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## ORIGINAL

### TECHNICAL AND TACTICAL ASSESSMENT TOOL FOR PADEL

### HERRAMIENTA DE EVALUACIÓN TÉCNICO-TÁCTICA EN PÁDEL

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## ABSTRACT

The analysis of Technical-Tactical performance Indicators (TTPI) is a usual topic on sports studies because they predetermine the performance and allow to establish the extent that defines the course of the game. In this work, we intend to design and validate an instrument that measures TTPI in professionals and amateur paddle players.

A panel formed by twelve experts had evaluated and agreed on a document in which the common Paddle TTI were grouped into different categories, developing a Systematic Observation Sheet using all of them, which recorded their frequency of occurrence. Four observers analyzed 371 game actions using the Systematic Observation Sheet, calculating the reliability of the comments among the different observers through Cohen's Kappa indexes.

The results showed that both the TTPI's proposed and the Systematic Observation Sheet which record them, can be used to analyze the categories that define the course of a paddle match, and therefore constitute an observational analysis paddle tool.

**KEY-WORDS:** Performance Indicators, racket and wall sports, padel, game analysis

## RESUMEN

El análisis de los Indicadores de rendimiento Técnico-Tácticos (TTI) es objeto de estudio en muchas especialidades deportivas, ya que condicionan el rendimiento y permiten establecer en qué medida determinan la trayectoria de un partido. Este trabajo pretende diseñar y validar una herramienta que evalúe TTI en pádel en jugadores amateurs y profesionales.

Doce expertos evaluaron y consensuaron un documento con TTI habituales en pádel clasificados en diferentes categorías, constituyendo todos ellos una Hoja de Observación Sistemática que registró su frecuencia de aparición. Cuatro observadores analizaron 371 acciones de juego mediante dicha Hoja de Observación Sistemática (HOS), calculándose la fiabilidad de las observaciones entre los diferentes observadores mediante los índices Kappa de Cohen.

Los resultados reflejan que los TTI propuestos y la HOS para su registro son válidos para analizar aquellas categorías que definen la trayectoria de un partido de pádel, constituyendo una herramienta adecuada de análisis observacional en pádel.

**PALABRAS CLAVE:** Indicadores de rendimiento, deportes de raqueta y pared, padel, análisis del juego.

## INTRODUCTION

There are many variables studied that influence sport performance. However, understanding the most relevant for each sport is a complicated task, as the technical, tactical and even the physical preparation are influenced by these variables. This is why so many researchers are trying to find answers to this difficult question.

These performance indicators have been studied in a wide variety of sports, individual, team and racket sports (Table 1)

M. Hughes & Franks (2008)	Individual sports	Boxing, tennis
M. D. Hughes & Bartlett (2002)		Long jump, swimming
William (2012)		Track and field
Calero Morales (2011)	Team sports	Volleyball
Garganta (2009)		Football
Martínez & Martínez (2013)		Basketball
Almonacid (2012)	Racket sports	Padel
Alonso Roque & Argudo Iturriaga (2011)		Olympic front tennis
Cabello (2000)		Badminton
Cabello, Carazo, Ferro, Oña, & Rivas (2004)		Badminton
Cabello, Serrano, & González (2000)		Badminton
Castillo (2012)		Padel
Hong, Robinson, Chan, Clark, & Choi (1996)		Squash
Hughes, M (1997)		Squash
Hughes, Hughes, & Behan (2007)		Squash, tennis, Badminton
Johnson & McHugh (2006)		Tennis
Murray & Hughes (2001)		Squash
O'Donoghue & Ingram (2001)		Tennis
O'Donoghue & Liddle (1998)		Tennis
Over & O'Donoghue (2010)		Tennis
Pradas, Castellar, Coll, & Rapún (2012)		Padel
Sanderson & Way (1977)		Squash
Sañudo, De Hoyo, & Carrasco (2008)		Padel

