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Short-interval consecutive goals and performance outcomes in elite women's futsal

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ABSTRACT

The goal of this study was to examine the impact of short-interval consecutive goals (SICGs), defined as ≥ 2 goals scored within three minutes, on team performance in elite women's futsal. Goal timings from 132 matches of the 2024–2025 Portuguese Women's Senior Futsal League were extracted from official reports. Goals inside and outside SICGs, match result, and league ranking were recorded. Path analysis using Structural Equation Modelling (SEM) tested model fit and direct and indirect paths among all variables. SICGs occurred in most matches and accounted for over half of all goals, clustering in the opening and closing periods of each half. Scoring SICGs was positively associated with points ($\beta = .30$, $p = .003$), whereas conceding SICGs was negatively associated ($\beta = -.24$, $p = .003$). Combined, these effects explained 50% of the variance in points earned and 40% in final league ranking. SICGs appear to be critical tactical and psychological junctures in elite women's futsal, with implications for match outcomes and season-long classification. Coaches may benefit from anticipating these high-leverage periods to enhance match management and prepare players for moments of advantage or disadvantage. Future research should clarify the role of SICGs in psychological momentum.

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Women's futsal; short-interval consecutive goals; coaching; elite sports

1. Introduction

Team-sport performance emerges from the interaction of technical, tactical, physical, and psychological constraints (Travassos et al., 2013). In futsal, performance is shaped by limited space/time for action, rapid transitions, frequent stoppages and complex tactical interactions (Barreira et al., 2025; Ribeiro et al., 2020; Spyrou et al., 2020). Similar performance constraints occur in basketball and handball, where the high tempo of play and frequent scoring opportunities produce dynamic shifts in match control (Pascual et al., 2024; Qiu et al., 2024). Contextual factors such as match location, opponent quality, tactical behaviour, match status, and goal scoring have been shown to shape players' psychological

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momentum (PM) and overall performance across invasion sports (Gollan et al., 2020; Lago-Peñas et al., 2007). Critically, short scoring bursts are particularly impactful, often signalling momentum shifts (Weimer et al., 2023). Futsal's higher event density makes it especially susceptible to these rapid swings, creating nonlinear fluctuations where brief sequences exert disproportionate competitive influence.

PM describes dynamic changes in cognition, emotion, and behaviour following performance-relevant events that influence subsequent performance (Gernigon et al., 2010; Taylor & Demick, 1994), evolving nonlinearly in response to contextual and situational variations (Briki et al., 2013). Positive PM enhances confidence, motivation, and assertive decision-making, whereas negative PM may impair emotional regulation and execution quality (Den Hartigh et al., 2014; Gernigon et al., 2010; Qiu et al., 2024; Wergin et al., 2025). In fast-paced invasion sports, momentum is operationalised through observable performance indicators such as scoring runs or rapid shifts in match status (Den Hartigh et al., 2020; Gautier et al., 2024; Qiu et al., 2024). The ability to identify these cues is fundamental for maintaining attention, decision-making and tactical behaviour (Lago-Peñas et al., 2007).

The concept of Short-Interval Consecutive Goals (SICGs), defined as ≥ 2 goals scored within 3 minutes in a single half, represents an original construct proposed in the present study. To our knowledge, no prior study in futsal or related invasion sports has defined or operationalised this concept under this or equivalent terminology. SICGs may act as critical PM episodes, producing changes in perceived control and tactical assertiveness consistent with momentum effects observed across sports (Briki & Markman, 2018; Gernigon et al., 2010). Research in football shows that goals scored at critical moments trigger pronounced positive PM in the scoring team and negative PM in the opponent, influencing subsequent performance beyond the immediate scoreline (Den Hartigh et al., 2020; Gautier et al., 2024). These findings highlight that the temporal proximity and sequencing of goals matter, reinforcing the need to analyse clustered scoring events. The 3-minute threshold adopted in the present study was not derived from a pre-existing framework but established on sport-specific grounds. In futsal, the number of substitutions is unlimited and, usually, coaches manage playing time in bouts of approximately 3 minutes (effective time), corresponding, to a specific PM that captures the futsal match scoring dynamics effectively (FIFA, 2021; Moraes et al., 2022; Spyrou et al., 2020). Although effective playing time was not available in the present dataset, a 3-minute interval was adopted as a theoretically informed temporal window based on these substitution patterns. This operational definition aims to capture short-term scoring dynamics characteristic of the fast-paced nature of futsal.

Across invasion sports, scoring sequences and short-term performance fluctuations are linked to competitive outcomes (Lago-Peñas et al., 2016; Sánchez-Murillo et al., 2021). Although football, basketball and handball differ in structural characteristics (e.g. playing area, number of players, time duration or substitution rules), they share common constraints, including the importance of goal-scoring events, match status effects, and the emergence of PM, which influence team behaviour and performance (Den Hartigh et al., 2014; Gernigon et al., 2010; Lago-Peñas et al., 2007; Travassos et al., 2013). Within this cross-sport framework, scoring the first goal has been shown to substantially increase the likelihood of winning (Ibáñez et al., 2018a; Lago-Peñas et al., 2016; Liu et al., 2021; Stafylidis et al., 2025), while goals scored in critical moments have

disproportionate influence on match dynamics (Greve et al., 2020; Pratas et al., 2018). Critically, short-time scoring sequences have been shown to strongly predict match success (Méndez-Domínguez et al., 2019), and can sharply alter the PM and individual tactical capacity of players and landscape of a match, elevating confidence and assertiveness in the scoring team via emotional convergence, while inducing frustration and vulnerability in opponents (Fritsch et al., 2024; Gómez et al., 2019). This cross-sport evidence provides a robust theoretical foundation for the present study, while emphasising the need for sport-specific contextualisation.

Female athletes generally report higher competitive anxiety than male players, potentially increasing vulnerability to negative momentum following setbacks, although effective self-regulatory strategies may stabilise emotional control during positive phases (Fernández et al., 2020; Kelemen et al., 2024; Kemarat et al., 2022; Pascoe et al., 2022). In futsal, where score fluctuations occur quickly, understanding gender-specific momentum dynamics is crucial for maintaining emotional stability and optimising decision-making under pressure (Fritsch et al., 2024; Vella-Fondacaro & Romano-Smith, 2023).

