Validation of a tactical analysis methodology for the study of pick and roll in basketball

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VALIDATION OF A TACTICAL ANALYSIS METHODOLOGY FOR THE STUDY OF PICK AND ROLL IN BASKETBALL

KEY WORDS: Observational methodology, Tactical analysis, Pick and roll.

ABSTRACT: This study examines the design and validation of a tactical analysis methodology proposal for the study of *pick and roll* in basketball, applying the principles of observational methodology and the recording of actions in their natural context. We have developed three phases: Phase 1) Identification and selection of analysis variables, in which behavioral variables have been identified and cataloged (*pick and roll*), contextual analysis variables (*court area, time of possession and period of play*) and evaluative analysis variables (*result of the action*); Phase 2) Ad hoc creation of recording instruments, in which a computer tool was adapted (*VA-Sports Software: Basketball*) to address the particularities and specific needs of the study of the *pick and roll* situations.; and Phase 3) Quality control of the data, in which selection criteria were set for the sample, the training process of the observers was carried out, and the level of internal agreement and intraobserver concordance were verified in order to assess the reliability of the methodological approach. A total of 192 *pick and roll* situations corresponding to 6 games of the Spanish ACB League were analyzed in this study. The results suggest a high level of reliability of the methodology designed; as a whole it earned a high average *Kappa* value (.994), leading to the conclusion that the proposed analysis variables are precise in their definition and categorization in order to study *pick and roll* situations. The analysis variables; *time of possession*, period of play and results of the action showed a maximum level of agreement (Kappa value 1.000), while the analysis variables; pick and roll and court area also show a high degree of objectivity (*Kappa* values of .990 and .981 respectively).

For several decades, observational methodology (Anguera, 1990, 2009; Lapresa, et al, 2011) has been consolidated in the field of research into team sports, as a research method specially adapted to the particularities of these disciplines (continually changing situations, presence of uncertainties, technical-tactical unit of analysis...), providing scientific rigor and systematization in order to study the sport in its natural context.

In basketball, studies on tactical aspects have covered diverse topics such as: game-related statistics (Kubatko et al., 2007; Ibañez et al., 2003,2008), prediction of the final standings in the season (Ittenbach and Esters, 1995), comparative analysis of tactical issues between different competitions (Mexas et al., 2005), or the study of differences in specific game positions (Sampaio et al., 2006; Sindik and Jukic, 2011).

These lines of research include analyses of the factors that determine the final result of the games, in an attempt to identify differences between winning and losing teams (Ortega et al., 2007; Trninić, Dizdar and Luksic, 2002) through the study of free throws (Christoforidis et al., 2000), assists (Melnick, 2001) or possession of the ball (Sampaio and Janeira, 2003, Ortega et al., 2007)

Other researches focused on tactical analysis in basketball have evaluated the influence of contextual factors such as the advantage of playing at home or away (Carron, Loughhead and Bray, 2005; De Rose, 2004) or differences between the strategies used by home or away teams (Gómez et al., 2010).

Pick and rolls are possibly the resource or collective tactical principle most used by offensive players during games. Almost all game systems have *pick and roll* situations within them that acquire a special presence and importance at the end of each ball possession (Huciñski and Tymañski, 2006).

This study aimed to design and validate a methodology designed for the tactical analysis of the *pick and roll* situation in basketball, to do so the principles of observational methodology and a contextualized actions record were applied. Those principles will enable the study of these game actions from an essentially tactical perspective, providing knowledge of when, where and what was the final results of *pick and roll* situations in a basketball game.

Method

Once the *pick and roll* was established as the object of study, and in order to validate a specific tactical analysis methodology to record and analyze it, the observational model of Anguera (1989, 2009) was taken as a reference. The following phases were carried out, adapting and applying the experience and empirical knowledge of a group of experts in the field of basketball and tactical analysis:

Phase 1: Identification and selection of analysis variables.

At this early stage we identified out and defined the variables for analysis of a behavioral, contextual and evaluative nature, identifying the corresponding category systems in each of them (Figure 1).