**Table 1.** Performance indicators in individual, team and racket sports

Padel is a sport that is growing rapidly in Spain. However, in spite of the high number of players (around 2 million), it is a sport that is not greatly studied. There are very few researchers dedicated to this sport. We find there are studies that look at the physiological variables and the competition demands (Amieba & Salinero, 2013; Castillo, 2012; De Hoyo, Sañudo, & Carrasco, 2007; Sañudo et al., 2008), psychological aspects (Ruiz & Lorenzo, 2008), high profile players (Romero et al., 2008), the temporary structure of the game (Almonacid, 2012; Pradas et al., 2012; Sánchez-Alcaraz, 2014) or training approaches for varying physical abilities (Martinez, 2011; Rivera, 2011). However, we haven't found any studies that analyse the importance of playing situations (notational analysis) using a valid tool.

Nevertheless, to obtain the data needed to draw conclusions and understand how this sport works, it is necessary to design a tool beforehand. A tool that can record the appropriate information to understand and analyse the sport at a technical, tactical and strategic level.

During any racket sport match you will see a high number of technical-tactical actions in a short space of time. These entail a continuous decision-making process for every hit, especially in sports where the time between each competitors' impact on the match is smaller. This can be the case for Padel. Due to the complexity of this decision-making, the design of a systematic evaluation model that allows you to record the actions of the match and better understand each player's strategy, can be interesting. The aim is to provide knowledge surrounding the results needed to improve performance (Pradas, Floría, Carrasco, Beamonte, & González, 2010).

If the analysis of the competitive game characteristics are crucial to establishing the training bases according to the real needs and requirements of the competitive stages (Cabello et al., 2000), it will be interesting to provide the indicators that determine the padel game performance. This way, the professional players will be able to organise their training around their strengths and weaknesses, as Hong et al. (1996); Malagoli, Lobiatti, and Merni (2010) have recommended.

## **OBJECTIVES**

Due to the lack of references surrounding the analysis of padel performance and the technical-tactical variables, the objective of this study is to design and approve a tool that evaluates TTI in padel for amateur and professional players.

## **MATERIAL AND METHODS**

### **Design**

This study has followed a descriptive-observational structure, so that using a new Delphi methodology (Panel of Experts), a document with the standard indicators for padel performance has been designed, with the aim to collect the most relevant ones at a professional and amateur level.

Once the technical-tactical indicators with the highest relevance were approved, and with the aim to assess the degree of agreement when applying to different game situations, various researchers recorded the frequency of appearance in each situation shown in different levels of the game. A systematic observation sheet designed for this purpose (Annex I) has been used.

## **Participants**

The sample in this study must be viewed from three perspectives: a) number of experts who participated in the Delphi technique, b) number of observers who record the game actions on the 'HOS', and c) number of game actions or recorded actions.

## **Experts selection**

The panel consisted of twelve experts, who evaluated the questionnaire designed to assess the suitability of the proposed performance indicators. Those selected as experts had to be national Padel instructors and meet at least one of the following inclusion requirements: a) a minimum of five years' experience training lower levels, such as beginners padel and/or training professional-level players, b) if they haven't been instructor, to have competed at a professional level for more than 10 years.

Once the experts for the investigation were selected, they were presented with the components to make the assessment, including a questionnaire that was sent digitally, which allowed them to assess each of the indicators using an assessment scale from 1 to 10 (where 1 equals no importance and 10 very important)

## **Observers selection**

Four observers, experts in padel, were selected. They met the same requirements as the judges but with no relation between them and none of them participating in the panel. There was no relationship between observers that could affect the data collection and they were unaware of those partaking in the process.

