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Original article

Planificación de un mesociclo de aceleración, para la carrera de home a primera base, en jugadores juveniles de béisbol

Planning an acceleration mesocycle for the home-to-first-base sprint in youth baseball players

Planejamento de um mesociclo de aceleração para a corrida de home à primeira base em jogadores juvenis de beisebol

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ABSTRACT

This present work involved developing a mesocycle -level planning system for acceleration development in the home-to-first-base sprint of youth baseball players. Its purpose was to provide a roadmap for improving the performance of these athletes, while also offering a novel resource for planning acceleration in this sport. This contributed to the professional

development of youth baseball coaches. The physiological demands of this type of speed, tailored to the specific needs of baseball, were taken into account. Data collection methods included document review, surveys, and observation. Since no references on acceleration planning for youth baseball players were found in the consulted specialized literature, the authors designed a weekly planning program for developing acceleration in the home-to-first-base sprint of youth baseball players, aligned with the physiological demands of the sport. This approach successfully influenced the development of this motor skill.

Keywords: acceleration, youth category, mesocycle

RESUMEN

El presente trabajo consistió en la elaboración de un sistema de planificación a nivel de mesociclo del desarrollo de la aceleración, para la carrera de home a primera base, en jugadores juveniles de béisbol. El mismo tuvo como propósito brindar una ruta para elevar el rendimiento de estos atletas, al mismo tiempo que un recurso novedoso para planificar la aceleración en esta modalidad deportiva. Así, se contribuyó con el proceso de superación de los entrenadores de béisbol de la categoría juvenil. Para ello, se tuvieron en cuenta las exigencias fisiológicas de esta variedad de la velocidad, ajustada a las necesidades del béisbol. Para la obtención de información se utilizaron como métodos la revisión de documentos, la encuesta y la observación. Al no hallarse referentes sobre la planificación de la aceleración para jugadores juveniles de béisbol en la bibliografía especializada que fue consultada, los autores diseñaron un programa de planificación semanal para el desarrollo de la aceleración, para la carrera de home a primera base, en jugadores juveniles de béisbol, acorde con las exigencias fisiológicas de este deporte. De este modo, se logró influir positivamente en el desarrollo de esta capacidad motora.

Palabras clave: aceleración, categoría juvenil, mesociclo

RESUMO

O presente trabalho consistiu na elaboração de um sistema de planejamento a nível de mesociclo para o desenvolvimento da aceleração para a corrida de home à primeira base em

jogadores juvenis de beisebol. O mesmo teve como propósito oferecer uma rota para elevar o desempenho dos jogadores juvenis, ao mesmo tempo em que se apresenta um recurso inovador para planejar a aceleração nesta modalidade esportiva. Assim, contribui-se também com o processo de superação dos treinadores de beisebol que trabalham com a categoria juvenil. Para isso, foram levadas em conta as exigências fisiológicas dessa variedade de velocidade, ajustadas às necessidades do beisebol. Para a obtenção de informações, foram utilizados como métodos a revisão de documentos, a pesquisa e a observação. Ao não se encontrar referências sobre o planejamento da aceleração para jogadores juvenis de beisebol na bibliografia especializada consultada, os autores conseguiram desenhar um programa de planejamento semanal para o desenvolvimento da aceleração para a corrida de home à primeira base em jogadores juvenis de beisebol, conforme as exigências fisiológicas deste esporte. Dessa forma, conseguiu-se influenciar positivamente no desenvolvimento dessa capacidade motora.

Palavras-chave: aceleração, categoria juvenil, mesociclo

INTRODUCTION

The dosage of sports training is crucial for achieving high competitive performance. The quantitative aspect (load dosage) of training is essential to optimize the qualitative aspect (type of physical exercise). These two variables combined form a determining factor for success in competitive activity; therefore, the selection and dosage of exercises are closely linked to the physiological demands of the sport in question.

Baseball is a team sport with alternating offensive and defensive actions, where acceleration is a determining factor in performance. The basic skills in this sport are identified as fielding, pitching, running, and batting. The dynamics of the game itself require specific conditions both defensively and offensively (Ávila et al. 2023).

Pila and Novoa (2020) argue that speed is the capacity to produce a large acceleration at the beginning of movement and to maintain it for as long as possible to reach a high speed. Given the distances run in baseball, maximum speed is never reached. Even during a lap

around the bases, the need to make changes of direction with an angular value of 90° forces a deceleration, followed by a reacceleration.