Despite advances in futsal performance analysis (Albalad Aiguabella et al., 2025; Amatria et al., 2021; Ribeiro et al., 2023, 2024, 2025; Rodrigues et al., 2024), the temporal sequencing of goals and its relationship with competitive outcomes remains largely unexplored. Existing studies have predominantly focused on technical-tactical indicators, physical and physiological demands, and general predictors of match success, without examining whether goals scored within short time intervals constitute a distinct and meaningful competitive phenomenon (Spyrou et al., 2020; Travassos et al., 2013). Research in women's futsal is particularly scarce, and, to the best of our knowledge, no published study has investigated goal-scoring patterns in relation to match outcomes or league ranking. Given futsal's temporal density and high scoring rate, the sport is especially prone to momentum-driven fluctuations. Whether such dynamics operate similarly in futsal remains unknown, the present study addresses this gap.

Accordingly, this exploratory study examines: (1) the frequency and temporal distribution of SICGs within each half of play; (2) their association with match points earned per game; and (3) their relationship with final league ranking in elite women's futsal. By doing so, the study aims to advance understanding of how short-interval scoring dynamics relate to competitive success, with practical implications for coaches and performance practitioners seeking to manage momentum during matches.

2. Methodology

2.1. Design

The study was observational and exploratory, including a cross-sectional analysis of the 2024–2025 Portuguese Women's Futsal League regular season.

2.2. Data source and sample

Official match reports were obtained from the Portuguese Football Federation website (https://resultados.fpf.pt/Competition/Details?competitionId=25258&seasonId=105).

Figure 1. Flowchart of match selection and data inclusion.

The Women's Futsal Placard League (2024–2025) comprised 12 teams and 147 matches, including 132 in the regular phase and 15 in the playoffs. Only regular-phase matches were analysed for three main reasons: (a) to ensure that all 12 teams contributed a balanced number of observations; (b) because playoff matches may involve extra time or penalty shootouts, which alter scoring dynamics and reduce comparability; and (c) because the regular phase captures a broader range of competitive variability across teams, which is methodologically advantageous for examining associations with match outcomes and final ranking. It is acknowledged, however, that findings may not generalise to high-pressure elimination contexts such as playoffs. Across these matches, 713 goals were recorded (mean 5.40 per match), and 264 team-match observations. The team-match observation served as the primary unit of analysis for all statistical tests. An overview of the match selection process is illustrated in Figure 1.

2.3. Procedures

For each match, the timing of goals and the final result of the match and respective number of points earned was extracted and recorded in a spreadsheet. At the conclusion of the regular phase, the final team competition ranking was also collected from the same source.

2.4. Statistical analysis

The analysis began with the examination of means, standard deviations, and Pearson bivariate correlations among all studied variables. Subsequently, a path analysis was conducted using Structural Equation Modelling (SEM) via the maximum likelihood estimator in AMOS 29.0 to test the model fit and the direct and indirect paths among all variables (Hair et al., 2019; Kline, 2016). The SEM model fit was assessed according to traditional goodness-of-fit indexes: the comparative fit index (CFI), the Tucker-Lewis index (TLI), the standardised root mean square residual (SRMR), and the root mean square error of approximation (RMSEA) with its 90% confidence interval (CI). For these indexes, the suggestions of Hair et al. (2019) and Kline (2016) were followed, which recommend CFI and TLI values greater than or equal to .90, and SRMR and RMSEA values less than or equal to .08 to indicate an acceptable model fit. Furthermore, the standardised direct and indirect effects among all studied variables were analysed. To evaluate the significance of these effects, a bootstrap resampling method (1000 samples) was performed using bias-corrected 95% confidence intervals (CI). Based on the recommendations of Hayes (2018) and Williams and MacKinnon (2008), an effect was considered statistically significant (at $p \leq .05$) if its 95% CI did not include zero. Correlation strength was interpreted using conventional thresholds: $r = 0.10–0.29$ as weak, 0.30–0.49 as moderate, 0.50–0.69 as strong, and ≥0.70 as very strong (Cohen, 1988).

Before conducting the primary data analysis, several preliminary procedures were performed. First, the required sample size was determined using the rule of thumb proposed by Hair et al. (2019), which recommends a ratio of 10 observations per estimated parameter. Given that the analysed model contained 14 parameters to be estimated, a minimum sample size of 140 observations was required. This criterion was satisfied, as the study included a total of 264 team-match observations (132 matches ×2 teams). Additionally, a preliminary analysis indicated that missing values accounted for less than 0.1% of the data. Consequently, Full Information Maximum Likelihood (FIML) estimation was employed for data analysis, as recommended by Cham et al. (2017). No violations of univariate normality were detected, as all skewness and kurtosis values fell within acceptable ranges of ± 7 and ±2, respectively (Kline, 2016). Furthermore, no univariate or multivariate outliers were identified. Finally, collinearity was assessed using tolerance and variance inflation factor (VIF) tests. Results confirmed that all values met the established thresholds (Tolerance > 0.1; VIF < 10), indicating acceptable conditions for regression analysis (Hair et al., 2019).

3. Results

3.1. Exploratory analysis

Applying the single-half restriction resulted in the exclusion of 23 potential sequence goals across 11 matches. These instances met the <3-minute temporal criterion but were excluded because they spanned the halftime boundary (e.g. a goal in the 20th minute of the first half followed by a goal in the 1st minute of the second half). SICGs were highly prevalent, occurring in 77% of matches ($n = 101$) and accounting for 394 goals, which represented 55% of all goals scored (see Table 1), with 34% of goals occurring within three minutes of the previous goal. Goal scoring was concentrated at the beginnings and endings of halves, with the first and last three minutes of each half accounting for 31% of

Table 1. Incidence and temporal characteristics of SICGs.

