Exercises with weights for the strength of the serve in school tennis players from Villa Clara

Abstract

The serve technique in tennis requires a level of application of force that allows an adequate execution of the element, being the school category where the preparation of the tennis player's strength acquires great importance. In this direction, there are inadequacies in the use of exercises for the development of strength with weights in the serve. When facing this situation, the objective of the investigation is: to propose exercises with weights for the development of the strength of the serve in school tennis players from Villa Clara from the muscles involved in the technical movement of serving. Various research methods are applied, such as: interviews with coaches of this sport on the preparation of strength in this category; workshop with the coaches where the study of the technical gesture of serving is carried out; document analysis is used; the survey; triangulation by the source and the criteria of specialists. The results determine the structure of the serve movement in tennis and its phases, the joints that intervene, the main muscular planes that act in each phase and, from these results, the exercises for the preparation of strength with dumbbells. The exercises with weights that are selected for the work of the force allow to offer a more objective and variable training according to the criteria of the specialists in this sport.

Keywords: *serve, tennis, strength training, weight training*

Introduction

A large amount of research has been devoted to the execution of the serve in Tennis, this is a sport with variable characteristics, so this action is standardized and for its execution a great coordination of movement with strength and speed is required, applied to technical execution.

In this direction, the integral development of tennis players is important, since in matches the union of capacities with skills will be decisive for the optimization of performance. Tennis players, to be competitive and achieve success, need to combine physical abilities such as speed, agility, acceleration and power (Fernández and Sáez, 2016); (Calero, Chávez and Casares, 2016).

It is also important to take into account in the preparation, the physical and physiological requirements of the players (Pardos and Sagarra, 2017), in this regard Calero and González (2015) consider that both the skills and the capacities and the demands of the game should be taken into account from early ages in training to achieve performance in adulthood.

Rousselet (2017) states that strength work should be one of the fundamental pillars for tennis players in their training system. Strength is linked to speed and endurance capacities, according to Osete (2018) criteria, the performance of tennis players can be considered as strength resistance, it is also carried out with a high manifestation of speed, power and explosiveness, that is, fast strength.

When studying the serve, it is proposed that the reaction forces of the ground through the kinematic chain contribute between 50 and 60% of the total force from the proximal segments of the chain. Kibler (2009) determined that during the tennis serve, about 51% of the kinetic energy is produced in the trunk / legs with the contribution of 13% from the shoulder, 12% from the elbow and 15% from the wrist.

For Vancell (2020) one of the main roles of the goal of strength work in the tennis player in the training stages is to rebalance asymmetry and reduce muscle imbalances. The strengthening program should cover all muscle groups and pay close attention to both the antagonist muscles and those on the player's non-dominant side, which will help reduce the high number of injuries that occur. However, this must be supported by an analysis of the muscle groups directly involved in the actions.

Barrios, Nandayapa and Pensado (2012) evaluated the transfer of exercises with weights aimed at the development of explosive force on the improvement of the execution and power of the serve in 16-year-old tennis players, however they do not take into account the analysis of the phases of this nor the muscle groups that participate with greater importance.

The improvement of the strength preparation process in Tennis for ages between 15-16 years in Villa Clara, Cuba, requires the incorporation of these scientific-technical advances, in accordance with world sport, with the use of more planning models. current, considering that planning is one of the fundamental premises to direct the process of sports training.

The physical component, on which the research is focused is the preparation of strength, this has been treated in previous research in other sports by Román (2014); González (2017); Noriega, Lanza and González (2020) who have addressed the relationship of force with resistance and technique as fundamental capabilities and components; This line of research will allow to address the selective process that exercises with weights must have for an efficient work of strength capacity.

The category 15-16 years in Tennis is one in which the preparation of strength must be deepened, however, tennis players as beginners show weaknesses in this capacity,

which is decisive for obtaining results in any discipline, which It is observed when carrying out the initial controls in which deficiencies appear in the development of the same, finding the coach with the need to deepen its development.

In the Comprehensive Sportsman Preparation Program (SPP) for Tennis of the year 2019 and the Tennis development strategy (2017) in Villa Clara, the guidelines lack details to develop physical preparation and specifically the work of strength.

There is a limited orientation for the work of the force, it is only stated that the same for this category should be characterized by a general development, based on exercises with the tennis player's own body weight, in addition to exercises with the rope, parallel lines, bar, planks. and games with medicine balls, mainly for the initial years in the category (13 years), while for 14 and 15 years, that is to say 4th and 5th year in sport, development is oriented in addition to general strength, as well as development of the special force, emphasizing in the beginning of the work in the fast force and the resistance to the force, through the exercises with weights, seeing in the oriented a contradiction and a weak orientation.

