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The Impact of Special Exercises on Flexibility and Strength Endurance in 100 m Frame Running (T72) Sprinters

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SPECIAL ISSUE ARTICLE

The Impact of Special Exercises on Flexibility and Strength Endurance in 100 m Frame Running (T72) Sprinters

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Abstract

The importance of this study lies in the impact of special exercises that aim at developing some physical features of 100 m frame running (T72) sprinters of disabilities. The observation of the researchers in the field and their follow up of the training units of this sample have revealed a weakness in the development of strength endurance and flexibility that have direct influence on the activity level of 100 m sprinters. The researchers designed special exercises by using a manufactured bicycle for 100 m frame running (T72) sprinters of disabilities which contributed to the enhancement of the reality of physical training for persons with disabilities, hence; the achievement of the best competitive levels. The researchers used the experimental methodology to design the pre-test and post-test group to match the nature of the study. They used a vertical selection process to select the group from the players of the national team in the Iraqi Federation of the Paralympic Athletics. Three 100 m frame running (T72) sprinters of disabilities were selected to represent a (100%) of the original community. The results showed that the calculated t-value for the flexibility test (4.892) was statistically significant at the 0.05 level with 2 degrees of freedom. Similarly, the calculated t-value for the arm muscular endurance test (5.751) was also statistically significant at the same level. The findings also indicated that the specialized training had a positive effect on developing muscular endurance in the 100 m Frame Running event. Moreover, there were significant differences in the study variables between the pre- and post-tests of the experimental group, and this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education).

Keywords: Special exercises, Strength endurance, Flexibility, 100 m frame running achievement

1. Introduction

Sport has a prestigious position among various peoples and enjoys widespread and significant interest from countries and the general public. Sports have taken remarkable steps towards advancement and progress at all levels as a result of depending on scientific methodology and various fields of knowledge. Specific exercises based on the components of the training load play a major role in developing strength endurance and flexibility of 100 m frame running (T72) sprinters. They are selected and designated based on the required physical activity duty. Furthermore, the use of exercise tools develops the level of

athletic performance leading to achieving high results. There are several exercises tools that motivated coaches to choose the appropriate training method according to the sport in question. However; the sport of persons with disabilities is relatively new. Nonetheless, all its activities have witnessed a remarkable development in a short time. Cerebral palsy, for example, is a disorder that affects movement and muscle coordination, and it usually results from brain damage before or during birth or during the first years of a child's life. Some of the challenges faced by people who suffer from cerebral palsy include muscle stiffness, difficulty moving, and problems with walking, speaking, or seeing. Although there is no definitive

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cure, therapeutic interventions such as physical therapy, medication, and surgery in some cases contribute to improving the quality of life of those affected. Because cerebral palsy limits movement and muscle coordination, exercising becomes a challenge that requires alternative solutions. Thus, designing a specialized bicycle is an effective tool to support the efficiency of frame running, develop the physical abilities of people with cerebral palsy, and enhance their chances of achieving the required performance level.

In their study, [Hussein and Khalaf \(2021\)](#) found out that flexibility and stretching exercises play a major role in reducing sports injuries. They are among the important factors that increase muscular potential, range of motion, and speed of movement, given that all these variables are interconnected.

[Ibrahim \(2022\)](#) argued that the development of scores in the 100-meter race is largely related to the type of training specific to this short-time competition, and that all training programs are designed to achieve maximum physical development according to the target heart rate required for performing the physical activity. This depends on choosing the correct length of recovery time when repeating exercises according to the pulse rate returning to 120 bpm. The researcher noticed that one of the reasons for the low performance in the 100-meter race is a weakness in physical abilities, which affects the sprinters' ability to achieve the best results. Therefore, the researcher decided to prepare maximum intensity exercises according to the target heart rate, which contributes to the highest levels.

The research aims at designing a device for training physical abilities according to the force and angle action of some technical phases of the 100 m activity. Moreover, it aims at identifying the effect of specific exercises according to the strength training plan using the innovative device on some physical abilities and kinematic variables during some technical phases and the completion of 100 m.

In contrast, [Al-Janabi and Naama \(2023\)](#) aimed at designing a device to train physical abilities according to the strength and angle work plan for some technical phases of the 100 m activity and at identifying the effect of specific exercises according to the strength training plan using the innovative device on some physical abilities and kinematic variables during some technical phases and the completion of 100 m.

The importance of this research lies in developing scientifically special exercises that contribute to improving flexibility and strength endurance, which has a positive impact on 100 m frame running (T72) sprinters.

