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Director: Fernando Emilio Valladares Fuente

Email: [fernando.valladares@upr.edu.cu](mailto:fernando.valladares@upr.edu.cu)

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Original article

## Fundamental characteristics of competitive activity for Rugby Sevens in the international context

### Fundamentales características de la actividad competitiva para el Rugby Siete en el contexto internacional

### Principais características da atividade competitiva do Rúgbi de Sete no contexto internacional

<sup>1</sup>"Manuel Fajardo" University of Physical Culture and Sport Sciences. Havana, Cuba.

Lestter Frias<sup>1\*</sup>  <https://orcid.org/0000-0001-9359-0166>

Yusimi Ramos<sup>1</sup>  <https://orcid.org/0000-0003-3488-5700>

\*Corresponding author: [lestterff@uccfd.cu](mailto:lestterff@uccfd.cu)

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## ABSTRACT

The main objective of this research was to characterize the Rugby Sevens competition from the competitive performance in real game conditions, allowing to know in detail the specific conditions in which a Rugby Sevens match takes place; serving fundamentally as an organizational tool for Cuban Rugby coaches, when planning the process of preparing first-rate Rugby players. For the development of the research, it was determined to select the Rugby Sevens World Cup "San Francisco 2018". Indirect observations and measurements were made through the Video Technique to the 35 most demanding matches for the female and male sex; accounting and tabulating the



competitive performance of the players, where the selection criteria was directed in the number of passes, kicks, Scrum, Line Up, Ruck, Moul and tackles made by matches, representing the average of the elements and the most representative matches for each sex, in addition to the time of completion of the actions; as well as a bibliographic review of the Rugby regulations and the variations for the Seven modality corresponding to the year of the World Cup under study. It was started from the characterization of Rugby Sevens through 11 indicators of internal factors of competitive activity. As a result, the fundamental characteristics for Rugby in the Sevens modality were determined in first level competitions, this being the fundamental resource to obtain the demands of competitive activity.

**Keywords:** detailed characterization; performance; competitive activity.

## RESUMEN

La presente investigación tuvo como principal objetivo caracterizar la competición de Rugby Siete a partir del desempeño competitivo en condiciones reales de juego, permitiendo conocer de forma pormenorizada las condiciones específicas en que se desarrolla un partido de Rugby Siete que sirve fundamentalmente como herramienta organizativa a los entrenadores de Rugby cubano, en el momento de planificar el proceso de preparación del Rugbiers de primera categoría. Para el desarrollo de la investigación, se determinó seleccionar el pasado mundial de Rugby Siete "San Francisco 2018". Se le realizaron observaciones y mediciones indirectas mediante la técnica del video a los 35 partidos más exigentes para el sexo femenino y masculino, se contabilizó y tabuló el desempeño competitivo de los jugadores, donde el criterio de selección estuvo dirigido en cantidad de pases, pateos, Scrum, Line Up, Ruck, Moul y tackles realizados por partidos, lo que representó la media de los elementos y los partidos más representativos para cada sexo, además del tiempo de realización de las acciones, así como una revisión bibliográfica al reglamento del Rugby y las variaciones para la modalidad de Siete, correspondiente al año del mundial objeto de estudio. Se partió de la caracterización del Rugby siete a través de 11 indicadores de factores internos de la actividad competitiva. Como resultado, se determinaron las características fundamentales para el Rugby en la modalidad de Siete en competiciones de primer nivel, siendo este el recurso fundamental para obtener las exigencias de la actividad competitiva.