## **Actions of game selection**

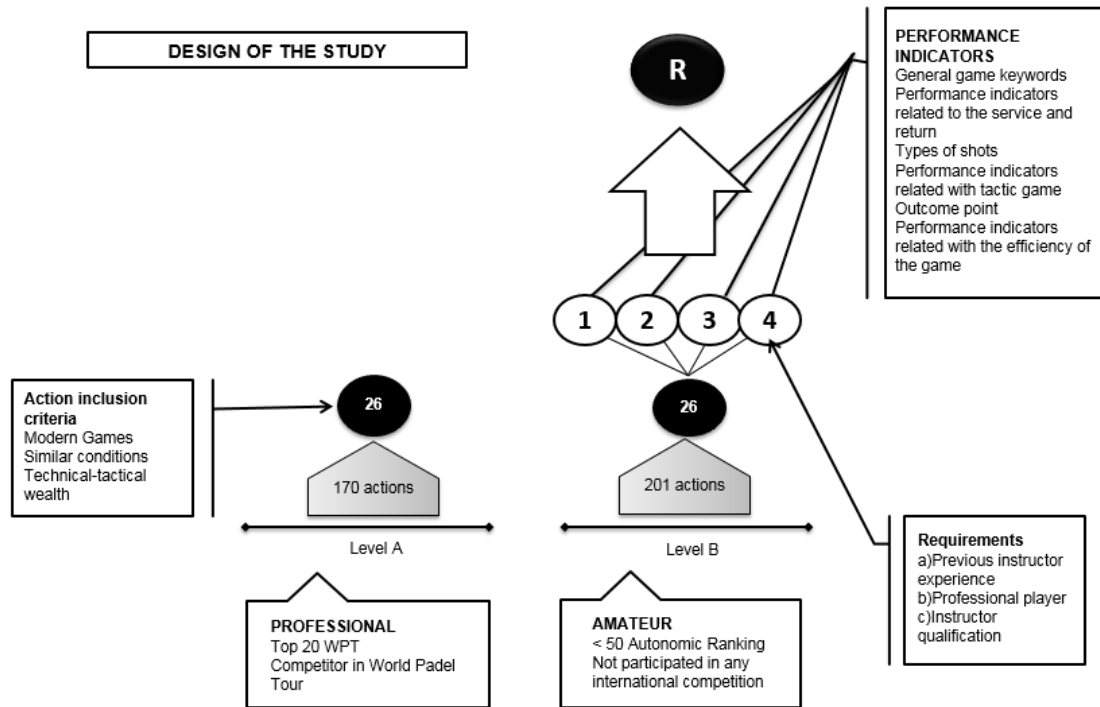
To assess the appearance of the game variables and their relevance, twenty-six game sequences within a professional match (170 technical-tactical actions) were selected. Another twenty-six (201 actions) at amateur level were selected, making a total of 371 game actions.

The number of sequences chosen was a result of selecting a complete game that would exhibit the real game (2013) and collect a high number of actions rich in technical-tactical elements.

To avoid potential errors in the data interpretation, sequences with identical conditions across both levels of the game were selected (same type of pitch, in the same covered air-conditioned space and with the same ball brand).

An amateur player was defined as a player that hadn't participated in any international competitions or ranking below the 50<sup>th</sup> position. The professional

category was defined as those who participated in the World Padel Tour (WPT) and ranked within the top 20 on an international level.



**Figure 1.** Diagram showing the design/structure of the study. Includes: Experts meeting, valid indicators, sample inclusion criteria, process to calculate the reliability of the measurement and analysis of the proposed indicators.

## PROCESS

### Validation of the technical-tactical indicators. Delphi methodology

To validate the technical-tactical performance indicators in padel, a meeting of experts was held following the stages and criteria of the Delphi methodology during the whole validation process that Linstone and Turoff (1975) established. Before the expert agreement stages, the experts who would be participating in the panel were selected fulfilling the steps that Bisquerra (2004) establishes.

For the validation process to be satisfactory and to avoid possible bias, the “expert judges” must adapt to the study material as well as justify why they have been chosen as expert judges (Zhu, Ennis, & Chen, 1998). Most authors suggest a minimum of 10 expert judges per panel (Dunn, Bouffard, & Rogers, 1999; Linstone & Turoff, 1975). Compliance with these factors makes this validation process more powerful and resilient.

The panel of experts that will validate the questionnaire was made up of 13 experts. Out of the 13 experts consulted, only one didn't meet the requirement and did not participate in the process.

