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The pivot player in handball and patterns detection – Instrument

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The theoretical context of this study is related with the observational methodology in the context of group games and sports studies, specifically Handball. Thus, this study intends to analyze the performance of the pivot player in the World Cup 2007 - Germany, European 2008 - Norway 2008 and China OG 2008 in a qualitative dimension. Our purpose was to get as much information as possible about the whole activity of the pivot player, by identifying sequential patterns of behaviour or conduct of the player/game, by using the sequential analysis. The observation instrument used to meet the main purpose of this work consists of a combination of format fields (FF) and systems of categories (SC). The codifications undertaken occurred in several handball games. Using this instrument we have shown that it provides support for the purposes for which it was developed, allowing more research into the offensive process of handball. Besides this, it makes possible the analysis of aspects of the game through perspective and contextual sequences, which we consider to be more accurate, to fit the "reality" of a game such as handball.

Key words: handball, methodological observation, pivot, patterns

The theoretical context of this study is related with the observational methodology in the context of group games and sports studies, specifically Handball. The study of these techniques try to acquire a better understanding of relationships, the conduct, besides the organized attack behaviour pivot player's and activity from the first eight teams of the World Cup 2007 - Germany, of European 2008 - Norway 2008 and China OG 2008. Beyond enabling the quantification, this analysis allows essentially the qualification of the conduct and the behaviour in a natural context.

In recent years, the observational method has been used by several authors in several ways (Arda, 1998; Bauer, 1994; Castellano, 2000; Domínguez & Valverde, 1993; Dufour, 1989; Lake, 2000; Mendo, 1996).

There are already some studies about handball, integrated in PhD theses and dissertations of master's degree in Portugal, which used the methodology and some observational information resources, specific of the sequential analysis, such as:

- The study of Prudente, Garganta & Anguera (2003), entitled "Characterization of the counter-attack during the Handball Championship of Europe 2002, using the sequential analysis";

- The study of Prudente (2006), with the title "Analysis of tactical and technical performance in high-level Handball: Study of offensive actions using the sequential analysis." The author's doctoral dissertation concerned the recorded data sequences of the multiple events software designated SDIS (Sequential Data Interchange Standard) with MSD (Multievent Sequential Data). The data obtained in this trial were treated with the use of the GSEQ (General Queries Sequential). The use of this program made the review of transitions or "delays" sequences possible. Parts of the data collected were treated with a vector representation using the technique of polar coordinates;

- The study by Salas (2007), entitled "Observation and analysis of the action of contra - ataque in Balonmano.

- The study of Freitas (2007), named "Methodology Observacional in Handball - Analysis of offensive actions of the selection of the World Champion 2007". This study used the sequentially analysis like in others previously mentioned and the data from this test were processed through the SDIS-GSEQ.

The detection of temporal patterns is done with the help of the computer program THEME, particularly in studies of interaction within the observational methodology, through corresponding records of game situations where you use the frame as a conventional measure unit. The number, frequency and complexity of the patterns found indicate that the conduct of the players is far more structured than it seems at first sight (hidden patterns). The patterns obtained grant us the possibility to differentiate various complex time structures that extend over the periods of time observed.

In literature studies on Handball it was not possible to find references about the analysis of patterns of temporal sequences using this software.

Thus, this study intends to analyze the performance of the pivot player in the World Cup 2007 - Germany, European 2008 - Norway 2008 and China OG 2008 in a qualitative dimension; our purpose in this study was to get as much information as possible about the whole activity of the pivot player, by identifying sequential patterns of behaviour or conduct of the player /game THEME 5.0 (2004), by using the sequential analysis.

Moreover, this research may be a source of useful and updated information to clarify important questions regarding the conduct of the pivotal player in the performance of their duties and within the teams observed. Besides it intends to be a new methodological

contribution, based on field formats and specific system categories, adjusted to a new method of analysis of conduct patterns in the Handball game.

The most remarkable change within football's development is the application of science to its problems and in particular the use of increasingly sophisticated technology that, supported by scientific data, allows us to establish a "Code of reading" the reality of the game (Castelo, 2004).

