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Decisional analysis of finishing in basketball

Análisis decisional de la finalización en baloncesto

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Abstract

The present study investigated the decision making linked to the basketball player's shooting and blocking shots based on the Strategic Logic proposed by the coach. A Spanish team which played in EBA League was studied in 4 games in the 2010-2011 season. 7440 motor decisions (ballhandler decisions and his defender) were analyzed using the ad hoc instrument called SODB. Among the most relevant conclusions it is worth mentioning: a) the importance of having a well-defined Coach's Strategic Logic in both offense and defense; b) the interest of assessing the match between the Coach's Strategic Logic and the players' individual decision making; c) a clear trend in the tight decision making of both the ballhandler (offensively) and the player who block shots (defensively) , confirming that the players respected the Coach's Strategic Logic; d) the main variable that helped predict the success of both the ballhandler and the rival of the ballhandler was the correct decision making of the players rather than the game system used; e) shooting and blocking shots in a correct way (following Coach's Strategic Logic) is related to success; and finally, f) the shot-block binomial is a relationship that depends more on the individual competence of the players involved than on the Coach's Strategic Logic.

Keywords: observational methodology, decision making process in basketball, tactical performance analysis, coach's strategy.

Resumen

El presente estudió investigó la toma de decisiones motrices vinculadas al lanzamiento y al tapón del jugador de baloncesto en función de la Lógica Estratégica propuesta por el entrenador. Participaron 13 jugadores de un equipo de Liga EBA entre 18 y 28 años de edad en la temporada 2010-2011. Se analizaron todas las decisiones que tomaba el jugador con balón y su rival (defensor) en 4 partidos (2 amistosos y 2 de entrenamiento) mediante el instrumento ad hoc denominado SODB. Entre las conclusiones más relevantes se destaca: a) una clara tendencia en la toma de decisiones ajustadas tanto del jugador con balón como del rival del jugador con balón, confirmando que los jugadores respetaban el plan estratégico del entrenador; b) la variable que ayudó a predecir el éxito tanto del jugador con balón como del rival del jugador con balón fue la correcta toma de decisiones de los jugadores más que el sistema de juego utilizado; c) lanzar y taponar de manera ajustada a la Lógica Estratégica del entrenador tiene relación con el éxito; y finalmente, d) el binomio lanzamiento-tapón es una relación que depende más de la competencia individual de los jugadores implicados que de la Lógica Estratégica del entrenador.

Palabras clave: análisis observacional, toma de decisiones, sistema de juego, análisis del rendimiento táctico, estrategia del entrenador.

Introduction

Basketball has traditionally been classified from the point of view of the type of motor relationship established, as a sport of cooperation-opposition (Parlebas, 2001). But, because the opposition is the key relationship that modifies the score of the match and the one that finally determines who is the winner and loser of the duel, this sport can also be interpreted as an opposition-cooperation sport (Serna et al., 2017). In this type of duels, Lavega (2004) argues that when two teams face each other, a series of processes are activated in athletes such as reading and interpreting the decisions of both teammates and opponents, issuing messages for teammates to decipher, sending wrong messages to confuse rivals, decoding messages from rivals, adapting to uncertainty; in short, the process of motor decision-making (TDM) of players is activated (Arias-Estero et al., 2018; Courel-Ibáñez et al., 2018; Suárez-Cadenas et al., 2017) and consequently their motor intelligence (Serna et al., 2014).

As provided by other research (Arias-Estero et al., 2018; Courel-Ibáñez et al., 2017; Dugas, 2006; Gréhaigne et al., 2001; Gamero et al., 2021; Jiménez-Sánchez et al., 2012; Lasierra et al., 2020) it is interesting that coaches can have instruments to measure the TDM of their players in order to, firstly, correctly diagnose their players and, secondly, optimally program their training tasks for improving improve these specific motor decisions (DM). To proceed with this evaluation of the TDM of basketball players, Serna et al. (2014) contribute that it is necessary to define the possible DMs that a basketball player can take by distinguishing four strategic roles, two associated with the attacking team (player with the ball and player without the ball) and two others associated with the defending team (rival of the player with the ball or rival of the player without the ball).

