COLLECTIVE VARIABLES FOR ANALYSING PERFORMANCE IN TEAM SPORTS

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Summary

In team sports, decision making requires, on the part of each player and the coach, an as-much-as-possible rational knowledge of elements of the sport and of events that occur during game play. The internal logic of team sports is presented as a basis for appreciating different analysis approaches. Two main categories of analyses are considered: static and dynamic, the second one being sub-divided into dynamic representational pictures, statistics of game play, and numerical performance indicators. Given the collective connotation of performance analysis considered in the chapter, configurations of play are seen as a central element to be used in the observation of game play and subsequent collective decision making.

Introduction

Analysing performance in team sports

In team sports, each player and the coach need as much information as possible about the unfolding of game play in order to make appropriate decisions. Therefore, one task is to collect objective data relating to players and their behaviours. It thus becomes logical to look for observation and assessment tools that make it possible to reflect on one’s own team or on the opposing team. Planning performance assessment in team sport requires careful thinking about the parameters to be observed, the observational methods that ought to be used to collect the data, the way these data will be analysed, and finally the way the assessment results will be presented and used.

It is the coaches’ and/or the players’ duty to deepen their own knowledge acquired through experience. Indeed, this experienced knowledge is never enough for one to possess all fundamentals of the sport. They must therefore improve this knowledge by taking time to systematically observe matches, game play, and the players. The pursued objective is to analyse elements that best define the ‘rapport de forces’ in play and to draw significant elements that may be used
to develop models that can be, at the same time, simple and as reliable as possible. In previous publications, we translated this concept as ‘rapport of strength’ or ‘force ratio’. After long discussions with Anglophone colleagues, however, it seems better to keep the French term and explain what it means. For a definition, see the section on ‘rapport de forces’ of this chapter. Observational data make it possible to assess more precisely, for a given player and/or the team, game-play actions in order to:

- better understand the roles and level of integration of various players within the team;
- develop a typology or classification of individual and collective behaviours by making comparisons over several competition situations;
- obtain measurements that will make comparisons possible between players or for the same player over time;
- determine directions of the evolution of game play and that of players over time;
- elaborate play models, taking better account of observed performance/learning levels.

**Intent and learning context of performance analysis**

In team sports, performance may refer to the end result or product of a play action or of a whole match. It may also refer to the process of play action. For a discussion on the facets of performance assessment in team sports, one may consult Gréhaigne *et al.* (1997) or Nadeau *et al.* (2008b). In the present chapter, the term performance will refer to what a player does or what a group of players do during game play when defending their territory and/or attacking the adverse territory.

Discussing the nature of team sports and the consequences for performance assessment, Gréhaigne *et al.* (1997: 501) recognized defensive and offensive aspects to both attack and defence. Each of these aspects of game play may in turn be broken down into myriads of particular variables depending on the information sought by observers or by the players themselves.

Performance assessment may be conducted by a scout looking for interesting prospects, or by a coach attempting to improve the performance of the team or that of particular players. While a scout’s assessment will likely be summative, leading to an acceptance or rejection decision, assessments conducted under the supervision of a coach may serve either a formative or a summative purpose. Also, the coaching approach may be coach-centred or player-centred. In a coach-centred approach, such as direct coaching, the purpose of the assessment will be to verify whether the player performs appropriately (that is the way he/she was told to do). In a player-centred approach, such as constructivism, the purpose of the assessment will be to provide the player(s) with a picture of what was accomplished and it will be up to the player(s) to reflect on that information under the guidance of the coach.

Finally, particularly but not exclusively in a constructivist approach, performance data collected during a match may involve three categories of observers: (a) the coach (or some neutral external observer), (b) teammates not involved in game play, and (c) players directly involved in the match (Gréhaigne *et al.*, 2005: 110).

