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THE EFFECT OF BALLISTIC EXERCISES USING RUBBER BANDS ON DEVELOPING SPECIAL ENDURANCE AND ACHIEVING 400M PERFORMANCE FOR ATHLETES UNDER 19 YEARS OLD

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ABSTRACT

The speed events are exciting activities that have specific physical requirements to achieve performance and outstanding results and compete internationally. This is particularly important in individual sports, especially for youth categories in athletics. The 400m event is considered one of the most challenging sprint events due to the special physical capabilities required to achieve performance. This race demands a huge amount of speed, endurance, and strength, in addition to the requirements of willpower, determination, and perseverance. Achieving the highest levels in this race necessitates a high level of important fitness components and characteristics. Training for this group of runners focuses on speed endurance and strength endurance through ballistic exercises using rubber bands, which help develop the working muscles of the athletes and enhance their physical capacity, subsequently improving performance. Ballistic exercises with rubber bands are considered modern training methods in athletics, aiming to develop muscular strength through strength training. This type of training forces the athlete's body to recruit and stimulate fast muscle fibers, which is crucial because fast muscle fibers have the potential for growth and development in strength training. The importance of this research lies in using ballistic training with rubber bands to develop special capacities and its impact on performance.

Keywords: *Ballistic exercises, special endurance, 400m performance.*

INTRODUCTION

The current scientific progress observed worldwide is one of the main reasons for the advancement and improvement of human life through well-studied scientific planning that contributes to achieving human goals. This progress has encompassed all areas of life, including the sports field, which has come through research and studies that have contributed to diagnosing and finding the most suitable solutions for the training process, in addition to relying on various sports education sciences that emphasize the importance of innovation and creativity, and finding the most suitable training methods to influence the development of achievements and achieve record numbers in various sports. It has become clear that training is significantly linked to scientific and technical advancement. The training process has taken on a form and organization consistent with the new developments in methods and techniques used, leading to the development of numbers in various individual events. This has allowed advanced countries in this field to showcase their best capabilities to enhance this aspect. The 400m event is considered an intermediate distance between short and medium distances, and is regarded as one of the toughest types of races, often referred to as the "death race" because the runner must sprint 400m with the same speed and power as in a 100m race. The improvement of many physical qualities and capacities, especially special endurance (speed endurance, strength endurance), comes through ballistic exercises, which are explosive movements performed with maximum possible speed. These exercises include many varied movements and are achieved through training with exercises by adding resistances like rubber bands during performance, adding an external load to the working muscles to improve their strength levels, and consequently increase their efficiency. The result of this efficiency is an increase in the runners' speed. The significance of the research and the importance of this study are evident through ballistic exercises with rubber bands as specific exercises for performance and their effect on special endurance and achieving a 400m performance for athletes under 19 years old.

RESEARCH PROBLEM

Through the researcher's observation of elite athletes in the 400m event, it has been noted that the recent developments in record numbers do not reach the level of Arab records in the 400m race. There is a pressing need to break the monotony of training, which may lead to muscular and neural adaptation. Thus, it is essential to enhance adaptation by innovating new methods that may provide a greater impact in developing special endurance and positive adaptation for the muscle work of the 400m runners using ballistic exercises with rubber bands to enhance special endurance training and its effect on performance levels.

RESEARCH OBJECTIVES

1. To prepare ballistic exercises with rubber bands and assess their effect on special endurance for the age group (19) years.
2. To identify the effect of ballistic exercises with rubber bands on the performance of the 400m event for the age group (19) years.

RESEARCH HYPOTHESES

1. There are statistically significant differences between the pre-test and post-test results in special endurance for the sample, favoring the post-test results.
2. There are statistically significant differences between the pre-test and post-test results in the performance of the 400m event under 19 years, favoring the post-test results.

RESEARCH SCOPE

- Human Scope: Elite athletes in the 400m athletics event, totaling .(4)
- Time Scope: From 9/9/2022 to 11/11/2022.
- Spatial Scope: Specialized athletics school stadium / Ministry of Youth / Baghdad.