From a general perspective, acceleration is related to the capacity to cover a certain distance in the shortest possible time, which is an advantage in many sports, especially situational sports (Foresto, 2022). Speed is a conditional human capacity used in different sports, some more than others. Therefore, at the international level, teams plan training systems that allow them to increase speed, according to the required performance (Bastidas & Aguilar, 2021).

According to Vinuesa and Vinuesa (2016), acceleration consists of a rapid increase in displacement speed until reaching maximum speed, which occurs when acceleration and deceleration are zero. Weineck (2013), on the other hand, assumes that acceleration occurs between 30 and 60 meters in a sprint race .

Thus, a difference can be seen between both manifestations of translational speed; consequently, the training methodology for each must be different, materialized in a specific dosage, which responds to the physiological demands, according to the requirements of the competitive activity.

Consequently, the objective of this research is to plan an acceleration mesocycle for the home run to first base sprint in youth baseball players, based on the needs of this sport and the morphofunctional characteristics of adolescents.

For planning an acceleration mesocycle, for the home run to first base run, it is important to consider the type of exercise, the weekly frequency, the volume (per session, per microcycle and per mesocycle), the intensity of the exercises and the recovery between sets and repetitions.

The basic type of exercise for acceleration training is the sprint run; however, in search of greater complexity to improve neuromuscular coordination, different starting positions can be adopted that significantly increase the difficulty of the efforts, such as exercises with different types of start: seated from a bench, with support on one leg, start against a resistance (elastic, rope, partner), among others.

Weekly frequency refers to the number of times the training is repeated within that period. Acceleration training can be performed at a high frequency, as the energy processes that drive it can fully recover within 24 hours. Glycogen (the form in which glucose is stored in skeletal muscles) is the predominant energy substrate during high-intensity efforts. Baseball players must undergo a high number of physical, technical, offensive, defensive, and tactical activities; therefore, the authors of this study propose a frequency of three acceleration sessions per week.

The average volume per session is the distance in meters that each athlete must cover in a training session; this determines the volume of the microcycle and mesocycle. Based on the calculation proposed by Vinuesa and Vinuesa (2016), considering the distances and the number of repetitions for team sports, an average volume of 240-300 meters per session can be obtained.

The intensity of exercises for developing any aspect of speed should be 100%. This is stated in the methodological guidelines provided by Vinuesa and Vinuesa (2016) for acceleration training in team sports; therefore, to achieve high levels of acceleration, maximum intensity work is required.

The recovery between series and repetitions are crucial for optimizing the effect of training loads. Fatigue is considered a multifactorial issue, and is primarily related to dehydration, decreased thermoregulatory capacity, decreased glycogen, muscle damage, and mental exhaustion (Moreno, 2020).

Weineck (2013) recommends that, to avoid lactic acid buildup, which is counterproductive to acceleration training, at least one minute of rest should be taken for every 10 meters covered. Given the need to perform each effort at maximum intensity, it is crucial that the energy systems responsible for acceleration have complete recovery to prevent the accumulation of fatigue from negatively impacting movement speed and neuromuscular coordination.

Regardless of the role of muscle glycogen, during intense efforts, acceleration relies primarily on the phosphagen system for ATP resynthesis. Peralta (2021) explains that this is the predominant energy system during the first 20 seconds of intense effort.

It is important to note that achieving optimal acceleration in the home-to-first-base sprint requires adequate development of muscular strength. This stems from an increase in maximum strength, allowing for efficient transfer to explosive power and, subsequently, to acceleration. In this regard, Linares (2011) argues that baseball actions activate type IIb fast-twitch muscle fibers, which are developed through increased maximum strength, thereby enhancing the potential for explosive power.

Another criterion that supports the dependence of strength to increase acceleration is that proposed by Peña et al. (2020), when referring to the fact that speed is closely related to the mobility of nervous processes and to fast strength.

For his part, Wu (2025) states that performance in sprint races depends on an optimal balance between strength and speed, and therefore integrated training can produce superior performance adaptations; correspondingly, Van Hooren et al. (2024) assume that sprint athletes can benefit from a low-volume, heavy strength training approach (loads equal to or greater than 85% of one repetition maximum), without reaching muscle fatigue, with ballistic and plyometric exercises .

MATERIALS AND METHODS

For this study, a purposive sample was selected, consisting of the eight coaches who worked with youth baseball players in Matanzas province, all of whom were surveyed. A training session for each coach was also observed, in which speed training was one of the physical objectives.