These aspects lack a precise explanation of how the capacity work should be carried out, and of the exercises that must be executed according to the technical gesture of Tennis, the use of new technologies is not oriented to analyze competitive movements and seek a rational choice of the exercises for the work of the force with weights in Tennis.

All these aspects lead to inadequacies in the use of exercises for the preparation of strength with weights, so the following reflection is presented: What exercises for the preparation of strength with weights should be used considering the muscles involved in the technique of the serve in tennis players 15-16 years in Villa Clara?

For this, the following objective is outlined: to propose exercises with weights for the development of the strength of the serve in tennis players 15-16 years of Villa Clara from the musculature that intervenes in the technical movement of serving.

Materials and methods

We worked with three populations, one made up of the five tennis players who make up the 15-16 year-old Tennis team of the Provincial “Héctor Ruíz” for Sports Initiation School (SIS) of Villa Clara, three of them boys and two girls. A second population made up of the two coaches responsible for the team and a sample of five tennis sport specialists from the province of Villa Clara, out of a population of 17.

Different methods and / or techniques were selected. From the theoretical level: analytical-synthetic, inductive-deductive. From the empirical level: documentary analysis, participant observation, interview, triangulation by the source, the workshop and the criteria of specialists. The investigation was carried out in three phases.

In the first phase, a diagnosis of the current state of use of exercises for the preparation of strength with weights was made, through the analysis of documents specifically the 2019 athlete preparation program, which provided information on the existing orientation to develop this activity; An interview was applied to the two coaches responsible for the category 15-16 years of the Provincial Sports Initiation School "Héctor Ruiz".

It was triangulated by the information sources to corroborate the information received, allowing conclusions to be reached. It was triangulated from the following units of analysis: work with weights per week; types of exercises with weights and relationship with muscle planes and guidelines for the development of training.

The second phase was aimed at determining the exercises with weights according to the muscles involved in each phase. In this, a workshop was held with the coaches of the category, where the study of the technical gesture of serving was initially carried out, based on the theoretical elements provided on this action in sports initiation in Tennis, as well as the aspects that Haitnaut offers (1976), which subsequently made it possible to select the exercises with weights according to the phases of the serve and the muscles involved.

In the third phase, a survey was carried out to assess, through the criteria of the specialists, the feasibility of using the exercises for the preparation of strength with weights selected for the tennis players. From the population of 17 tennis coaches in the province, five specialists were selected, these have an average of 20 years of experience as coaches in the sport and were part of provincial and national teams as players or coaches. These consulted specialists expressed their acceptance to participate in the research.

Results and Discussion

First phase: Diagnosis of the current state of use of exercises for the preparation of strength with weights

By triangulating the information collected on the planning of the training of the special force in tennis players aged 16-18 years, the following results are offered:

Unit of analysis No. 1. I work with weights per week.

1. The sessions are located according to the guidelines in the SPP, (2019): In the general preparation stage, three sessions for each microcycle (week). In the special preparation stage, two sessions per microcycles. In the competitive stage, one session per microcycle.
2. Only three exercises are applied in each weight session
3. Only the resistance to the force is worked in the planned periods.
4. The planning of the exercises with weights is carried out in the second training session to seek a higher level of recovery and restoration of the energy levels of the tennis players.

Unit of analysis No. 2. Types of exercises with weights and relationship with muscle planes

1. Generally applied: twists, bent bow, and back squat.
2. There is a lack of motivation for weight training.
3. Exercise variability in weight training is insufficient.
4. The exercises that are applied intervene to a limited extent in the gesture of taking out.
5. They do not contemplate all the musculature that intervenes in the gesture of taking out.
6. The number of exercises is insufficient, it is known that there are more, but they are not applied because there is not a good orientation.

Unit of analysis No. 3. Guidelines for the development of training.

1. The only way of orientation is the SPP that presents limited orientations, the material conditions are not considered.
2. The indications do not address the volume to work for this category, the intensity or the exercises to be developed in strength training, only natural exercises are proposed.
3. The bibliography on the subject is known, but there are limitations to access them.
4. Insufficiencies in the methodological preparations, these must be deeper and more enjoyable, they must address these issues.

Second phase: Selection of exercises with weights according to the phases and the muscles involved

In the second phase, the workshop was held for the selection of exercises with weights according to the muscles involved in each phase. In it, the analysis of the technical gesture of serve and the phases of this technical action was initially made, which are: starting or waiting position; ball elevation; flexion of the knees; movement towards the moment of impact; instant of impact; accompanying movement.

