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Program of exercises with elastic resistance bands for the increase of the speed in the home-first base race with junior baseball players from Matanzas

Programa de ejercicios con bandas elásticas de resistencia para el incremento de la velocidad en la carrera home-primera base, con jugadores de béisbol, categoría juvenil de Matanzas

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ABSTRACT

In the last decades, exercises with the use of tubes (round) or elastic bands (flat) of progressive resistance have been incorporated into the training programs, being a fundamental tool to develop muscle strength and imitate sport movements or gestures in numerous sports specialties, because of its ease to be used. The objective of this study was to design a training program with elastic resistance bands for the increase of the speed in the home-first base race with junior baseball players from Matanzas who participated in the XLVI National Baseball Championship. The experimental stage is developed during the preparatory period, which had a duration of 20 micro cycles, with a frequency of three days per week, using the combination of speed exercises with bands or elastic tubes and the models of periodization of strength and the System of Block or Concentrated Strength. The results show significant changes in the times of the home-first base race of the players in the different controls carried out with a 95 % of confidence, since the value of the probability (p-value=0.0001) is less than 0.05. In addition, a 4.37 % increase was achieved with a reduction of 0.37 seconds.

Keywords: home-first base run; baseball; strength; Thera-band; speed.

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RESUMEN

En las últimas décadas, se han incorporado a los programas de entrenamiento ejercicios con la utilización de tubos (redondos) o bandas (planas) elásticas, de resistencia progresiva, lo que constituye una herramienta fundamental para desarrollar la fuerza muscular e imitar movimientos o gestos deportivos en numerosas especialidades deportivas, debido a su facilidad de uso. El objetivo del presente estudio fue diseñar un programa de entrenamiento con bandas elásticas de resistencia para el incremento de la velocidad, en la carrera home-primera base, con jugadores de la categoría juvenil de Matanzas que participaron en el XLVI Campeonato Nacional de Béisbol. La etapa experimental se desarrolla durante el periodo preparatorio, que constó de 20 microciclos de duración, con una frecuencia de tres días por semana, utilizando la combinación de ejercicios de velocidad con bandas o tubos elásticos y los modelos de periodización de la fuerza y el Sistema de Bloque o Fuerza Concentrada. Los resultados demuestran cambios significativos en los tiempos de la carrera home-primera base de los jugadores, en los diferentes controles efectuados para un 95 % de confianza, pues el valor de la probabilidad (p-value=0.0001) es menor que 0.05. Además, se alcanza un 4.37 % de incremento, con una reducción de los tiempos de 0.37 segundos.

Palabras clave: corrido home-primera base; béisbol; fuerza, Thera-band; velocidad.

INTRODUCTION

The sportman preparation proccess ia a multifactorial issue; in this sense, Geiger y Schmid, (2015) consider that to carry out a succseful training not only the exercise structure is important, but also the load dosage, and therefore, the desired training efecto, which depends on the magnitude of selected load. In baseball context, according to Reynaldo (2017), the sport training is defined as a pedagogical proccess organized into areas and aimed to the integral development in the game defensive and ofensive situations, with tactic intent, which misión is to prepare the players to get the highest sport performance, on the base of the physical fitting out through basic principles, methods, and aids that will favor its achivement and development.

There is concensus among different authors like, Ozolin, (1988); Bulatova y Platonov, (2017), to whom the authors of this work are joined, on the fact that the physical fitting out constitute the base for the sportman preparation (main support of the rest components of the refered preparation), as well as the exercises generalization and specifityto develop motor capacities having in mind the particularities for their showing in the different modalities, according to the variety of every sport modality and each of thei discipline. On the refered basis, the coach designs the programme to develop the different motor capacities for a given sport modality and for a determined sport group of sportmen.

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Over the last few decades, exercises using tubes (round) or elastic bands (flat) with progressive resistance (System of Progressive Resistance) have been incorporated into fitting out programmes. This instrument is now widely used, and in Da Silva's opinion (2005) has become an important tool for the development of muscular strength that makes it possible to imitate movements or sports gestures in many sports specialities, in addition to its ease of use.