1.1. Problem of the study

The 100 m event is one of the most prominent events in athletics due to the high levels it requires. These requirements are even more important for (T72) sprinters when using a specially designed frame running device because the type of the disability and the specificity of motor performance represent additional challenges that require the adoption of standardized, scientifically-based training programs that are appropriate to their physical capabilities. Through their experience and presence in the field, and their monitoring of training units specific to this group, the researchers observed a defect in the development of flexibility and strength endurance, which has a direct impact on the effectiveness level of the 100 m sprinters. Therefore, the researchers decided to prepare special exercises using a bicycle manufactured for 100 m frame running (T72) sprinters to identify the impact of these exercises on the sprinters. The study hypothesizes that the impact of these exercises is positive.

1.2. Study scope

- **Human Domain:** Iraqi national team players in the Paralympic Athletics Federation of 100 m sprinters (T72) frame running in 2025.
- **Temporal Domain:** from November 24, 2025 to January 1, 2026.
- **Spatial Domain:** Athletics track at the Ministry of Youth and Sports stadium/Baghdad Governorate.

2. Methodology and procedures

The researchers used the experimental methodology by designing pre- and post-tests single group.

2.1. Population and sample of the study

The sample of the study was selected by the vertical selection process. The sample includes players of the national team in the Iraqi Federation of the Paralympic Athletics. Three 100 m frame running (T72) sprinters of disabilities were selected to represent a 100% of the original community.

2.2. Sample homogeneity

2.2.1. Data collection

Observation, tests and measurements, Arabic and Foreign resources, the World Wide Web.

2.2.2. Tools and equipment used in the study

Athletics track, manufactured bicycle (3), 2kg medical ball (6), signposts (20), stopwatch (3), measuring tape, Sony video camera with a frequency of 250 frames (1), Dell laptop, electronic medical scale (1).

2.2.3. Tests

1- Constant flexibility (American College of Sports) Medicine. (2021).

Purpose of the test: Measuring back and thigh flexibility from a prolonged sitting position.

Tools: A measuring tape or graduated ruler.

Performance description: The participant sits upright for a long time, then extends his arms straight forward and bends his torso forward to reach as far as possible.

Documentation: Documenting the best try to reach out with the fingertips.

2- Endurance of the arms (Strand et al., 2023).

Test of throwing a 2 kg medicine ball over the head with both hands towards the wall for 30 seconds.

Purpose of the test: endurance of arm muscles.

Tools: 2 kg medicine ball, electronic stopwatch.

Performance description: The participant stands behind a pre-placed strip of tape on the floor, 2.50 meters away from the wall, holding the medical ball with both hands behind his head. Upon hearing the start signal, the participant begins throwing the ball over the head towards the wall until the time specified in the test expires for (30) seconds.

Registration: number of throws are counted within the 30 seconds of the test.

2.3. Pilot study

The researchers implemented a pilot study on November 24, 2025 in the 100 m frame running (T72) event on the sample to identify the mechanism for implementing the research procedures.

- Assessing the suitability of the tests and the participant's understanding of their use.
- Ensuring the time and place are suitable for conducting the tests.

- Overcoming errors that may occur during the test.
- Testing the suitability of the manufactured bicycle.

2.4. Pre tests

The researchers conducted the pre-tests on November 27, 2025 at the athletics track in the Ministry of Youth and Sports stadium in Baghdad Governorate. The test consisted of endurance and then flexibility tests at 3:00 pm.

2.5. The training program

The designed program included flexibility and endurance exercises for the arms using low-intensity interval training. The intensity ranges from (55–75%). The number of training units were 24, at a rate of 3 training units per week on Saturdays, Mondays, and Thursdays. The program was implemented during a special preparation phase and lasted for 8 weeks, from November 29, 2025 to January 24, 2026.

2.6. Post tests

Implemented on January 26, 2026 on the Athletics Stadium at the Ministry of Youth and Sports Stadium/Baghdad Governorate.

2.6.1. Statistical tools

SPSS software package was used.

3. Results

This section presents the results of the pre and post tests.

The results shown in Table 1 indicate a significant improvement in the flexibility of the experimental group after using the manufactured bicycle. The mean increased from 8.003 cm in the pre-test to 9.532 cm in the post-test.

The t-value of 4.892 is statistically significant at the 0.05 level, indicating a statistically significant difference between the pre- and post-test. This suggests that the specialized exercises using the bicycle had a positive impact on flexibility.

Table 1. Results of the flexibility variable: pre- and post-test for the experimental group.

Variable	Unit of Measurement	Test Design	Mean	Standard Deviation	Hypothetical mean	t-value	Sig	Statistical significance
Flexibility	Cm	Pre-test	8.003	1.845	0.665	4.892	0.000	significant
		Post-test	9.532	1.721				

The result is significant at the 0.05 level, with degrees of freedom (n) – (1) = 2.

Table 2. Results of the endurance variable: pre- and post-test for the experimental group.

