

INDICATORS TO EVALUATE BASE RUNNING IN BASEBALL, FIRST CATEGORY FROM MAYABEQUE

H.G. JOSÉ LUIS ¹ M.S. JOSÉ FRANCISCO² V. P. MERCEDES²

Abstract: *In the last seasons of the National Series there has been a loss of the possibilities in the base run by the first category Baseball players. In order to solve this problem, it is proposed as an objective: to develop indicators to evaluate the running of bases in the first category baseball team of Mayabeque. Theoretical methods Historical-logical, Inductive-deductive, Analysis-synthesis, the review of documents, observation of training units and games, the statistical results of the games in front of different teams, surveys, interviews and the measurement with the use of the HUMAN technique to detect the main deficiencies related to the race and other important factors of the base run was decisive to achieve the necessary effectiveness during the competitive exercise.*

The metrics demonstrate a solid framework and methodological foundation for evaluating base running performance. Validation was conducted using specific criteria, which confirmed their effectiveness in improving performance during training and competition.

Key words: *Indicators, Qualitative evaluation scale, Quantitative evaluation scale.*

1. Introduction

Efficiency in mechanics is very important in sports performance, so we must avoid the evaluation of these aspects that are closely linked to sports technique.

In most sports the movements are repetitive, although baseball is and a

cyclical sport, this article aims to focus attention on the base running cycle, emphasizing its particularities.

Movement evaluation can be performed with a trained eye with video analysis or with specialized biomechanical equipment, such as pressure sensors, force plates and

¹ University of UNAH. CUM Bejucal, Cuba

² University of the Sciences of the Physical Culture and the Sport *Manuel Fajardo*, Cuba.

three-dimensional movement analysis programs [2], [7], [10].

Henderson, Kirousis and Gootman, (2012), said: "Each athlete has a unique physical constitution, as well as strengths and weaknesses" [4].

The fastest players are not necessarily the best runners on a team, speed is only one factor, since in most cases speed is deciding when to go out and when not to, together with the action of getting a good start determine the value of a baserunner [6], [9], [11]. Baseball games are won or lost depending on how the bases are run, mentioning that there are other factors of interest but this is of great importance; aggressive base running causes defensive players to rush when making plays and make mistakes, so the importance of running the bases well is obvious, since the greater the aggressiveness, the fewer double plays, the greater the number of extra bases and many other additional advantages [11].

In summary, according to García González, I. (2006), four fundamental factors can be identified to determine the value of a base runner [3]:

- Your natural speed and your reaction speed.
- Their knowledge and ability to judge the game situation.
- His mastery of the fundamentals of base running.

It is good to express that regardless of whether we are in a position to optimize the athlete preparation process on the subject in question, all preparation processes will always be governed by the Comprehensive Athlete Preparation

Program, where the purpose of these aspects is to enrich the same.

Collective of authors consider that the Comprehensive Athlete Preparation Program is a very important tool for the work of baseball coaches, whose effective use will have unquestionable value in the changes generated by the new projection of improvement of Cuban Baseball and the tasks emanating from the National Baseball Directorate that serves as a guide and orientation for its adequacy, compliance, self-control and self-evaluation [1].

2. Materials and Methods

In the research, 100% of the position players, who participated in the 59th and 60th National Baseball Series, of the Mayabeque first category team, were used, this sample being significant within the type of study being carried out.

Sample Characterization.

Average Age Sports Experience National Series average participation
33.8 years 17.7 years 7 Series.

This research used Theoretical and Empirical level Methods, which were useful to carry out the investigative process.

Theoretical Level:

- Analysis-synthesis: To learn the fundamental elements and functionalities of the registration and analysis of information in baseball. It is applicable after establishing the relationships between the components of the object of study and its general characteristics;

making it possible to dialectically interpret the essential components.

- Inductive-deductive: To achieve assertions and generalizations, carrying out particular demonstrations and inferences after stating the necessary conclusions based on a specific logic.

Content analysis: It allows us to verify, through the bibliographic review of various observational methodologies, the advantages and disadvantages to incorporate and correct respectively.

