

HOW GROUP MOTION DYNAMICS CREATE INSTABILITIES AND GOAL-SCORING OPPORTUNITIES IN ASSOCIATION FOOTBALL

Duarte, R. 1), Araújo, D. 1), Davids, K. 2), Vilar, L. 1)3) & Travassos, B. 1)4)

- 1) Faculty of Human Kinetics, UTL, Portugal
- 2) School of Human Movement Studies, QUT, Australia
- 3) Faculty of Physical Education and Sports, ULHT, Portugal
- 4) Department of Sports Sciences, UBI, Portugal

Keywords: small-groups, perturbations, shooting opportunities

Introduction

In a non-linear dynamical systems explanation, abrupt changes in a team's motion dynamics create instabilities/perturbations, leading to scoring opportunities. In this study we investigated whether small-group motion dynamics of players may explain how system instabilities arise, leading to goal-scoring opportunities.

Methods

Eight football players (age=11.7±0.4 years; 4 yrs experience) performed in a 3vs3 game for 6 mins in a field (20x20m), with two scoring areas (14.5x20m). Goals could only be scored after a penetrating pass was made into the scoring area. From 21 shooting opportunities, we selected all plays (n=10) ending in shots at goal, with no changes in ball possession between teams. Player displacement trajectories (25 Hz) were established (see procedures in Duarte et al., 2010) and a single centroid value (i.e., the team's centre) for all six outfield players was calculated. Distance of the centroid to the scoring area was investigated as a potential order parameter. Potential control parameters candidates were the distance between centroids and the relative stretch index. A Friedman's test statistically compared distributions of control parameters before and after the moment of perturbation.

Results & Discussion

The candidate order parameter revealed two stable states of play, and an abrupt change between them, indicating non-linear behaviours of the teams. Changes were influenced by consistent low values of inter-centroid distance, and high stable and increasing positive values of relative stretch index. Friedman's test revealed significant differences for both variables before and after perturbations (P<.001).

Conclusion

Goal-scoring opportunities arising in 3vs3 sub-phases of football may be captured by abrupt changes in team centroid distances to a scoring area. Small distances between teams and high relative dispersion of the players seemed to promote instabilities that led the small-group dynamics to move towards scoring areas.

References

1. Duarte, R. et al. (2010). *Med Lith*, 46(6): 408-414.