In this chapter, we will focus on the following aspects of performance analysis in team sports:

- the discussion will be limited to invasion team sports (Gréhaigne *et al.*, 2005: 5);
- collective variables will be referred to in relation to the process aspect of performance;
- the discussion will apply to coaching, although many analysis tools could be used in a teaching environment as well.
Collective variables for analysing team sports

Primary rules and logic of invasion team sports

Collective sports refer to sports that involve opposite teams where players interact directly and simultaneously with one another in view of achieving an objective. This objective calls for members of a team to facilitate the movements of a ball, or of some similar element, according to a given set of rules, in order to score points. The rules of a game are established in order to provide a structure that manages game play and guide practitioners’ actions. These rules, called primary or fundamental, provide the foundations for the organization of game play. These constraints limit and regulate players’ actions; they put restrictions on game play, without prescribing, allowing players to try out a variety of answers to problems encountered during game play. For instance, in soccer, the rule states that one cannot touch the ball with one’s hands (except for the goalkeeper and for a player in charge of the throw-in), rather than stating that one must play the ball with one’s feet. These primary rules concern: (a) scoring, in relation to specificities of the targets, (b) attackers’ and defenders’ rights or constraints with regards to their movement on the field, and (c) the degree of freedom of actions on the ball which favours, or not, the continuity of movements.

In addition, agreements or secondary rules make it possible to normalize or facilitate the evolution of game play. They differ from constraints in the fact that they may be modified without jeopardizing the essence of the game. Both primary and secondary rules impose play organization rules on the functioning of the confrontation system.

The ‘rapport de forces’

In invasion games, the logic of the play has its source in the opposition relationship that generates, during each sequence of play, a dynamics of moving from one target to the other. We call this opposition relationship the rapport de forces. It refers to the ‘antagonist links existing between several players or groups of players confronted by virtue of certain rules of a game that determine a pattern of interaction’ (Gréhaigne et al., 1997: 516). At all times, the possession of the ball can change and, then, the direction of play switches. This fact imposes on both teams an organization where location, movement, and replacement (general movement generated by the opposition of two teams on the pitch, between two targets) are responses to this reversibility of play. Each player must consider the general movement, keeping in mind a possible reversal of game play. Indeed, for each player, any defensive movement stays organically linked to the counter-attack play that it potentially contains; inversely, any offensive movement stays organically linked to the defensive falling back that may eventually prove to be necessary. We will call such an organization a double-impact organization, where the basic challenge for each player is to cooperate with partners in order to oppose more effectively the opponents while either attacking (keeping one’s defence in mind) or defending (getting ready to attack).

Organizational levels of play

The potential for reversibility of the general movement at any instant, in both dimensions (depth and width), is a major characteristic of the internal logic of team sports. One must bear this fact in mind. Team organization in response to the reversibility of play implies, for each team, a collective frame of reference of which all players must remain aware. At the same time, everyone must be capable of initiatives that one’s teammates can decode in order to react appropriately or, better still, anticipate. This double dimension of a collective frame of reference within a team strongly linked to individual initiative is fundamental in team sports; this fact is often overlooked.
The rapport de forces may be associated with the ‘match organizational level’ (Gréhaigne and Godbout, 1995: 493); it is then interpreted as two teams facing one another. But in fact, during the game, the team opposition relationship breaks down into smaller opposition relationships, as shown in Figure 9.1.

The opposition setting that momentarily involves some of the players generates a particular shape of play representing the ‘partial forefront organizational level’ (see Figure 9.1). At any moment of the match, this partial forefront contains a third-level opposition unit that links the ball holder and his/her direct opponent. We call this the ‘primary organizational level’ (Gréhaigne, 1992). Figure 9.1 illustrates these last two organizational levels, whereas the drawing of the whole field would represent the ‘match organizational level’. Thus the rapport de forces may be looked at as involving two teams, two sub-groups of players, or eventually two specific players. The continuity of opposition influences the opponents’ moves not only at the one-to-one level, but at the partial forefront level and at the match level as well. These simultaneous, interlocked opposition settings constitute the context of play (Deleplace, 1979). They evolve in reciprocal relationship in response to the evolution of any part of the system.

At any specific moment, according to the evolution of play, this reciprocal relationship offers, for example, a specific problem to attackers but, at the same time, contains pertinent solutions for action:

- to continue the action at the one-to-one level;
- to pursue the attack with the help of partners in the partial forefront; or
- to change the general movement by transforming its shape, its orientation, or even both.

Thus, besides the potential for reversibility mentioned earlier, the continual reciprocal relationship between the three organizational levels constitutes the second major characteristic of the logic of team sports (Deleplace, 1966).

As one can see, the general dynamics of team sports can be expressed as a ‘rapport de forces’ where, in a sense, two networks of forces are confronted one to the other. This fact implies the consideration of a second frame of analysis, that of the ‘team organizational level’ (Gréhaigne and Godbout, 1995: 494).