Measure	Value
Matches with SICG	101 (77%)
Total SICG sequences	154
SICG	394 (55%)
Goal after < 3-minutes	240 (34%)*
Goals in first 3 min of match	6%
Goals in last 3 min of 1st half	8%
Goals in first 3 min of 2nd half	6%
Goals in last 3 min of match	11%
Opening and Closing Periods (first/last 3 min of each half)	31% of all goals
Sequences occurring in the Opening and Closing Periods	50 (33% of sequences)
Goals from sequences in the Opening and Closing Periods	110 (28% of all goals)
Sequences in which both teams scored	44%
Typical sequence length	2 goals ($n = 103$)
Maximum sequence length	7 goals (one sequence)
Sequences resulting in leadership change	11
Final score equals score after the last sequence	84% of matches

Note. SICGs are sequences of ≥ 2 goals scored within 3 minutes of official match time, restricted to a single half. Percentages refer to the share of all goals in the dataset. 'Opening and Closing Periods' comprise the first and last 3 minutes of each half. *The total of 240 goals occurring within 3 minutes of a previous goal is derived from the sum of: 62 (same minute), 81 (1 min), 74 (2 min), and 23 (3 min).

all goals. These periods also produced 33% of all sequences. Most sequences contained two goals, although one reached seven goals. No consistent team-level pattern emerged, but teams scoring more goals during sequences tended to finish higher in the standings. Across all sequences, only 11 resulted in a change in match leadership, and in 84% of matches, the score at the end of the last sequence matched the final result.

3.2. Descriptive results

Descriptive statistics and bivariate correlations for all study variables are presented in Table 2. Results showed a *moderate* positive correlation between SICGs scored and final result (points won) ($r = .43$, $p < .001$, [.33, .52]). In contrast, the relationship between SICGs conceded and points won was non-significant ($r = .07$, $p > .05$, [−.05, .19]). Goals scored and conceded outside sequences showed *strong* negative correlations with points ($r = -.55$, [−.63, −.46]; $r = -.54$, [−.62, −.45], respectively), indicating strong associations with match outcomes.

Regarding final ranking, SICGs scored ($r = -.25$, [−.36, −.13]) showed a *weak* association, while SICGs conceded ($r = -.39$, [−.49, −.28]) showed a moderate association. Points demonstrated a *moderate* negative correlation with final ranking ($r = -.36$, [−.46, −.25]).

The distribution of goals across ranking positions provides additional context for these relationships. Figures 2 and 3 indicate that higher-ranked teams tended to score more goals within SICG sequences, whereas lower-ranked teams conceded a greater number of goals during these sequences. Although goals scored and conceded outside of sequences also varied across ranking positions, SICGs displayed a clearer gradient across the league table, suggesting that they are more sensitive indicators of team performance differences.

Table 2. Descriptive statistics and bivariate correlations with 95% confidence intervals and effect size classification.

	SICGs Scored	SICGs Conceded	Goals Scored Out of Sequence	Goals Conceded Out of Sequence	Final Result (Points)	Final Ranking
SICGs Scored	—	−.10 [−.22, .02] *Weak*	.08 [−.04, .20]	−.36** [−.46, −.25] *Moderate*	.43** [.33, .52] *Moderate*	−.25** [−.36, −.13] *Weak*
SICGs Conceded	−.10 [−.22, .02] *Weak*	—	.00 [−.12, .12]	−.36** [−.46, −.25] *Moderate*	.07 [−.05, .19]	−.39** [−.49, −.28] *Moderate*
Goals Scored Out of Sequence	.08 [−.04, .20]	.00 [−.12, .12]	—	−.35** [−.45, −.24] *Moderate*	−.55** [−.63, −.46] *Strong*	−.22** [−.33, −.10] *Weak*
Goals Conceded Out of Sequence	−.36** [−.46, −.25] *Moderate*	−.36** [−.46, −.25] *Moderate*	−.35** [−.45, −.24] *Moderate*	—	−.54** [−.62, −.45] *Strong*	−.29** [−.40, −.17] *Weak*
Final Result (Points)	.43** [.33, .52] *Moderate*	.07 [−.05, .19]	−.55** [−.63, −.46] *Strong*	−.54** [−.62, −.45] *Strong*	—	−.36** [−.46, −.25] *Moderate*
Final Ranking	−.25** [−.36, −.13] *Weak*	−.39** [−.49, −.28] *Moderate*	−.22** [−.33, −.10] *Weak*	−.29** [−.40, −.17] *Weak*	−.36** [−.46, −.25] *Moderate*	—
Mean	1.48	1.48	1.23	1.24	1.43	2.00
SD	1.88	1.88	1.15	1.14	1.41	.82

Note. SD = Standard Deviation. Values in brackets are 95% CIs computed via Fisher *r*-to-*z* transformation ($n = 264$). Magnitude classifications follow Cohen (1988): weak (0.10–0.29), moderate (0.30–0.49), strong (0.50–0.69), and very strong (≥0.70) .**$p < .001$.

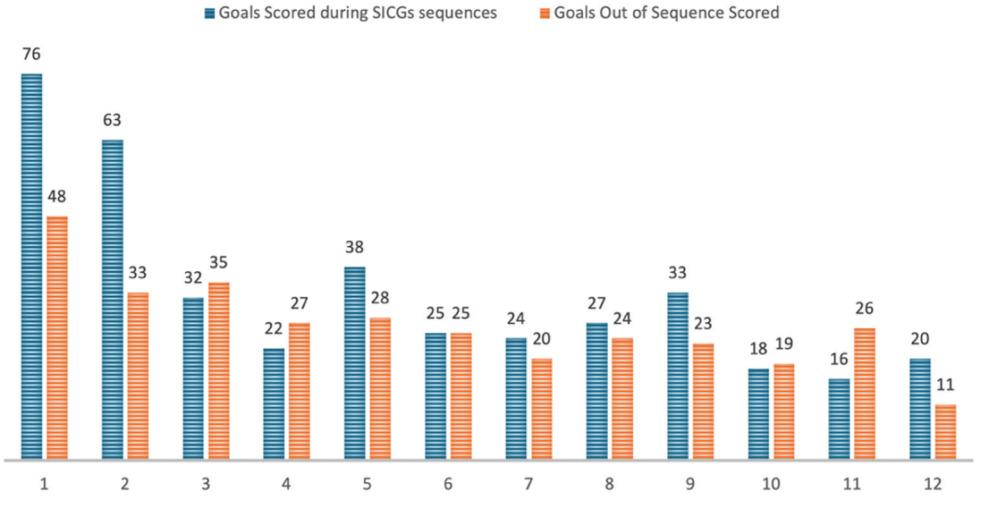

Figure 2. Goals scored by final ranking.

