



Tests to Assess Arm Strength Endurance in Junio Wrestlers in Camaguey, Cuba

[Pruebas para evaluar la resistencia a la fuerza de brazos en luchadoras escolares de Camagüey]

[Testes para avaliar a resistência à força dos braços em lutadoras de escolas femininas em Camagüey]

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Received: 30/09/2022.

Accepted: 20/10/2022

ABSTRACT

The aim of this study is to design tests to assess arm strength endurance during the control and evaluation process of sports training in junior wrestlers at the Provincial Sports School of Camaguey (EIDE). Theoretical methods, such as documentary analysis, the analytical-synthetic method, and the inductive-deductive were used. Meanwhile, the empirical methods used were surveys, measurements, and expert opinion; statistical-mathematical methods were also included in this research. The results showed that there are methodological flaws and discrepancies among the teachers in relation to determining and assessing this type of strength for the arms. All the specialists noted that the tests were appropriate for application in this age category during the strength training process, and highlighted their relevance. The analysis of the results led to conclusions and recommendations that permit the application of the test thanks to its reliability.

Keywords: Tests, strength endurance, women's freestyle wrestling



RESUMEN

El objetivo de la investigación es, confeccionar pruebas para evaluar la resistencia a la fuerza de brazos durante el proceso de control y evaluación del entrenamiento deportivo, en luchadoras escolares de la Eide de Camagüey. Se aplicaron métodos del nivel teórico como son el análisis documental, analítico sintético, inductivo deductivo, también se utilizaron métodos del nivel empírico, como fueron encuestas, medición, criterio de expertos, se utilizaron métodos en el orden estadísticos-matemáticos. Los resultados arrojaron que existen dificultades metodológicas y discrepancia por partes de los profesores en como determinar y evaluar este tipo de fuerza para los brazos, así como 100 % de los especialistas opinan que las pruebas son adecuadas para su aplicación en esta categoría durante el proceso de preparación de la fuerza y de gran importancia. El análisis de los resultados permitió arribar a conclusiones y recomendaciones que permiten aplicar la prueba debido a su confiabilidad.

Palabras clave: Pruebas, resistencia a la fuerza, test, lucha libre femenina.

SÍNTESE

O objetivo da pesquisa é desenvolver testes para avaliar a resistência à força do braço durante o processo de controle e avaliação do treinamento esportivo em lutadoras escolares do Eide de Camagüey. Foram aplicados métodos de nível teórico, tais como análise documental, analítico sintético, indutivo-dedutivo, bem como métodos de nível empírico, tais como pesquisas, medição, julgamento de especialistas e métodos matemáticos-estatísticos. Os resultados mostraram que existem dificuldades metodológicas e discrepâncias por parte dos professores em como determinar e avaliar este tipo de força para os braços, assim como 100% dos especialistas acreditam que os testes são adequados para sua aplicação nesta categoria durante o processo de treinamento de força e de grande importância. A análise dos resultados nos permitiu chegar a conclusões e recomendações que nos permitem aplicar o teste devido a sua confiabilidade.

Palavras-chave: Testes, resistência à resistência, teste, luta livre feminina.

INTRODUCTION

Wrestling originated with our civilization; it is one of the most ancient and universal sports, and one of the oldest combat forms. The popularity of women's freestyle wrestling is so big that it was included in the program of the modern Olympic Games.

Wrestlers must be resistant, and maintain the quickness and strength indexes, and the techniques and movements of pulling, pushing, and projecting from the start of the fight through the end. It entails a relatively long duration of muscle tension, trying to prevent early fatigue due to exhaustion and wearing, and therefore, to the loss of psycho motor coordination and technical and tactical confusion that leads to tactical inefficiency. Due to the continuous changes of the rules, combat sports have been under constant changes in terms of their training structure to keep up the pace of the leading powers.



Training means planning and arranging working sessions that permit a correct formation of athletes, so that their preparedness becomes optimum in the pursuit of their sports goals and achievements. Athletes should be constantly assessed, seeking enhancements through systematic training. According to Barroso (2019), coaches need to include assessment indicators for their athletes. The reasons for this are multiple, namely, the selection of future athletes, practical information about training guidance, and the effects on the athletes under their command, etc. The system to acquire this type of information is a set of tests for sports assessment.

These tests are measurements performed to determine the status or development of athletes' capacities and qualities. At the same time, measurement is the correspondence established among the phenomena studied, on one hand, and their numerical expression, on the other.

The tests have several basic characteristics, such as:

- Pertinence. The parameters evaluated should be appropriate to the activity performed.
- Validity and reliability. When a test measures the target to be assessed.