To select the experts considered for this investigation it was essential to calculate the competency (K) ratio of each of them. This way we would understand if their opinions were, or were not, justified. The competency ratio was obtained by calculating the ratio of knowledge to argumentation, where:

$$\text{Competency ratio } K = 0.5 \cdot (K_c + K_a)$$

Competitors values above 0.8 confirm the high levels of expert competence about the subject and, therefore, their opinions are to be taken into consideration for their high relevance.

To validate the items from the questionnaire committed to the prospective method of Delphi and following the bibliography (Bisquerra, 2004; Linstone & Turoff, 1975), it was considered that those items for which evaluation by the experts was above the value of seven in the scale would be included as performance indicators in padel.

With the objective of improving the edition of the questionnaire, this was supervised by a linguist who, without knowledge on the subject, was made participant of the process with the goal of correcting the possible mistakes in the edition. For the making of the questionnaire, due to the lack of investigations, the investigator used her experience and knowledge to originate the questions to value. The instrument was elaborated in a way that before every item to be evaluated, the answers were as closed as possible, but at the same time, giving the possibility to explain or add some observation

A summary of this questionnaire for one the questions is presented in Figure 2. The real questionnaire included each of the questions designed for the indicators shown in Table 4, Table 5, Table 6, Table 7, Table 8 and Table 9.

Performance indicator..."Unforced error"	1	2	3	4	5	6	7	8	9	10
<p>In what measure do you consider that this item should be part of the questionnaire?(1-10): _____</p> <p>In what measure do you consider that this item is well elaborated? (1-10): _____</p>	OBSERVATIONS:									

Figure 2. Type of Questions of the Experts Reunion.

### Reliability of the systematic observation sheet

To obtain the reliability of the interobservers measurement in the systematic observation sheet (SOS), the observers registered the same 371 actions of game. Each of them had been provided with the systematic observation sheet and a CD or pen drive with the videos of 26 sequences (points) of amateur game and 26 sequences (points) of professional game. They were given enough



time for the data collection. The collected data was passed back onto Excel for its further statistical processing in SPSS.

## STATISTICAL ANALYSIS

The indexes Kappa of Cohen (K) were calculated to evaluate the reliability of its measurements and interobservers observations using the systematic observation sheet. The statistical analysis of the data has been treated with the statistic package SPSS version 20.

## RESULTS

### Validation of the performance indicators. Prospective Method of Delphi

The coefficient of Knowledge or information (Kc) was obtained from the self-assesments of the experts about their own level of knowledge on the sujet in question and obtaining values above 0.7 in all of them (Table 2).

The coefficient of Argumentation (Ka) was obtained from the evaluation of the level of substantiation of the topic obtained after the analysis of the answers of the experts against one same question with which it was intended to assess a group of aspects that influence the level of argumentation or substantiation of the subject to be studied.

The evaluated question was: “Do you consider that the current tactics of game have evolved in relation to the tactics used in the early stages of this sport? As a result, have the technical gestures been modified? Which tactics of game do you consider prevailing in the current play? Do you know any case study in this regard?”

Experts	1	2	3	4	5	6	7	8	9	10	11	12
Kc	1	0.8	0.9	0.8	0.7	0.8	0.9	0.8	0.9	0.8	0.8	0.7
Ka	0.9	1	1	0.9	1	0.9	0.8	0.8	0.9	1	1	0.8

**Tabla 1.** Coefficients of Knowledge and Argumentation of the components of the reunión of experts.

Once the values of the Coefficient of Knowledge (Kc) and the Coefficient of Argumentation (Ka) were obtained, the values of the Coefficient of Competition (K) of each of the experts were calculated (Table 3). Two rounds of assesment were needed to find unanimity in the valuations, obtaining values above 7 in all the proposed items. For this reason, all the indicators will be part of the final proposal.

As represented in Table 3, all the experts had high levels of competence, and thus their contributions were considered very accurate and taken into

consideration when determining the indicators of technical-tactical performance in padel.