In endurance work with elastic bands, Hooke's law is applied, who states: "Endurance or load increases in proportion to elongation. This means that the greater the elongation of an extender or elastic band, the greater its endurance. This law is valid only in the elastic area, which means that the extender must not be deformed when it stops stretching. On this point, researchers Ehlenz, others. (1990) expresses that extenders are suitable for endurance training and static muscle work.

As a main purpose of these Works with elastic bands in the physical fitting out, Gorostiaga et al. (2004); Michaleff y Kamper (2011) refer to the development of specific qualities according to the age and level of technical ability, developed by athletes, which allows to build the physiological basis that will need in future stages of sports training.

In the scientific literature, there are several studies related to this subject, where Page and others stand out. (1993) and Jones, (2013) who for six weeks performed strength exercises with elastic band (Thera-Band) in baseball pitchers, they found improvements in the eccentric strength of the muscles of the rotator cuff, very important for the prevention of injuries in this type of athletes. Another study carried out by Yu An, and Kang, (2013), also with baseball pitchers, using elastic bands of light and moderate intensity, in a period of 10 weeks, training twice in each of them, showed improvements in the static and dynamic balance of the subjects.

Research results with subjects trained in strength from various sports modalities, Anderson et al. (2008), showed greater gains in a maximum repetition (1RM) in squat and in prone position, as well as greater power and peak upper and lower limbs by combining strength exercises with bar and elastic band.

Meanwhile, Poblete-Valderrama et al. (2016) assured to be well documented on the fact that intense training with elastic bands contributes to the development of muscle strength, induced by the gradual increase in endurance of the bands.

Another study carried out by Argus et al. (2011) reveals that training with elastic bands, when combined with plyometric training, made it possible to reach higher peaks of maximum relative power in counter-movement jumps in professional rugby players. Although these studies do not inform the model and endurance of the elastic band to use, it limits the better understanding and reproduction of them.

These physical preparation programs sometimes include training to improve muscle strength, agility, performance of the speed of the run, among others. Therefore, researchers and trainers have designed various methods and strategies to improve these physical qualities, Cardozo and Yánez, (2017).

Despite the related benefits of working with bands or elastic tubes, considering the great variety of training with this method, the

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possibility of being performed at high speed with a moderate to high level of muscle strength, without causing great overloads in joints such as those generated by the plyometric method, there are few studies where it is used with populations of athletes to improve their athletic performance. This encouraged that the objective of this study was to design a program of exercises with elastic band of resistance for the increase of the speed in the home-first base race, with baseball players, juvenile category of Matanzas.

MATERIALS AND METHODS

An experimental study (pre-experiment) was carried out, and a non-probability sample was selected for convenience and the 18 players of the youth category of the Matanzas team who participated in the XLVI National Baseball Championship were intentionally chosen.

The research is transverse and included the preparatory period, which consisted of 20 microcycles, with a frequency of three days per week, using the combination of speed exercises with bands or elastic tubes, Uchida others. (2016), to optimize the linear movements of athletes, following the different stages of speed training proposed by Cometti, (2007). In search of the effect that the increase in speed of the home-first base race will have on baseball players, the Bompa and Buzzichelli (2006) strength periodization models were used in combination with the block system or concentrated strength Verjoshanskij, (2017); Triplett y Haff, (2017).

The individuals were measured on four occasions, at the beginning of the anatomical adaptation phase (C1), at the end of the muscular hypertrophy phase (C2), at the end of the maximum force phase (C3) and at the end of the conversion to specific force phase (C4). The test used was the home-first-base run, using an electronic CASIO chronometer with a precision of 0.1 hundredth of a second; this is activated by the controller at the first base level, which activates it when the player makes contact with the ball and stops it when he steps on the first base, Reynaldo, (2007).