After reviewing the specific studies (theoretical framework), a process of "expert consultation" (empirical contribution) took place, from which different analysis variables were agreed for integration into the proposed methodology for the *pick and roll* tactical analysis. Each of the analysis variables covered the categories that can occur in basketball games in relation to *pick and roll*.

To define the initially proposed catalog and repertoire of the category system, a "passive" exploratory (or pre-scientific) phase was performed (Anguera, 1989). In this passive phase several basketball games were analyzed, which allowed to check on all the behaviors and circumstances related to the *pick and roll* situations included in the proposed category system (see Figure 1).
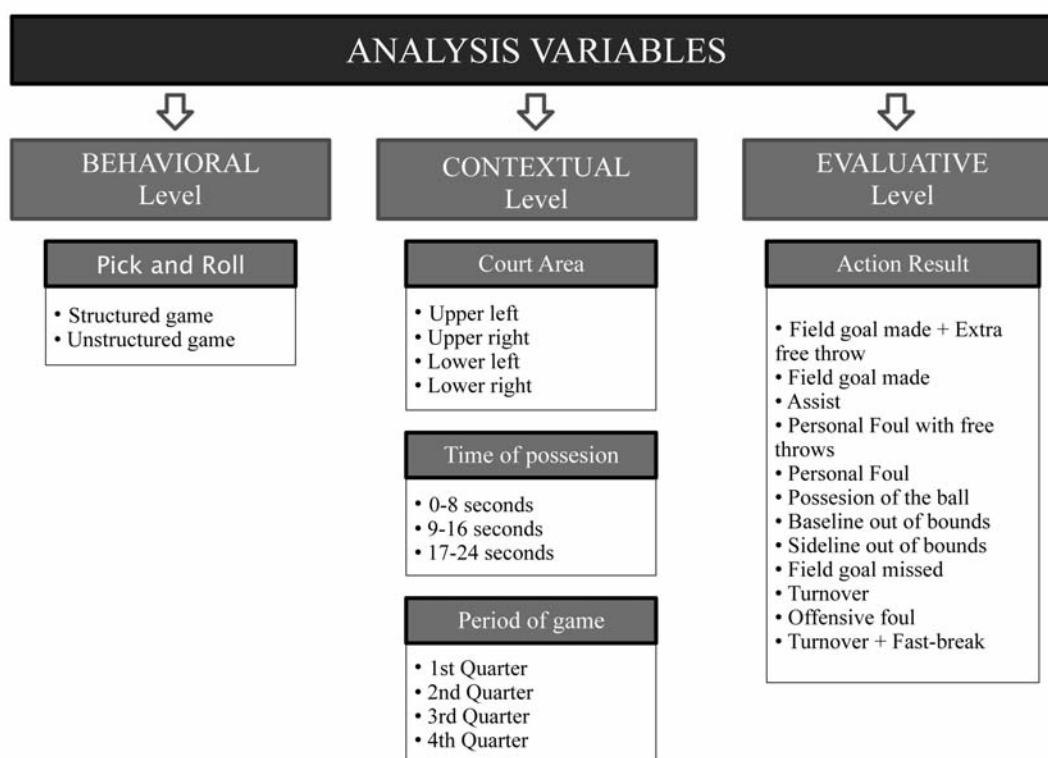

Figure 1. Analysis variables applied to the study of pick and roll.

Phase 2: Ad hoc creation of recording instruments. *Ad hoc* adaptation of a software tool designed especially for the observational recording of basketball games (VA-Sports software: Basketball) (Morante, 2009) was performed, based on the specificities and needs of this study.

VA Sports Software: Basketball (Figure 2) has been designed with an "open" or configurable idea to allow the use of the study variables and specifically defined by categories of analysis (Figure 1) that enable the contextualized recording of the study units (*pick and rolls*). So, once these analysis variables have been introduced into the software (*pick and roll, court area,* time of possession, *period of play* and *result of the action*), they can be identified in the video and recorded for subsequent statistical treatment.

