Multifactorial analysis of injuries in baseball pitchers in a national series in Cuba

Abstract

In the present study, a correlational, longitudinal and prospective investigation was carried out between November 2018 and November 2020. The objective of the work was: determine the relationship of the history of injuries, physical preparation and compliance with physioprophylaxis with the occurrence of new injuries during the 59th National Baseball Series in Cuba. The 16 pitchers who made up the pitching group of the Villa Clara team participated, who were between 19 and 35 years old and had sports experience between 11 and 25 years. Among the methods used were: a specific questionnaire to obtain information on the history of injuries and a form to record the injuries that occurred during the competition, the Mile test for the evaluation of aerobic power and relative oxygen consumption, while to evaluate compliance with the physio-prophylactic plan, structured observation and empirical frequency distribution were used. A significant relationship was obtained between past injuries and the occurrence of new injuries in the series, with those who had previously been injured being more likely to be injured. Presenting lower aerobic power and relative oxygen consumption, as well as performing a poor warm-up and massage was related to the occurrence of the injury. In addition, poor stretching was related to a greater number and severity of injuries in the series analyzed. It is essential to improve physical preparation and compliance with physioprophylaxis in pitchers with a history of injuries in order to prevent them.
Keywords: Oxygen consumption, physioprophylaxis, sports injury, aerobic power.

Introduction

The development of Baseball is largely due to advances in applied sciences such as physiology, cardiology, biology, psychology, kinanthropometry, biomechanics, nutrition and biochemistry, among other disciplines, which are strongly interrelated around improving the sports performance based on the scientific findings that support the training methods and their functional direction (Bracic, 2017).

One of the aspects that is the object of attention of the sciences applied to this sport are injuries, because these significantly affect the performance and health of athletes, mainly pitchers, whose risk of injury is notably higher than the rest of the athletes. the players (Fleisig and Riff, 2012; Malek, 2015; Ríos Garit et al., 2021).

Several studies have identified the existence of multiple risk factors that affect the occurrence of injuries (Cebrian and Guerra, 2019; Fleisig and Riff, 2012; Malek, 2015; Ríos, 2017; Ríos, 2021; Ríos et al., 2021).), however, it has been specifically determined that sports gestures in Baseball subject the body to high-speed maneuvers and explosive force, putting the joints at risk.

Throwing is considered the most predisposing technical gesture to injury because it is unnatural and compromises the different structures of the joint to twisting, stretching at high speed and at acute angles; In addition, its repetition above the head produces important mechanical overloads in the elbow and shoulder joints (Dove et al., 2021). Several authors have determined that the lack of coordination or control of movements leads to an increased risk of injury (Becerra and Sánchez, 2019).

The act of throwing requires a coordinated movement that progresses from the toes to the tips of the fingers. This sequence of events is considered as a kinetic chain whose efficiency requires sequential muscular activity, so that the energy generated in the lower body can be transmitted to the upper body through the arm, hand and fingers and, finally, through the upper body. the ball.

The rotation of the body, the chronology and position of the scapula are key elements of the kinetic chain, so any physical condition that alters the components of the kinetic chain, especially one that affects the so-called center (trunk, back and proximal part of the lower limbs), alters the most distal segments and can cause injuries (Pilots, 2012).

In the case of baseball pitchers, it is a proven fact that the main causes of injuries are due to overuse and stereotyped movements. Sports injuries in baseball pitchers are significantly more frequently focused on the shoulder and elbow of the pitching arm. Because their specifications and clinical characteristics are so particular, they have been named "Thrower's Shoulder and Elbow" (Agresta et al., 2019).

This work is based on the need to investigate and obtain information that allows preventing the occurrence of injuries in Baseball pitchers during fundamental competition, so the objective is: to determine the relationship between the history of injuries, physical preparation and compliance with physioprophylaxis with the occurrence of new injuries during the 59th National Baseball Series in Cuba.

Methodology

Type of study

A correlational, longitudinal and prospective study was carried out with the objective of determining the relationship between risk factors and the occurrence of injuries in baseball pitchers from Villa Clara in the 59th National Series.

Population

We worked with the entire population made up of the 16 pitchers of the Villa Clara team during the 59th National Baseball Series. These presented an average chronological age of 24.18 years and an average sports experience of 15.71 years.

Techniques and instruments

The Sports Aspects and Injuries Questionnaire (Olmedilla et al., 2006) was applied to identify the injury history in the population under study (injury history, number of injuries, greater injury severity, injury occurrence context).

The mile test was applied to determine aerobic power and relative oxygen consumption.

A structured and participatory observation was carried out on the pitchers during training and competition in order to detect adequate compliance with preventive measures and the physio-prophylaxis plan (warm-up, stretching, use of cryotherapy and massage).

The injuries that occurred during the national series were recorded using a record form designed for this purpose, allowing the pitchers who were injured, the severity of the injuries, the quantity and the context of occurrence to be identified.

Analysis of data

Empirical frequency distribution was used to describe the injury history and new injuries suffered by the pitchers in the analyzed series. Kendall's Tau-b non-parametric correlation coefficient was used to identify levels of relationship between the variables under study. The SPSS version 22.0 package for Windows was used.

Procedures

The analysis of the history of injuries, the state of the physical variables and compliance with the physioprophylactic plan was carried out during the pre-competitive stage. The medical records were reviewed at the Sports Medicine Center also during this stage, while the observation was applied for three weeks in training and meetings with other teams prior to the start of the national series.

Ethical Considerations

The research was carried out in compliance with the ethical principles contained in the Declaration of Helsinki and subsequent revisions. The principles that regulate ethics during the scientific research process were complied with, taking into account the four basic principles of research on human subjects (beneficence, non-maleficence, justice and respect for the person).