**Palabra clave:** Caracterización pormenorizada; Desempeño; Actividad competitiva.

## RESUMO

O principal objetivo desta investigação foi caracterizar a competição de Rúgbi de Sete a partir do desempenho competitivo em condições reais de jogo, permitindo conhecer em detalhe as condições específicas em que um jogo de Rúgbi de Sete é desenvolvido, o que serve principalmente como uma ferramenta organizacional para os treinadores de Rúgbi cubanos, aquando do planeamento do processo de preparação da primeira categoria de Rúgbis. Para o desenvolvimento da investigação, foi selecionado o último Campeonato Mundial de Rúgbi de Sete "San Francisco 2018". Observações e medições indiretas foram feitas utilizando a técnica de vídeo aos 35 jogos mais exigentes para os sexos feminino e masculino. O desempenho competitivo dos jogadores foi contado e tabelado, onde os critérios de seleção se basearam no número de passes, pontapés, scrums, alinhamentos, rucks, mouls e tackles feitos por jogo, que representaram a média dos elementos e jogos mais representativos para cada sexo, bem como o tempo necessário para realizar as ações, e uma revisão bibliográfica do regulamento do Rúgbi



e das variações da modalidade de Sete, correspondente ao ano do Campeonato do Mundo em estudo. O ponto de partida foi a caracterização do Rúgbi de Sete através de 11 indicadores de fatores internos de atividade competitiva. Como resultado, foram determinadas as características fundamentais para o Rúgbi de Sete em competições de alto nível, sendo este o recurso fundamental para obter as exigências da atividade competitiva.

**Palavras-chave:** Caracterização detalhada; Desempenho; Atividade competitiva.

## INTRODUCTION

Historically, the importance in the organization of the sports preparation process of the more or less detailed description of the competition scenario, i.e., the actions of the competitors and the characteristics of the physical environment (Frías, 2021) is well known.

Almost by consensus, Matveev (2001; Verkhoshanski (2004); Platonov (2015); Bompa and Buchelli (2019) among others, have started from the assumption that training is the process of adaptation of the practitioner to the demanding conditions of sports competition, with the aim of obtaining considerable sports achievements, which also imply the need for the description of the competition in question.

However, Matveev (2001) does not suggest the concrete way to do it, Ozolin (1989), in "Contemporary system of sports training", advances a brief methodology to make it clear, but limited because it focuses on the competitive modalities of swimming. García *et al.*, (1996) and Verkhoshansky (2002), on the other hand, emphasize aspects specific to the subject, such as: heart rate and blood lactic acid concentration which, although, for the author, perhaps do not have great scope due to the known genotypic and phenotypic differentiation from one athlete to another, evidently intend to refer to the need to build a successful competitor model.

Rugby as a sport has undergone multiple changes over the years since its professionalization in 1995. Authors such as (Brannigan, 2016; Gill, 2019; McMahon *et al.*, 2021), report functional and anthropometric studies of Rugby competition with full aid of the scientific and technological method, but in the modality of 15 players. Since the inclusion of Rugby Sevens in the program of the Olympic Games, this modality has taken every day more followers, interested in optimizing the training processes in search of greater competitive results, (Loturco *et al.*, 2017; Schuster *et al.*, 2018; Henderson *et al.*, 2019 a, b; Rodriguez and Galvez, 2021) are among the most active coaches and researchers in the last quadrennium, employing accurate means of measuring and monitoring players, even, in competitive conditions that allow them to estimate, at least, the physical demands of the Seven modality. Others such as (Higham *et al.*, 2012; Granatelli *et al.*, 2014) prefer to inquire about the recovery and fatigue processes evidenced by training or games, exhibited by their best performing players and as necessary conditions for sports performance in the modality. But none specifically establishes the necessary demands of competitive activity for the first level Rugby Sevens game.

Within the American continent, undoubtedly, the most prestigious sport-scientific coaches are the Argentines; among them, we have researchers such as those of Professor (Perasso, 2008 a, b; Dionisi, 2020), but based essentially on traditional Rugby and far from describing aspects of competitive activity.



A detailed description of the competitive activity is necessary to determine its requirements or demands. Frías (2021), uses a methodology for Rugby Sevens taking a set of indicators for sports fundamentally of tactical objective, which allow obtaining the associated value that ensure the description of the competitive scenario and that has been used for studies of trends in competitive activity.