The features and utilities that are part of this video-analysis tool (Figure 2), include: 1) Identification of players and teams. 2) An "open" or configurable system of analysis variables. 3) Graphical information of spatial contextualization. 4) Video images. 5) Sequences of bounded competition to the score of the game at that time, with reference to the moment of the game when the *pick and roll* situations take place. 6) Timeline of the evolution of the game.

Figure 2. Interface of VA-Sports Software: Basketball *adapted to study the* pick and roll.

Step 3: Monitoring the quality of the data. Once the behaviors to be observed have been defined and an *ad hoc* instrument was developed for recording and data collecting, we proceeded to carry out the data monitoring process, which seeks to ensure and verify the reliability of the proposed analysis methodology.

In order to avoid bias in the research, initially the criteria was requiredin all the games included in the sample: all the games analyzed belong to the same competition and season, the video of every game incorporates the entire period of play; the observation units (*possessions* of each team and *pick and roll* situations) should be completely observable.

The next step was the observers' training process, following the guidelines proposed by Medina and Delgado (1999). One observer was a Sciences of Physical Activity and Sport graduate with teaching experience and specific training in basketball. At this stage theoretical and practical training activities were carried out, together with familiarization with the behaviors to be observed, and the use of the process and registration tool (software). The different analysis variables were explained in these training sessions, reaching consensus on specific observable patterns in categories that could be more subject to interpretation by the observer.

Finally, we verified the level of internal agreement or intraobserver concordance, evaluating the reliability of the proposed methodology based on a dual viewing and data collection from 6 complete games in the Spanish ACB League, with a 10-day rest period between the recording and analysis

before and after each game (Medina and Delgado, 1999). The sample included a total of 192 *pick and roll* situations. In these games the analysis was limited to teams playing as the away team, and seeking standardization, because playing at home or away entails differences in patterns of play and in the match result, as reported by some authors (Gómez et al., 2010; Madrigal and James, 1999).

Results and discussion

In order to verify the reliability of the proposed methodology, we compared the *pick and roll* data recorded in the 6 ACB games analyzed, obtained at two different times, and proceeded to analyze intraobserver concordance using the *Kappa* coefficient (Cohen, 1960).

Based on the *Kappa* values obtained for each variable, the data can be classified depending on their degree of objectivity:

a) Maximum objectivity: The variables in *time of possession*, and *period of play* gave the highest *Kappa* value (1.000); they both show total objectivity. Both contextual variables present no difficulty for the observer as they are obtained directly from the electronic scoreboard. The variable resulting from the *action* also reflects clear objectivity, giving a *Kappa* value of 1.000. This is due to the fact that most of the categories of analysis are linked to actions or situations directly indicated by the referee.

b) High objectivity: The *pick and roll* and *court area* variables have *Kappa* values of .990 and .981 respectively, being framed

in the scale of Landis and Koch (1977) at the highest level of agreement. In assessing the *pick and roll* variable the observer has to classify each *game action* as structured/unstructured. Although these categories are explained accurately, as has been demonstrated in this study, their differentiation presented no difficulty to expert basketball observers. Meanwhile, at the *court area* variable, low subjectivity appears because four players (two offensive and two defensive players) participated, and they can operate in an intermediate space between two areas, which may generate some uncertainty in certain situations.

Therefore, it is clear that all the proposed analysis variables (behavioral, contextual and evaluative) clearly exceed the minimum value of .610 established by Landis and Koch (1977) as acceptable in terms of intraobserver concordance. In this study, the average *Kappa* value obtained by the proposed methodology as a whole is .994, which helps verify its high reliability, showing that the proposed analysis variables are precise in their definition and categorization and lead to a very low number of discrepancies between different observations.

Conclusions

The proposed methodology, specifically designed to study the *pick and roll* situation has been proved as reliable, and defines a specific category system for the identification and recording of behavioral patterns related to the study of game patterns.

Future research studies that apply this methodological proposal should pay special attention to the explanation and definition of "observable patterns" in the training phase associated with the *pick and roll* and *court area* variables, which have been the two levels that offer some possibility of "interpretation" by different observers.