To undertake this work, the approval and consent of the baseball team management, the ethics committee and the scientific council of the institution were taken into account.

Informed consent was obtained from all participants, clarifying the voluntary nature of participation.

Results and Discussion

Table 1 shows the history of injuries of the pitchers analyzed. It is evident that most of these athletes have suffered injuries, although with a low frequency of repetition. The significant presence of serious injuries is striking, most of which have occurred during the competition.

Table 1

History of injuries of pitchers from Villa Clara in the 59th National Baseball Series

Variables		N	Percentage
History of injury	Has not been injured	4	25.0
	Has been injured	12	75.0
Number of injuries	More fingers	1	8.3
	Two	3	25.0
	One	8	66.7
Greater severity of injury	Serious	7	58.3
	Moderate	2	16.7
	Mild	3	25.0
Injury occurrence context	Training	1	8.3
	Competing	11	91.7

Source: self made

Table 2 shows the behavior of the injuries during the national series under study where the majority of the pitchers did not suffer any injury, although the injured suffered more than one injury between moderate and very serious, occurring only during competitive games.

Table 2

Distribution of new injuries in pitchers from Villa Clara in the 59th national series

Variables		N	Percentage
New injuries	He wasn't injured	11	68.75
	he was injured	5	31.25
Number of new injuries	Two	2	40.0
	One	3	60.0
Severity of injuries	Moderate	3	60.0
	Very severe	2	40.0
Injury occurrence context	Competing	5	100

Source: self made

Table 3 shows the relationships determined between variables. It is observed that having previously been injured is positively related to the new injury in the series, as well as the severity of past injuries. Aerobic power, relative oxygen consumption, warm-up and massage are inversely related to the occurrence of the injury in the national series. Furthermore, stretching is negatively related to the number of injuries and their severity.

Table 3

Correlation of injury history, physical preparation and physioprophylaxis with new injuries

Variables	Occurrence SI		Number of SI		Gravity SI	
	Tau_b de Kendall	*p.*	Tau_b de Kendall	*p.*	Tau_b de Kendall	*p.*
History of injury	.389*	.044	-	-	-	-

Number of injuries	.105	.773	-.500	.221	.500	.221
Greater severity of injury	.577**	.007	-	-	-	-
Injury occurrence context	-.250	.289	-	-	-	-
Aerobic power	-.502*	.032	.500	.221	-.500	.221
VO_2 Relative	-.496*	.027	-.500	.221	.500	.221
Poor heating	-.612**	.012	-	-	-	-
Poor stretch	-.423	.074	-1.00**	.014	-1.00**	0.14
Use of Cryotherapy	-.265	.105	-	-	-	-
Use of massage	-.373*	.044	-	-	-	-

Note. *p≤ 0.05; ** p≤ 0.01 (Sig. bilateral); SI= sports injury; VO_2 Relative = Relative oxygen consumption
Source: self made

The presence of a higher proportion of pitchers with a history of injury, the low frequency of reiteration and its predilection for occurrence in competitions coincide with findings obtained in other investigations carried out in this population at different times (Ríos et al., 2019; Ríos et al ., 2021; Ríos, 2021), however, they differ from those studies in terms of the severity of the injuries suffered, since in this case a greater presence of serious injuries was found.

In a longitudinal study carried out with pitchers from Villa Clara under 23 and 1st category in several national series between 2017 and 2019 (Ríos et al., 2021), its authors identified that the majority of these athletes suffered injuries during competitive games, fundamentally coinciding with the results of the present study in terms of the context of

occurrence, but differing in the proportion of injured pitchers, since it was obtained that the majority of the pitchers in the 59 national series were not injured, although more serious injuries occurred. These differences may be due to the fact that in the present study only one national series was analyzed in a single team of the highest level in the province.

A lower incidence of injuries was obtained during the 59th national series in relation to prevalence, predominating those who suffered a single injury, an aspect that supports the good work done in this regard, although by not classifying the team in the post season the work of pitchers was lower than at other times.

The relationships obtained between the variables of preparation and injuries show that the higher the aerobic power and the relative oxygen consumption of the pitchers, the lower the occurrence of injuries. Regarding technical preparation, the results do not show a significant relationship with the variables related to injuries in this series.

A significant relationship was also obtained between the history of injury and those injured in the series, with those pitchers who had previous injuries being more likely to be injured. This aspect coincides with other studies (Ríos, 2017; Ríos et al., 2019), which suggest that having been injured represents the first risk factor for re-injury and the new injury that occurs on an old one is the main one. risk factor depending on its severity.

Another relevant result to discuss is that it was possible to show that the better the compliance with the warm-up and the massage, the fewer injuries these pitchers present. While stretching has a significant relationship with the number and severity of injuries in the series, showing that those pitchers who do not stretch correctly are likely to suffer more injuries of a higher degree of severity, coinciding with the findings of previous studies (Becerra and Sanchez, 2019; Dove et al., 2021).

Conclusions

The results obtained demonstrate the importance of physical preparation and adequate compliance with physioprophylactic plans for the prevention of injuries in these Baseball pitchers, as well as the need to establish preventive work with emphasis on pitchers with the highest injury burden.

Despite the usefulness of the findings, they are insufficient to guide injury prevention due to the low representativeness of the population analyzed, since a particular pitching group was studied within the framework of a single national competition.

Due to the above, it is considered that the research should be extended both temporally and population-wise to obtain data that allow improving the primary and secondary prevention of injuries in these athletes from Villa Clara.

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