Sports Medicine

Sports Teams as Superorganisms
Implications of Sociobiological Models of Behaviour for Research and Practice in Team Sports Performance Analysis

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Supplemental Digital Content

This Supplemental Digital Content contains the information referred to in the full version of this article, which can be found at http://adisonline.com/sportsmedicine

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Supplemental material

Table 1 – Exemplar data on compound positional variables from two competing teams during the first 15-mins of an association football match\textsuperscript{[39]} calculated with a specifically conceived software application – TeamSense.\textsuperscript{[38]} Tutorial examples of computations: left panel shows a photogram of each variable for a single time frame extracted from the 2D video animations; right panel displays time plots of each variable.

<table>
<thead>
<tr>
<th>Variables illustration</th>
<th>Time-series plots</th>
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<tr>
<td><strong>Surface area</strong></td>
<td><img src="image" alt="Diagram" /></td>
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**Computation details:** calculated as the area of a polygon drawn by linking the externally positioned players in each team’s formation. These values were computed using Matlab functions (convhull) employing the rule of a convex polygonal area (see left panel).

**Meaning:** This compound variable expresses the relation between the shapes and the occupied spaces of the two teams, and how they change over time. Overlapped areas can also be obtained.
### Team centre

**Computation details:** calculated as the mean position of all team players over time in each axis of motion. Distance between team centres can also be measured (right panel).

**Meaning:** Based on the mean point or “centre of mass” of a team, this variable captures its global oscillatory movements such as movements towards or away from the goals or the sidelines. Distance between the team centres can also be used as an indicator of the closeness of teams.

### Stretch index

**Computation details:** computed as the average of the vectorial distance of each player to the corresponding team’s centre \(^8\) (it can be alternatively calculated decomposing positions in x- and y-axis of motion \(^9\)).

**Meaning:** This compound variable captures the synergistic counter-phase relation of contraction and expansion behaviours of teams as a function of exchanges in ball possession \(^9\). First derivative of this measure may also evidence the speed at which teams stretch or shorten their dispersion on the field.
### Team length

**Computation details:** calculated as the difference between the maximum and minimum positions of players in the field’s longitudinal dimension in each time frame.

**Meaning:** This variable captures the compactness of the whole team and its variation as a function of changes in performance constraints. It can be used in the monitoring of specific reference values for team length, or to evaluate depth differences between teams.

### Team width

**Computation details:** calculated as the difference between the maximum and minimum positions of players in the field’s lateral dimension in each time frame.

**Meaning:** When in defence, the width of a team may reveal the potential for the opponents to find inner or outer spaces to penetrate. When attacking, it may indicate the lateral spread of the team.
References