Of this limited number of DMs that a basketball player can perform, in this research we tried to focus on the strategic roles that can alter the score more directly, such as the player with the ball (JCB) and the rival of the player with the ball (RJCB); that is, those players who can score or can prevent the opponent from scoring. That is why it could be said that the JCB's competence will be greatly influenced by both his correct decision making when shooting and the efficiency at the moment of shooting (scoring); and exactly the same for the RJCB, who must be competent in taking the correct DMs to avoid the opponent's shot and effective in blocking or disturbing the opponent's shot as much as possible (Serna & Muñoz, 2015).

In this scenario, the basketball coach has to help the players to establish a collective order that favors cooperation among the members of the same team. This is why coaches design a Strategic Logic (LE) specific to their team. This LE aims to create a guide for the players in order to achieve collective success (Muñoz et al., 2015; Serna et al., 2021). The development of this LE, will consider the individual characteristics of the players and should organize the TDM of these, so that the team works in a coordinated and harmonious way (Lasierra et al., 2020; Serna & Muñoz, 2015).

The LE is composed of different strategies when the team is attacking and another when the team is defending. The main goal of the LE of the offensive team (ECB) is to finish scoring thanks, to a large extent, to finish with uncontested shots or with the greatest possible advantage (Alsasua et al., 2022; Gómez et al., 2013; Ibáñez et al., 2009); while the main goal of the defending team (ESB) is getting the ball, block shots or, at least, to bother the offensive team's shot (scoring) and, if it occurs, to control the defensive rebound (Gómez et al., 2006; Leite et al., 2014).

The LE of ECB and the ESB must consider the different phases of the game (fastbreak, transition and half-court offense) (Gómez et al., 2013; Piñar et al., 2014). From the point of view of the TDM of the ECB players, it is not the same to attack in a situation of disorganization of the ESB (fastbreak), as in a situation of momentary reorganization of the opposing team (offensive transition) or in a situation of clear organization (half-court offense) (Gómez et al., 2013). In parallel, the LE of the ESB must have structured how to reorganize in the defensive balance (in this research, called unorganized defense), how to act in the defensive transition and, of course, the organization and rules in half-court defense (Gómez et al., 2006).

When the ESB is defending in half-court, there are different types of defensive systems depending on whether he defends in man man-to-man organization (each player defends an opponent), zone (each player is responsible for a defensive space) or mixed (some players are in man-to-man and others in zone) (Gómez et al., 2006). These strategic possibilities of the ESB will require adjustments of the players in their TDM since each defensive system has singularities. In the same way that facing these defensive systems will cause adjustments in the LE of the ECB since he will have to adjust his offensive strategies and, therefore, his TDM, depending on the defense he is facing; since it is not the same to attack against a man-to-man defense than against a zone defense or a mixed defense (Serna et al., 2014; Serna & Muñoz, 2015).

Also, with the objective of improving the team performance and of each of its players, it should be evaluated if the TDM of the players is in accordance with the LE proposed by the coach. The TDM of the players must be in accordance with the coach's LE, but without adopting a submissive attitude. It is about adjusting decisions in an effective way with the goal of solving the particular motor situation (Serna & Muñoz, 2015).

Therefore, these individual DMs can be categorized as: a) adjusted DMs (DMs accepted by the LE defined by the coach); b) unadjusted DMs (DMs not accepted by the LE defined by the coach); and, c) anti-regulation DMs (DMs that violate the rules and should be sanctioned by the referee) (Serna et al., 2014).

For all of the above, the research goals were: a) to study the predictive variables to obtain success in shots; b) to study the predictive variables to prevent success in shots of the offense team; and, c) to evaluate the level of adjustment of the DMs linked to JCB and RJCB finishing, according to LE proposed by the coach.

Method

The research design was nomothetic because each player was analyzed, follow-up because several matches were observed and multidimensional by considering different levels of response within the observation instrument (Anguera et al., 2011).

Participants

The sample consisted of 13 players from an EBA League team of the 2010-2011 season, with an age range between 18 and 28 years, (Mage = 22.3 years, SD = 3.12). Four unofficial games were played (two friendly games and two training games) which were filmed and subsequently analyzed. All participants gave their consent to voluntarily

participate in the study. The observational sample was 7440 records; of these, data linked to JCB and RJCB finishing were analyzed. Therefore, 468 MDs from the JCB and 423 MDs from the RJCB were studied in greater depth.