Experts	1	2	3	4	5	6	7	8	9	10	11	12
$K=0.5(Kc+Ka)$	0.95	0.9	0.95	0.85	0.85	0.85	0.8	0.9	0.9	0.9	0.9	0.75

**Tabla 2.** Coefficient of Competence of the Experts.

### Variables resulting from the validation process

The resulting variables, some of them drawn from the proposal of Read and Edwards (1992) considering that padel is a sport of net and wall, were selected from the result agreed by the experts panel and were grouped into 6 different categories, general descriptors of the match (Table 4), service and return (Table 5), types of shot (Table 6), Tactic (Table 7), completion of point (Table 8) and game efficiency (Table 9).

<p><b>Number of shots played per Match, Set, Game and Point:</b> Sum of actions of game from the time the point starts until it finishes, that is to say the total number of shots delivered per each point. These will be also counted per each game, set and in the whole of the match.</p>
<p><b>Number of Points per Match, Set and Game:</b> Sum of the number of points played in every game, set and during the whole match.</p>
<p><b>Score:</b> Scoreboard and result of every point played.</p>
<p><b>Rally length (s) Duration of the Points, Game, Set and Match:</b> Total time of game played since the first shot until the point is concluded. Per each game it will be the aggregate of the total times of each point. The duration of the set will be obtained from adding the Total Time of each game and the duration of the game from adding every set played.</p>
<p><b>Frequency of shots per player:</b> Relation between the number of total shots and each player.</p>

**Table 4.** Indicator of performance related to the general descriptors category of the match.

<p><b>General Data of the Service:</b> Frequency and percentages of First and Second services.</p>
<p><b>Number of double faults</b></p>
<p><b>Area of direction of the Serve (2A,2B,3A):</b> The bounce of the ball will be registered once the service has been completed, assigning one of the three areas in which the rectangle for service is divided. The rectangle for service is divided into 3 areas (2A,2B,3A). (See in Annex II the areas of division of the service).</p>
<p><b>Area of return direction (1-6):</b> Each side of the court has been divided into 6 areas (See Annex II). The area where the rival strikes will be registered in case of continuation of the point or where the action of the receiver's shot puts an end to the point, identifying this with one of the 6 areas into which the side of the padel court is divided.</p>
<p><b>Type of return:</b> The type of return will be selected from the different possible types of shots. The report provides all the possible types of return:</p> <ul style="list-style-type: none"> <li>- Forehand without wall</li> <li>- Forehand Sidewall: Ball hits the sidewall and then it's hit with the forehand or drive.</li> <li>- Forehand Double wall opening: Forehand that happens after the ball hits two walls, first the sidewall and straight after the back wall before bouncing for the second time.</li> <li>- Forehand Double wall closing: Forehand that happens after the ball hits two walls (first the back wall and straight after the sidewall before bouncing for a second time).</li> <li>- Forehand Facade: Returning the ball from the forehand using the wall of your own side of the court.</li> <li>- Backhand Facade: Returning the ball from the backhand using the wall of your own side of the court.</li> <li>- Backhand without wall</li> <li>- Sidewall backhand: The same way as the Forehand Sidewall but striking with a backhand.</li> <li>- Backhand double wall opening: Similar shot to the forehand double wall opening but backhand shot.</li> <li>- Double wall that closes with a backhand: Similar shot to the forehand double wall closing but backhand shot.</li> </ul>
<p><b>Execution Mode of the Return (Lob or Low):</b> Low (lower) Return: When the shot with a background is considered to be rectilinear or downwards. Lob: When the hit of the service it's executed with an upwards performance of the ball and the goal of directing this one to the area of the back of the court.</p>

**Table 5.** Performance indicators related with the Category of Service and Return.

The classification of the types of shots that was part of the first round of the panel of experts was retrieved from the proposal that Almonacid made (2012). This previous classification of 24 types of shots, was completed and reformulated after the opinion and evaluation of the 12 components of the panel. The new classification will serve as a basis for our new systematic observation sheet that is presented in Table 6.