Research methods

The information gathered comes from the study of the literature consulted and the experience accumulated by the authors, which is also a feature that characterises the methodology followed in the research presented. The use of theoretical and empirical methods should be highlighted. Among the former, the analytic-synthetic was specified, used to support the research topic, on the basis of the bibliographic analysis, allowing the authors to recognize the multiple relationships and components of the problem addressed separately to then integrate them into a whole as presented in reality, which was the way by which the interpretation of the information was made after consulting various authors; the inductive-deductive, which provided the determination of the problem and the differentiation of the tasks to be developed during the research process, and allowed the design of the program. In addition to providing the establishment of relations between the facts analyzed and the explanations and conclusions reached in this research, the historical-logical was used to verify the existence

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of antecedents that use this type of activities that at the same time allowed to investigate the process of physical preparation (muscular force) and the systemic-structural-functional, bearing in mind that the task as a basic level in the realization of the objective, must be structured as a system that privileges the work aimed at perfecting the process addressed in the application of science methods. The latter included the analysis of content, which was needed to analyze and evaluate in the Integral Program of Preparation of the Athlete (Cuban Baseball Federation, 2016) of the use of methods and means (exercises) for the development of muscle strength as a support for increasing speed in the home-first base run, the observation that allowed to verify the initial state or starting point of the players in relation to the home-first base race, through parameters and indicators, considered in the guide made to the effects and the measurement with the home-first base race by the players, controlling and recording the times made.

Statistical analysis

In the statistical treatment of the data, the statistical package STATGRAPHICS PLUS Version 5.1 was used, specifically in the comparison of means with a level of significance equal to 0.05 to determine the existence or not of significant differences between the results obtained in the four controls performed, where the Duncan test allows to define which are different. The effectiveness of the home-first base run of the players of the youth baseball team of Matanzas is calculated from the percent (%) increase (Incrt) according to Brody, quoted by Guzhalovkij (1984), taking as base the following equation:

%Incrt=((X2-X1)/ =(X2+X1)*100)

Based on the results obtained from the statistical processing of the data, the authors were able to make the corresponding assessments on the state of the matter in question.

Training

Almost all sports disciplines incorporate strength, speed, physical tolerance or flexibility, or a combination of these three elements. Strength exercises consist of overcoming endurance; speed exercises develop maximum speed and high frequency; endurance exercises involve long distances, long duration and many repetitions; and flexibility exercises maximize range of motion.

Coordination exercises include complex movements, Bompa and Buzzichelli, (2006). According to these authors, periodization of strength is the most influential training method, offering a positive transfer to explosive movements, and who subscribers assume that baseball skills such as running, pitching, and batting are performed quickly and reversed between 100 and 180 milliseconds. It is important to consider that Reynaldo and Padilla (2007), assume the incorporation of strength and speed as a determining physical direction in the competitive activity of baseball players, where such physical directions include exercise programs that involve large productions of strength and speed, which could be beneficial for the development of specific skills in lower limbs, Garcia and Cortegaza (2014).Traditionally, the plyometric method has been used, which generates greater neuromuscular activation, but requires prior preparation in the muscles and tendons due to the high physical impact that its practice entails, in addition to monitoring a structured conditioning program, organized into progressive levels of difficulty and

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physiological demand, Bompa, (2003); Verkhoshansky, (2016).

In the case of baseball, Wilson and Kritz (2014) consider that the inclusion in endurance training of the elastic bands, offers players the possibility that when making a movement, the muscles are integrated with more power. This is coupled with the fact that the sports skills being multi-articular movements, which occur in a certain order, are called kinetic chain or Barbany movements, (2013)

This program of exercises with elastic band for increasing the speed of the home-first base run was carried out in combination with overload exercises, using the specific sequence of phases of the Bompa and Buzzichelli strength training (2006), which includes the phases of anatomical adaptation, muscular hypertrophy, maximum strength, conversion into specific strength, maintenance, suspension and compensation. These authors suggest that, in order to obtain the desired development in strength work, the preparation must be focused in such a way that the best adaptation to the training is achieved, that physiological capacity is increased and athletic performance is improved, according to the needs of the sport chosen, with the aim of maximising power, endurance to power and muscular endurance of short, medium and long duration.

For the correct use of the band or elastic tubes during the exercises, it is necessary to know the strength index, which indicates the strength and resistance in a given range of motion. The techniques for assessing muscle strength have important correlations ranging from 0.48 to 0.93 and have a high degree of reliability, Manor others, (2006). The strength index can be used as an initial and final evaluation as well as an indicator of exercise progression.

