 51	480 $\pm$ 62	412 $\pm$ 60†‡	-0.81 [-0.84; -0.78]	-2.05 [-2.08; -2.01]	-1.12 [-1.15; -1.08]
NAPen (au)	0.077 $\pm$ 0.012	0.084 $\pm$ 0.014	0.085 $\pm$ 0.010	0.54 [-1.09; 2.17]	0.72 [-0.93; 2.38]	0.08 [-1.52; 1.68]
lpwratio (au)	1.25 $\pm$ 0.37	1.18 $\pm$ 0.10	1.19 $\pm$ 0.08	-0.26 [-0.29; -0.23]	-0.23 [-0.25; -0.20]	0.11 [0.08; 0.14]
NAPen (au)	0.141 $\pm$ 0.022	0.108 $\pm$ 0.017	0.134 $\pm$ 0.026	-1.68 [-3.54; 0.18]	-0.29 [-1.90; 1.32]	1.18 [-0.55; 2.92]
SI (m)	12.0 $\pm$ 1.83	11.7 $\pm$ 2.21	10.8 $\pm$ 1.98	-0.15, [-1.07; 0.78]	-0.63, [-1.58; 0.32]	-0.43, [-1.36; 0.51]
NAPen (au)	0.073 $\pm$ 0.011	0.074 $\pm$ 0.008	0.081 $\pm$ 0.013	0.01 [-1.50; 1.71]	0.66 [-0.98; 2.31]	0.65 [-0.99; 2.29]
SEI (m)	11.1 $\pm$ 1.44	10.6 $\pm$ 1.18	10.8 $\pm$ 1.14	-0.38 [-1.31; 0.55]	-0.23 [-1.16; 0.70]	0.17 [-0.75; 1.10]
NAPen (au)	0.093 $\pm$ 0.013	0.089 $\pm$ 0.010	0.091 $\pm$ 0.009	-0.35 [-1.96; 1.27]	-0.18 [-1.78; 1.43]	0.21 [-1.14; 1.82]
Long sync (au)	0.57 $\pm$ 0.14	0.58 $\pm$ 0.15	0.64 $\pm$ 0.08*	0.07 [-0.47; 0.60]	0.61 [0.07; 1.16]	0.50 [-0.04; 1.04]
Lat sync (au)	0.49 $\pm$ 0.14	0.50 $\pm$ 0.14	0.49 $\pm$ 0.15	0.07 [-0.46; 0.61]	0.00 [-0.53; 0.53]	-0.07 [-0.99; 0.86]
<b>Physical performance</b>						
Total distance (m)	1628 $\pm$ 72.3	1606 $\pm$ 120	1626 $\pm$ 123	-0.22 [-1.15; 0.71]	-0.02 [-0.94; 0.90]	0.17 [-0.76; 1.09]
Walking	651 $\pm$ 45.8	663 $\pm$ 47.4	657 $\pm$ 32.9	0.26 [-0.67; 1.19]	0.15 [-0.78; 1.08]	-0.15 [-1.07; 0.78]
Jogging	625 $\pm$ 93.4	595 $\pm$ 109	615 $\pm$ 106	-0.30 [-1.23; 0.63]	-0.10 [-1.03; 0.82]	0.19 [-0.74; 1.11]
High speed	320 $\pm$ 50.0	312 $\pm$ 75.8	314 $\pm$ 59.4	-0.13 [-1.05; 0.80]	-0.10 [-1.03; 0.82]	0.03 [-0.90; 0.95]
Very high speed	24.8 $\pm$ 18.7	28.5 $\pm$ 14.9	31.3 $\pm$ 18.0	0.22 [-0.71; 1.15]	0.35 [-0.58; 1.29]	0.17 [-0.76; 1.10]
Sprinting	9.71 $\pm$ 12.5	6.38 $\pm$ 8.75	7.12 $\pm$ 7.17	0.00 [0.00; 0.03]	0.06 [0.00; 0.18]	0.05 [0.00; 0.17]
<b>Perceptions</b>						
Enjoyment (au)	4.32 $\pm$ 0.73	4.44 $\pm$ 0.58	4.42 $\pm$ 0.63	0.18 [-0.74; 1.11]	0.15 [-0.74; 1.11]	-0.03 [-0.96; 0.89]
Competence (au)	3.83 $\pm$ 0.78	3.61 $\pm$ 0.65	3.77 $\pm$ 0.71	-0.31 [-1.24; 0.62]	-0.08 [-1.01; 0.84]	0.24 [-0.69; 1.16]

Abbreviations: SA, surface area; lpwratio, length-per-width ratio; SI, stretch index; SEI, spatial exploration index; NAPen, normalised approximate entropy; Long sync, longitudinal synchronisation; Lat sync, lateral synchronisation; au, arbitrary units. Note: Superscripts indicate significant differences at  $p < 0.05$ : \* higher than NO condition; † lower than NO condition; ‡ lower than 2T condition.



**Figure 3.** Density of player positioning during possession games with no (left), two (middle) and four (right) scoring objects. Density represents the relative frequency of player positions, with brighter areas indicating zones occupied more often and darker areas indicating zones occupied less often.