Traditionally, the publications on game analysis are mostly confined by the collection of quantitative indicators (e.g., number of passes), qualitative indicators (e.g., ball recovering areas), and external indicators (e.g., distance) of the game. However, these indicators cannot necessarily capture the full complexity of a performance when framed within the context that has led to its expression (Borrie, Jonsson & Magnusson, 2002). This may not be obtained specifically through an interactive analysis of contextual factors within the actions of the game, since its identity is created through an articulation of the system which creates conditions to maintain or change, depending on the circumstances (Garganta, 2005).

The different variables inherent to competition, the interaction that occurs between them and the difficulty in controlling the contextual variables, which are never the same in most situations, demand the use of observational methodology (Mendo, Anguera & Santos, 2005). In our study, we were able to ascertain that the sustenance of the keeping of that variability is an inherent aspect to each game and some significant behaviour may express an emerging trend during the games. This way we intend to determine behaviours, particularly spatial and contextualized variables that allow us to characterize and distinguish the offensive game methods as in a Soccer or Handball match.

The aim of this paper is to describe the development of an observation instrument that can reinforce the existing game analysis schemes in handball in order to provide specific additional information on offensive game methods and the activity of the players.

Methods

The instruments of a standard observation can not be used in a sport or physical activity context, because of the diversity of possible situations that may be observed. Therefore the construction of ad hoc instruments with ample flexibility is crucial as it allows adjustments to the conduct flowing in relation to each situation and to the context in which the observations fall into analysis.

The observation instrument used to meet the main purpose of this work consists of a combination of format fields (FF) and systems of categories (SC).

A theoretical support behind a system of categories leads to greater accuracy, because they have a closed system, the only which is non-coding and self-adjustable. Rather, even within the same authors, field formats are particularly appropriate when there is a lack of

theoretical support and in highly complex situations. Moreover, the basic properties of the FC are an open system that allows multiple encodings and high flexibility.

Given the characteristics and differences between FF and SC, both systems were chosen in this study as a way of reconciling them, like the author Arda (1998) recommend, and this way we intend to create a tool that allows the contextualized and detailed record of observed behaviours.

In a more specific context, we intend to create a tool for the observation of handball which will set up the criteria for the study's vertebrates.

The overall structure of the six criteria that constitute the type of observation and characterization of the pivot player is presented below.

Once a list of settings is created, add the relevant code of conduct or an event in each of the criteria presented above, with a single register without simultaneous occurrence.

Since the observation allows us to objectively describe reality in order to analyze it, the definition of the objectives becomes compulsory. Thus, the purposes we intend to accomplish with this research are:

- Given the randomness of action to attack the teams during the game, examine the possibility to detect patterns of behaviour related to activity of the pivot player in the attack;
- Acknowledge the success of the actions of the pivotal player during the organized attack;
- Identify tasks that the offensive pivot player makes with and without ball;
- Meet the location space, the actions of the pivot player in carrying out its tasks within the offensive game;
- Identify the development ways of the organized attack from each team;
- Get to know the prior forms executed by the pivot player in the finalization;
- Know how to end the organized attack of the teams;
- Identify the length of time of the shares held by the pivot player observed.

After the aims had been defined, we prepared the monitoring system. This is a combination of field formats and category systems, which had been developed ad hoc. The use of field formats provides an instrument with dimensionality and flexibility, and makes it readily adaptable, whereas the category systems render it more consistent. The observational design in our study are based on the specific characteristics of the subject dimensions, on time and flow, it is the Follow-up design /Nomothetic/ multidimensional (F / N / M).

In order to prepare the field format, firstly we defined the bone criteria instrument's and then, through an exploratory phase, produced an opened list of behaviors / situations

observed, corresponding to each criterion. This exploratory phase was carried through the observation of video images of games (*n* = 24) of the World Cup 2007 - Germany, European 2008 - Norway 2008 and China OG 2008, focusing on the offensive sequences observed in those games. The games were recorded on VHS video and then converted to MPEG-1.

As previous studies can illustrate (Freitas, 2007; Salas, 2007), the process of development of our observational tool started by setting criteria. For each of the criteria dimensions (according to the field formats), we built a system of categories for subsequent data collection based on diachronic settings.

Results

Six criteria were defined through observation of relevant conduct in every offensive sequence:

Criteria for Format Field 1 - The recovery of the ball possession - Home Process Offensive / Beginning of Attack (IA). We consider the recovery of the ball when the team was in a defensive recovery of the ball possession thus beginning the attack phase.