There are quite a few tests conducted in different parts of the world, some of them have been pooled, since it is more appropriate and effective at the moment of assessing people physically, also validated in several different studies, which offers greater reliability when applied to junior athletes, who, in turn may be more stimulated to engaging in physical and sports activities at schools (Gálvez, 2018).

Measuring and assessing students' physical and motor development is a high responsibility, as it will allow them to design practical and optimum situations and contexts, thus ensuring collaborative education and customization, besides collaborating in the detection, diagnostic, and guidance to rehabilitate students with disabilities (Rosa, & Carrillo, 2018).

Physiologically, muscle strength is the capacity of a muscle or group of muscles to perform a maximum contraction against endurance or load (Haqiyah, Mulyana, *et al.*, 2018).

Strength endurance It is the capacity to withstand fatigue when performing muscular efforts that may be short, mid-term or long. Hence, it entails a combination of strength and endurance qualities where the load intensity and effort duration ratio will determine the preponderance of one quality over the other.

Particularly, the test that measures strength-endurance (extension-flexor of the arms in one minute), as the effect of the maximum strength is positive thanks to the high resistance to be overcome (Platonov, 2018). The same author estimates that in the prone-supine position adopted when flexing-extending the arms, the load is higher than 50 % (66.4 %, approximately).



Recently, it has been evidenced that the body works using several variations, which permit improvements in the upper limb muscle strength because of the progression of the exercise program. Kotarsky C.J Christensen B.K, Miller J.S, Hackney KJ, (2018).

Among the main exercises used to improve upper limb strength are the *press banca powerlifting* with free weights, usually performed to activate the upper body strength and arm flexions, usually called lizards, push-ups, or just flexions, since they also help evaluate muscle strength and endurance. Alizadeh S, Rayner M, Mamdouh M, Behm D.G (2020).

Arm flexions are relatively safe and stable, since they need no greater coordination Clemons J, (2019).

The *Comprehensive Program for Athlete's Preparedness* (PIPD, 2016) offers guidelines that prioritize overall physical preparedness; however, strength training has not been dealt with in detail. According to the previous criteria, the flaws observed in the organization of strength preparedness in junior wrestlers should be tackled. Not only the physical side should be targeted, but also other key factors for the development of this capacity with a high level of optimization.

Strength is the physical capacity with the highest incidence on sports performance. However, without the combination of strength and the other capacities, the goals of physical preparedness would not be met in any sports specialty. Athletes must be as strong as fast, as strong as with coordinated movements, as strong as resistant in the training sessions and competitions, as strong as flexible and harmonious in the execution of the specific motor skills of the corresponding sport.

This study was motivated by the need of the women's junior freestyle wrestling team in Camaguey, for assessing their athletes' arm strength endurance. In practice, the wrestlers showed flaws in arm strength endurance acquisition, evidenced by the appearance of fatigue signs and symptoms during their combats, especially in the last minutes. On the offense (attack), the athletes loosened their grips very easily, and on the defense, they showed very little arm strength to defend from a tackle, thus yielding their points to their rivals in most cases. Considering that this type of strength is fundamental in women's wrestling, particularly when mastering the grip to pull, push, knock down, and project a rival at the expense of their endurance to try and achieve the same. Throughout the combat, the arms and hands must be used to perform the technical actions. It demands the design of tests to assess arm strength endurance in the junior category based on a scale, as there is no teaching program or guiding document that states how to assess this capacity during the training period in this sex, as a response to the demands of the central sports body in terms of high-performance athlete training.

Accordingly, the aim of this study is to design tests to assess arm strength endurance during the control and evaluation process of sports training in junior wrestlers.



MATERIALS AND METHODS

The study was based on an intentional sample made of sixteen female students belonging to the women's wrestling team at EIDE in Camaguey. The best pedagogic tests by division to the previous course students with satisfactory results were used in the analysis, accounting for 100% of the sample (Table 1).

Table 1. - Population and sample

| Population | Sample | % |
|------------|--------|-----|
| 16 | 16 | 100 |

The following theoretical methods were used

- Analytical-documentary.
- Inductive-deductive.

Analytical-synthetic: It determines its particularities through synthesis, and leads to integration, permitting the elucidation of its relation and general characteristics.

The following empirical methods were used:

Observation: It was used to gather information about the problematic of this research, at the training and competition areas.

The survey was used to search for information to assess the level of scientific knowledge of coaches with a possibility to be part of the group of experts that will validate the proposed tests.