Variable	Unit of Measurement	Test Design	Mean	Standard Deviation	Hypothetical mean	t-value	Sig	Statistical significance
Arms endurance	Number	Pre-test	25.032	1.634	0.743	5.751	0.000	significant
		Post-test	28.001	1.789				

The result is significant at the 0.05 level, with degrees of freedom $(n) - (1) = 2$.

Table 2 The results of the arm endurance test, through the medicine ball throw, showed a clear improvement in the sprinters' ability to sustain muscular effort. The mean increased from 25.032 throws in the pre-test to 28.001 throws in the post-test.

The t-value of 5.751 is statistically significant at the 0.05 level, indicating a significant difference between the pre- and post-tests. This suggests that the specialized training exercises led to a significant improvement in arm muscular endurance.

Strength endurance is a crucial factor in sprinting, especially for the upper body, which plays a major role in acceleration and maintaining speed during the race. Improving arm endurance enables sprinters to maintain a stronger, more consistent arm movement, contributing to better overall sprint performance. The experimental group in the pre and post-tests, which indicates that the use of the exercises of the manufactured bicycle went in the right direction regarding the development of flexibility. The same result was reported by [Badawi and Nabeel \(2020\)](#) who stated that the flexibility-focused exercises were concentrated exercises for muscle flexibility and elasticity, and for developing range of motion. They expressed the same impact on the flexibility of the trunk and spine, and consequently lengthening and increasing the range of motion of the muscles, ligaments, and tendons that make up those joints ([Yahya, Jaleel, & Kalaf, 2024](#)). Moreover, the results of the current study match those of [Jassim \(2021\)](#) in showing the effectiveness of targeted stretching exercises in developing spinal flexibility in sprinters of sprinters. We can say the same about the results of [Hussein and Khalaf \(2021\)](#) that stressed the importance of Regulating training load in developing strength endurance of the upper limb muscles is crucial due to its supporting role in the overall performance of the sprinter. In addition, [Abbas \(2020\)](#) discussed the positive connection between special flexibility and numerical achievement in 100 m running, which supports the interpretation of the improvement of the experimental group.

These findings are further clarified when compared to those of [Abd \(2023\)](#), who demonstrated that specific training related to the nature of the activity contributes to creating functional adaptations appropriate to motor requirements. This is in addition to what [Kadhim \(2024\)](#) confirmed regarding the impor-

tance of dynamic flexibility training in improving range of motion and increasing movement rhythm, especially in the end phase of the race. Furthermore, the results of the current study are consistent with [Hattroosh et al. \(2025\)](#), who contributed to the development of kinematic variables in the acceleration phase, leading to improved performance in the (100 m) running. In contrast, [Dakhil \(2024\)](#) found that resistance exercises in water contributed to improving some physical variables and performance in 100 m race, thus indicating the importance of diversifying training methods to produce multiple adaptive responses. Finally, [Fadel and Kareem \(2025\)](#) confirmed that the use of the Jump Trainer led to a clear improvement in physical abilities related to maximum speed, which reinforces the idea that scientifically guided, targeted exercises can produce tangible improvements in performance.

4. Conclusion

The researchers in the current study concluded that the special exercises had a positive impact on 100 m frame (T72) sprinter and they have a significant difference on the variable of the study in the pre and post tests of the experimental group.

5. Recommendation

The researchers recommend that coaches should consider conducting further physical tests and raising the players' physical and technical level, and the necessity of opening training courses that present the major developments that have occurred in the science of sports training through modern studies and research.

Author's declaration

Conflicts of interest

None.

We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Ethical clearance

This manuscript approved by the Scientific Committee of the College of Physical Education and Sports Sciences for Women, University of Baghdad, Iraq, on (2025/11/24).

Author's contributions

All contributions to this study were carried out by the researchers Fatima Mohammed Hussein Mohammed Ali, who conducted the study procedures, collected and organized the data, participated in the implementation of the experimental program, and contributed to drafting the manuscript; and Prof. Dr. Aseel Jaleel Gatia, who developed the research idea, designed the study, supervised the research procedures, interpreted the results, and reviewed and finalized the manuscript, with the assistance of a number of experts: Asst. Lect. Mais Kamar in Statistics, Prof. Dr. Israa Fouad Saleh in revision and Asst. Prof. Dr. Fatimah Mohammed Al-Asadi in Translation.

Facilitating the task

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Roles of each researcher in the research

Fatima Mohammed Hussein Mohammed Ali was responsible for participating in the implementation of the study procedures, collecting and organizing the data, assisting in conducting the experimental program, contributing to the interpretation of the results, and assisting in drafting the manuscript. Prof. Dr. Aseel Jaleel Gatia was responsible for the conceptualization of the research idea, study design, literature review, supervision of data collection and experimental procedures, interpretation of the results, reviewing the manuscript, and final revision.