A fieldgram was created to record the spatial location of events to observe.

We propose: 12 possible categories for the top of the offensive process.

Criteria for Format Field 2 - Offensive Development Process - Development of Phase Attack (DA).

Actions that are driving the team or player with the ball held after the recovery of the ball possession, in order to achieve a state of completion in the adversary.

We propose: 7 possible categories for the top of the offensive process.

Criteria for Format Field 3 – Beginning of the Organized Attack

We organized the beginning of the attack when the team is offensive in the process, after completing the phase of counter-attack or attack, fast action tactics for the attack start, with an opposing defence structure.

Create a fieldgram to register the spatial location of events to observe.

We propose: 10 possible categories for the top of the offensive process.

Criteria for Format Field 4 - Processes and development of the pivot player actions without a ball.

The technical tactical group actions (actions that involve two to four players) and collective actions (actions involving more than five players) are performed with or without the ball, as the pivot player is deprived of it during the organized attack. The aim is to obtain a stable situation or assistance for the completion of the pivot's actions inside the opposing defence.

We propose: 7 possible categories of tactical offensive proceedings for the pivot player.

Criteria for Format Field 5 - Processes and development of the player's actions with a ball. Pivot technical tactics are the actions that the pivot player performs with ball to achieve the goal, gets in a situation of complete protection towards the opponent.

We propose: 10 possible categories for the realization of the process offensive.

Criteria for Field Format 6 - Procedure for the completion or finalization of the action of the pivot/End of Organized Attack.

We end the operation of the offensive player or pivot by finishing the attack, when the pivot and his team no longer have possession of the ball. The field program for the registration of events observed fit in with the areas of space completion.

We propose: 15 possible categories for the offensive end of the process.

The criteria were produced through a system of comprehensive and mutually excluding categories (criteria one, two and six). This construction converged in a system in which all behaviours were likely to be registered, so that to each behaviour matched only one category. The next phase was the allocation of a set of behaviours that would correspond to each of the criteria, forming a list called the catalogue. Chart 1 is an example of the conduct attributed to criteria six, way and direction of the pass (chart 1).

Chart 1. Settings for criteria 6

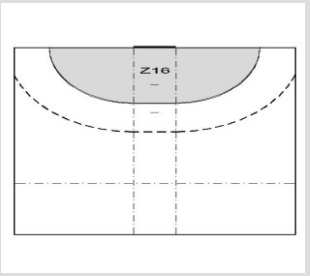
Field Format Criteria 6

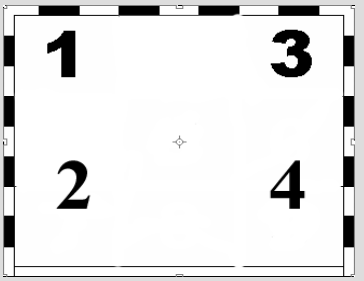
Process of completion or finalization of the pivot action / Finishing of the Organized Attack

Conceptual Definition:

We consider it to be the end of the operation of the offensive player or pivot when the attack ends, when the pivot and his team no longer have ball possession.

The field program for the registration of events observed matches with the areas of space completion





Fieldgram dividing the playing field in 6 areas

We suggest 15 possible categories for the end of the offensive process

Forms that must happen prior to Finishing		
Catalog	**Code**	**Description**
The Pivot against the goalkeeper	PXG	The stage of the offensive proceeding before the upshot with the Pivot holding the ball in front of the opponent goalkeeper
The Pivot against 1 defender	PX_1	The stage of the offensive proceedings before the upshot with the Pivot holding a ball against 1 defender plus opponent goalkeeper
The Pivot against 2 or more defenders	PX_2	The stage of proceedings offensive before the upshot has the action of the Pivot holding the ball against 2 or more defenders and opponent goalkeeper

Conclusion

The codifications undertaken occurred in several handball games and by using this instrument we have shown that it provides support for the purposes for which it was developed, allowing more research into the offensive process of handball. Besides this, it make possible the analysis of aspects of the game through perspective and contextual sequences, which we consider to be more accurate, to fit the "reality" of a game such as handball.

These studies require stability within observations (reliability of data collection is essential to assure the quality of the data) for the inter-observer agreement (Kappa index of reliability).

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