Procedure and instrument

In order to identify the DMs of JCB and RJCB, the Basketball Decision Observation System (SODB) was used. It is a system, based on the *ad hoc* Observational Methodology that evaluates the decisions made by players on the basketball court as according to the coach's strategy (Serna et al., 2013). This observational tool is composed of 5 criteria and 40 categories (Table 1). The images were processed with the MOTS program (Castellano et al., 2008) which allowed the use of the SODB instrument by recording the time of each observation and creating code matrices collected in an Excel sheet.

Data analysis

For data analysis, contingency tables were carried out using the adjusted residuals when necessary, as the contrast statistic in the case of univariate tests. The technique called CHAID 9 (Chi-square automatic interaction detector) classification trees was also used as a technique to analyze the effect of the independent variable on the dependent variable, in this case, a cross-validation system was applied and 50 was considered as the minimum number of cases in the terminal nodes, and 100 cases in the branch nodes. Other characteristics were: tree size control (minimum node size, split size: 10; maximum tree levels: 3), validation method (10-fold cross-validation) and statistical significance ($p < .05$), the other options were applied with the default parameters of the program. The Answer-Tree® SPSS Classification Trees ™ 13.0 module was used.

Results

JCB Finishing: Variables predictive of performance.

To study the performance in JCB finishing, successful shots were identified as those that ended in a basket or with a foul received in the shooting action, while failure was identified when there was a missed shot or a turnover.

Table 1. Criteria and categories of the SODB observational tool

Criteria	Categories
Player	
Defensive systems (ESB)	Man-to-man (IND)
	Zone (ZON)
	Mixed (MIX)
	Unorganized defense (DSC)
DM of player with the ball (JCB)	Passer (PS)
	Receiver (REC)
	Forwarder (PG)
	Protector (PT)
	Offensive retriever (REP)
	Playing one and one (DO)
	Playing ball screen (DC)
	Time manager (TP)
	Shooter (LZ)
	Offensive rebounder (RA)
DM of rival of the player with the ball (RJCB)	Pass interceptor (IP)
	Pass denier (DP)
	Pass controller (CP)
	Reception interceptor (IR)
	Reception denier (DR)
	Reception controller (CR)
	Forward controller (CA)
	Orientator (OR)
	Stealer (DES)
	One-on-one defender (CO)
	Ball screen defender (CCO)
	Time manager controller (CT)
	Shot blocker (TB)
	Double team player (DB)
	Collaborator (CL)
	Defensive retriever (RD)
	Defensive rebounder (RB)
TDM Assessment	Adjusted (AJUS)
	Unadjusted (DESA)
	Anti-regulation (ANTI)
Finishing	Successful (EXI)
	Failure (FRA)

CHAID classification trees (Figure 1) identified DM assessment as the first predictive variable for performance in JCB finishing. Significant differences ($p < .001$, $x2 = 86.516$, $gl = 1$) were observed between adjusted DMs (65.6%) and unadjusted DMs (34.4%). When DMs were adjusted (node 2), the percentage of success was higher (61.2%) than failure (38.8%), whereas in unadjusted DMs (node 1) (shots and turnovers are included) this trend was reversed, as those completions failed most of the time (83.9%) and were successful in a much lower percentage (16.1%). Only 27.4% of the unadjusted DMs (node 4) ended with successful shots, as opposed to 72.6% that were unsuccessful.