By multiplying the strength (based on elongation) by the repetitions, the strength index objectively measures work and progression. The angle between the initial and final position of the Thera-Band tape and the extremity should be between 30-160º. For this reason, it is very important to pay attention to the angle of force (between the band and the force arm - arm, leg-). With an angle of 90° maximum resistance is achieved and when it is less than 30° the exercise is not as effective. Kempf and others, (2007).

The percentage of elongation for an exercise on a single joint is determined by the range of motion (45°=50% elongation) during the exercise. In exercises performed on several joints, the percentage of elongation is approximately equal to (100 % at 90° and 200 % at 180°), provided that the length of the tube is equal to the linear distance of movement, as a result of which the direction of stretching of the band has an influence on the muscles and joints. Robertson, (2004).

According to the biomechanical principles of elastic endurance, the position of the athlete can be improved to ensure that the muscles are strengthened over the full range of movement and, for this, the appropriate exercise routine should be determined, i.e. the number of repetitions and the level of endurance, taking into consideration that the different colors of bands and tubes indicate the different levels of endurance, Diplom others., (2006).

In this case, the first sequence of exercises was developed in the muscular hypertrophy II phase, serving as the basis for the next phase of maximum strength by adapting the

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organism to the use, progressively, of heavier resistances, following the new concepts of strength training proposed by Bompa and Buzzichelli, (2006). This variant is the most suitable for baseball players, with a demand for fast-contracting muscle fibers, increasing absolute strength by provoking neuromuscular and structural adaptations. Initially the thin yellow band of minimum resistance was used with the exercise of scissors to the front with displacement, happening to the exercises of flexion and extension of the unilateral and bilateral legs, concluding with the exercises of quadruped with flexion and extension of unilateral and bilateral legs, with black bands of very strong resistance according to the nomenclature of Diplom others., (2006).

First exercise variant

Objective: To increase the muscles´size (hypertrophy).

Exercise 1

Scissors forward with movement (Figure 1)

Repetions: Start with 1-2 sets of 6-10 repetitions and to progress to 3-4 sets of 8-12 repetitions, Page and Ellenbecker, (2008).

Pause: 10-30 seconds after each exercise set.

Characteristics of the elastic endurance band: start your programme with yellow bands which are of lighter endurance to emphasize the form and the correct movements; they are used in advanced beginners, with an intensity leval (1), with ¼ wide, with 4/5 mm thickness and 2-6 pounds endurance.

The elongation percentage fot an exercise performed on some joints is determined by the amplitude movement, performed at 90 degrees (100% elongation) with a Thera-Band yellow tuve, the endurance index will be 17-29 (endurance kilograms) when it is used 6-10 repetitions and between 23-25 (endurance kilograms) when it is used 8-12 repetitions, Page and others, (2000).

Fig. 1 - Forehead scissors exercises with displacement with yellow elastic resistance bands

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Exercise 2

One-sided and two-sided knee flexions (Figure 2).

Repetitions: Start with 1-2 sets of 6-10 repetitions and progress to 3-4 sets of 8-12 repetitions Page and Ellenbecker, (2008)

Pause: 10-30 seconds after each exercise series.

Elastic resistance band features: progressively increasing resistance to blue bands that are strong resistances for a particular exercise with different strength levels; used in advanced athletes, with an intensity level (4), with a width of 1/2", a thickness of 4.5mm., and a resistance of 5-25 pounds (lbs.).

The elongation percentage for an exercise performed on several joints is determined by the movement amplitude, performed at 90 degrees (100% elongation) with Thera-band blue tube, the strength index will be between 43-71 (endurance kilograms) when it is used 6-10 repetitions and 59-85 (endurance kilograms when it is used 8-12 repetitions, Page et al (2000).

Fig. 2. - Knee push-ups with blue elastic resistance bands

Exercise 3

Four-legged with one-sided and two-sided legs flexions legs (Figure 3)

Repetitions: Start with 1-2 sets of 6-10 repetitions and progress to 3-4 sets of 8-12 repetitions Page and Ellenbecker, (2008)

Pause: 10-30 seconds after each exercise series.