To understand the specific characteristics of the object of study, the following theoretical methods were used: analytical-synthetic, inductive-deductive, and systemic-structural-functional. The analytical-synthetic method provided a foundation for the problem under study, supported by specialized literature; the inductive-deductive method allowed for structuring the problem and arriving at conclusions; and the systemic- structural-functional method served as a guide for selecting the type of exercise to use for training acceleration for the home-to-first-base run and for determining the appropriate dosage of those exercises.

The empirical methods used were document review, surveys, and observation. The document review focused on the training plans of the selected coaches and on the Comprehensive Athlete Preparation Program (PIPD), whose dimensions and indicators were analyzed as follows:

Dimension: load content

Indicators :

- Type of speed to work with (acceleration)
- Type of exercises to perform (sprint race)

Dimension: load dosage

Indicators :

- Weekly frequency of acceleration training.
- Volume of acceleration work per mesocycle, microcycles and training sessions.
- Intensity of sprints.
- Recovery between repetitions and between sets.

Dimension: load organization

Indicators :

- Sprint races order, with respect to technical content and other motor capacities.
- Sprint races method.
- Organizational procedure used.

The survey was conducted to determine the distances selected for acceleration training, as well as the average distance covered in meters and the weekly training frequency. The observation aimed to verify the correlation between the information obtained from the survey and the work carried out in the field. The parameters to be observed were the following:

1. Types of speed to work.
2. Selected exercises for speed work.
3. Average volume of the training session.
4. Recovery time between repetitions and sets.
5. Suitability of the selected methods.
6. Order of performing the exercises, according to the type of strength to be worked on.
7. Organizational procedures used for strength exercises.

RESULTS AND DISCUSSION

Document review

In the PIPDs and in the revised training plans:

- Acceleration work was not considered, as races with distances shorter than 60 meters were not prioritized.
- No dosage was offered by mesocycles , microcycles and training sessions for sprint race work, nor was the frequency, methods, organizational procedures, or timing of its implementation indicated, which led to a poor distribution and organization in the training plans.
- The recovery time between repetitions and sets for acceleration work was not indicated, which led to methodological errors in the training plans.

Survey of coaches

- 100% of the coaches assigned very rigid recovery times between repetitions and sets.
- Two of the coaches (25%) performed sprint runs at the end of the training session, clearly confusing acceleration with anaerobic alactic endurance .

- Four of the coaches (50%) performed only two sprint sessions per week, although this was an insufficient stimulus to develop acceleration.

Observation of training sessions

- 100% of the coaches observed did not prioritize acceleration work, as distances greater than 60 meters predominated in the sprint races they planned.
- Six of the coaches observed (75%) did not apply load undulation in sprint races within microcycles.
- Since acceleration work was not prioritized, 100% of the coaches observed planned very high volumes for sprint work .

Parameters for the design of the acceleration mesocycle, for the home to first base run, in youth baseball players

Type of exercise*:* for the design of this mesocycle, the sprint race was chosen as the exercise. The starting variations were: a medium start, a seated start from a bench, and a single-leg start.

Weekly frequency: for the construction of this acceleration mesocycle, a frequency of three weekly sessions on alternate days (Monday, Wednesday, and Friday) was used. It was taken into account that the planned mesocycle had four microcycles, and the total number of sessions per mesocycle was 12. The determination of this frequency followed the criteria of authors such as Min et al. (2025), who indicated that different studies evaluating the effectiveness of sprint training in various team sports had favorable results with a frequency of two to three training sessions per week.

Average volume per session: the proposals of the various authors consulted were evaluated, and it was assumed that baseball players accelerated during the game over distances no greater than 30 meters. The authors determined an average volume of 20 meters, with an average of six repetitions. This resulted in a total of 120 meters on average per session for acceleration training. It was considered that there were three sessions per microcycle and 12 sessions per mesocycle. The average volume per microcycle was 360 meters, while the total volume of the mesocycle was 1440 meters.

Intensity : 100% effort in each repetition performed. The importance of performing speed exercises at maximum intensity was argued by Xiaohuan et al. (2025), who indicated that research using electromyography demonstrated that the nervous system activated motor units, through precise coordination for specific sprint actions that resulted in 95% activation of fast-twitch fibers.

Recovery: between repetitions, there was a rest period of one minute for every 10 meters covered. Between sets, the recovery period was five minutes.