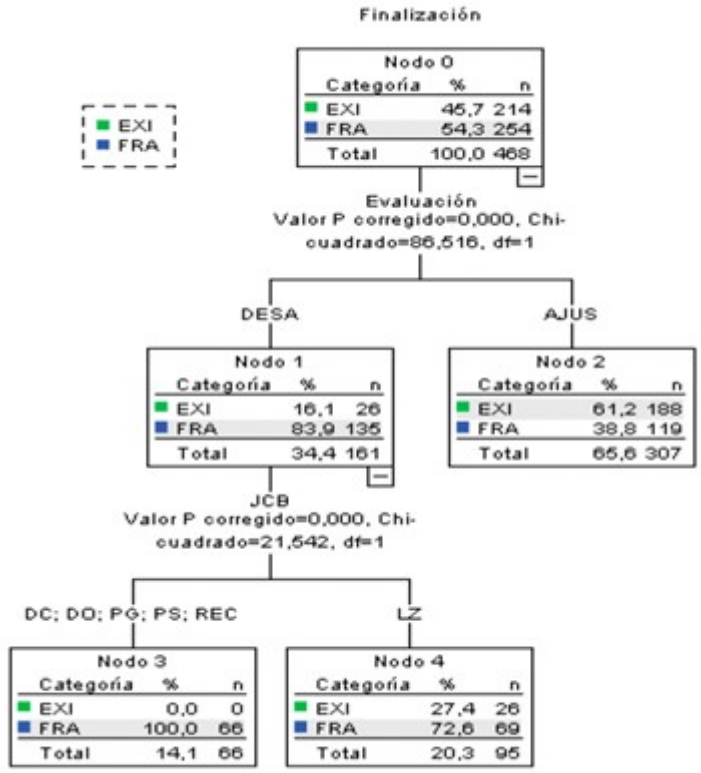

Figure 1. Influence of JCB's DM on the success of offensive finishing
Note: EXI (success); FRA (failure); DESA (unadjusted); AJUS (adjusted); JCB (player with the ball); DC (playing ball screen); DO (playing one-on-one); PG (forwarder); PS (passer); REC (receiver).

JCB Finishing: Relationship between DM level of adjustment and ESB defensive systems

When analyzing in greater depth the level of adjustment of these DMs linked to the finishing of the JCB before the different ESB game systems (Table 2), it was found, firstly, that the DMs in the finishing were mostly adjusted (76.4%) compared to the unadjusted ones (23.6%) in all the situations analyzed. Secondly, a statistically significant relationship was found between these variables ($x2 = 11.158$; $gl = 3$; $p = .011$), specifically between DMs taken in unorganized situations (when the JCB finishes in fastbreaks) and DMs that occurred in the man-to-man game system.

RJCB Finishing: performance predictors

To study the performance in the RJCB finishing, successful DMs were identified as those DMs that allowed either getting the ball or causing a missed shot by the opposing team. Failure was identified when a basket was produced by the offense team.

When studying the predictive strength of the effectiveness of RJCB behavior at the time of finishing (Figure 2), the evaluation of DMs was identified as the first predictive variable for achieving defensive success. Significant differences ($p < .001$, $x2 = 26.471$, $gl = 1$) were observed between the two types of DMs, with a predominance of adjusted DMs (69.3%) over unadjusted DMs (30.7%). At node 0, it is necessary to highlight the success of RJCB defensive actions to avoid shots (66.9%) with respect to those of failure (33.1%).

When the DMs were adjusted (node 1) the percentage of success in defense (74.7%) was higher than failure (25.3%), while in the unadjusted DMs (node 2) the defensive results were similar in failure (50.8%) and success (49.2%), despite the DMs were unadjusted, there was a 49.2% chance of getting the ball successfully. In the adjusted DMs the stopper (TB) (node 4) left a high percentage of success (68.4%).

Table 2. Level of adjustment of the JCB's shots according to ESB game system

Defensive Game Systems		Shooter Assesment		Total
		Adjusted	Unadjusted	
Unorganized	Count	97	14	111
	% within organisation	87.4	12.6	100%
	Adjusted residuals	3.2*	-3.2	
Man-to-man	Count	145	60	205
	% within organisation	70.7	29.3	100%
	Adjusted residuals	-2.7*	2.7	
Mixed	Count	23	8	31
	% within organisation	74.2	25.8	100%
	Adjusted residuals	-.3	.3	
Zone	Count	42	13	55
	% within organisation	76.4	23.6	100%
	Adjusted residuals	.0	.0	
TOTAL	Count	307	95	402
	% within organisation	76.4	23.6	100%