Repeticiones: Iniciar con 1–2 series de 6-10 repeticiones y progresar a 3-4 series de 8-12 repeticiones, Page y Ellenbecker, (2008).
Pause: 10-30 seconds after each exercise series.

Elastic endurance band features: progressively increasing resistance to black bands that are strong endurance; it is used in highly trained athletes who master the form and the technique to increase the strengt producction and to take on more rapid contraction fibers, with an intensity level (5), with a width of 1/2", a thickness of 6,4 mm., and a resistance of 10-35 pounds (lbs.).

The elongation percentage for an exercise performed on several joints is determined by the movement amplitude, performed at 90 degrees (100% elongation) with Thera-band black tube, the strength index will be between 58-97 (endurance kilograms)

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when it is used 6-10 repetitions and 78-116 (endurance kilograms) when it is used 8-12 repetitions, Page et al (2000)

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Fig. 3. - Four-legged with flexion and extension of unilateral and bilateral legs with endurance black elastic bands at the ankles

Second variant of exercises

The second sequence of exercises was carried out in the phase of maximum strength, following as main objective to develop the maximum possible level of strength. This phase can last from three to five weeks depending on the sport and the needs of the athlete and his progression is between 2-5 percent (%) per microcycles, with the aim of increasing the frequency of unloading motor units. This increases strength by 10% to 30%, and achieves increases in muscle mass, power, endurance, speed and agility.

Complex of exercises 4, 5, 6,7 (Figure 4)

Scissors in front with intermediate saltillo, deep jump with legs joined and legs separated, squatting displacement with legs separated and lateral jumps unilaterally.

Repetitions: perform 3-4 sets of 8-12 repetitions, Page and Ellenbecker, (2008).

Pause: 10-30 seconds after each exercise set.

Characteristics of the endurance elastic band: use the blue bands on the ankles that are of strong endurance and the yellow bands on the thighs that are of lighter endurance; it is used in advanced athletes, with an intensity level (1/4) for muscle strengthening in those sports that want to gain strength, with a width of 1/2", a thickness of 4.5mm, and a resistance of 5-25 pounds.
The percentage of elongation for an exercise performed on several joints is determined by the amplitude of movement, performed at 45 degrees (50% elongation) with a yellow Thera-Band tube in the thighs, the strength index will be between 14-22 (kilograms of resistance) and blue in the ankles, the strength index will be between 37-55 (kilograms of resistance) when using 8-12 repetitions, Page others., (2000).

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Fig. 4. - Sequence of exercises that incorporates scissors to the front with intermediate Saltillo, jump in depth with legs united and legs separated, displacement with squats with the legs separated and unilateral lateral jumps with elastic bands of endurance, yellow in the thighs and blue in the ankles

Exercise 8

Lateral displacements (Figure 5)

Repetitions: progress to 5-6 sets of 15-20 repetitions, Page and Ellenbecker, (2008).

Pause: 10-30 seconds after each set of exercises.

Characteristics of the endurance elastic band: to progressively increase endurance to black bands that are very strong endurance; it is used by highly trained athletes who master form and technique to increase the production of strength and recruit more rapid contraction fibers and provide greater acceleration in the initial movement, with a level of intensity (5), with a width of 1/2", a thickness of 6.4m, and a resistance of 10-35 pounds (lbs.).

The percentage of elongation for an exercise, performed on several joints, is determined by the amplitude of movement, performed at 90 degrees (100% elongation) with a black Thera-Band tube; the strength index will be between 146-194 (kilograms of resistance) when using 15-20 repetitions, Page et al, (2000).

Fig. 5. Lateral displacements with black endurance elastic bands.