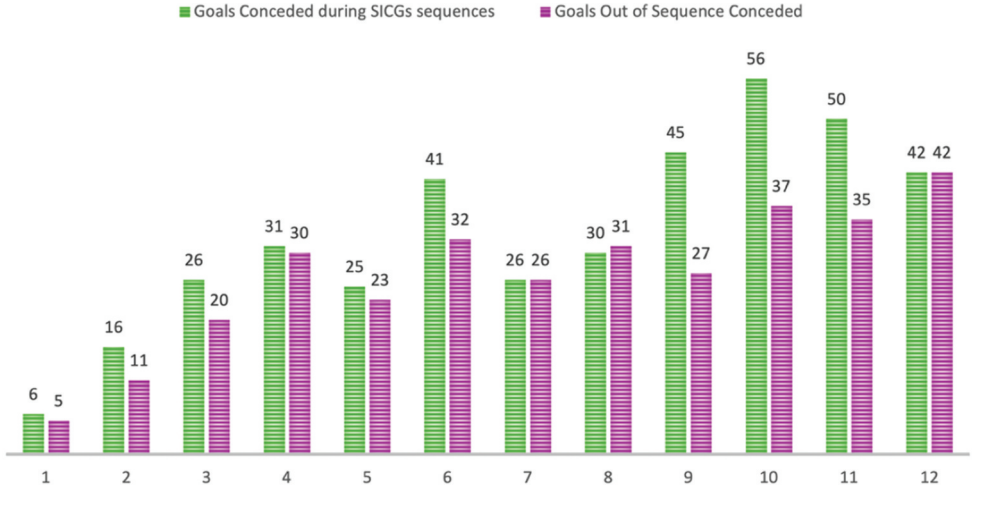

Figure 3. Goals conceded by final ranking.

3.3. Path analysis

The model, shown in Figure 4, demonstrated an adequate overall fit to the data: χ^2 /df = 4.67 (7); TLI = .927, CFI = .944, SRMR = .052, RMSEA = 058. (90% CI = .049, .078). Analysis revealed a statistically significant negative correlation between scoring and conceding goals in 3-minute sequences ($r = -.10$, $p = .047$). The direct effects demonstrate that scoring goals both in sequence ($\beta = .30$, $p = .003$) and out of

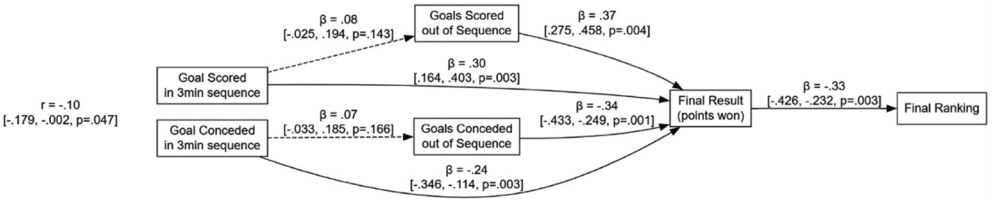

Figure 4. Path analysis model of goal sequences and match Outcomes. Note. Solid arrows represent significant direct paths$p < .05$), while the dashed arrow indicates a non-significant path.

sequence (β = .37, $p = .004$) positively predict points won, whereas conceding goals in sequence (β = −.24, $p = .003$) and out of sequence (β = −.34, $p = .001$) negatively predict points won. Subsequently, the points won exhibit a strong negative direct effect on the final ranking (β = −.33, $p = .003$). The analysis of standardised indirect effects revealed that Goals Scored in a 3-minute sequence (β = .03, 95% CI [−.009, .072], $p = .154$) and Goals Conceded in a 3-minute sequence (β = −.02, 95% CI [−.067, .011], $p = .155$) predicted the Final Result (points won) through the combined mediating effects of Goals Scored out of Sequence and Goals Conceded out of Sequence. However, these specific indirect effects were not statistically significant. In contrast, significant indirect pathways were found for the prediction of the Final Ranking. Goals Scored in a 3-minute sequence (β = −.11, 95% CI [−.165, −.059], $p = .003$) and Goals Conceded in a 3-minute sequence (β = .09, 95% CI [.044, .140], $p = .003$) were significant predictors of the Final Ranking, mediated by the Final Result (points won). Furthermore, Goals Scored out of Sequence (β = −.12, 95% CI [−.176, −.082], $p = .002$) and Goals Conceded out of Sequence (β = .11, 95% CI [.071, .169], $p = .002$) also demonstrated significant indirect effects on the Final Ranking, through their relationship with the Final Result (points won). When considering the combined direct and indirect effects, the model accounted for a substantial proportion of the variance in the outcome variables, explaining 50% of the variance in the Final Result (points won) and 39% of the variance in the Final Ranking.

4. Discussion

The present study examined the prevalence and timing of SICGs within halves, and their association with match points and final league ranking in elite women's futsal. Results generally showed a high occurrence rate of SICGs and substantial contribution to total scoring, reflecting the intense temporal pressure that occurs after each action in futsal (Spyrou et al., 2020; Travassos et al., 2013). In fact, recent futsal-specific literature emphasises that due to the spatial-temporal constraints the short-term performance fluctuations have a clear impact in game dynamics, making it especially sensitive to rapid shifts in control (Travassos et al., 2024). This broader contextual framing reinforces the idea that SICGs emerge naturally from the functional constraints of futsal rather than representing anomalous scoring events. Within this framework, SICGs can be understood as windows of instability in which small fluctuations in player coordination, emotional state, or tactical structure are more likely to escalate into rapid changes in match control. The concentration of SICGs in the opening and closing minutes of each

half suggests that these moments may reflect periods of heightened system instability in which teams are either adapting to evolving constraints or experiencing the accumulated effects of fatigue and time pressure (Moesch et al., 2014; Skala & Zemková, 2022).