Method: varied discontinuous. Platonov and Bulatova (2017) argue that practical methods for the development of motor capacities were based on continuous or interval work, where the latter (was carried out in a standard or varied regime, according to the modifications during the execution of the exercise) and presented the distinction of having regulated rest breaks.

Determination of volume by microcycles

The mesocycle consisted of four microcycles: two medium-load (ordinary), one high-load (shock), and one low-load (recovery). Similarity in the type of effort was considered, given the predominant energy substrate and the high level of neuromuscular coordination required. For determining percentage values, a mesocycle load was considered low when it was between 10-19%, medium when it was between 20-30%, and high when it was between 31-40%. Consequently, the following volume distribution was established:

- Microcycle 1 (22%): 317 meters
- Microcycle 2 (28%): 403 meters
- Microcycle 3 (33%): 475 meters
- Microcycle 4 (17%): 245 meters

The following percentage values were assigned for the distribution of the microcycle volume:

- Monday: 35%

- Wednesday: 40%
- Friday: 25%

In the medium-load microcycles , distances of 20 meters were run on Monday; 25 meters on Wednesday; and 15 meters on Friday. In the high-load microcycle, distances of 25 meters were run on Monday; 30 meters on Wednesday; and 20 meters on Friday. In the low-load microcycle, distances of 15 meters were run on Monday; 20 meters on Wednesday; and 10 meters on Friday.

Mesocycle of acceleration, for the home-to-first-base run, in youth baseball players

- Mesocycle volume: 1440 meters
- Intensity: 100%

Microcycle 1. Volume: 317 meters

- Session 1. Volume: 111 meters (two sets of three repetitions of 20 meters). Recovery: two minutes between repetitions and five minutes between sets.
- Session 2. Volume: 127 meters (one set of three repetitions of 25 meters and one set of two repetitions of 25 meters). Recovery: two minutes and 30 seconds between repetitions and five minutes between sets.
- Session 3. Volume: 79 meters (one set of three repetitions of 15 meters and one set of two repetitions of 15 meters). Recovery: one minute and 30 seconds between repetitions and five minutes between sets.

Method: varied discontinuous (by variation of the starting position).

Organizational procedure: wave

Microcycle 2. Volume*:* 403 meters

- Session 4. Volume: 141 meters (one set of four repetitions of 20 meters and one set of three repetitions of 20 meters). Recovery: two minutes between repetitions and five minutes between sets.

- Session 5. Volume: 161 meters (two sets of three repetitions of 25 meters). Recovery: two minutes and 30 seconds between repetitions and five minutes between sets.
- Session 6. Volume: 101 meters (one set of four repetitions of 15 meters and one set of three repetitions of 15 meters). Recovery: one minute and 30 seconds between repetitions and five minutes between sets.

Method: varied discontinuous (by variation of the starting position).

Organizational procedure: wave

Microcycle 3. Volume *:* 475 meters

- Session 7. Volume: 166 meters (one set of four repetitions of 25 meters and one set of three repetitions of 25 meters). Recovery: two and a half minutes between repetitions and five minutes between sets.
- Session 8. Volume: 190 meters (two sets of three repetitions of 30 meters). Recovery: three minutes between repetitions and five minutes between sets.
- Session 9. Volume: 119 meters (two sets of three repetitions of 20 meters). Recovery: two minutes between repetitions and five minutes between sets.

Method: varied discontinuous (by variation of the starting position).

Organizational procedure: wave

Microcycle 4. Volume *:* 245 meters

- Session 10. Volume: 86 meters (two sets of three repetitions of 15 meters). Recovery: one and a half minutes between repetitions and five minutes between sets.
- Session 11. Volume: 98 meters (one set of three repetitions of 20 meters and one set of two repetitions of 20 meters). Recovery: two minutes between repetitions and five minutes between sets.
- Session 12. Volume: 61 meters (two sets of three repetitions of 10 meters). Recovery: one minute between repetitions and five minutes between sets.

Method: varied discontinuous (by variation of the output position) .

Organizational procedure: wave

CONCLUSIONS

Based on the analysis carried out, it was concluded that the mesocycle developed for the development of acceleration in youth baseball players constituted a resource to guide the planning of this motor ability and avoid the negative effects of an incorrect selection, organization and dosage of the exercises to be performed, a matter that was evidenced in the diagnosis carried out on the subjects of the sample.

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Conflict of interest statement:

The author declares that there are no conflicts of interest.

Author's contribution:

The author is responsible for writing the work and analyzing the documents.



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