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Third variant of exercises

The third variant of exercises was developed in the specific strength conversion phase, the main purpose of which is to convert maximum strength increments into competitive and sport-specific strength combinations. In the training of speed in the home-first base run of baseball players, maximum strength must be gradually converted into power and certain maximum strength levels must be maintained for this. When using the risers, more fast-contraction fibres are recruited from the beginning, due to the greater resistance experienced towards the end of each repetition in the search for power and increases sports performance when training with high intensity, Cánovas, (2016). They also provide tension for the body's joint and multi-articulate movements in different functional activities such as pitching, lifting and running, Page and Ellenbecker (2008).

Exercises 9, 10, 11 (Figure 6)

Run, lifting thighs with endurance elastic bands and finish in speed run, alternating jump with endurance elastic bands and finish with speed run and, finally, speed run with endurance elastic bands.

Repetitions: progress to 3-4 sets 12-15 repetitions for exercises between 25-30 meters Page and Ellenbecker, (2008).

Pause: 60-90 seconds after each repetition.

Characteristics of the resistance rubber band: use black bands that are very strong resistances; they are used by highly trained athletes who master form and technique to increase the production of force and recruit more rapid contraction fibers and provide greater acceleration in the initial movement, with a level of intensity (5), with a width of 1/2", a thickness of 6.4mm, and a resistance of 10-35 pounds.

El porcentaje de elongación para un ejercicio realizado sobre varias articulaciones se determina por la amplitud del movimiento, realizado a 90 grados (100% de elongación) con un tubo Thera-Band color negro, el índice de fuerza será entre 116-146 (kilogramos de resistencia) cuando se emplean de 12-15 repeticiones, Page et al, (2000).

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Fig. 6. - Running exercises, lifting thighs with resistance bands and terminal in speed run, alternate jump with terminal resistance bands in speed run and speed run with resistance bands

Like any modality of strength training, elastic endurance offers several advantages and disadvantages, kempf et al, (2007).

Advantages and disadvantages of muscle strength training with elastic endurance

Advantages

- Allows a high level of neuromuscular control
- Produces greater training of the central somatic segment (abdominal and lumbar region, as well as the hips)
- The elastic bands also allow faster movements and plyometric exercises (fast and powerful movement consisting of an eccentric muscle contraction "contramovement or pre-stretch" followed immediately by a powerful concentric muscle contraction.
- The significant increase in tension at the end of the tape extension is used to make more demands on the joint's fixing musculature.
- Band training can be used on angles that provide the desired combination of horizontal and vertical load. -Su principal característica es que provee resistencia variable dependiendo del ángulo, posición y largo de la banda.
- The elastic bands serve to improve strength, endurance which increases muscle and the capacity to withstand fatigue that comes from prolonged effort.
- Provides safe development of strength, muscle endurance, range of motion and flexibility.
- Can be used by beginners and experienced athletes.
- Direction of movement is less restricted than with free weights or exercise equipment.
- Exercises can be performed on more functional movement planes.
- It is used in plyometric exercise techniques, speed races and neuromuscular proprioceptive facilitator (NFP).
- The same principles of the progressive endurance exercise can be applied.
- Elastic bands also allow faster movements as well as plyometric exercises, Page and Ellenbecker, (2008). Plyometry is a type of training designed to produce fast, powerful movements generated from the ground by stressing the extremities of the lower and upper limbs, García et al, (2017).

Disadvantages

- The amount of strength changes according to the angle of tension of the contracting muscle, reaching its peak when the angle of tension is 90º.
- The strength changes constantly through the amplitude of the movement, requiring greater impulse force to overcome the inertia of the weight.
- During the exercise, the treadmill should not lose tension at any time, otherwise the joint's locking effect is not guaranteed.
- If the elastic recoil is not controlled, it can cause injury.

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RESULTS AND DISCUSSION

During the preparation stage where the specific sequence of phases of the strength training is framed, the four controls were carried out in the home-first base run (Figure 7), a decrease in the times was observed that points to the effectiveness of the program.