Empirical Level:

- Direct observation: Used to record the base running in the games in which our first-class team participated, during the 59th and 60th National Series and the identification of the functional requirements of the proposed indicators.

Mesa et al (2015) Expert Criteria (Delphi): This was very useful when determining the competence of the experts in relation to the competence of the Indicators, analyzed and the direct impact of these on the success of the offensive action of the base run. [8]

Mathematical Statistics:

- Arithmetic mean, relative frequency and standard deviation: To describe the behavior of base running in baseball, calculate the probability of occurrence of events during a game as an average.

- The foundation of the variables significantly influential in the sporting performance of Cuban baseball and the implementation of indicators from a biomechanical perspective that efficiently affect the criteria, which enrich the theory related to the control of base running in a

correct way. and metrology applied to baseball in these aspects

The practical contributions lie in:

- The evaluation of base running in baseball based on the implementation of KINOVEA as an evaluative and corrective tool of the athlete's technical actions during the action, which is why both athletes and coaches lacked a series of indicators that identify, as You must perform the appropriate running technique, the optimal angle of the different joint sectors that intervene during the execution of the action, the trajectory line that makes it possible to identify if there is a deviation and therefore travel more distance and the table analysis. To box, to help the Global-Fragmentary-Global method. And in turn more running and the use of the fundamental factors on which races depend.

The research designs a group of indicators, for the analysis of base running, that allows investigating Cuban baseball with one of the offensive actions, which is the speed based on making the run, identifying the statistics with the greatest predictive value in tournaments of short duration and contribute to the improvement of the running technique between the bases, optimizing the time of running between bases and achieving the proposed objective which is to gain one more base.

Measurement: It was carried out with the use of KINOVEA to detect the main deficiencies related to running technique and other important factors during the base run; it was decisive to determine the

ideal model during the competitive exercise.

3. Results

During the 59th National Series, 60% of the games of the Hurricanes of Mayabeque team were observed for a total of 27 games and during the 60th National Baseball Series, 45 games were observed, representing 60%, the difference is given that the 59 the qualifying was 45 games and in the 60th Series the qualifying was 75 games, we had enough time and material to analyze the fundamental aspects that help improve the base running technique

in the first category baseball team of Mayabeque.

The fundamental aspects that with the use of KINOVEA, which was decided by the result obtained with the criteria of experts, so that the base running of the aforementioned Baseball team could be analyzed, was the trajectory line of the running between the bases, the angle of the anterior support and posterior take-off during the race, the frequency of the steps and the length of the steps, as well as the running technique in a first approach, the present study is divided into two parts in this first part. Some indicators and in the second part the remaining indicators and method will be analyzed.

Table 1

Behavior of the Hurricanes of Mayabeque Team, in the base running during the 59th and 60th National Baseball Series

National Series	<u>Indicator 1</u> knee angle		<u>Indicator 2</u> Hip Angle		<u>Indicator 3</u> Anterior Support Angle		<u>Indicator 4</u> Moment of Impulse	
	Ideal	Real	Ideal	Real	Ideal	Real	Ideal	Real
Serie 59	150	90	450	360	450	560	1800	2100
Serie 60	150	120	450	380	450	530	1800	2080

The present analysis is carried out from the use of the KINOVEA Software, in the first category Baseball team of Mayabeque, from a qualitative and quantitative perspective, it is good to point out that a slight improvement is seen in these aspects, since For the 60th National Series, the author of the research has worked on correcting the difficulties and, although not significant, the results are visible.

It is good to point out that 8 indicators are studied for the research, but as can be seen, only 4 are treated in this part, so the

remaining 4 are left for a future analysis of what the research wants to address.

It can be seen in indicator 1, in the 59th National Series of 150, it only flexes 90 because very little elevation of the pendulum is seen at the time of the race, this being a factor that does not allow the race to be carried out. Correctly and at the same time the expected result cannot be achieved, which is to gain one more base. The 60 Series with a number of corrective exercises, focusing especially during training on correct execution and the ABC of Racing, shows an improvement from a

biomechanical point of view and lower limb injuries were reduced by 70%, in relation to the previous Series.