VALIDACIÓN DE UNA METODOLOGÍA DE ANÁLISIS TÁCTICO PARA EL ESTUDIO DEL BLOQUEO DIRECTO EN BALONCESTO

PALABRAS CLAVE: Metodología observacional, Análisis táctico, Bloqueo directo.
RESUMEN: El objetivo de esta investigación se centra en el diseño y validación de una propuesta metodológica de análisis táctico para el estudio del *bloqueo directo* en baloncesto, aplicando los principios de la metodología observacional y el registro contextualizado de acciones. Se han desarrollado tres fases: Fase 1) Identificación y selección de variables, donde se han definido y catalogado las variables conductuales (*bloqueo directo*), contextuales (*zona del campo, tiempo de posesión y periodo de juego*) y evaluativas (*resultado de la acción*). Fase 2) Creación *ad hoc* de instrumentos de registro, en la que se ha adaptado una herramienta informática (software *VA-Sports: Baloncesto*) para atender a las particularidades y necesidades específicas del estudio de acciones de *bloqueo directo*. Fase 3) Control de la calidad del dato, en la que se fijaron los criterios de selección de la muestra, se desarrolló el proceso de entrenamiento de observadores, y se verificó el nivel de acuerdo interno o concordancia *intraobservador*, para evaluar la fiabilidad de la propuesta metodológica. Fueron analizadas un total de 192 acciones de *bloqueo directo* correspondientes a 6 partidos completos de la Liga ACB española. Se pudo constatar una elevada fiabilidad de la propuesta metodológica diseñada que, en su conjunto obtuvo un elevado valor promedio de *Kappa* (0.994), lo que permite concluir que las variables de análisis propuestas resultan precisas, en su definición y categorización para estudiar acciones de bloqueo directo. Las variables *tiempo de posesión, periodo de juego* y *resultado de la acción*, han evidenciado un nivel de concordancia máximo (valor *Kappa* de 1.000), al tiempo que las variables *bloqueo directo* y *zona del campo*, también han evidenciado un grado de objetividad elevado (valores de *Kappa* de .990 y .981 respectivamente).

VALIDAÇÃO DE UMA METODOLOGIA DE ANÁLISE TÁCTICA PARA O ESTUDO DO BLOQUEIO DIRECTO NO BASQUETEBOL

PALABRAS CLAVE: Metodologia observacional, Análise táctica, Bloqueio directo.
RESUMO: O objectivo desta investigação centra-se no delineamento e validação de uma proposta metodológica de análise táctica para o estudo do bloqueio direto no basquetebol, aplicando os princípios da metodologia observacional e o registo contextualizado de acções. O estudo desenvolveu-se em três fases: Fase 1) Identificação e selecção de variáveis, sendo definidas e catalogadas as variáveis comportamentais (*bloqueio directo*), contextuais (*área do campo, tempo de posse e período de jogo*) e de avaliação (*resultado da acção*). Fase 2) Criação *ad hoc* de instrumentos de registo, na qual se adaptou uma ferramenta informática (software *VA-Sports: Basquetebol*) para atender às particularidades e necessidades específicas do estudo de acções de bloqueio directo. Fase 3) O controle de qualidade dos dados, onde foram definidos os critérios de selecção da amostra, foi desenvolvido o processo de treino dos observadores, e verificou-se o nível de concordância interna ou concordância *intra-observador*, para avaliar a fidelidade da proposta metodológica. Foram analisados um total de 192 acções de *bloqueio directo* correspondentes a seis jogos completos da Liga ACB espanhola. Os resultados sugerem uma elevada fidelidade da proposta metodológica delineada que, no seu conjunto obteve um elevado valor médio de *Kappa* (.994), o que permite concluir que as variáveis de análise propostas se revelam precisas, na sua definição e categorização para estudar as acções de bloqueio directo. As variáveis *tempo de posse, período de jogo e resultado da acção*, evidenciaram um nível de concordância máximo (valor *Kappa* de 1.000), enquanto que as variáveis bloqueio directo e zona do campo, também evidenciaram um elevado grau de objectividade (valores *Kappa* de .990 e .981, respectivamente).

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