BACKHAND SHOT	NET SHOT
Forehand without wall: D	Forehand volley: VD
Backhand without wall: R	Backhand volley: VR
Forehand sidewall: PLD	Forehand drop shot: DED
Backhand Sidewall: PLR	Backhand drop shot: DER
Forehand end wall: PFD	Smash: REM
Backhand end wall: PFR	Bandeja: BAN
Forehand double wall closing (back-side): 2CD	Smash x3: X3
Forehand double wall opening (side-back): 2AD	Smash x 4: X4
Backhand double wall closing (back-side): 2CR	Smash power: SP
Backhand double wall opening (side-back): 2AR	Viper: VIB
Forehand mesh: MD	Smash feint: FR
Backhand mesh: MR	Counterattack forehand: CAD
Forehand double wall: CD	Counterattack backhand: CAR
Backhand double wall: CR	
Forehand drop wall: BD	
Backhand drop wall: BR	
Forehand half volley: BTD	
Backhand half volley: BTR	
Special: ES	

**Table 6.** Performance indicators related with the category Types of Shots in Padel and their acronyms.

<p><b>Area of the court where the ball is hit:</b> Every part of the padel court has been divided into 6 areas to register the hits that take place during the points (See Annex II the areas of division of the padel court).</p>
<p><b>Way of hit:</b> Way of returning the rival's hit. This category has been determined by 4 levels of variable, Attack, low Defense, high Defense and Lob.</p> <ul style="list-style-type: none"> <li>- Attack: Way of execution of the shot that usually is played in the situation of a driveline advantage over the rival in which the ball is hit downward and usually with the intention of finalising the point.</li> <li>- High Defense: Ball hit in a situation of positional disadvantage with regard to the rival that causes the ball to be hit over the waist without exceeding the height of the head.</li> <li>- Low Defense: Ball hit in a situation of position disadvantage with regard to the rival that causes the ball to be hit below the waist.</li> <li>- Lob: Way of hitting the ball with which we give an upward trend that is typically aimed to the back of the court area.</li> </ul>
<p><b>Distribution of the winning shots per types of shots and per areas:</b> Areas of the court where the point is finalized, with the winning shots and the types of shots that have been made.</p>
<p><b>Distribution of errors per types of shots and per areas:</b> Areas of the court in which the forced and unforced errors have been made, together with the types of shots.</p>
<p><b>First shot prior to the outcome of point:</b> Shot that precedes the shot with which the point ends.</p>

**Table 7.** Performance indicators related with the tactic category in padel.

<p><b>Winner shots – Winners (W):</b> Shot that because of its effective execution gets the direct point and the outcome of game (Cabello, 2000).</p>
<p><b>Unforced error (ENF):</b> Errors made by the player when the previous action of the opponent does not entail any complication to be returned without failing. (Cabello, 2000).</p>
<p><b>Forced Error (EF):</b> Error returning a ball caused by a right shot made by the rival and that involves the loss of the point played.</p>
<p><b>Distribution of winner shots/errors:</b> Relation between the total number of winner and error (forced and unforced) points of a player or a couple of players.</p>

**Table 8.** Indicators of performance related the outcome point

<p><b>Relation between total break points and the break points won:</b> Rate between the number of break points played and the break points won by the player or couple of players.</p>
<p><b>Relation between total advantages in favour and advantages in favour won:</b> Rate between the number of advantages in favour played and the advantages won by the player or team.</p>
<p><b>Relation between total Set points and set points won:</b> Rate between the number of total set points and the set points won by the player or team.</p>
<p><b>Relation between total match points and match points won:</b> Rate between the number of total match points and the match points won by the player or team.</p>

**Table 9.** Indicators of performance related to the category of efficiency of the game.

## Reliability of the observations

Once the validation of the content was solved, and therefore the indicators validated by the experts, the systematic observation sheet was developed. In order to assess the reliability among different observers, they were provided the sheet to analyze selected game actions at each level of performance, by viewing a video of the same.

Considering that some of the TTI were obtained from the combination of the others, the sheet has shown uniquely those collected directly during the execution of the game itself. Once the data was obtained and collected, the rest of the variables were calculated in an indirect way.