These indicators are classified into three main groups, the first of which is conditioned by the regulations. The first indicator is the *actual and total duration of the presentations*, which refers to the duration of the game, according to the regulations (total) and the actual, equivalent to the sum of one time and the other, counting the rest. A second indicator is the regulatory time between presentations. In addition, there is the *number of presentations to be among the first*, which has to do with the organization charts used, taking into account the number of participating teams. Another aspect to evaluate is the *Approximate duration of the competition*, which refers to the duration of the competitive activity, which depends on the number of presentations and the way the competitions are organized. There are also the *spatial or temporal limitations*, which depend on the area where the competitive exercise takes place, as well as the positions and displacement of the rugby players on the field. And finally, there is the *criterion of effectiveness of the actions*, which is the way in which the actions are valid; the winner is the team that, regardless of the quality of the execution of the technical elements, manages to accumulate the most points during the two halves of the game through the scores.

In a second group of indicators, there are those that describe the actions that are applied. There is the classification of the actions, which can be acyclic, varied or polystructured and, with respect to their functions, they can be offensive or defensive. And the functional structure of the actions, which, through this indicator, it is possible to appreciate which are the modes of relationship that take place between the functions of the body segments involved in the actions.

Within the last group, there are the indicators that define the effect on the participating subjects. The first indicator is the predominant type of perception, which allows identifying the perceptions that should be the object of education and specialization in training in order to be able to apply the correct actions within the game. The second indicator is the density of the loads in the competitive exercise, which represents the number of actions that are executed, both offensively and defensively. The last indicator is the *character of the efforts*, which allows inferring the energetic cost of the executed action.

## **MATERIALS AND METHODS**

A documentary review of the Regulations was carried out, with the objective of describing the regulated forms of space and time limitations during the competitive exercise of Rugby Sevens. As a unit of analysis, "Rugby Laws and Regulations" issued by *World Rugby*, as well as the "Regulations of the rules for the game of Rugby Sevens", corresponding to the 2018 edition (Rugby, 2018) would be used. The indicators analyzed were the regulations on the immediate environment of performing the competitive exercise and the regulatory limitations of the execution time and pauses during the performance of the competitive exercise.



Indirect observations and measurements were also carried out using video technique, with the main objective of describing the competitive exercise of Rugby Sevens from the most demanding games, taking as a sample 35 matches of the Rugby Sevens World Cup, San Francisco, 2018. The most important Rugby Sevens competition, subsequent to the Summer Olympic Games and which had implied the greatest amount of regulations and regulatory changes to the Rugby Sevens modality, from its Olympic participation, was used as a selection criterion. The observations were carried out by the three maximum responsible for the sport preparation process of the Cuban Rugby Sevens team, with an academic formation: 2 Masters in Physical Culture Sciences; 1 in Biological Sciences, the three coaches with certification of international levels of *Officiating* and *Couching*, granted by the international Rugby federation with more than 10 years of sport experience.

Video files in digital extension format (\*.fly), computer, Sport Timer IHM stopwatch and KMPlayer 3.4.0.59 video file playback software were used as measurement media or instruments.

## RESULTS

From the analysis of the 11 indicators for the detailed characterization of Rugby Sevens, the following results were obtained within the 6 indicators that were conditioned by the Regulations. The duration of the real and total time of the matches resulted in an average total time of 9:50 minutes and the most demanding match for the women's team did not exceed 7:30 minutes. For the cup finals, the total average time was 11:30 minutes, both for the men's and women's games. The regulatory time between presentations was set at a minimum of 15 minutes. The *number of presentations to be among the first places* in a Rugby Sevens competition is between 5 and 6 matches in official competitions. The *approximate duration of the competition*, in general, is characterized for being developed in two days according to the first level Rugby Sevens events organized by the *International Rugby Federation*.