In relation to indicator 2, it can be seen that in the 59th national series the athletes ran a little more upright, they did not run with an inclination of the trunk, and for the 60th series corrective exercises are performed and it is seen that there is already more inclination of the trunk although it is not yet the ideal for running, more comfortably.

Indicator 3 essentially deals with the favorable angle of the anterior support of the foot so that the race is not carried out in a plantar manner. The support of the entire foot is seen during the 59th National Series forming an angle of 560, where it can be expressed that The support is completely plantar, which does not allow the running technique to be carried out adequately and even takes longer to move from one point to another, so the objective is not achieved either, since in In the 60th National Series, a significant improvement and much more pronounced support of the metatarsal is seen, although it is not yet ideal.

Indicator 4 shows the flexion of the leg that serves as a push to alternate the support and flight phases of the stroke. If the push phase is not adequate, it requires greater force and greater energy expenditure, influencing the Directly in injuries of the lower body, mainly in the agonist muscles during that phase, a very marked flexion of the driving leg is seen in the 59 National Series of 2100, in turn this marked flexion causes it to descend from its line of trajectory the center of gravity of the body. Keeping in mind the aforementioned aspects, we tried to eradicate them during the 60th National Series, although it was improved, in 2080 we continued correcting for two reasons that are essential, the first to avoid injuries, the second to gain one more base, with the appropriate technique.

After analyzing the existing bibliography, it was determined that the one consulted deals with base running from a methodological point of view, it does not address this aspect from the use of kinematic pairs, angles that help the proper execution of the work.

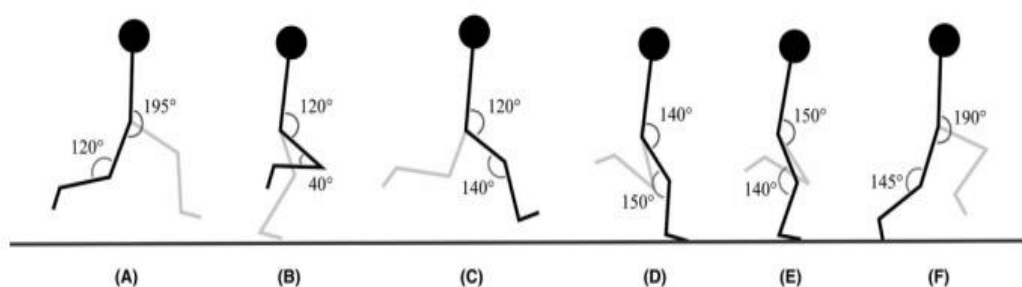


Fig. 1. *Knee and Hip Angles complete running cycle according to Kenneally, D. (2019) [5]*

Phases:

- A) Shows the flight phase where both legs are separated from the surface, showing the appropriate hip angle, which is 1950, in addition to the posterior knee angle, all of these values are considered ideal.
- B) Vertical moment, where a significant decrease in the hip angle is visualized, decreasing by 750, dizzyingly in less than 60 thousandths of a second.
- C) Again the flight phase cycle with a slight inclination of the trunk that activates the aerodynamic aspects during the race.

In the phases (D, E F,) it is shown how the angle varies in the moments of positioning, cushioning and active take-off and this provides greater propulsion, in these sports games it has been seen that in general they do not give the importance adequate to the ABC of careers, which is a fundamental tool, although they know and master all aspects, they do not execute

them in the appropriate way, hence the main deficiencies in the phases of the career.

These aspects are taken into account, in order to establish the ideal pattern and the correct comparison of the work and the information provided by the Kinovea Software, however this work carried out in the research can be applied to athletes from other leagues that have an equal or higher level. To ours to establish pattern levels, however we limit ourselves at this time to the field of study to be analyzed. It is definitive to go through the different phases of the races and emphasize the fundamental factors on which the races depend, frequency of steps, length of steps and running speed.