The values from the Kappa´s test show a high degree of agreement with the interobservers for all the analysed categories (Table 10 and 11). Therefore, this high consistency in what was registered guarantees the reliability of the measurements registered in the sheet.

		Professional			Amateur		
		Ob.2	Ob.3	Ob.4	Ob.2	Ob.3	Ob.4
Type of Stroke	Ob.1	0.780	0.750	0.824	0.962	0.943	0.867
	Ob.2		0.795	0.863		0.937	0.848
	Ob.3			0.787			0.911
	Range	0.750 - 0.824			0.848 - 0.962		
Area of hit	Ob.1	0.783	0.767	0.839	0.864	0.865	0.772
	Ob.2		0.750	0.815		0.732	0.878
	Ob.3			0.799			0.732
	Range	0.750 - 0.839			0.732 - 0.878		
Out. point	Ob.1	0.981	0.943	0.981	0.983	1	0.965
	Ob.2		0.962	1		0.983	0.948
	Ob.3			0.962			0.965
	Range	0.943 - 0.981			0.948 - 0.983		
Way of hit	Ob.1	0.865	0.824	0.844	0.968	0.893	0.817
	Ob.2		0.869	0.822		0.860	0.785
	Ob.3			0.816			0.922
	Range	0.816 - 0.869			0.817 - 0.968		

**Tabla 10.** Values of the Kappax Index for the study of reliability of interobserves in the categories Type of stroke, Area of court, Way of hit, and Outcome point (out. point)

Table 10 represents Kappa's values for the type of shot category. In the amateur professional category, the observers select in most of the cases the same type of shot from the classification provided. The values above 0.7 from Kappa's index show this. In the same table, the observers' Kappa's index is summarised when they register the categories of type of shot, area of shot and end of shot during the observation of the analysed game sequences.

From the information referring the serve, in the categories of player that serves, service (first or second) and outcome of service, there have not been no significant differences between the observations; the reality that the observers see is the same.

We find the same situation when analysing the inter-observers reliability of the categories referring to the information collected about the scoreboard and the return (type of return and outcome). Values of 1 in Kappa's index show the maximum agreement between observers.

As the results from Table 11 show for the indicators areas of direction of the service and the return and the type of return, the values obtained have been very close to 1, which guarantees that the observers register practically the same when they analyse the actions of the game.

		Professional			Amateur		
		Ob.2	Ob.3	Ob.4	Ob.2	Ob.3	Ob.4
Area of Service	Ob.1	0.920	0.939	0.940	1	1	0.964
	Ob.2		0.940	0.940		1	0.964
	Ob.3			0.960			0.964
	Range	0.920 - 0.960			0.964 - 1		
Direc. Return	Ob.1	0.761	0.805	0.826	1	1	0.852
	Ob.2		0.913	0.847		1	0.852
	Ob.3			0.826			0.852
	Range	0.761 - 0.913			0.852 - 1		
Type of Return	Ob.1	0.978	0.933	1	1	1	0.978
	Ob.2		0.955	0.978		1	0.978
	Ob.3			0.933			0.978
	Range	0.933 - 1			0.978 - 1		

**Table 11.** Values of the Kappa's Index for the study of the interobservers reliability from the categories Area of Service, Direction of the Return (Direct. Return), and Type of return.

## SYSTEMATICAL OBSERVATION TOOL

The final result of the process will be a systematical observation tool “ad hoc” (See Annex 1), organised in a system of categories that collects the TTI obtained as a result of the modifications after the first and the second round of the panel. The resulting questionnaire of the Delphi process collected the [proposed items, the experts' evaluations and the measured variables registered in a reliable way by the observers.

## DISCUSSION

This study is intended to design and validate an instrument that collects indicators of technical and tactical performance relevant in padel at a professional and amateur level for the purpose of creating a quantified register of the key elements of competition in a valuable and coherent way.