To the best of our knowledge, no previous research in futsal has operationalised goal scoring within short temporal intervals as a discrete performance indicator or examined its association with competitive outcomes. However, evidence from football supports the broader relevance of scoring timing and concentration (Ibáñez et al., 2018b; Lago-Peñas et al., 2007; Liu et al., 2021). Temporal analyses further reinforce the importance of scoring concentration, showing that goals tend to cluster in the final phases of matches (Kubayi & Toriola, 2019), and that the likelihood of a second goal increases significantly when the first is scored later in the match (Pratas et al., 2018). Additional situational evidence shows that goals conceded immediately before half-time carry disproportionate competitive consequences, as the interval disrupts psychological recovery and delays tactical readjustment (Greve et al., 2020). Similar self-reinforcing scoring dynamics have been reported in basketball, where short bursts of scoring, conceptually aligned with SICGs, strongly influence subsequent offensive performance (Mihályi et al., 2025). Collectively, this cross-sport body of evidence reinforces the external validity of the present findings, suggesting that the ability to generate or prevent short, concentrated scoring sequences may represent a broader mechanism of competitive advantage applicable across invasion sports.

A central finding of this study is the asymmetric impact of scoring versus conceding SICGs. At the bivariate level, conceding SICGs was not significantly associated with match points, yet showed a moderate negative association with final ranking ($r = -.39$). However, within the path model conceding SICGs exerted a significant direct negative effect on points won, comparable in magnitude to the effect of SICGs scored. This distinction between bivariate and multivariate results underscores the importance of considering the broader scoring context when interpreting momentum-related effects. The asymmetric pattern observed at the bivariate level remains consistent with theoretical perspectives arguing that negative PM functions as a more powerful and destabilising attractor than positive PM (Den Hartigh et al., 2014; Gernigon et al., 2010). Consecutive setbacks have been associated in prior literature with disruptions in emotional regulation, collective efficacy, and tactical coordination, thereby potentially reducing a team's capacity to stabilise performance after an initial error (Briki & Markman, 2018). This vulnerability is consistent with patterns observed across invasion sports, where consecutive adverse events are lined to rapid performance deterioration. Evidence from basketball illustrates this dynamic, showing that time-outs are most effective at interrupting negative momentum when used during disadvantageous states, but may paradoxically attenuate positive momentum when requested while ahead (Qiu et al., 2025). This principle extends to futsal, where technical time-outs have been shown to be most effective when the requesting team is drawing or losing and has just conceded a goal (Lovato & Barreira, 2025) – precisely the scenario in which an emerging SICG sequence poses the greatest threat. Complementing this, review-based evidence indicates that strategic interruptions operate as broader regulatory mechanisms capable of reorganising tactical behaviour and mitigating negative momentum across team sports (Seeber, 2024). Taken together, these findings

converge on a clear practical implication: requesting a time-out immediately after conceding a goal in a tied or losing state may serve as a key tactical tool for disrupting negative scoring sequences before they consolidate into SICGs. Overall, these findings support the notion that negative performance states may escalate rapidly and become increasingly difficult to reverse once established. Within the fast, high-density environment of futsal, a second conceded goal within a short interval may represent a critical moment associated with increased performance instability. However, it should be noted that psychological mechanisms such as emotional regulation or collective efficacy were not directly measured in the present study, and therefore these interpretations remain speculative.

From a nonlinear perspective, SICGs may consolidate performance states by pushing teams into more stable patterns of coordinated action or, conversely, into states of systemic breakdown (Briki, 2017; Den Hartigh et al., 2020). Successive positive events strengthen collective efficacy and tactical assertiveness, whereas successive negative events accelerate emotional deterioration and reduce the capacity to halt ongoing negative momentum (Vilar et al., 2012). Thus, SICGs appear to represent psychologically meaningful moments that redefine the competitive landscape and are associated with changes in subsequent match behaviour.

A key finding of the present study relates to the importance of goals scored and conceded outside SICGs. At the bivariate level, goals scored and conceded outside SICGs showed the strongest correlations with match points. Within the path model, however, their direct effects on points won were comparable to those of SICGs, suggesting that both types of scoring events contribute substantially to immediate match outcomes. Crucially, the path model also revealed significant indirect pathways to final ranking: goals scored and conceded outside sequences predicted final ranking through their effect on points accumulated across the season, indicating that their influence extends beyond individual matches to long-term competitive positioning. Similarly, SICGs exerted significant indirect effects on final ranking through points won, reinforcing that their influence on competitive success operates cumulatively over the course of the season rather than through isolated match episodes. This suggests that the capacity to maintain emotional stability and consequently PM after scoring or conceding a goal may be considered a key factor in distinguishing more successful teams. PM theory posits that meaningful momentum arises from continuity rather than isolated successes (Den Hartigh et al., 2014).

Taken together, these findings offer practical implications for coaches and performance staff. Monitoring the onset of SICGs may serve as an early indicator of emerging momentum shifts, enabling timely interventions aimed at either preserving favourable match states after scoring or interrupting negative momentum after conceding. Interrupting negative momentum during the game (Qiu et al., 2025) through substitutions, time-outs or structured tactical adjustments, may help prevent the evolution of adverse states following the conceded goal. In particular, implementing predefined tactical or communicative responses immediately after conceding may help stabilise performance before a second goal occurs. At the same time, the distinctive physical, tactical, and psychological constraints of futsal (Travassos et al., 2024), reinforce the need for sport-specific training strategies that simulate game dynamics associated with such scoring scenarios.

Overall, SICGs appear to reflect transient destabilisations within the competitive system, offering a complementary perspective to traditional performance indicators by capturing how performance unfolds over time rather than solely its aggregate outcomes.

