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Original article

Cuban women in weightlifting: a methodological perspective

La mujer cubana en el levantamiento de pesas: una perspectiva metodológica

Mulheres cubanas no levantamento de peso: uma perspectiva metodológica

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ABSTRACT

One of the sports that represents the most versatility is weightlifting, since its practice is not only reduced to competitive sports, but is a physical activity that develops strength capacity in the rest of the sports. This constitutes a reality that is reflected in sports performance, however, the women who practice it do not have treatment adjusted to their gender, so the

objective of this work was to determine what level of knowledge lifting coaches have of weights in Santiago de Cuba, to distribute the loads in the women's team of this sport. To achieve this purpose, empirical level methods were implemented such as scientific observation applied to training sessions and surveys of coaches who care for these athletes. As a result of the diagnosis, it was declared that there is a significant lack of knowledge about how to distribute the loads in these weightlifters and there is a lack of a methodology to increase this knowledge and improve the competitive results of the female gender, in this category.

Keywords: load distribution, female weightlifting

RESUMEN

Uno de los deportes que más versatilidad representa es el levantamiento de pesas, pues su práctica no solo se reduce al deporte competitivo, sino es una actividad física que desarrolla la capacidad de fuerza, en el resto de los deportes. Esto constituye una realidad que se concreta en el rendimiento deportivo, sin embargo, las féminas que lo practican no cuentan con un tratamiento ajustado a su género, por lo que el objetivo de este trabajo consistió en determinar qué nivel de conocimientos poseen los entrenadores de levantamiento de pesas en Santiago de Cuba, para distribuir las cargas en el equipo femenino de este deporte. Para lograr este propósito, se implementaron métodos del nivel empírico como la observación científica aplicada a las +sesiones de entrenamiento y la encuesta a los entrenadores que atienden a estas atletas. Como resultado del diagnóstico, se declaró que existe un significativo desconocimiento sobre cómo distribuir las cargas en estas pesistas y se carece de una metodología para incrementar este conocimiento y mejorar los resultados competitivos del género femenino, en esta categoría.

Palabras clave: distribución de cargas, levantamiento de pesas femenino

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RESUMO

Um dos esportes mais versáteis é o levantamento de peso, pois sua prática não se limita apenas ao esporte competitivo, mas é uma atividade física que desenvolve a capacidade de força em outros esportes. Essa é uma realidade que se reflete no desempenho esportivo, no entanto, as mulheres que o praticam não têm um tratamento ajustado ao seu gênero, por isso o objetivo deste estudo foi determinar qual o nível de conhecimento que os treinadores de halterofilismo em Santiago de Cuba têm para distribuir as cargas na equipe feminina desse esporte. Para atingir esse objetivo, foram utilizados métodos empíricos, como a observação científica aplicada às sessões de treinamento e uma pesquisa com os técnicos que treinam essas atletas. Como resultado do diagnóstico, constatou-se que há uma significativa falta de conhecimento sobre como distribuir as cargas nessas levantadoras de peso e que falta uma metodologia para aumentar esse conhecimento e melhorar os resultados competitivos do gênero feminino nessa categoria.

Palavras-chave: distribuição de carga, levantamento de peso feminino.

INTRODUCTION

Nowadays, women's weightlifting has gained importance and need in the world; In Cuba, its appearance is relatively recent and requires systematic studies that increase knowledge of how to distribute and apply strength training loads, to improve the athletic performance of women in this sport.

Different studies show that exercises with weights, properly dosed, do not cause any harm to women or their health, but rather tone the muscles, contribute to the improvement of general physical condition and are affordable for people of both sexes and different age groups. This type of exercise presents a wide field of action in which its application as a sport, or as a complementary activity, can be considered; however, the majority consider its practice to be taboo for women, due to the lack of scientific information and research on the subject and the non-acceptance of performing exercises with weights for women, which limits their incorporation into this activity.

Authors like Amdi *et al.* (2022), Carrasco *et al. (2023*) and Ruiz (2023) refer to the anatomical and physiological differences between females and males; however, women train strength in the same way, with the same programs, exercises, intensities and volumes relative to their body mass.