***** ($p < .001$)

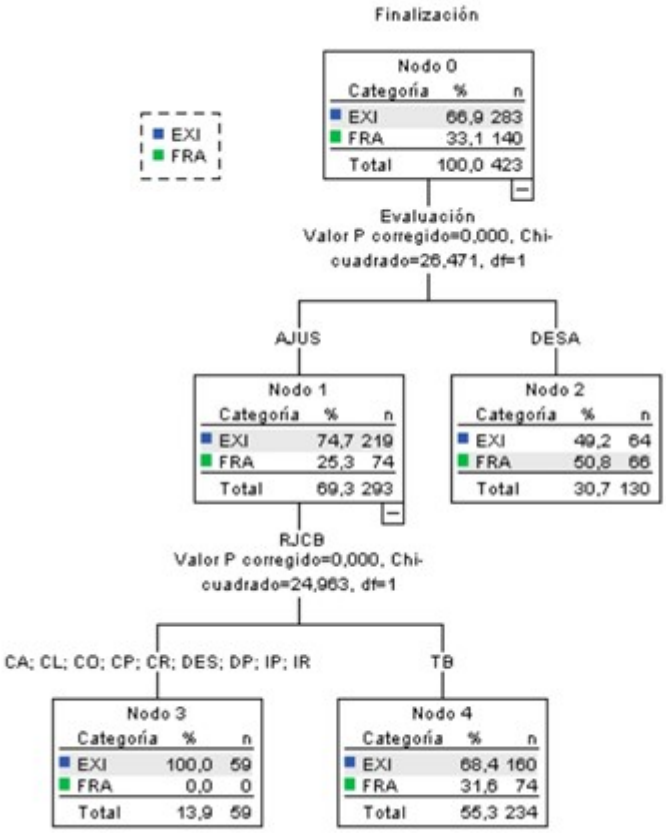

Figure 2. Influence of RJCB DM on the performance of defensive finishing
Note: EXI (success); FRA (failure); DESA (unadjusted); AJUS (adjusted); RJCB (rival of the player with the ball); CA (forward controller); CL (collaborator); CO (one-on-one defender); CP (pass controller); CR (reception controller); DES (stealer); DP (pass denier); IP (pass interceptor); IR (reception interceptor); TB (shoot blocker)

RJCB Finishing: Relationship between the level of adjustment of RJCB DMs and ESB defensive systems

Of all the DMs of the RJCB, attention is focused on those linked to the Shot Blocker (TB) to study the confrontation between the attacker and the defender at the moment of shooting.

When analyzing the relationship between the TB level of adjustment and the ESB game systems (Table 3), it was observed that there was no statistically significant relationship between both variables (x2 = 6.036; gl = 3; p = .110). However, a trend towards adjusted DMs was observed in all the ESB game systems (unorganized defense = 54.5%; man-to-man = 69.2%; mixed = 59.4%; zone = 63.9%) but less than in the JCB DMs.

Table 3. Level of adjustment of the Shot blocker according to ESB's defensive system

Defensive Game Systems		Shot Blocker Assessment		Total
		Adjusted	Unadjusted	
Unorganized	Count	48	40	88
	% within organisation	54.5	45.5	100.0%
	Adjusted residuals	-2.1	2.1	
Man-to-man	Count	139	62	201
	% within organisation	69.2	30.8	100.0%
	Adjusted residuals	2.1	-2.1	
Mixed	Count	19	13	32
	% within organisation	59.4	40.6	100.0%
	Adjusted residuals	-.6	.6	
Zone	Count	53	30	83
	% within organisation	63.9	36.1	100.0%
	Adjusted residuals	-.1	.1	
TOTAL	Count	259	145	404
	% within organisation	64.1	35.9	100.0%

Discussion

The objectives of this research were, firstly, to study the predictive variables of the performance in shooting at the basket. Secondly, to study the predictive variables to prevent success in the opposing team's drives to the basket and, finally, to evaluate the level of adjustment of the TDM linked to the finishing of the JCB and the RJCB according to the LE proposed by the coach.

How to be successful at shooting in basketball?

The first variable that predicted success finishing was that the shot taken was adjusted to the LE proposed by the coach. This data confirms the importance of following the coach's indications and that the players make shots that are framed in the idea of collective play (Serna et al., 2021). It could be affirmed the idea that following the LE and making shots that have a collective game thinking approach towards success (Serna et al., 2017).

The results obtained suggest that the coach's LE can help to find the shot in a comfortable situation for the shooter, but, in the end, the success of the attack will depend, fundamentally, on the individual competence of the player in this DM. It is for this reason that basketball should be called an opposition-cooperation sport since the LE of the team (cooperation relationship) is at the service of individual competition in reaching the protected space of the opposing team (opposition relationship) (Serna et al., 2017).