Board Categories awarded by the specialists to the process of determining the indicators for the base running of the Mayabeque first category Baseball team through the questionnaire carried out. (Table 2)

Board Categories

Table 2

Categories	
1. Professional Level of Specialists	Very suitable
2. Years of work of specialists	Appropriate
3. What factors in your opinion specifically affect the running of bases in Mayabeque first-class team.	Inappropriate
4. Using Kinovea software	Very suitable
5. The indicators will be able to optimize the effectiveness of the base running of the first category Mayabeque Baseball team	Appropriate
6. The use of indicators for base running will be feasible and applicable to theory and practice.	Very suitable

4. Conclusions

The bibliography consulted on the subject is scarce and the existing one does not deal with the analysis of the base run, from another perspective than methodological.

An improvement in base running is seen in the 60th National Series, in relation to the 59th Series. From a kinematic point of view, there are significant improvements in the four indicators analyzed.

KINOVEA is viable Software to optimize analyzes in Baseball related to base running since, like batting, it is an offensive action.

References

1. Collective of authors: *Baseball athlete preparation program. Olympic cycle (2020-2024)*. Havana Cuba. 2021, Sports Editorial.
2. DellaVilla, F., Buckthorpe, F., Buckthorpe, M., Grassi, A., et al.: *Systematic video analysis of ACL injuries in professional male football (soccer): injury mechanisms, situational patterns and biomechanics study on 134 consecutive cases*. In: British Journal of Sports Medicine Vol. 54, 2020, p.1423-1432.
3. Garcia González, I.: *Baseball: Considerations on base running.*, 2006, available on: <http://www.efdeportes.com>
4. Henderson, B.: *A dichotomy theorem for constraint satisfaction problems on a 3 elements set*. In: Journal of the ACM Vol. 53 (1) , 2012, p. 66-120.
5. Keneally, D.: *Late swing of early stance? A narrative review of hamstring injury mechanism during high speed running*. In: Scandinavian Journal of Medicine & science in Sports Vol. 29(8), 2019, p. 1083-1091.
6. Kirby, B.S., Winn, B.J., Wilkins, B.W. et al.: *Interaction of exercise bioenergetics with pacing behavior predicts track distance running performance*. In: Journal of Applied Physiology, Vol. 131(5), 2021, p.1532-1542.
7. Madden, K., Mayes, S., Cook, J., et al.: *The Effects of Pointe Shoes on Ballet Dancers' Biomechanics, Muscle Activity, Movement and Symptoms: A Scoping Review*. In: Journal of Dance Medicine & Science. Vol. 28(1), 2024, p. 57-71. doi:[10.1177/1089313X231218305](https://doi.org/10.1177/1089313X231218305)
8. Mesa, M., Fleitas, I.M., Vidaurreta, R.R.: *Sobre el tratamiento estadístico a los datos provenientes de las opiniones de los expertos en las investigaciones de la Cultura Física*. EFDeportes.com. In: Revista Digital. Buenos Aires, Año 20, Nº 210, noviembre de 2015, p.72. <http://www.efdeportes.com/>
9. Pol, R., Balagué, N., Ric, A. et al.: *Training or Synergizing? Complex Systems Principles Change the Understanding of Sport Processes*. In: Sports Med - Open 6, Vol. 28 2020, p. 1-13. <https://doi.org/10.1186/s40798-020-00256-9>
10. Prescorniță, A. Tohănean, D.: *Tehnici de monitorizare a performanței sportive*. Brașov, Editura

Universităţii Transilvania din Braşov,
2008.

11. Ríos Fuentes, A., Calero Morales, S.,
Eizméndiz Domínguez, et al.:
*Variables del rendimiento de los
bateadores del béisbol cubano
utilizando el sensor BlastMotion
baseball*. Pódium. Revista de Ciencia
y Tecnología en la Cultura Física,
Vol. 15(3), 2020, p.509-517.
[https://podium.upr.edu.cu/index.p
hp/podium/article/view/980](https://podium.upr.edu.cu/index.php/podium/article/view/980)