Society expects men and women to adopt and carry out specific gender roles, following already established stereotypes (Mujica-Johnson, Concha-López, 2020 and Posso *et al.*, 2021). Formerly, men were characterized by their physical strength, independence and an athletic form; while women, for being quiet, obedient, attractive, submissive and quiet (Dosal -Ulloa *et al.*, 2017 and Posso *et al.*, 2022). Currently, a gender order based on these stereotypes persists in society to define physical activity and sport; some are expected to carry out more violent and physically demanding activities; while others have more passive exercises with less contact.

Traditionally, sport is thought of in terms of "gender", with a local perspective. For Camacho- Miñano , Girela -Rejón (2017) "(…) men are motivated to participate in strenuous, aggressive and competitive team sports, while women are generally directed towards different more aesthetic activities, such as gymnastics, figure skating and synchronized swimming" (p.7).

In this sense, it is considered that there is a division in sports, according to sex and this can be a factor that incentivizes and encourages women not to accept the physical limits that have been imposed on them and are challenged by physically active athletes, involved at all existing sporting levels; although many of the studies reviewed refer to the fact that society is a little more reflective and permissive with everything related to the male gender in physical activity and sports (Arrebola *et al.*, 2022 and Posso *et al.*, 2021). This unequal treatment can be equated with the patriarchal nature of society (Torres *et al.*, 2022).

The above reveals the need for an update and preparation of the topic, in correspondence with contemporary transformations. Researchers like Carrasco *et al.* (2023) demystify female strength training and provide data on the specific neuromuscular adaptations for its training. According to (Cupeiro 2020), athletes seem to get less tired, both in isometric and

dynamic contractions, especially in the lower extremities, which allows them to endure more training. This author further states that:

> (…) the muscular composition of women differs from that of men in terms of strength and therefore ease of training. Therefore, men have better muscle strength than women (up to 173% in the upper body and up to 64% in the lower body. Women have 73.8% more relative muscle strength in the lower part of the body, which translates into greater loads during exercises that involve the lower extremities. (P.17)

Regarding the physiological and hormonal characteristics, the menstrual cycle and its different stages must be taken into account. A recent study by McNulty et al. (2020) shows that physical performance appears to change during this period and decreases at the beginning of the follicular phase; the reason that seems to lead to this conclusion is that estrogen levels are very low at this time and that this hormone has many functions that can affect performance.

From another edge, Chinchilla-Campos *et al.* (2020) argue, when looking at both sexes, that fat storage differs between them; men store more fat around the midsection and women store more fat around the hips and thighs. In addition, fat storage within tissues also differs, as they store more fat within skeletal muscle.

Regarding the magnitude of the maximum strength, the existence of marked differences between the two is recognized, and with regard to age the strength in favor of children is notable; in adolescence, inequalities increase naturally due, in large part, to the increase in testosterone at these ages. At the age of 15, girls' maximum strength, measured with a hand dynamometer, is approximately 25% lower (Nuzzo, 2022). Recent research tends to show less difference, with a clear change in trend in gender inclusion, in the practice of all types of sports (Handelsman *et al.*, 2018; Nuzzo, 2022).

Another significant aspect is that type I fibers are more oxidative than type II fibers, this helps to better understand why women are generally shorter and why some sports and disciplines are more resistant to fatigue. Women have higher intramuscular triglycerides and lower energy reserves in their muscles, especially in type I fibers, which are more

common in them. Intramuscular triglycerides provide energy quickly, through the oxidative pathway (lipolysis) (Ansdell *et al.*, 2020), all the more reason to think that when it comes to strength training, they may respond better to moderate repetitions (more than 6 repetitions per set, which does not mean that they do not lift heavy objects) than to low repetitions (Roberts et al., 2020).

As stated, although training in both sexes is very similar, there are elements that should not be overlooked such as the incidence of hormones, testosterone levels and the menstrual cycle; Therefore, at a physiological level, there are important differences that influence absolute strength and muscle mass.

Testosterone has been shown to play an important role in explaining these differences. For women, testosterone production is about 15 times less than the average peak for men. These values affect the initial muscle level at which you begin training, but have an impact on the percentage of relative progress you experience over the weeks, months and years of training and playing a particular sport.

Females have an average of 40% less absolute muscle strength than men and approximately 40-45% less total muscle mass, so it is very unlikely that they will reach the levels of strength and muscle development of men, in general absolute terms.