4.1. Limitations and future directions

Despite number of matches observed it is acknowledged that the observational, cross-sectional design and reliance on official match reports prevent causal conclusions; SICGs may contribute to better performance, but they may also reflect underlying team quality or tactical superiority. Although the choice of a fixed 3-minute interval is supported by previous research related to substitution patterns, alternative windows or definitions were not tested (e.g. windows of 2 or 4 minutes), leaving open the possibility that different thresholds could capture scoring bursts more effectively. Also, no specific numerical data on effective playing time were available in the official reports used. Therefore, the total elapsed time between consecutive goals within a SICG sequence may be longer and more variable than the effective time of play. This should be acknowledged as a limitation, as a 3-minute interval in clock time may correspond to substantially different effective playing durations, particularly when interruptions such as injuries, video review, or time-outs occur.

It should also be acknowledged that, although several associations identified in this study reached statistical significance, some were small in magnitude, particularly those involving SICGs Scored and Final Ranking, Goals Scored Out of Sequence and Final Ranking, and Goals Conceded Out of Sequence and Final Ranking. As statistical significance does not, by itself, imply meaningful practical effects, these correlations should be interpreted cautiously. Their limited ability to explain variance suggests that additional determinants (contextual, tactical, or psychological) contribute to performance outcomes in elite futsal. Consequently, the present findings should be viewed as part of a broader performance landscape, and future research would benefit from incorporating a more comprehensive set of variables to better account for the complexity and multidimensionality of performance variability.

Finally, the data were restricted to one season of a single national league, so some caution is required when extrapolating these results to other competitions, age groups, gender or levels of play. Future research should address these limitations by examining multiple seasons and leagues, exploring alternative temporal thresholds for defining SICGs, including total elapsed time, and integrating richer contextual, tactical, and psychophysiological data. Experimental or quasi experimental approaches – for example, evaluating the effects of time-out timing, substitution strategies, or psychological interventions during emerging scoring sequences – may further clarify how coaches can manage these high leverage phases of play. Together, such efforts would deepen understanding of how short interval scoring dynamics, PM, and tactical behaviour interact to shape performance in elite futsal and other invasion sports.

5. Conclusion

This study identifies SICGs as a central organising feature of performance in elite women's futsal. SICGs are not merely clusters of goals but appear to be dynamic catalysts associated with subsequent match trajectories, which exert disproportionate influence on points

accumulation and season-long success. More broadly, the findings highlight that effective performance management in futsal could extend beyond technical execution to include psychological regulation and temporal awareness, through the understanding of goals temporal relations.

By identifying SICGs as observable momentum episodes with clear temporal structure and competitive consequences, the present study provides a theoretically grounded foundation for examining emotional expression as a key mechanism through which momentum is enacted, perceived, and potentially regulated in real match contexts.

Author contributions

CRediT: **Rute Carvalho:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Visualization, Writing – original draft; **Diogo Monteiro:** Data curation, Formal analysis; **Júlio A. Costa:** Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review & editing; **Jaime Sampaio:** Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review & editing; **Bruno Travassos:** Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review & editing.

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Data availability statement

Will provide the data upon request.

References

Albalad Aiguabella, R., Mainer-Pardos, E., Roso-Moliner, A., Lozano, D., Vicente-Rodríguez, G., & Muniz-Pardos, B. (2025). Fitness profiles of highly trained female futsal players according to their playing positions. *International Journal of Sports Physiology and Performance*, *20*(3), 473–480. https://doi.org/10.1123/ijspp.2024-0424

Amatria, M., Álvarez, J., Ramírez, J., & Murillo, V. (2021). Identification of the patterns produced in the offensive sequences that end in a goal in European futsal. *Frontiers in Psychology*, *12*, 12. https://doi.org/10.3389/fpsyg.2021.578332

Barreira, J., Wunderlich, K., Batista, A. B., & Silva Junior, J. E. (2025). Physiological demands and player characteristics in women's futsal: A systematic review. *Frontiers in Physiology*, *16*. https://doi.org/10.3389/fphys.2025.1642594

Briki, W. (2017). Rethinking the relationship between momentum and sport performance: Toward an integrative perspective. *Psychology of Sport & Exercise*, *30*, 38–44. https://doi.org/10.1016/j.psychsport.2017.02.002

Briki, W., Den Hartigh, R. J., Markman, K. D., Micallef, J., & Gernigon, C. (2013). How psychological momentum changes in athletes during a sport competition. *Psychology of Sport & Exercise*, *14*(3), 389–396. https://doi.org/10.1016/j.psychsport.2012.11.009

Briki, W., & Markman, K. D. (2018). Psychological momentum: The phenomenology of goal pursuit. *Social and Personality Psychology Compass*, *12*(9), e12412. https://doi.org/10.1111/spc3.12412

Cham, H., Reshetnyak, E., Rosenfeld, B., & Breitbart, W. (2017). Full information maximum likelihood estimation for latent variable interactions with incomplete indicators. *Multivariate Behavioral Research*, *52*(1), 12–30. https://doi.org/10.1080/00273171.2016.1245600

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Edition ed.). Lawrence Erlbaum.