The first day is the group elimination rounds and the second day is the Semi-Finals and Finals. The *spatial or temporal limitations* for Rugby Sevens were obtained as a result of the time of play during the actions of groupings within the game did not exceed 5 seconds without a clear conquest of the ball, the players do not intentionally delay the development of the game always advocating the fast, dynamic game and with the least intervention of the officials, making the most of the time and playing area. There are also other regulations of space and time from the interaction between players within a Rugby match that are specifically regulated by the different situations of the game specifically reflected in the location of the offensive players with respect to the location of the defensive players, the separation between rugby players regulates the type and mode of action to be performed, the speed, direction and way of movement in the area will determine the exact time to perform a particular action.

The *criterion of effectiveness of the actions* for Rugby is of realization since in the Rugby Sevens matches wins the team that regardless of the quality of the execution of the technical elements, manages to perform the actions effectively accumulating the most points through the scores either by *Try* with a value of five points, *Try Penalty* with a value of five points and *Drop Goal* with a value of three points (Table 1).



**Table 1.** - Indicators for the characterization of the competitive activity

COMPOSITION OF THE ACTIVITY	INDICATORS
<b>Conditioned by regulations</b>	1-Actual and total duration of presentations
	2- Regulatory time between presentation and exercise
	3- Amount of presentations to be among the first ones
	4- Approximate duration of the competition
	5- Spatial or temporal limitations
	6- Criteria for effectiveness of actions
<b>Description of actions to be implemented</b>	7- Classification of shares
	8- Predominant type of stimuli
<b>Define the effect on the participating subjects</b>	9-Tipo de estímulos predominante
	10- Density of loads represented by competitive
	11- Character of the efforts

Among the indicators that regulate the actions that are applied is the classification of actions. Rugby Sevens is a sport that due to the variability of the actions and multiple referee interruptions has a varied acyclic structure and that due to the use of the components of the preparation to solve the various situations that occur in the games has a tactical purpose, being classified into two situational systems: offensive and defensive. The types of actions can be simple or complex.

Offensive elements: the use of the ball in this modality is quite varied since it can be passed in any way, but with the limitation that it must be backwards or in the same passing line, a pass is declared when the ball is thrown from one player to another with the hands, arms, head, trunk and thighs; never forward. Among the most used types of passes is the Basic pass used mainly in short distances between players, it guarantees the safe transmission of the ball; the spiral pass is the type of pass that is most used by first level players product to the real distances during Rugby Sevens matches, players are able to reach up to 20 meters; the backhand pass, this type of technical element was not the most used by the players, but with a high efficiency, the pigeon pass was the element that allowed to get the ball without complications in 80 % of the phases of conquest, mainly in the *scrum*.

In Rugby the ball can also be kicked in any direction or zone within the playing area either in the air or rolling on the turf to be taken by a player of his team or to be received by the kicker himself or simply to seek to restructure the defense and for the opposing team to seek possession of the ball. A kick is declared when the ball makes contact with the player's leg or foot, never above the knee. Kicks are the *kick* kicking the ball before it hits the ground or the *drop kick* kicking the ball immediately after it makes contact with the ground.

Running in possession of the ball has essential characteristics in first level Rugby Sevens, manifesting itself in various forms within the game, all with the aim of destabilizing the defense to take advantage of free spaces. The most used elements are the change of pace that can occur with accelerations and decelerations in any of their combinations and the change of direction that can occur from right to left or vice versa.



The offensive elements of cooperation: these are complex actions that allow you to establish pre-established interactions between the players of a team, which are established in different ways depending on the quality of the teams. One of them is the cross, the two most used variants: the true cross, when the ball carrier makes an explosive diagonal change of direction and his closest teammate makes another timely change of direction in the opposite direction of the carrier's movement, making the pass at the moment of the interruption; and the false cross identical to the previous one, here the pass is feigned, but it is not made by straightening the run after the teammate's cross. Another variant is the redouble, which is manifested as a true redouble where the ball carrier makes a pass to the nearest teammate, which very slightly changes direction, approaching the player who received the pass and this player will run in a semicircle behind the new carrier who will return the oval again at the time of the interception on the same side where he received the ball and the false redouble, identical to the previous one, the pass is faked, but is not performed, straightening the run after the teammate's crossing. The false redo with pass is the same as the previous one, but after straightening the run a pass is made on the opposite side to the reception of the pass. The intervals consist of passing the ball to the closest player who enters at maximum speed between two defenders; although the fake variant was also used, where the pass is feigned but not actually made. A very effective combination within the Rugby Seven games in the first level was the false with true interval, where the pass is feigned to the first player who enters at speed and another who enters in the same way by another place close to the carrier, but with a small delay will be the one who receives the ball. A very peculiar action of the forwards was the inside outside inside, a pass is made to the second closest player, leaving the first player slightly delayed between them; this one, after the first pass, will enter at full speed to receive a second pass to the inside of both players.