Measurements: They permitted to measuring the outcome from arm strength endurance tests of the female athletes upon the application of the methodology designed.

Expert opinion: Pair comparison was used to assess the feasibility of the theoretical rationale and the methodology suggested and enhanced by expert opinion.

Statistical-mathematic methods: To process the results, several methods were included, such as arithmetic means, standard deviation, percentage distribution, and graphics, which were used to characterize and describe the results (Figure 1).



Test structure and design

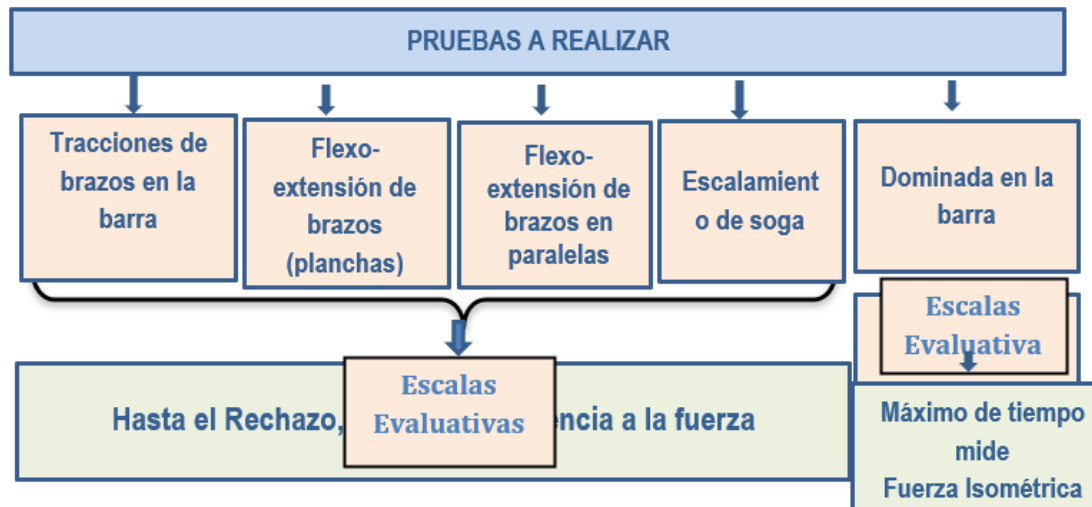


Fig. 1. - A scheme for the design of tests for assessing arm strength endurance in female junior athletes

RESULTS AND DISCUSSION

Based on the results of the diagnostic, a group of wrestling coaches was selected from the province and other areas who work directly with women, and with a vast experience and results. The objective was to measure their knowledge about strength endurance capacity and other tests to evaluate them. The average working experience of the sample was 22 years, with participation in national championships in the junior and cadette categories, and 100% of the sample were university graduates, with a degree in Physical Culture. Five of them hold a Master's degree (33 %); three were specialists (20%), and seven had bachelor degrees (47 %), of them, ten are national referees, and another is an international referee. They were asked to fill a survey to measure their competence coefficient. It was applied to 15 coaches to measure their competence coefficient (K), through self-assessment, in order to create a group of specialists that will validate the tests suggested.

Results of the second survey applied to the coaches

In question No. 1, of the 15 coaches, 14 coincided in the great importance of these tests to assess strength endurance in women, being the first part of the body exposed to contact to knock down, push and pull, and to mark during the period of time assumed in the combat (90 %).

In question No. 2, of the 15 coaches, 14 agreed that number 2 was the most convenient period to work this type of strength, particularly in the mesocycle of the general physical training, accounting for 90 % of the surveyed



In question No. 3, of the 15 coaches, 12 agreed that number 2 was the most convenient period to work this type of strength, particularly in the mesocycle of the general physical training, accounting for 80% of the surveyed individuals.

In question No. 4, of the 15 trainers, 14 agreed it was the most convenient part of the lesson to work this type of strength, accounting for 90% of the surveyed individuals.

In question No. 5, of the 15 trainers, 12 agreed that it was the most convenient frequency in which this type of strength, particularly is the micro of general physical training, accounting for 80 % of the surveyed individuals.

In question No. 6, of the 15 trainers, 14 agreed that it was the appropriate selection of the method to be used to develop that strength, accounting for 90 % of the surveyed individuals.

In question No. 7, of the 15 trainers, 9 agreed with the physiological goals pursued by strength endurance, accounting for 60 % of the surveyed individuals.

In question No. 8, of the 15 trainers, 11 agreed with the physiological goals pursued by strength endurance, accounting for 70 % of the surveyed individuals.