![Diagram](image-url)
The team competency network

At the ‘team organizational level’, the numerous interrelations between players, within the team, make up what one might call a ‘competency network’ (Gréhaigne, 1992). Although based on each player’s recognized strengths and weaknesses with reference to the practice of the sport, and also on the group’s dynamism, the competency network is more a dynamical concept than a static one. It refers to the player’s game-related conducts in general that one can identify in connection with the rapport de forces, or with each player’s status, within the team. Such conducts vary depending upon players, moments, external factors, and the particular team sport involved. During play, in connection with conducts, the notion of ‘role’ is essential for analysing the competency network. In this case, ‘role’ refers to conducts and that conveys (a) what a player thinks he or she ought to do, given the way he or she experiences the rapport de forces or competency network within the team, and (b) how the player manages his or her resources in this system of constraints.

The function within the team, chosen by the player, or assigned by the coach or by the team, is another indicator of the player’s position in the team’s dynamism. At the interface of the player’s logic, the team’s logic, and the internal logic of the sport involved, the player’s function in this competency network often is a reliable indicator of the reciprocal relationships between a player and the team. Contrary to what one might think at times, cooperation in team sports, as in other aspects of life, goes far beyond simple goodwill and an easy-going way of looking at sport. For the best possible use of the competency network, there is a need for both efforts and restraints on the part of all players.

Match analysis approaches

Due to the complexity of the environment, temporal and spatial characteristics of players’ locations and movements, as well as those of the ball, game play must be analysed in a very systematic way if one wishes to obtain dependable, reliable, and useful information. This kind of analysis necessarily takes into account lasting elements, such as the playing surface, but also other variables which are controlled by players, such as the ball, play organization rules, tactics, etc. (Gréhaigne and Godbout, 1995).

Problems with analysis of performance in team sports are those related to the assessment of any complex system: that is (a) the intervening elements are not only numerous but also interacting, (b) the rapport de forces plays an important role and it may vary in different opposition situations or even during one given situation, and (c) the members of a given team are interdependent.

Performance analyses reported in the literature reflect two main measurement strategies or observational points of view. On the one hand, the observation may be based on a frozen picture of game play at any given instant, drawing one’s attention to the players’ location on the field and the location of the ball, with respect to various phases of game play. Such an approach may be considered as static. On the other hand, the observation may focus on the evolution of game play with respect to players’ location, direction of movements, and speed of movement, given momentary configurations of play. Such an approach may be classified as dynamic.

For the sake of illustration in this chapter, the approaches presented will be used in reference to soccer but they could as well be used for European handball, basketball, field hockey, and other invasion team sports.
Static approach to observation of game play

The simplest observational approach that can be used consists of considering, on the one hand, the defensive zone and, on the other hand, the offensive zone. If one divides each zone, one obtains four observation areas: (a) defensive; (b) pre-defensive; (c) pre-offensive; and (d) offensive, as shown in Figure 9.2. One could also consider the central corridor of the pitch and two bordering corridors on each side. This would make it possible to note play actions conducted in the ‘attacked goal/defended goal’ axis (central corridor [c3 in Figure 9.2]) and others carried in the median corridors (c2 and c4) or in the peripheral corridors (c1 and c5). A third type of grid might consider the direct play-space with a vertical target, as in soccer or handball, for instance. The direct play-space is then defined as the surface area of the pitch from where the ball can be shot directly at the target. Due to the verticality of the target, the apparent target area varies according to the shooting angle. In Figure 9.2, the direct play-space is delimited by four dotted lines.

An important feature of these tools is that they give some idea on the players’ placement on the pitch, which illustrates different configurations of play. This type of information can be very useful to coaches and players in the evolution of a team’s play and performance. For their part, the notions of ‘centre of gravity’ and ‘effective place on the pitch’ illustrate the way a coach can use static observational data of game play. For examples, readers may consult Bourbousson et al. (2010), Gréhaigne (1992), Gréhaigne et al. (1996) and Winkler (1988).

If one considers a given configuration of play as the one illustrated in Figure 9.2, one can summarize it using the notion of effective play-space (Gréhaigne, 1989; Gréhaigne et al., 1999a; Mérand, 1977). The effective play-space (EP-S) may be defined as the polygonal area that one obtains by drawing a line that links all involved players located at the periphery of the play at a given instant (see dotted black line in Figure 9.2). The ball can be in different positions in relation to the effective play-space: located in a central position, in the middle of the effective play-space, at the rear of the effective play-space, in a flank position either on the left or on the right periphery of the pitch, ahead or at the rear of the effective play-space. In the example illustrated in Figure 9.2, the ball is located at the rear of the EP-S, in the central corridor (c3), in the pre-defensive area (b).