Den Hartigh, R. J., Gernigon, C., Yperen, N. W. V., Marin, L., & Geert, P. L. C. V. (2014). How psychological and behavioral team states change during positive and negative momentum. *PLOS ONE*, *9*(5), e97887. https://doi.org/10.1371/journal.pone.0097887

Den Hartigh, R. J., Van Yperen, N. W., & Gernigon, C. (2020). Psychological momentum in football: The impact of a last-minute equalizer in a knock-out match. *Science and Medicine in Football*, *4*(3), 178–181. https://doi.org/10.1080/24733938.2019.1665704

Fernández, M. M., Brito, C. J., Miarka, B., & Díaz de Durana, A. L. (2020). Anxiety and emotional intelligence: Comparisons between combat sports, gender and levels using the trait meta-mood scale and the inventory of situations and anxiety response. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.00130

FIFA. (2021). *FIFA futsal analysis framework*. FIFA Training Centre. https://www.fifatrainingcentre.com/en/game/tournaments/fifa-futsal-world-cup/fifa-futsal-analysis-framework.php

Fritsch, J., Leis, O., Wohlfarth, D., Triller, N., & Jekauc, D. (2024). The role of emotional convergence in sport: A scoping review. *Sport, Exercise, and Performance Psychology*, *13*(1), 39–58. https://doi.org/10.1037/spy0000330

Gautier, H., Cavailles, O., & Gernigon, C. (2024). Patterns of collective organization associated with positive and negative momentum experiences in football: An expert coach description-based analysis. *Journal of Human Sport and Exercise*, *19*(2), 667–678. https://doi.org/10.55860/mtfbn157

Gernigon, C., Briki, W., & Eykens, K. (2010). The dynamics of psychological momentum in sport: The role of ongoing history of performance patterns. *Journal of Sport & Exercise Psychology*, *32*(3), 377–400. https://doi.org/10.1123/jsep.32.3.377

Gollan, S., Bellenger, C., & Norton, K. (2020). Contextual factors impact styles of play in the English Premier League. *Journal of Sports Science & Medicine*, *19*(1), 78–83.

Gómez, M. A., Méndez, C., Indaburu, A., & Travassos, B. (2019). Goal effectiveness after players' dismissals in professional futsal teams. *Journal of Sports Sciences*, *37*(8), 857–863. https://doi.org/10.1080/02640414.2018.1531498

Greve, H. R., Nesbø, J., Rudi, N., & Salikhov, M. (2020). Are goals scored just before halftime worth more? An old soccer wisdom statistically tested. *PLOS ONE*, *15*(10), e0240438. https://doi.org/10.1371/journal.pone.0240438

Hair, J., Babin, B., Anderson, R., & Black, W. (2019). *Multivariate data analysis* (8th ed.). Pearson Education.

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). The Guilford Press.

Ibáñez, S. J., Pérez-Goye, J. A., Courel-Ibáñez, J., & García-Rubio, J. (2018a). The impact of scoring first on match outcome in women's professional football. *International Journal of Performance Analysis in Sport*, *18*(2), 318–326. https://doi.org/10.1080//24748668.2018.1475197

Ibáñez, S. J., Pérez-Goye, J. A., Courel-Ibáñez, J., & García-Rubio, J. (2018b). The impact of scoring first on match outcome in women's professional football. *International Journal of Performance Analysis in Sport*, *18*(2), 318–326. https://doi.org/10.1080/24748668.2018.1475197

Kelemen, B., Tóth, R., Benczenleitner, O., & Tóth, L. (2024). Mental preparation in runners: Gender differences, competition levels, and psychological training effects on performance. *Frontiers in Sports and Active Living*, *6*, 1456504. https://doi.org/10.3389/fspor.2024.1456504

Kemarat, S., Theanthong, A., Yeemin, W., & Suwankan, S. (2022). Personality characteristics and competitive anxiety in individual and team athletes. *PLOS ONE*, *17*(1), e0262486. https://doi.org/10.1371/journal.pone.0262486

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). The Guilford Press.

Kubayi, A., & Toriola, A. (2019). Trends of goal scoring patterns in soccer: A retrospective analysis of five successive FIFA World Cup tournaments. *Journal of Human Kinetics*, *69*(1), 231–238. https://doi.org/10.2478/hukin-2019-0015

Lago-Peñas, C., Acero, R., & Vargas, F. (2007). El rendimiento en el fútbol. Una modelización de las variables determinantes para el F.C. Barcelona. *Apunts. Educación Física y Deportes*, *90*, 51–58. https://raco.cat/index.php/ApuntsEFD/article/view/300388

Lago-Peñas, C., Gómez-Ruano, M., Megías-Navarro, D., & Pollard, R. (2016). Home advantage in football: Examining the effect of scoring first on match outcome in the five major European leagues. *International Journal of Performance Analysis in Sport*, *16*(2), 411–421. https://doi.org/10.1080/24748668.2016.11868897

Liu, T., García de Alcaraz, A., Wang, H., Hu, P., & Chen, Q. (2021). Impact of scoring first on match outcome in the Chinese Football Super League. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.662708

Lovato, V., & Barreira, J. (2025). Analysis of team timeouts in high-performance futsal matches: When to call and what to expect? *International Journal of Performance Analysis in Sport*, *26*(2), 1–12. https://doi.org/10.1080/24748668.2025.2499347

Méndez-Domínguez, C., Gómez-Ruano, M. A., Rúiz-Pérez, L. M., & Travassos, B. (2019). Goals scored and received in 5vs4 GK game strategy are constrained by critical moment and situational variables in elite futsal. *Journal of Sports Sciences*, *37*(21), 2443–2451. https://doi.org/10.1080/02640414.2019.1640567

Mihályi, B., Biczók, G., & Toka, L. (2025). All about momentum: Investigating high-pressure situations in the NBA through scoring probability. *International Journal of Sports Science and Coaching*, *20*(4), 1584–1597. https://doi.org/10.1177/17479541251333956

Moesch, K., Bäckström, M., Granér, S., & Apitzsch, E. (2014). Hard fact or illusion? An investigation on momentum in female elite handball from a team perspective. *International Journal of Sport and Exercise Psychology*, *12*(2), 106–120. https://doi.org/10.1080/1612197X.2013.804287

Moraes, G. A. D., Soares, V. N., & Chiminazzo, J. G. C. (2022). Temporal analysis of goals scored in futsal: A comparison of two models. *Human Movement*, *23*(4), 63–69. https://doi.org/10.5114/hm.2022.108319

Pascoe, M., Pankowiak, A., Woessner, M., Brockett, C. L., Hanlon, C., Spaaij, R., Robertson, S., McLachlan, F., & Parker, A. (2022). Gender-specific psychosocial stressors influencing mental health among women elite and semielite athletes: A narrative review. *British Journal of Sports Medicine*, *56*(23), 1381–1387. https://doi.org/10.1136/bjsports-2022-105540