The defensive elements: contain the *tackle*, which is the defensive element used in Rugby, which can be executed in any area within the field of play, but can only be performed on the ball carrier. The *tackle* must be executed below the shoulders and the tackler will contact the back of the head and neck, trapezius, shoulder, where he must wrap or embrace the opponent's body with both arms and interlocking hands. The most effective types of *tackle* in Rugby Sevens are the *up tackle*, where the player is tackled on the pectoral area, leaving the arms of the ball carrier inside the tackler's grip, preventing him from maneuvering with his arms with total freedom; the *down tackle*, where the player is tackled on the thigh area, making it impossible for him to move. Within the most specialized teams, the mixed *tackle* was observed, where a defender performs a defense above, simultaneously with another defender who performs it below.

The indicator that regulates the *functional structure of the actions* showed that, during most of the general actions that take place during a Rugby Sevens match, the shoulder girdle, upper limbs, trunk, pelvic girdle and lower limbs are involved, since, due to the versatility of the game, most of the muscular segments are involved. During running, passing, kicking and tackling, the muscles involved were mainly the deltoids, trapezius, paravertebral, round, dorsal, rectus abdominis, obliques, gluteus, quadriceps femoris, biceps femoris, calves and tibialis. The most involved joints are scapula-humeral, humero-radiocubital, coxofemoral, knee and ankle. In conquest actions such as the Ruck, Moul, Scrum and Line-up, the musculature involved are the deltoids, trapezius, paravertebral, round, dorsal, rectus abdominis, oblique, gluteus, quadriceps femoris, biceps femoris, calf and tibialis. The most compromised joints are the scapulohumeral, humero-radiocubital, coxofemoral, knee and ankle.



Among the three indicators that define the effects on the players are the *predominant types of stimuli*. Rugby players must see where the opponents are located, how their teammates are formed, which is the most feasible area to attack or the most vulnerable to defend, where and to where the ball is moving, predominantly visual stimuli. But, in addition to these, proprioceptive stimuli play a fundamental role during repeated physical contact actions, both for attackers and defenders. A second indicator is the *Density of the loads presented by the competitive exercise*, resulting in the average number of passes made in a match was 31 and the most demanding match up to 56 passes; kicks, not counting those at the start and restart of the games, averaged two and, in the most demanding match, nine kicks were made. In the defensive field, tackles averaged 14 per game and in the most demanding game, 19 tackles were made. It should also be taken into account for the tabulation of data in the density of actions, that in the phases of conquest, initially, it is not defined which team is defending or which is attacking until possession of the ball is obtained through an impartial fight, so that both teams are subject to the same efforts within the same action. Rucks were performed with an average of 16 per game and in the most demanding games they reached up to 21, Mouls averaged one per game and in the most demanding game there were five actions performed, Line ups reached 3 per game, with a maximum of 8 and Scrum averaged about four per game and in the most demanding games there were up to seven Scrum.

Finally, the *character of the efforts*. The dynamics with which the Rugby Sevens matches are played are fast and explosive in terms of movements, offensive and defensive actions. As a matter of law, this game is developed from constant disputes in the form of fights for the possession of the ball, giving priority to strong efforts; it is also manifested as a characteristic for Rugby Sevens the resisted efforts, due to the duration of the matches, the prolongation of the disputes and the repetitiveness of the actions.