All of which denotes that conditions are expressed from theory in systematic preparation, with a differentiated approach in the strength training of women in weight lifting, since from the planning, models, methodologies and strategies of the training loads analyzed the anatomical-physiological particularities and differences are not taken into account for this process.

Despite this sport being very useful for all athletes, women who practice it do not have treatment tailored to their gender, so the objective of this work is to determine what level of knowledge weightlifting coaches have in Santiago de Cuba, to distribute the loads on the women's team.

MATERIALS AND METHODS

The study was applied in the "Capitán Orestes Acosta" Sports Initiation School (EIDE), Micro 4 Sports Complex of the José Martí District and the coaches of the San Luis Municipality. The universe consisted of 34 coaches and, based on a random sampling, 27 weight trainers were selected from the province of Santiago de Cuba.

Among the theoretical methods used in the research, the analytical-synthetic, which allowed the object of study to be analyzed in order to find the causes of the insufficiencies that correspond to the strength preparation process, as well as the coordination of the new procedure; the hypothetical-deductive, to assimilate the principles and laws of sports training and base the methodology with the relevant logic were used.

Scientific observation, applied to 12 training sessions, interviews and documentary review were used as empirical level methods.

The observation was carried out in the period 2020-2021, after the post-pandemic stage in Cuba. The observation guides contain four dimensions: planning, execution, control and evaluation, based on the determined variables; this method was applied to verify the treatment and differentiation of strength improvement in the 48 planned training sessions, six of these sessions were part of the planning stage and the others, the execution stage.

The document review was carried out on the Comprehensive Athlete Preparation Program (2022) and the reports of the visits made by the National Commission, with the purpose of evaluating the treatment on strength preparation in female weightlifters. The indicators evaluated were:

- Indicator 1: strength work for school weightlifters based on the sensitive stages for the improvement of capacities, with the final objective of achieving coordinated, coherent and well-structured preparation.
- Indicator 2: capacities training with the stimulus that causes the training load, to obtain greater benefit in relation to other ages with the same charges.

- Indicator 3: aimed at the possibilities of starting and accentuating the training of conditional capacities in the different age phases.

Inferential and descriptive statistics were applied, the average measurements, standard deviation, coefficient of variation, minimum and maximum. Additionally, the non-parametric Willcoxon test, alternatively, after checking for non-normalization, the Student test.

48 training sessions were observed whose objective was to analyze in practice how women's weightlifting training is carried out in the general preparation stage of the first macrocycle. The stage had 16 macrocycles; three sessions were observed for each one.

The applied guide underwent a review process with the following requirements:

- Have more than 10 years of experience in teaching, teaching category of assistant or full and scientific of Master's or PhD.
- Having studied the topic related to the collection of information and its application in sports research and in improvement courses.

After evaluating the guide, it is confirmed that it allows observing the selected context, responds to what exercises are used after the classic and special exercises and where they are selected, how the volume, intensity and type of strength are controlled according to the intensity, how classic, special and auxiliary exercises are related to strength and how individualization of training is carried out.

The survey made it possible to collect general criteria on women's weightlifting training, its conception, functionality and systematization. This instrument underwent a review process by the expert trios.

- The population of the 14 weightlifting specialists, from the sports teams of Santiago de Cuba.
- The four coaches of the provincial EIDE "Orestes Acosta Herrera", selected at random, as they are the ones who work and transfer to the category under study.

Coincidences and the presence of very particular features in the diagnosis were determined through methodological triangulation.

RESULTS

The survey yielded the following data:

- In strength training for female school weightlifters, 90% of the coaches did not establish a differentiation based on the sensitive stages in the improvement of abilities.
- In 70 % of the cases, a coordinated, coherent and well-structured preparation was not achieved, in accordance with the anatomic -physiological characteristics of the women.

· 100% of the trainings did not establish a basis for conditional capabilities, which did not cause the adequate stimulus on the training load to obtain greater benefit, in relation to other ages with the same loads.

In the review of documents, it was determined that no precise guidelines were provided for the planning, execution, organization and components of the load to be used, since these were only in a general way and without specifying the work for one sex or another; therefore, the instructions of the National Weightlifting Commission show the need to plan strength preparation as a determining capacity in weightlifting.