RESEARCH METHODOLOGY AND FIELD PROCEDURES

RESEARCH METHODOLOGY

The researcher used the experimental method for its suitability to the design of a single group to address the research problem.

RESEARCH SAMPLE

The sample was selected intentionally from 400m runners under 19 years old, totaling (4) runners, representing (100%) of the sample in Baghdad for athletics.

TOOLS AND INSTRUMENTS USED IN THE RESEARCH

1. Arabic and foreign references and sources.
2. Information network (internet).
3. Observation and experimentation.
4. Personal interviews.

INSTRUMENTS AND EQUIPMENT USED IN THE RESEARCH

1. Four (4) Casio stopwatches.
2. Six (6) plastic cones.
3. One (1) HP laptop.
4. Five (5) Imation CDs.
5. Athletics field.
6. Four (4) rubber bands.

TESTS USED IN THE RESEARCH

1. **300m Sprint Test**

- Test Objective: To measure special speed endurance.
- Tools Used: Athletics field, stopwatches, assistants, registration form.
- Test Description: Runners start from a standing position at the starting line, and upon hearing the starting signal, they sprint the test distance of 300m as fast as possible. Upon reaching the finish line, the stopwatches are stopped.
- Test Registration: The time is recorded to the nearest (fraction of a second) for each runner once, and entered into the testing form by the assisting team.

2. **Weight Jump Sprint Test (150m)**

- Test Objective: To measure strength endurance.
- Tools Used: Athletics field, stopwatches, assisting team, registration form.
- Test Description: The runner stands behind the starting line in an upright position, and upon hearing the starting signal, they sprint the test distance of 150m while jumping correctly. Upon reaching the finish line, the stopwatches are stopped.
- Test Registration: The time is recorded to the nearest (fraction of a second) for each runner once, and entered into the testing form by the assisting team.

3. **400m Sprint Test (Performance)**

- **Test Objective:** To measure the performance of the 400m race.
- Tools Used: Athletics track, stopwatches, assisting team, registration form.
- Test Description: Runners start behind the starting line from a seated position, and upon hearing the starting signal from the whistle, they sprint the test distance of 400m. Upon reaching the finish line, the stopwatches are stopped.
- Test Registration: The time is recorded to the nearest (fraction of a second) for each runner and entered into the testing form by the assisting team.

PRE-TESTS

The researcher conducted pre-tests for the sample at 5 PM for two consecutive days, from 9/9/2022 (Saturday) to 10/9/2022 (Sunday) at the athletics field in the Ministry of Youth / Specialized Sports Talent School for Athletics, preparing the necessary tools for the tests. The tests were carried out after the researcher explained how to perform the tests and their sequence briefly. During the post-tests, the following tests were conducted:

- On the first day: 300 -m speed endurance test, 150m weight jump sprint test.
- On the second day: 400m performance test.

TRAINING METHODOLOGY

Based on the researcher's experience in the training program, special ballistic exercises using rubber bands were prepared and applied to the research sample. The training program commenced on 12/9/2022 (Tuesday) and lasted until 7/11/2022 (Tuesday) for a duration of (8) weeks, with three training sessions per week on (Sunday, Tuesday, Thursday), totaling (24) training units, with each unit lasting (30-35) minutes for the research sample. Using repetitive training, the researcher intervened in the main section of the training unit, and the training program for the sample of 400m runners was based on ballistic exercises with rubber bands. The implementation of the exercises followed the principle of variability in intensity, volume, and rest, as noted by Abu Al-Ala that the principle of fluctuation in formulating the training program leads to better results. Fluctuation refers to the increase and decrease in training loads and not adhering to a constant or uniform level.

POST-TESTS: After the completion of the training units prepared by the researcher and a rest period of (48 hours), the post-tests were conducted. The same testing methods used in the pre-tests were applied, following the same procedures as the pre-tests.

RESULTS AND DISCUSSION

STATISTICAL MEANS

To find the differences between the pre-tests and post-tests in special endurance and performance, the researcher used the statistical package (SPSS) program to process the data, employing statistical methods (mean, standard deviation, T-test).