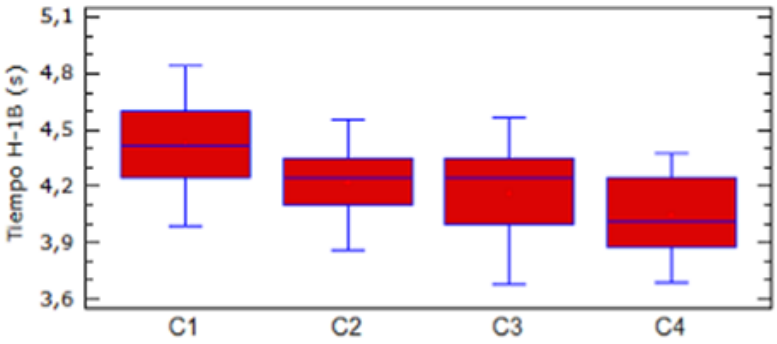

Fig. 7. - Behavior of the home-first base times of the baseball players juvenile category of Matanzas in different phases of preparation

When comparing the times in the different controls, it is shown that there are significant differences for 95% confidence, as the value of the probability (p-value = 0.0001) is less than 0.05. Duncan's test denotes that significant differences are expressed between the C1-C2 controls (anatomical adaptation phases and the end of muscular hypertrophy), between the C1-C3 controls (beginning of the anatomical adaptation phase and end of the maximum force phase), between the C1-C4 controls (beginning of the anatomical adaptation phase and end of the specific force conversion phase) and between the C2-C4 controls (end of the muscular hypertrophy and end of the specific force conversion phase). It should be noted that although there was an appreciable decrease in times, no significant differences were found between the controls C2-C3 (end of the muscular hypertrophy phase and of the maximum force), and C3-C4 (end of the maximum strength phase and of the conversion into specific force), which could be signalled by the fact that when organizing the planning there was not enough time before the beginning of the competitive activity and it was decided to prioritize the phases of anatomical adaptation and muscular hypertrophy, due to the fact that the players, besides having little experience with this type of training, had to increase their muscular mass. Also, the limited time for maximum strength and conversion; even though from the Mx F phase onwards, due to the use of heavy loads, and to the explosiveness during the conversion of Mx F into P, the time-force curve shifts to the left Bompa, (2000); this is not sufficient as similar reactions are recorded in both phases. When calculating the increments from one measurement to another (start - end of each phase) no significant results were obtained (Figure 8), although there were always increases that were more noticeable between the phases C1-C4 (anatomical adaptation - conversion into specific force) with 4.37 %.

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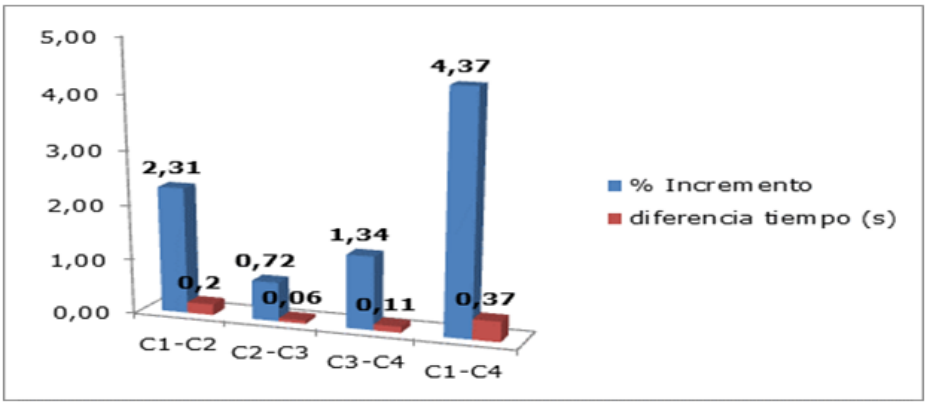

Fig. 8. - Representation of % increments and time differences between controls

The lowest time records occur in controls C1-C2 and C1-C4, with a notable reduction in home-first base run times from 4.42 to 4.22 s (with a decrease of 0.2 s) and from 4.42 to 4.05 s (with a more appreciable decrease of 0.37s) respectively, and that when evaluated on the scale proposed by Reynaldo, (2007), for home-first base run in baseball players the maximum evaluation is achieved (80 s). points). This effort to increase the speed of the run, associated with training with elastic endurance bands to achieve great benefits in the development of speed, is recognized by Collins (2016) as one of the most important factors related to improving sports performance. Precisely, in baseball, Brigaud, (2016), emphasizes the training of speed, mainly in the home-first base run.