## Discussion

Using a multidimensional approach, this study sought to assess the impact of adding scoring targets in women's football possession games. The results of this investigation show that (a) the effective playing time and average duration of ball possession did not vary between the training scenarios; (b) the inclusion of four targets led players to occupy less space, positioning themselves near the targets, and to play in a more synchronised manner longitudinally than in the non-directional game; and (c) the physical demands and players' perceptions of enjoyment and competence did not differ between the possession games.

Female footballers showed similar game dynamics across the three possession game conditions. The effective playing time with or without targets was a third higher than that of Girls' England Talent Pathway U14 and U16 league matches, which ranged from 57% to 61% (Harkness-Armstrong et al., 2023). Providing high playing time in training ensures ample motor engagement time, which is crucial for optimising training and furthering player development. The average duration of ball possession in the three training scenarios was also similar to that in elite female youth matches, ranging from 8.5 to 9.4 s (Harkness-Armstrong et al., 2023), which aligns these tasks more closely with match conditions (Roca & Ford, 2020). Since incorporating scoring targets did not reduce playing time or possession duration, possession games may include them to preserve a core element of football, such as directionality, without altering game dynamics.

As expected, players occupied less space and played closer to the targets in a more synchronised manner when multiple scoring objects were added. Their dispersion on the pitch, individual use of space, or entropy measures did not change. Along these lines, Coutinho et al. (2024) found that including two mini goals per team in four-a-side possession games decreased young male footballers' individual use of space (i.e. SEI) and increased the distances to their nearest teammates and opponents, with no change in entropy measures. The location of the targets can play a key role in shaping players' tactical behaviour. Positioning them on the end line resulted in less exploration and a greater separation between the nearest players (Coutinho et al., 2024), whereas the internal location elicited players' centring and synchronising on the pitch. In any case, providing directionality to the game seems to help

players strategically position and organise themselves around the targets. The absence of changes in entropy measures indicates that the inclusion of targets did not affect behavioural regularity. The positive effects of directionality on player centring and synchronisation on the pitch, together with the lack of change in behavioural regularity and duration of ball possession, highlight the value of introducing scoring targets to boost collective tactical performance.

As players may adopt a more strategic way of playing with multiple targets – occupying less space and playing in a more synchronised way – a lower external load would be expected as a consequence. However, the physical performance of highly trained female footballers was similar with and without targets. In contrast, including regular and mini goals seems to impact the physical performance of young and senior male footballers in small- and large-sided games (Castellano et al., 2013; Clemente et al., 2019; Coutinho et al., 2024; Santos et al., 2024). Acute effects of regular goals were inconsistent: including them (and goalkeepers) increased total and running distances (3.88–5.55 m/s) of professional players in 10-a-side games (Clemente et al., 2019), decreased total distance of semi-professionals in seven-a-side games (Castellano et al., 2013), and did not affect total and high-speed running (above 5.83 m/s) distances of U23s in four-a-side games with an area per player near 100 m<sup>2</sup> (Santos et al., 2024). Adding mini goals in both the four- and seven-a-side formats resulted in young (Coutinho et al., 2024) and semi-professional (Castellano et al., 2013) players running less than in non-directional games. Unlike their male counterparts, women's football coaches can orientate possession games with multiple targets without worrying about altering their physical demands.

Incorporating scoring objects did not affect players' enjoyment or perceived competence, which remained above 4 and 3.5 out of 5, respectively, across all possession games. The results of this study are in line with previous studies with female academy footballers in which the relationship with space (Los Arcos, Gonzalez-Artetxe, Bayer-Perez, et al., 2025) or opponents (Los Arcos, Gonzalez-Artetxe, Lombardero, et al., 2025) was modified. They are also consistent with enjoyment reported by male team sport athletes in different activities, such as possession or small-sided games (Clemente, 2025): the manipulation of task conditions does not appear to affect participants' enjoyment. Similarly, perceived competence, an-

other key component of motivation that is closely related to enjoyment (Papaioannou et al., 2006), did not change when scoring objects, pitch obstacles (Los Arcos, Gonzalez-Artetxe, Bayer-Perez, et al., 2025), or additional rules that alter oppositional interactions (Los Arcos, Gonzalez-Artetxe, Lombardero, et al., 2025) were introduced. These findings allow coaches to modify task conditions according to their training objectives without worrying about compromising the players' subjective experience.

This study combined different dimensions and levels of playing competence to contribute to a better understanding of the acute effects of manipulating the internal logic of the game in women's football training. Given its novelty, further studies are required to increase the sample size and extend the sampling to different age groups and levels of competition. In future investigations, it might be possible to integrate observational, tactical, physical and perceptual data, which would strengthen and enrich the multidimensional approach.

## Conclusions

Placing targets in possession games provides the game with directionality – a relevant feature of football – and leads players to occupy less space and play more centred and synchronised, with no changes in game dynamics, external load or perceptions of enjoyment and competence. Thus, women's football coaches can introduce scoring objects to boost tactical performance without compromising the primary purpose of possession games: keeping the ball.

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## Conflicts of interest

The authors declare no conflict of interest.

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