JCB TDM in accordance with the LE proposed by the coach

As confirmed in previous research (Serna et al., 2014), each coach's LE will originate a singular tendency of the players' TDM. Therefore, it is necessary that players have the ability to adapt their TDM according to the changing situations as they arise in the real game situation (Courel-Ibáñez et al., 2017; Jiménez-Sanchez et al., 2012).

This confirms the contributions of previous research (Serna et al., 2014), which observed a clear predominance of adjusted DMs, an aspect that confirms that the players generally respected the LE proposed by the coach. The reason for such a high frequency of adjusted JCB DMs in these investigations could be due to a low level of opposition on the part of the RJCB because the matches studied were friendly or training matches, confirming the contributions of other investigations (Dawson et al., 2004).

One of the findings of this study was that the best shots were made in the Unorganized system, i.e. in fastbreaks. This fact can be intrerpreted, probably, thanks to the lack of organization of the defending team in this type of situation, which allows non- defended shots and, therefore, with a higher probability of success (Erčulj & Štrumbelj, 2015; Gómez et al., 2015; Ortega, 2010). In contrast, the individual defense was the one that caused less comfortable shots due to the fact that it is a proximity-oriented defense in the individual duel (Csataljay et al., 2013).

How to make the ESB a success?

This research confirms that the variable that best predicts the success of the ESB is the level of adjustment of the DMs to the coach's LE, which reinforces the idea of following the LE to achieve success getting the ball (Serna et al., 2017).

Of all the DMs studied linked to the RJCB finishing, Shot Blocker has to be logically highlighted. The results obtained show that blok shots in a tight way achieves a high percentage of success for the ESB. Therefore, it is essential to maintain the opposition until the last instant of the JCB shots, as indicated by different investigations (Fierro, 2002; Gómez et al., 2006; Sampaio et al., 2004).

In spite of the RJCB DMs being unadjusted, there was a 49.2% probability of successfully getting the ball. From this data, it can be deduced that the ESB could be successful not because it had made good decisions but because the JCB did not have a sufficient level of success. Thus, the importance of shotting performance as a fundamental variable in this sport is reiterated (Erčulj & Štrumbelj, 2015; Gómez et al., 2015).

RJCB TDM in accordance with the LE proposed by the coach

When delving deeper into the RJCB MDs, a predominance of adjusted MDs was observed. Previous research (Serna et al., 2014) had found a percentage close to 50% of unadjusted DMs when studying all the RJCB DMs, confirming that, for different reasons, there was no syntony between all the coach's LE and the players' behavior. However, in this

research, where the focus is placed on the moment of finishing and only on the DM of blocking (not only valued as the fact of touching the ball but also as trying to disturb the opponent's shot as much as possible), it is observed that the tendency is to follow the coach's LE. These findings open a reflection for coaches based on defining which are the key DMs of the RJCB and where the coach's ESB LE has to put the focus of attention (Serna & Muñoz, 2015). It should be taken into account that, in this research, in two of the four matches, the RJCB was aware of the offensive LE of his opponent (training matches) with which he could have clues to be able to anticipate in some situation.

To conclude, it is observed that the intention to block or bother the shot is a DM that depends on the individual competence of the player, independently of the coach's game system. Therefore, it is a key DM in the training of players that will have a transfer to any game system proposed by the coach (Serna & Muñoz, 2015).

Conclusions

From all the above it can be concluded that for sports performance in team sports such as basketball it is essential to have defined, by the coach, a strategic plan or LE and objectively evaluate whether the players respect this plan. These data will provide key information for the training process of the team and of each player in particular.

This study has identified that the variable that best predicts the success of both the ECB and ESB is that the players follow the coach's LE. When studying both the JCB and RJCB the variable that best predicts success is the correct decision making of the players, ahead of the particular system of play proposed by the coach.

A clear trend of adjusted DMs of both JCB and RJCB has also been found, a fact that confirms that players respect the coach's LE.

It could be argued in this research that the shot-block binomial is a relationship that is independent of the coach strategy and depends primarily on individual competence of both JCB and RJCB rather than on the coach's LE.

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