Pascual, A., Font, R., Pascual, X., & Lago-Peñas, C. (2024). Evolution of match performance parameters in elite men's handball 2012-2022. *International Journal of Sports Science and Coaching*, *19*(1), 301–305. https://doi.org/10.1177/17479541221142418

Pratas, J. M., Volossovitch, A., & Carita, A. I. (2018). Analysis of scoring sequences in matches of the Portuguese Premier League. *Journal of Human Kinetics*, *64*(1), 255–263. https://doi.org/10.1515/hukin-2017-0199

Qiu, M., Zhang, K., Chao, Y., & Zhang, M. (2025). Interrupt or reinforce? The impact of timeout on momentum in basketball game. *Frontiers in Psychology*, *16*. https://doi.org/10.3389/fpsyg.2025.1673186

Qiu, M., Zhang, S., Yi, Q., Zhou, C., & Zhang, M. (2024). The influence of "momentum" on the game outcome while controlling for game types in basketball. *Frontiers in Psychology*, *15*. https://doi.org/10.3389/fpsyg.2024.1412840

Ribeiro, J. N., Ferraz, A., Gonçalves, B., Serrano, C., Coutinho, D., Ballester, R., & Travassos, B. (2025). Training exercises, match demands, and variability in elite futsal. *Frontiers in Sports and Active Living*, *7*, 1553046. https://doi.org/10.3389/fspor.2025.1553046

Ribeiro, J. N., Gonçalves, B., Coutinho, D., Brito, J., Sampaio, J., & Travassos, B. (2020). Activity profile and physical performance of match play in elite futsal players. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.01709

Ribeiro, J. N., Yousefian, F., Illa, J., Couceiro, M., Sampaio, J., & Travassos, B. (2023). The effects of players' rotations on high-intensity activities in professional futsal players. *Journal of Human Kinetics*. https://doi.org/10.5114/jhk/169522

Ribeiro, J. N., Yousefian, F., Illa, J., Ferraz, A., Nakamura, F., & Travassos, B. (2024). Profiling the acceleration and deceleration components in elite futsal players. *International Journal of Performance Analysis in Sport*, *24*(6), 641–653. https://doi.org/10.1080/24748668.2024.2352678

Rodrigues, M., Leite, N., Ribeiro, J. N., Sampaio, J., Araújo, D., & Travassos, B. (2024). Understanding the visual search strategies of expert and novice coaches in futsal set pieces. *Frontiers in Psychology*, *15*. https://doi.org/10.3389/fpsyg.2024.1390536

Sánchez-Murillo, P., Antúnez, A., Rojas-Valverde, D., & Ibáñez, S. J. (2021). On-match impact and outcomes of scoring first in professional European female football. *International Journal of Environmental Research and Public Health*, *18*(22), 12009. https://doi.org/10.3390/ijerph182212009

Seeber, M. J. G. (2024). Momentum-stopping: Effects on performance. *Sports Economics Review*, *7*, 100038. https://doi.org/10.1016/j.serev.2024.100038

Skala, F., & Zemková, E. (2022). Effects of acute fatigue on cognitive performance in seam sport players: Does it change the way they perform? A scoping review. *Applied Sciences*, *12*(3), 1736. https://doi.org/10.3390/app12031736

Spyrou, K., Freitas, T. T., Marín-Cascales, E., & Alcaraz, P. E. (2020). Physical and physiological match-play demands and player characteristics in futsal: A systematic review. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.569897

Stafylidis, A., Chatzinikolaou, K., Mandroukas, A., Stafylidis, C., Michailidis, Y., & Metaxas, T. I. (2025). First to score, first to win? Comparing match outcomes and developing a predictive model of success using performance metrics at the FIFA Club World Cup 2025. *Applied Sciences*, *15*(15), 8471. https://doi.org/10.3390/app15158471

Taylor, J., & Demick, A. (1994). A multidimensional model of momentum in sports. *The Journal of Applied Sport Psychology*, *6*(1), 51–70. https://doi.org/10.1080/10413209408406465

Travassos, B., Davids, K., Araújo, D., & Esteves, T. P. (2013). Performance analysis in team sports: Advances from an ecological dynamics approach. *International Journal of Performance Analysis in Sport*, *13*(1), 83–95. https://doi.org/10.1080/24748668.2013.11868633

Travassos, B., Ribeiro, J. N., Freitas, T. T., Alcaraz, P. E., & Spyrou, K. (2024). Editorial: Performance enhancement and injury mitigation in futsal. *Frontiers in Sports and Active Living*, *6*. https://doi.org/10.3389/fspor.2024.1446031

Vella-Fondacaro, D., & Romano-Smith, S. (2023). The impact of a psychological skills training and mindfulness-based intervention on the mental toughness, competitive anxiety, and coping skills of futsal players: A longitudinal convergent mixed-methods design. *Sports*, *11*(9), 162. https://doi.org/10.3390/sports11090162

Vilar, L., Araújo, D., Davids, K., & Travassos, B. (2012). Constraints on competitive performance of attacker-defender dyads in team sports. *Journal of Sports Sciences*, *30*(5), 459–469. https://doi.org/10.1080/02640414.2011.627942

Weimer, L., Steinert-Threlkeld, Z. C., & Coltin, K. (2023). A causal approach for detecting team-level momentum in NBA games. *Journal of Sports Analytics*, *9*(2), 117–132. https://doi.org/10.3233/JSA-220592

Wergin, V. V., Wolf, S. A., Schwender, J. T., & Mallett, C. J. (2025). Experienced emotions, emotion regulation strategies, and regulation depletion in collective team collapse and performance recovery situations. *The Journal of Applied Sport Psychology*, *37*(3), 326–347. https://doi.org/10.1080/10413200.2024.2413996

Williams, J., & MacKinnon, D. P. (2008). Resampling and distribution of the product methods for testing indirect effects in complex models. *Structural Equation Modeling: A Multidisciplinary Journal*, *15*(1), 23–51. https://doi.org/10.1080/10705510701758166