Figure 9.2 Various areas of a static observational grid and effective play-space
Considering the respective positioning of attackers and defenders, one may also determine an offensive effective play-space (OEP-S) and a defensive effective play-space (DEP-S). One obtains, then, two more or less interpenetrated polygonal surfaces (for an illustration, see Gréhaigne et al., 2010b, Figures 3 and 4). The relationship between these two opposing areas and their respective evolutions in time may enlighten us on changes in the balance of the opposition relationship during matches.

Several studies have been conducted using the EP-S construct: Duprat (2005) on the topological aspect of the recovery of the ball in the defence area; Gréhaigne (2007) on the study of configurations of play; Meunier (2005) on the analysis of prototypic configurations of play in basketball; Zerai (2011) on the learning condition with verbalization on the action project and on the pertinence of choices in configurations of play during game play in handball.

For all their worth, static observational data remain particularly interesting inasmuch as they may be considered in a transitional mode, from one instant to the other. In so doing, they transform into dynamic observational data, considering not only the space aspect of performance but its time aspect as well.

**Dynamic approach to the observation of game play**

Contrary to the static analysis of performance in team sports, dynamic observational data provide information relative to the unfolding of game play, taking into account the passage of time. Collected data may take the form of (a) representational pictures, concerned with the evolution of the configurations of play or defined parts of configuration of play, or (b) numerical data presented as statistics of game play or as numerical indicators.

**Dynamic representational pictures**

During a match or over several matches, the different configurations of play can be analysed with respect to ‘defence in block’ plays or ‘defence in pursuit’ plays. We shall consider that the defence is in ‘block’ when it is positioned between the ball holder, the attackers, and its own goal. We shall consider that the defence is in ‘pursuit’ when it is positioned behind the ball holder and the attackers with reference to its goal (Gréhaigne, 1990; Gréhaigne and Godbout, 1995).

Two other analytical concepts are based on the different locations of the ball in relation to the effective play-space at the origin of the ball movement. In the rear-ball play (kick-and-run play), the origin of ball movement is always at the rear with respect to the future receiver of the ball. Play usually starts with the recovery of the ball until its loss to the opposition for whatever reason. In the forward-ball play (pretty pass play), at some point during the movement of the ball, it travels backward towards a supporting player. The transformation of the movement of the ball is the consequence of a defensive organization that creates great difficulty for the offensive team to move the ball forward. With respect to the effective play-space, one can see a diversification of the movement of the ball.

To better understand the evolution of configurations of play, it is also possible to study shapes and distortions of OEP-S and DEP-S. The main distortions are the respective contractions or expansions of the offensive or defensive effective play-space. As illustrated in Figure 9.3, a contraction of game play illustrates the presence of several players on a small surface; for its part, an expansion represents the distribution of several players over a large area. For a more elaborate discussion and illustrations in basketball, readers may consult Gréhaigne et al. (2010b).
Transitions between two play states always contain potentially noticeable information on the evolution of game play. Describing dynamical states makes it possible to better understand, for one given instant, how players move. Each of them occupies one location but it is evolving since all players display different instantaneous speed and direction of movements, as shown, for instance, in Gréhaigne et al. (2010b: 37, Figures 10 and 11). Then, the evolution of a dynamic system can only be modelled as a discontinuous evolution through time.

To obtain a comprehensive representation of the opposition rapport, as illustrated in Figure 9.4, five observational criteria may be simultaneously considered: (a) location of the EP-S on the field, (b) location and circulation of the ball, (c) respective locations of OEP-S and DEP-S, (d) the type of defence (in block or in pursuit), and (e) the compressed or extended state of the EP-S.

Different dynamic representational pictures of game play have been studied in soccer (Ali and Farrally, 1990; Dugrand, 1989; Frencken et al., 2011; Lemoine et al., 2005), basketball (Bourbousson et al., 2010), and Gaelic football (Bradley and O’Donoghue, 2011). For instance, in soccer, studying attack sequences in the offensive half of the field, Ali (1988) and Ali and Farrally (1990) identified seven types of attacking patterns and analysed their final actions prior to a shot at goal. They found that attacks along the length of the wing (e.g. at the periphery) were more successful than those in the central corridor. Also, the analysis showed that there were significant relationships between final actions and patterns of plays.