According to the criteria of Bompa and Buzzichelli (2006), to help maximize the potential of speed in a sport as varied as baseball, it is required to gradually convert strength into power and to do so must maintain certain levels of maximum strength. If this is not the case, the power may decline due to the distraining of the neuromuscular qualities at the end of the competition phase, as it has a very long season. In team sports such as baseball where power is dominant, it should be combined with exercises that lead to the development of agility, rapid movements and reactions, Weineck, (2013). Only this type of approach prepares players for the competition requirements of the specific sport. The duration of this phase depends on the capacity to develop and is achieved in four or five weeks of training of the specific power.

Another reasoning to take into account during the run towards first base, are the supports in the run with the anterior part of the foot (metatarsus). Based on studies conducted by Brigaud (2016), this support technique has many advantages and can be a formidable strategy to develop, stabilize and enhance the run. The active swinging of the arms contributes to the propulsion and stabilizes the architecture of the legs, which favors a better dynamics of the run and shows the great importance of the interactions between the arms, trunk, hips, legs and feet, Polischuk, (2015), which must be considered in this type of preparation because the preparation in baseball is very diverse and complex.

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It is important to emphasize that strength training with tubes or elastic bands because of their ease of use, variety and physical characteristics allows exercises with possible characteristics similar to isotonic exercises (generating large productions of force at a high speed of execution). Both elastic and isotonic strength have similar force curves. A recent study by Triplett and Haff (2017) showed that elastic endurance training and endurance training exercises are as effective as isotonic machines in increasing strength and muscle mass.
When training with tubes or elastic bands, the greatest the degree of muscular elongation in the execution of an exercise, the greatest will be the generation of tension strength, Uchida others., (2016). This training with elastic tubes, black color, generates a neuromuscular work that can modify values of strength, peak power and the rate of strength development (RFD) Laffaye and Wagner, (2014).

Studies carried out by Cronin, McNair and Marshall, (2003), assure that the work with elastic tubes optimizes the tension length relation, by means of neuromuscular activation on the serial sarcomers and in this way the frequency of nervous impulses are increased obtaining greater strength through the eccentric action. Another research was carried out by Maffiuletti otros. (2016), which used a group of exercises with black elastic tubes, generating a much higher RFD, which contributed to the explosive strength work, with which the athlete deploys a faster execution.

Turner and Jeffreys (2010), suggest that the work done with elastic tubes provide a recruitment of glucolytic fibers and fast in relation to speed, taking into account the work of the contractile elements of the muscles within the cycle stretch shortening, which provides a great development of eccentric strength, for greater performance in the jump and the race Bridgeman others., (2016). However, according to the duration of the shortening stretching cycle, the exercises are classified as slow (≥250 milliseconds) and fast (≤250 milliseconds), Turner and Jeffreys, (2010).

Therefore, it should be noted that the present study used a training program with elastic tubes for the lower limbs, which is a very effective method to increase the performance capacity of the main muscle groups, and is based on the principle of endurance work, kempf others. (2007). It started by using the thin yellow band of minimum endurance and gradually increased endurance by changing from band to strong endurance blue, ending with very strong black endurance bands (Diplom, Diplom and Sportpädagogin, 2005). These authors state that the endurance increases from 20 to 30 % between each color of band or tube (Thera-Band) with 100% elongation and the exercises should be performed at a high speed of execution with completion in speed runs during the preparatory period.

The results obtained in this study indicate that a program of exercises with elastic bands of endurance, with a duration of 20 microcycles (weekly), with a frequency of three days per week, coinciding with the training with overloads, produces significant changes in the times of the home-first base run of the baseball players juvenile category of Matanzas in the different controls carried out for a 95 % of confidence, since the value of the probability (p-value=0.0001) is smaller than 0.05. From the beginning of the work to its end a 4.37 % increase is reached with a reduction of the times of 0.37 seconds. It is demonstrated that the implementation

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of this type of training allows better times in the home-first base run, which results in player performance.

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