## WITH REGARD TO THE VALIDATION PROCESS

Regarding the validation of the performance indicators, as it is shown in tables 2 and 3, it justifies the high degree of competence of the participating experts in the panel; the resulting indicators during the Delphi process could be used to measure technical and tactical performance in padel at different levels of the game.

This type of methodology has also been used for the validation of performance indicators and the design of observation tools in other sports (Ortega, Jiménez, Palao, & Sainz, 2008; Pradas et al., 2010; Santos, Sarmiento, Alves, & Campaniço, 2014).

As in the study of Ortega et al. (2008) and the one from Santos et al. (2014), the number of experts in the panel with a high level of competence goes over the dozen, as our study demonstrates (Table 3). This supports the validation of the content of the process with regard to the information and the knowledge that the experts have in the definition of the TTI and later proposed for the analysis in padel of the different levels of game.

### **With regard to the stability process of the observations**

The HOS that collected the TTI has optimal levels of reliability for the register of these in players from different competitive levels. The values from Kappa's test showed a high degree of interobservers agreement ( $K > 0.8$ ) for all the analysed categories.

The observers are capable of differentiating between the different levels of variable of each of the performance indicators proposed. They could differentiate actions of attack, high and low defense and lob, area of the court where the player hits the ball and directs the shot between the 6 possible areas of outcome the shot; with a winning shot, forced error, unforced or if it continues the point and the different options of serve and return.

The indicators that obtained higher values of reliability with maximum values ( $K=1$ ) are those referred to the information of the service. Values very close to one, over 0.9, were obtained in indicators that referred to the way of ending the point (ENF, EF and W) (Table 10) and the area of direction of the service and the type of return (Table 11).

Values under the 0.9 and over 0.75 were given in the rest of indicators. In all the cases, the data obtained for each of the indicators shows a high degree of reliability at the time registered by the HOS. For such reason, they were included in the system of observation that will collect these indicators as a way of category and will shape the tool of observation "ad hoc" following the instructions of Anguera, Blanco, Losada, and Hernández (2000).

Due to all the above, it is considered that the register guaranteed the reliability of the measurements that could be collected, i.e., that the observers categorised the different actions of game in the same way.

As a practical application, the system of observation proposed will help to determine the relevant information about the game itself and allow to know padel better, contributing to guide and plan the trainings of the real game and the individualities of each player or team.

## **CONCLUSIONS**

The conclusions of this study can be summarised in two statements:



a) The indicators of technical and tactical performance proposed have been validated by experts with a high level of competence, and

b) The observations made by different observers using the observational systematic sheet generated a very acceptable reliability.

For this reason, we consider that this is a very useful tool for the observational analysis in padel.

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**ANNEX 1. OBSERVATIONAL SYSTEMATIC SHEET; EXAMPLE OF REGISTER FROM THE PROFESSIONAL CATEGORY**

Score	Point	Duration of Point (s)	SERVICE				RETURN				SHOT				Area of outcome of point	Shot W	Final Shot	Shots per point
			Player	Service	Area	Outcome	Type	Mode	Area	Outcome	Player	Type of Shot	Mode	Area				
0-0	1	13	3	1	3A	C	D	B	2	C	3	VD	A	5				11
											2	PFR	DB	4				
											4	VR	A	5				
											2	D	G	6				
											4	BAN	A	4				
											2	VR	A	5				
											4	R	G	2				
											1	REM	A	2				
											4	MD	A	1	ENF	2		MD
0-15	2	8	3	1	2A	C	R	B	2	C	3	VD	A	1				6
											1	R	G	6				
											3	SP	A	6				
											2	CAD	A	4	W	4	CAD	
0-30	3	5	3	1	2A	F												5
				2	2A	C	R	G	6	C	3	FR	A	3				
											2	VD	DA	2				
											3	VR	A	2	W	2	VR	
15-30	4	7	3	1	2A	F												4
				2	2A	C	R	G	5	C	4	BAN	A	3				
											2	VR	A	2	W	2	VR	

## ANNEX II. DIVISION AREA FROM THE PADEL COURT AND THE AREAS OF DIVISION OF THE SERVICE