Subsequently, the selection of the exercises was made with the participation of the category trainers, for this the kinematic study of the movement and the muscles that participate in the gesture of serve was considered, the criteria provided by Román (2011) with reference to the exercises for Tennis, finally the selected exercises were:

• Lateral push-ups and arm rotation with dumbbells.
• Assault to the front bringing the arms forward with dumbbells.
• Lying down, straight arms opening.
• Wrist twists with dumbbells or heavy equipment.
• Imitation of the dumbbell serve.
• Torsion of the trunk with support of a foot with a bar.
• Torso twist with both arms straight with dumbbells.
• Disc pass.
• Hanging starter stopped.
• Halon starter.
• Clin hanging stopped.
• Clin halon.
• Clean and jerk push.

The selected exercises are shown in Table 1 by muscle types and planes.

Table 1. Auxiliary exercises by planes.

AREA	EXERCISES
Arms	- Forearms - Biceps - Rowing Standing - Force Stopped - Lying Force - Triceps standing. and lying down
Trunk	- Reverence with flexion - Hyperextension with weights - Crunches with weights - Twists
Legs	- Leg Extension - Leg curl - Squat from behind - Dumbbell cufflinks

After having determined the phases of the movement, the joints that intervene and the muscles that act for each phase, considering the weaknesses detected in the observations and corroborating the orientation, it is proceeded to determine the exercises for the preparation of strength with weights. This is done considering the muscles involved in each phase, arriving at the results shown in table 2.

Table 2. Service phases. Movement, muscles and exercises with weights .

Phases	Movement	Joint	Muscles	Exercises with weights
Home or Standby Position	Knee extension flexion	Patellar tibial femur Coxofemoral Tibium peroneal talar	Quadriceps Femoral Twins	Squat ahead Leg extensions
Ball Toss	Rotation of the hips	Coxofemoral	Quadriceps Femoral Twins	Squat ahead Leg extensions
Knee flexion	Rotating the arm over the shoulder	Knee joint	Quadriceps Femoral Paravertebral muscles Twins	Squat ahead Leg extensions Cufflink machine Hyperextensions Machine

Movement towards the moment of impact	Elbow extension	Shoulder joint Elbow joint Wrist joint	Quadriceps Femoral Twins	Leg extensions Femoral bench Cufflink machine
Impact moment	Wrist flexion	Shoulder joint Knee joint Coxofemoral	Deltoid Biceps Triceps Forearm	Stationary force Barbell standing biceps Triceps behind the neck with bar Dumbbell forearms
Accompanying movement	Trunk flexion	Shoulder joint Knee joint Coxofemoral Spine wrist	Quadriceps Femoral Paravertebral muscles Deltoid Biceps Triceps Forearm	Hyperextensions Machine Standing strength Biceps standing with bar

Third phase: Assessment by specialists of the selected exercises

The judgments made by the selected specialists allowed to corroborate the objectives of why to select them, as well as the coincidence of criteria about the effect that these exercises can produce on the muscles involved in the technical gesture of serve. The specialists generally agreed in giving positive evaluations about the proposed exercises, demonstrating the importance that from a practical point of view they are attributed and 100% considered yes in terms of their viability.

100% affirmed that they are necessary for the development of strength in the serve according to the characteristics of the tennis players in that category.

80% agreed on the correct relationship of the exercises with the muscles involved in the technical gesture of serving, the rest (20%) pointed out that the particular characteristics of each tennis player must be taken into account.

Their considerations were affirmative in 100% of the cases about the possibility of application in the school category and the originality of the study, since they do not know another with similar characteristics.

The need to use them as an alternative for the development of strength in the serve and the continuous improvement to improve the preparation of strength with weights in this sport, they consider it very necessary because it allows the practice of exercises with greater objectivity, considering the lack of means for the practice of exercises with weights.

Among the positive and negative aspects of the selected exercises, they stated:

Positive aspects

• Exercises are more objective and greater variability is achieved in weight training.

• The weaknesses of the tennis players can be considered for each phase and work in a more specific and personalized way.

• Only the necessary exercises are applied, which makes a rational use of the means, taking into account the lack of a gym.

• Improves technical movement because the exercises work the muscles involved in it.

Negative aspects

• Plan the exercises for the session in a general way without considering individual technical weaknesses.

They also considered that the exercises correspond to the age and the technique established by the SPP 2019, since the methodology used for their selection is based on the technical structure of the pull movement.

Conclusions

1. There are limitations in the guiding methodological elements and in the application of strength training with weights for the development of the serve in school tennis players, which are manifested in the type of exercise and its relationship with the muscles involved in the gesture technical.

2. The exercises with weights proposed for the strengthening of the specific muscles of the serve, based on the study of the technical gesture of serving and the phases of the movement, are considered by the specialists necessary and useful for the variability of the training, its individualization and the perfecting the movement technique according to the needs of 15-16 year old tennis players.

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