Cuban women have the potential to practice this discipline and improve their sports performance through the use of programs, exercises, intensities and volumes in relation to their body mass, as applied to men; to do this, an update and preparation is required in accordance with innovative transformations, which allow the elimination of differences between the training regimens of both sexes, from weight lifting to recovery methods.

Men lift more weight than women due to the amount of testosterone in their blood and muscle mass, which is given as a common justification for the training program; however, it is considered that although the link between the hormone testosterone and the growth of muscle strength is strong, there are not many differences in the training of both sexes.

When comparing the information provided by the sources used in this phase, with the triangulation method, the results were:

- Only pull-ups and squats were controlled as special and auxiliary exercises for strength and most of the training focused on technical improvement.
- Little knowledge and theoretical control in strength preparation training, male athletes were given more freedom to perform the exercises they desired.
- Casual performance of auxiliary exercises for strength preparation that are not related to classic and special exercises, or those included in training plans.
- Little methodological guidance on the preparation of muscular strength for school categories, in regulatory documents.
- Limited control over strength training preparation during training.

In the descriptive analysis, the mean values, the standard deviation, the coefficient of variation and the maximum and minimum values were shown, along with the results of the tests of the classic exercises and various tests carried out at different times of the preparation process; also, the results of statistical comparisons.

Wilcoxon rank hypothesis test was used to analyze the significant differences between microcycles three, four, five, six and nine, applied in identical conditions, and in related samples at different times of training. For this, the treatment began with the application of the normality test. Based on the difficulties presented, a methodology is proposed to improve strength training in female weightlifting. To make this methodology possible, different component are used, they are:

1. Variation coefficients.

2. Descriptive analysis of the snatch and clean and jerk tests.

3. Comparisons with the Wilcoxon test.

Normal values between 10 and 12 % were observed in the variation coefficients, which reaffirmed that there is no significant dispersion of the results obtained. If it is proceeded to the analysis of the classic exercises and refer to the snatch, a constant increase in the average values is observed, as the preparation develops and they go from 35.63 kg in microcycle three, to 49.15 kg.

Similar results were observed in the clean and jerk tests, where mean values increased from 50 to 68.11 kg with coefficients of variation ranging from 10 to 12%. It should be noted that statistical comparisons between the different microcycles in the snatch and clean and jerk tests showed significant differences with levels lower than 0.05 in both cases.

When performing the descriptive analysis, an inflection was highlighted in the results of both tests between microcycles six and nine. This could be due to the decrease in loads both in the precompetitive mesocycle of macrocycle I, and in the preparation mesocycle with which macrocycle II begins. The dynamics of the results of the pull-out and push tests allowed to notice the constant increase in the average values shown.

The average values between the first and last measurement were about 18 kg, as part of the proposal the strength push and squat test was introduced and they increased in relation to the results of the strength push test. The normal dispersion values, which were slightly higher in the strength push test with results between 14 and 20% of the coefficient of variation, support this positive increase in the mean values in both measurements; However, the criterion that there is no significant difference between them can be maintained.

The squat test, in which the coefficient of variation ranged from 10 to 14%, does not demonstrate this. When the Wilcoxon test was used, the comparisons showed statistical significance in all cases, which reiterates the modifications related to the development of the preparation.

As the different preparation mesocycles developed, the average values in the standing strength and lying strength tests continued to increase. While lying strength started at 53.11 kg and increased to 59.14 kg, standing strength increases ranged from 36.13 kg to 48.15 kg. When statistical comparisons between the two tests were used to determine whether the changes that had occurred were statistically significant less than 0.05, the results showed that they were statistically significant in all cases, which supported the adjustments that had been made in the development of preparation.

The results of the lying strength test showed values between 11 and 12%, which could be a consequence of the differences in the results by body weight categories in this test, but it is not possible to talk of a great dispersion of results in any of the two cases. The Wilcoxon test showed that the statistical significance of the changes produced is less than 0.05 when the statistics of the two tests are compared.

It was decided that it was advisable to determine the current influence between the different tests on the classic exercises after performing the descriptive analysis and statistical comparisons of the results obtained during the different moments of preparation. For this reason, a correlation study was carried out, which showed a high correlation between the tests.