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Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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The training program for (100m) event category (T 72)**Week 1****Training unit: 1st, 2nd, 3rd****Goal: flexibility and endurance improvement****Training level: Special preparation****Saturday**

No.	Exercise	Severity	Frequency	Rest between repetitions	Time of repetition	Groups	Rest between groups	Total time
1	Raise your knee for 20 seconds	70%	3	30 sec.	20 sec.	2	60 sec.	110 sec.
2	Half a weight 5 kg for 25 sec.	70%	3	30 sec.	25 sec.	2	60 sec.	115 sec.
3	From a prolonged sitting position, extend your torso downwards for maximum flexibility.	70%	3	30 sec.	15 sec.	2	60 sec.	105 sec.

Monday

No.	Exercise	Severity	Frequency	Rest between repetitions	Time of repetition	Groups	Rest between groups	Total time
1	Raise your knee for 25 sec.	70%	3	30 sec.	25 sec.	2	60 sec.	115 sec.
2	Half a 5 kg shirt for 20 seconds	70%	3	30 sec.	20 sec.	2	60 sec.	110 sec.
3	From a prolonged sitting position, extend your torso downwards for maximum flexibility.	70%	3	30 sec.	15 sec.	2	60 sec.	105 sec.

Thursday

No.	Exercise	Severity	Frequency	Rest between repetitions	Time of repetition	Groups	Rest between groups	Total time
1	Half a pound for 25 sec.	70%	3	30 sec.	25 sec.	2	60 sec.	115 sec.
2	Half a 5 kg shirt for 20 seconds	70%	3	30 sec.	20 sec.	2	60 sec.	110 sec.
3	From a prolonged sitting position, extend your torso downwards for maximum flexibility.	70%	3	30 sec.	15 sec.	2	60 sec.	105 sec.

تأثير تدريبات خاصة لتطوير المرونة وتحمل القوة لعدائي 100 م (Frame Running) فئة (T72)

فاطمة محمد حسين محمد علي اسيل جليل كاطع

المستخلص

تكمُن أهمية البحث في اعداد تأثير تدريبات خاصة لتطوير بعض القدرات البدنية لعدائي 100 م (Frame Running) للمعاقين فئة (T72) ومن خلال خبرة الباحثان وتواجدهم في المجال الميداني ومتابعتهم الوحدات التدريبية الخاصة بهذه الفئة لاحظا ضعف في تطوير تحمل القوة والمرونة التي لها تأثير مباشر على مستوى فعالية 100 م، حيث ارتأى الباحثان اعداد تمرينات خاصة باستخدام دراجة مصنعة لعدائي 100 م (Frame Running) للمعاقين فئة (T72) ما يسهم في تطوير واقع التدريب الرياضي لذوي الإعاقة وتحقيق أفضل المستويات التنافسية، استخدم الباحثان المنهج التجريبي بتصميم المجموعة الواحدة ذات الاختبار القبلي والبعدي لملاءمة طبيعة البحث، تم اختيار عينة البحث بالطريقة العمدية من لاعبي المنتخب الوطني في الاتحاد العراقي العاين القوى البارالمبي في فعالية ركض 100 م (Frame Running) فئة (T72)، وبلغ عددهم (3) عدااء، يمثلون المجتمع الاصلي بنسبه 100%، حيث استنتج الباحثان ان التمرينات خاصة اثرا ايجابيا لتطوير المرونة وتحمل القوة 100 م (Frame Running) فئة (T72)، وحدثت فروق معنوية في متغيرات البحث في القياسات القبلية والبعدي للمجموعة التجريبية. اثبتت النتائج التي توصلت اليها الباحثان ان اهم نتيجة أن قيمة ت المحتسبة (٤,٨٩٢) في اختبار المرونة هي قيمه داله احصائيا تحت مستوى دلالة أصغر او يساوي ٠,٠٥ وتحت درجه حريه ٢ وان قيمه ت المحتسبة (٥,٧٥١) في اختبار تحمل القوة للذراعين هي قيمة داله احصائيا تحت مستوى أصغر او يساوي ٠,٠٥ وتحت درجه حريه ٢ وان للتدريبات الخاصة اثرا ايجابيا لتطوير تحمل القوة 100 م (Frame Running) وحدثت فروق معنوية في متغيرات البحث في القياسات القبلية والبعدي للمجموعة التجريبية، وهذا يحقق أحد أهداف التنمية المستدامة للأمم المتحدة في العراق وهو (التعليم الجيد).

الكلمات المفتاحية: تمرينات خاصة، تحمل القوة، المرونة، انجاز 100م (Frame Running).