In question No. 9, of the 15 coaches, 9 agreed with the type of recovery to be used for greater effectiveness of the work using this type of strength, accounting for 60 % of the surveyed individuals.

Overall, the questions in which the knowledge percentage was the lowest by the surveyed individuals, were 7, 8, and 9, respectively. There was a discrepancy, in terms of physiological topics, energy work, and recovery type, depending on the energy system for strength resistance. Accordingly, there are theoretical and methodological flaws concerning the type of strength, and therefore, there is a need for professional training of direct coaches in women's wrestling to improve the national outcome, since only a few provinces are taken into account. Finally, 10 coaches were selected out of the 15 initially surveyed, to be part of the group of specialists that evaluated the tests.

Specialist assessment

The specialists concluded that the tests suggested to assess arm strength endurance in women's junior wrestling was within the adequate to very adequate range, coinciding in terms of validity, feasibility, and pertinence for training.

Based on the assessment of experts, the variation coefficient was determined to describe the level of specialist's concordance in every question. The greater the value, the lower the concordance in relation to the aspects evaluated.

The following table shows the frequency a question is assessed, with a category validated by the specialists, where C5 is very adequate; C4 is quite adequate; C3 as adequate; C2 as little adequate; and C1 inadequate. However, it is necessary to include a single assessing category for every question or aspect for evaluation, since the individual assessment by test is not enough to hold a conclusive result.



After building the table of frequencies to evaluate each question, a relative accumulative frequency table was built, and the cut off points to determine the category or level of adequacy of every question in relation to the tests, was calculated, according to the opinion of the specialists consulted (Table 2).

Table 2. - Relative accumulative frequencies

| Cut off: | | | | | | | | |
|-----------------|----------|--------------|-------------|-------------|--------------|--------------|-------|--------------|
| No. | Elements | C1 | C2 | C3 | C4 | Sum | P | N-P |
| 1 | E.1 | -0.37 | 0.18 | 1.07 | 3.72 | 4.61 | 1.15 | -0.39 |
| 2 | E.2 | -0.37 | 0.57 | 1.07 | 1.07 | 3.06 | 0.77 | -0.01 |
| 3 | E.3 | -1.07 | -0.79 | -0.37 | 0.37 | -1.86 | -0.46 | 1.23 |
| 4 | E.4 | -0.37 | 0.17 | 1.06 | 3.72 | 4.60 | 1.16 | -0.39 |
| 5 | E.5 | -0.37 | 0.57 | 1.07 | 1.07 | 3.07 | 0.78 | -0.01 |
| 6 | E.6 | -1.07 | -0.79 | -0.37 | 0.37 | -1.86 | -0.46 | 1.24 |
| 7 | E.7 | -0.37 | 0.19 | 1.06 | 3.72 | 4.62 | 1.15 | -0.39 |
| 8 | E.8 | -1.07 | -0.79 | -0.38 | 0.37 | -1.87 | -0.45 | 1.23 |
| 9 | E.9 | -0.57 | 0.18 | 0.79 | 3.72 | 4.12 | 1.03 | -0.27 |
| 10 | E.10 | 0.57 | 1.07 | 3.72 | 3.72 | 9.07 | 2.27 | -1.51 |
| Sum | | -1.07 | 1.20 | 6.28 | 12.59 | 19.01 | | |
| Cut off: | | -0.21 | 0.24 | 1.26 | 2.52 | | | -0.19 |

The cut off values were obtained by dividing the sum of the corresponding values to every column between the pass number (relative average), where N-P is the average value given by the specialists consulted between tests. The cut off values were the limits among which the mean value may vary, as given N-P by question in every evaluating category, according to the method.

C5: N-P lesser than 4.26, C4: N-P greater than 4.26 and lesser than 7.93. It can be concluded that all the aspects evaluated in the tests were within the C5 and C4 categories (very adequate and quite adequate), which means that the tests suggested were helpful to evaluate the arm strength endurance of junior female wrestlers, as it was theoretically evaluated by specialist opinion (Delphy).

CONCLUSIONS

There are theoretical and methodological flaws concerning the type of junior female wrestlers' strength, and therefore, there is a need for professional training of direct coaches in women's wrestling to improve the national outcome.

The specialists concluded that the tests suggested to assess arm strength endurance in women's junior wrestling and their validity for implementation in training sessions were positive.



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Conflict of interest statement

The authors declare no conflicts of interests.

Author contribution statement

The authors have taken part in the redaction of the manuscript and analysis of the documents.



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