The use of social network analysis for the evaluation of team ball sports performance: a review

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Introduction

In recent years, Social Network Analysis (SNA) has been used to understand many physical, biological and social systems (Strogatz 2001). These systems can be represented by networks (Newman, 2003). They are defined a set of nodes (or actors) connected by edges (interactions) which are mathematically described by indices (Scott, 2011). These methods can also be extended to assess performance in team sports. A sports team, in fact, can be defined as a network consisting of vertices (players) and links (interaction between players, that is ball passes) (Davids, 2005). This study aimed to describe the use of SNA in the scientific literature with regards to the evaluation of team ball sports.

Methods

We performed a literature search using Pubmed, ScienceDirect and accessing to sectorial journals. We used the following search terms: network, network metrics, social network analysis, social network, network analysis in sport, team sport analysis, team performance, match analysis network structure, centralization, centrality, collective behaviour, soccer, basketball, rugby, water polo and handball.

Results

We found a dozen of articles which used SNA to evaluate the performance in sports like soccer, basketball and water polo from 2011 to 2015. These studies were published on sport and social science journals. SNA describes which and how many interactions between teammates occur during a match, defining indices such as: total interactions, density (the proportion of observed interactions among the potentially observable ones), outdegree centrality (number of interactions that the node directs to others), indegree centrality (number of interactions directed to a node) and centralization (distribution of the interactions in a network). These measures allow to identify the interactions between players associated with team performance. It was reported that increased interactions, such as passes between players, lead to success of a team. Furthermore, several studies found that high values of degree centrality identify the role of the most prominent player. Another study showed that a network with a homogenous distribution of links (passes) is associated with a greater probability of success of the team. Some studies have conducted the analysis taking into account the interactions between players in reference to the different areas of the playing field. In this regard, a study introduce a zone passing network in order to analyse passes within the zones of the playing field, moreover, it was assessed the zone of the player with higher centrality for all minutes of the match.

Conclusions

The review found more results in sports such as basketball, football, water polo. SNA can assess performance in team sports, analysing how interaction between players affect the outcome of a game. The possible applications of these investigations provide relevant information to optimize training sessions and improve tactics.

References

Davids, K., Araújo, D. & Shuttleworth, R. (2005). "Applications of dynamical systems theory to football." *Science and football V:537-550.*

Newman, M. (2003). "The Structure and Function of Complex Networks." SIAM Review no. 45 (2):167-256.

Scott, J. (2011). "Social network analysis: developments, advances, and prospects." *Social Network Analysis and Mining no. 1 (1):21-26.*

Strogatz, S. H. 2001. "Exploring complex networks." *Nature no. 410 (6825):268-76.*