## DISCUSSION

From the results of the indicators that allow determining the characteristics of the competitive activity, it can be inferred that the Rugby Sevens events due to the real and total duration of the matches, the regulatory time between performances, the *number of performances to be among the first*, the *approximate duration of the competition* and the *nature of the efforts* described in the characterization of the competitive activity, require players to have a great development of aerobic endurance, specifically power to meet the demands of the duration of the game times. It is also necessary the development of aerobic capacity for the duration of the event, mainly ensuring a more efficient recovery in order to face each game with the lowest possible energy debt. (Schoenfeld *et al.*, 2016; Sözen & Akyıldız, 2018; Saladin, 2021).

On the other hand, starting from the spatial and temporal limitations, the classification of the actions, the density of the loads and the *character of the efforts* presented by competitive exercise, it is necessary for rugby players to maintain a high performance in conditions of lactacidemia; mainly, to be able to meet the demands of prolonged actions at high intensities, the lactic anaerobic capacity and to meet the actions of maximum intensity and short duration that manifest themselves in repetitive ways throughout the match the work of lactic anaerobic power, optimizing the development of resistance to explosive efforts and resistance to fast efforts (Wilmore & Costill, 2015; George Theofilidis *et al.*, 2021).



Through the analysis of the *character of the efforts*, the classification of the actions, the criteria of effectiveness, as well as the spatial and temporal limitations, the *functional structure of the actions* and the *type of predominant stimuli*, it is clearly evidenced the great importance that have during the matches the actions of high intensity and short duration with insufficient oxygen, that is to say, anaerobic actions of alactic type, both of anaerobic alactic power and capacity, taking the main responsibility, the development of the speed of action, reaction and of equal repercussion the magnitudes of explosive force and fast force (Broussal & Ganneau, 2017; Fox & Rompolski, 2019; Laursen, 2019; Grgic et al., 2020).

The predominant types of stimuli during Rugby Sevens matches allow to value more general aspects, such as those that are evident in the context of the game, understanding relations of collaboration and opposition that are evident between teammates and opponents; relationship with the mobile, (ball) taking into account the reference, (Try zone) players must be able to assess how each of the elements and actions that occur in the execution of the activity, therefore, will analyze the time and space in which they are manifested in a precise manner. Likewise, it happens with the distance in which the actions occur and it is necessary that this assessment is made in relation to the speed with which the object that moves occurs, in addition, be able to assess in a broad dimension where the different game situations occur, so it must have a high development of what we call "specialized perceptions". It is possible to appreciate the framing development of changes of pace, combined and polystructured actions, the sense of anticipation and coordination that take place without a previous warning or information, so the high development of coordinative capacities is eminently important for Rugby players (Brewer, 2017; Hall & Hall, 2021) (Table 2).

**Table 2.** - Competitive activity requirements for Rugby Sevens

Indicators	Functional capacity	Physical capacity
1,2,3,4,11	AEROBIC (capacity)	Short-time resistance
5,7,10,11	LACTIC ANAEROBIC (capacity-power)	Resistance to Rapidity Strength Resistance
5,6,7,8,9,11	ALACTIC ANAEROBIC (power)	Speed Rapid force Explosive strength

## CONCLUSIONS

The fundamental characteristics of competitive activity for Rugby Sevens in the international context were determined, with the help of a review of international Rugby rules and observations of the 2018 Rugby Sevens World Cup matches.



Eleven reference indicators were used for sports, mainly of tactical objective, which allow obtaining the associated value and ensure the description of the competitive scenario.

The main results are the increase in the dynamics of the games for which up to 58 passes per game and up to 20 tackles were recorded, the predominance of the mixed nature of the activity due to the increase in work intensities and the predominance of the lactic anaerobic capacities due to the gradual increase in the number of actions.

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**Conflict of interests:**

The authors declare not to have any interest conflicts.

**Authors' contribution:**

The authors have participated in the writing of the work and analysis of the documents.



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