Studying 188 situations of play that led to a shot at goal or a goal, Gréhaigne et al. (2010a) isolated eight configurations of play that occur most frequently with novice players. A closer analysis of these 4 vs 4 games showed that short attacks with few ball exchanges, and the position on the field where ball possession originated, appeared to determine the form of attack adopted thereafter. These game play configurations are called ‘prototypic configurations’ (Caty and Gréhaigne, 2006), in the sense that they represent fundamental configurations of game play for a given team sport. In a similar study conducted with ice hockey, Moniotte et al. (2011) identified 13 prototypic configurations of play.

### Statistics of game play

Although they are the oldest form of observational data, statistics drawn from game play remain largely used nowadays, not only by sport journalists but also by researchers. In 1981, Morris presented one of the first studies on the analysis of play with the objective of obtaining precise...
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statistical data. The author considered the number of played balls per match and the continuity of game play. After studying ten international matches, Morris showed that, in a typical match, one could expect 2000 played balls (roughly equally divided between the first half and the second half of the match) and approximately 100 periods of intense activity.

Nowadays, team sport performance researchers rarely make use of statistics for descriptive purposes only; they rather use statistics in correlational or in comparative studies, trying to establish a relationship between various events observed during game play and victory or defeat. Examples of comparative studies are those conducted by: Lago-Ballesteros and Lago-Peñas (2010), involving 18 variables and comparing, for each, the four top, 12 middle and four bottom teams of the Spanish soccer league; Lorenzo et al. (2010), involving 18 variables and comparing, for each, winning and losing basketball teams; and Ortega et al. (2009), using no less than 28 variables and comparing, for each, winning and losing rugby teams in the Six Nations tournament. Examples of correlational studies are those conducted by Tenga et al. (2010) in soccer and by Vaz et al. (2010) in rugby.

Although a series of statistics, either raw or transformed, have been considered in several team sports in an attempt to identify suitable predictors of performance, possessions, goals, and

Figure 9.4 Offensive and defensive effective play-spaces with respect to space and time

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shots at goal remain, understandably, among the variables most consistently investigated (e.g. Hughes and Franks, 2005; Jones et al., 2004; Lago and Martin, 2007; Lago-Ballesteros and Lago-Peñas, 2010; O’Shaughnessy, 2006; Sampaio et al., 2010; Tenga et al., 2010).

One particular team sport performance assessment instrument has been developed in the last 15 years (Gréhaigne et al., 1997). The team sport assessment procedure (TSAP) calls for the systematic observation of six specific events: received ball (RB), conquered ball (CB), neutral ball (NB), offensive ball (OB), successful shot (SS), and lost ball (LB). Although statistics can be calculated for individual players, it is possible to compute the sum of each statistic to determine the collective performance of the team. Adaptations of the procedure for ice hockey have been reported in recent years (Nadeau et al., 2008a, 2008b).

**Numerical performance indicators**

In order to better appreciate team performance, a coach may wish to compute indices combining particular statistics.

**The conservation index**

The conservation index consists of computing the ratio between lost balls and played balls (LB/ RB + CB). The index values vary from 0 (for no lost ball) and 1 (when the number of lost balls is equal to the number of played balls).

**The defensive index**

The defensive index considers the number of conquered balls and the number of lost balls; it is equal to CB/LB. It shows the players’ capacity to recover the ball (offensive aspect of defence) and their capacity not to lose it (defensive aspect of offence). The index values vary from 0 (when there was no conquered ball) to a value higher than 1 (when the number of conquered balls exceeds the number of lost balls).

**Other indices**

Depending upon the coach’s need for information, other indices may also be computed. Combining various TSAP statistics makes it possible to compute (a) the team’s volume of play (RB + CB), indicative of the general involvement of the players in the game, (b) the efficiency index ([CB + OB + SS]/[10 + LB]), and (c) the performance score ([volume of play/2] + [efficiency index × 10]). Such indices provide an overview of the players’ or the team’s performance but coaches may prefer to work with the primary statistics of the assessment procedure and focus on specific weak elements that need to be improved. In the same line of thought, Thomas et al. (2009) have proposed the use of performance scores in soccer, based on the effect of the pass, the dribble, the first touch, and individual defensive tactics.