DISCUSSION

González and Gutiérrez (2021) address that systematic practice is an essential element of sports training, since it allows the athlete to develop the physical, technical and tactical capabilities necessary to achieve maximum performance. These authors agree with Matveiev (1988) who points out "(…) sports training is a basic form of athlete preparation based on systematic practice and an educationally organized process that is intrinsically intended to guide the development of the athlete" (p. 17).

The theory of sports training is a fundamental articulation that integrates ideas from descriptive anatomy, neurophysiology, biomechanics and experimental psychology that Hours (2018) identifies as characterizing the pursuit of physical performance and productivity.

Training should be aimed at correcting technical deficiencies, developing physical caoacities and achieving maximum sporting performance. (Escalona and Calero, 2022). These researchers promote the development of physical capacities to achieve the maximum result in competitive exercises, so the volume to be performed in each component of the preparation must be carefully planned (Beaudart , *et al.,* 2019; Enríquez-Del Castillo, *et al.,* 2021 and Vite *et al.,* 2020) so as not to overload the athletes; the volume to be carried out in the fundamental load is regulated in the Comprehensive Athlete Preparation Program, in almost all Cuban sports, but the volume for the complementary load is dosed according to the coach's knowledge with an important empirical character.

The implication of working with weights in women is a topic that has been widely studied in recent years, Huebner *et al.* (2021) point out that, compared to men, women tend to be shorter (by 10%) and weigh less (by 20%) and have a greater amount of body fat (by 16-23% more, in those who are sedentary and 10-15%, in those who practice exercises or sports activities).

However, the use of weights is not contraindicated in women, in fact, a study conducted by García-Verdugo *et al.* (2019) shows that a 12-week strength training program is effective in improving body composition, muscle strength, and physical performance in the untrained.

These results coincide with those of other studies that have investigated the effects of strength training in women from different groups, whether overweight or obese (Alonso-Fernández, *et al.,* 2020) and in the elderly (Gómez-Cejudo, *et al.* 2021).

It is confirmed that women have higher estrogen levels than men, which can lead to more prominent volume maintenance of muscle mass due to anti-catabolic properties. This impact is created in stages of caloric deficit by a lower turnover of muscle proteins. This can be considered in calorie deficiency phases where there is a concern of losing volume all the

time. During preparation, the ligaments are responsible for communicating the tensile strength that the muscles apply to the joints. In women, a less rigid nature of these has been noted, which causes less tension in the muscle myofilaments and less muscle damage.

The above shows that women can withstand (or need) a greater volume of preparation and cause adaptations to it. Additionally, due to less muscle damage, they recover sooner between sessions. During the first few months of training, relative rates of upper body strength gains are considerably higher in women than in men (Roberts, *et al.*, 2020).

Women have about half the muscle mass of a man in their torso. According to Nuzzo (2022) in long-term studies, the relative rates of strength gains may be slightly higher in them. In relation to the anticatabolic effects of estrogens, they also oxidize fewer amino acids during preparation, which allows them to easily withstand metabolic pressure, that is, they can beat or try and need longer repetitions of reiterations than men to create a preparation total muscle works.

According to what was stated, women can endure a greater volume of preparation than men and recover from it. This translates into more prominent resilience potential for longer reps and a higher number of reps each week, demonstrating the superiority of the approach.

This strength work for school weightlifters must be planned on the basis of sensitive phases for the improvement of capacities, with the final objective of achieving a coordinated, coherent and well-structured preparation. During the sensitive stages, some capacities can be trained and with the stimulus caused by the training load, greater performance is obtained in relation to other ages with the same loads.

CONCLUSIONS

The diagnosis showed that both knowledge about the distribution of loads for female weightlifters and work with strength capacity in this category were significantly limited.

The proposal presented included a group of components that facilitate the coach's work in order to apply an approach that considers the conception of gender in the sport of women's weightlifting.

This proposal contributes to the increase in knowledge to improve strength capacity with a gender perspective, by achieving a coordinated, coherent and well-structured preparation, in correspondence with the anatomophysiological characteristics of women.

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***Conflict of interests*:**

The authors declare not to have any interest conflicts.

***Authors' contribution*:**

The authors have participated in the writing of the work and analysis of the documents.