RESULTS OF THE SPECIAL ENDURANCE TESTS

The researcher compared the pre-test and post-test results to examine the differences in special endurance. The data was analyzed and the following table was created:

Table (1).Shows the mean values, standard deviations, calculated (t) value, and significance level between the pre- and post-tests for the research group.

Variable	Unit	Pre-Test		Post-Test		Mean Difference	Std Difference	(t) Value	Sig	Significance
Running with jumps for 150m	Second	26.51	2.13	24.78	1.02	6.90	12.615	7.084	0.00	Significant
Running 300m	Meters	38.20	0.57	37.30	0.47	0.89	0.14	12.23	0.00	Significant
400m Performance	Second	52.35	0.11	51.22	0.07	0.73	0.08	5.22	0.01	Significant

Significant if the real significance value ≤ 0.05 under degrees of freedom (3).

- **Discussion of Pre- and Post-Test Results for the Research Sample**
- **Discussion of the Pre- and Post-Test Results for Physical Ability Tests in the Research Sample**

The researcher attributes the positive impact on 150-meter running with jumps to the ballistic exercises using rubber bands, which helped create the necessary muscular adaptations for improved physical ability. Additionally, the training curriculum, which included scientifically based training loads regarding volume, intensity, and appropriate rest periods for the athletes, led to strength endurance development across all tests for the research sample. The exercises and optimal rest intervals between repetitions contributed to improved performance as noted by the statement: “Exercises and optimal rest between repetitions lead to performance improvement” (363:3). These exercises aimed at strength endurance are foundational for activities that require overcoming high resistance, focusing on the development of endurance and strength components. This development affects the muscle fibers in body parts subjected to load or resistance, enhancing muscle efficiency and growth. Consequently, strength endurance is “the ability of muscles to sustain force output to combat increasing fatigue, which combines strength and movement duration.”

Table (1) reveals a significant difference in the 300m run test, attributed to the controlled special training applied to the research sample. This development in speed endurance results from the ballistic exercises with rubber bands, performed at intensities adjusted according to distance and speed, where intensity gradually increases with distance. This process engaged a greater number of muscle fibers, leading to physiological adaptations. McArdle notes that “training specificity generates unique adaptations due to the particular effects of the training process.”

Similarly, Table (1) shows a significant difference in the 400m run, with a notable improvement in post-test performance compared to the pre-test. The researcher attributes this progress to the exercises implemented in the training program, including various types of jumps and running with rubber bands on body parts. These exercises were designed to enhance specific physical abilities such as strength endurance and speed endurance, which are essential for a 400m runner. The improvement in physical abilities yielded positive indicators, as shown by the test results, which demonstrated reduced completion time for the required distance. This progression across all variables highlights the need for specific capacity adaptation and fatigue resistance in this event. "Using high-intensity load to induce fatigue is essential for adaptation and performance elevation," especially since the 400m event requires both speed and strength. The correlation between speed and strength should be direct, ensuring that power and speed work in tandem, with strength as the physical reality and speed as its manifestation. As strength increases and is applied over less time, it becomes easier to overcome resistance and achieve maximum speed in the starting phase.

CONCLUSIONS

The research demonstrated the effectiveness of ballistic exercises using rubber bands, which were included in the training curriculum aimed at improving performance. Ballistic training had a significant impact on developing specific endurance, as evidenced by the results obtained. Ballistic training effectively enhanced strength endurance and had a positive impact on the technical stages of the 400m event. The development of speed endurance in the research sample was evident, confirming the improvement in the muscle reactions of the lower limbs during rapid movements, which are characteristic of ballistic training. Water-based training with resistance had a positive effect on improving the level of specific strength for the 400m event, which influenced performance times based on the results obtained.

RECOMMENDATIONS

Based on the conclusions reached, the researcher recommends:
The necessity of incorporating resistance training into training programs to develop the physical capabilities specific to speed events across various categories. The need for periodic general physical tests for athletes to assess their physical levels.
The importance of diversifying training methods and aids in speed events, as they have proven to be highly effective in alignment with the requirements of movement tasks.
Conducting similar studies for other speed events in particular and other events in general, addressing other functional variables.

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