**Using configurations of play for collective decision making**

In a broad sense, a configuration is a list or a schema providing the nature and the main characteristics of all elements of a given system. As alluded to before, the notion of configuration of play, in team sports, refers to the relative positioning of players in both teams in relation to the
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possession and the location of the ball (or any object fought for) and in relation to the various players’ movement. At times, it is also referred to as pattern of play (Ali and Farrally, 1990), situation of play (McPherson, 1993), or display (McMorris and Graydon, 1997). During the game, players need to study the shift from one configuration of play to another in order to better understand the evolution of the play. For instance, in soccer, if attackers who have circulated the ball at the centre of the pitch realize that the defenders have spread themselves width wise, they may elect to go on with an attack depth wise in order to get closer to the goal. In basketball, once they realize that they face a zone defence, attackers could choose to shoot from the periphery. Another choice could be to pass the ball to a player located behind the defenders in the front part of the actual play-space (the specific area where players are effectively engaged in the action).

During the game, a configuration of play evolves from a state 1 to a state 2, and so on, to a state n, as long as the ball remains in play. There are two ways of looking at this. First, as in a picture, the configuration of play may be defined by the positions of the players at a moment M (Gréhaigne et al., 1997; Gréhaigne, 2007). This would lead to a static two-dimensional study of the spatial distribution of attackers and defenders and of the position of the ball. Considering then several successive configurations of play (like a series of pictures), one could determine the reasons for attackers’ and defenders’ choices of action.

However, another way of considering the problem in a more dynamic manner consists of defining the micro-state of the attack/defence system on the basis of location, direction, and possible speed of all players and the ball involved in the confrontation system at this moment. Then each micro-state is determined by a distribution of the players and the ball on the pitch with regard to their respective locations, orientations, and speeds of displacement (Gréhaigne et al., 1997). Considering such dynamic configurations of play represents a more elaborate answer for describing the reality of the game.

In connection with perceptual and decisional skills, the construct of configuration of play appears crucial because it makes it possible for the players to optimize their activity during play in movement. In this case, one can hypothesize that:

the perceptual learning consists in extracting configuration schemata from pertinent and typical clues whose covariance or co-presence, in a given situation, makes it possible to reduce the time of analysis and of evolution of the informational context through the choice of favoured indicators that are predictive of the global situation. [...] [This allows] the identification of spatial structures likely to reveal the surprising capacity of our nervous system for detecting constants and regularities. This confronts us with the problem of identifying the criteria that determine the choice, among the possible directions that the organizational process can take, of those that will be selected and stabilized.

(Paillard, 1987: 1422)

One can think that, in order to detect pertinent clues in a given configuration of play, a novice needs to be guided with precise landmarks. These precise and simple reference elements are probable indicators of the evolution of the situation of play and they make it possible for the novice to ignore many parameters that are useless for dealing adequately with the configuration of play. Configurations of the game vary since players’ actions bring in purposeful or random changes. Dealing adequately with a configuration of play means that a player makes a pertinent analysis of its characteristics and potential and takes an appropriate decision. However, there may be more than one pertinent analysis applicable to a configuration of play. As the opposition
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evolves, new relations are created between elements of the game, and others are destroyed, thus
the production of endless instantaneous balance states. From the point of view of the player’s
activity, all these relations that constitute the whole set of configurations are not equally inter-
esting. Some are not at stake and the player can ignore them; others must be recognized because
they are the ones that will prompt the production of an adequate response in the shortest pos-
ible time. This subject has been also discussed by Carling et al. (2009).

Concluding remarks

In invasion games four elements are at play at the same time: opposition to opponents, coop-
eration with partners, attack on the adverse camp, and defence of one’s own camp. In this
opposition relationship, while ensuring the defence of its own camp, the team must coordinate
its actions in order to recapture, conserve, and move the ball so as to bring it into the scoring
zone and effectively score. Inversely, while attempting to move the ball towards the goal and
effectively score, each team must coordinate its action to avoid loss of the ball to the hands of
the opponents and face a possible counter-attack. Thus, choices must be made depending upon
likely costs and benefits, and players must manage varying courses and trajectories of team-
mates, of opponents, and of the ball in conditions of decisional urgency. As decision making is
constantly influenced by teammates’ and opponents’ movements, performance analysis in team
sports must rely on representational pictures of transitions between successive configurations of
play. In so doing, performance analysis brings in a qualitative dimension to notational analysis.

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