

Increase the speed of running 100 meters using the bench and skipping training methods

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Abstract

Background and Study Aim

Running 100 meters requires optimal speed, strength, and physical endurance. Running speed is often a key indicator of physical ability and athletic performance. However, not everyone achieves optimal speed and physical ability in running the 100 meters. Many factors influence a student's running performance, including the training methods used. The aim of the research is to determine the increase in speed for running 100 meters using bench and skipping training methods.

Material and Methods

This research is an experimental study aiming to find cause and effect relationships in one or more experimental groups through different training treatments. The design used is a two-group pretest-posttest design. The participants were male students actively involved in sports activities, capable of performing running techniques well, and willing to participate in the training sessions. Initially, students underwent a pretest to determine their treatment group by ranking the pretest scores. This allowed the formation of two groups: one group of 15 students participating in bench climbing exercises, and another group of 15 students engaging in skipping exercises, using ordinal pairing. The instrument used for the 100-meter running test is the 100-meter running test.

Results

Based on the results of hypothesis testing using pretest and posttest t-tests, the 100-meter running speed after bench up and down training was 4.621. The pretest and posttest data for 100-meter running speed with skipping training was 4.790. For the posttest, the running speed for 100 meters with bench up and down training and skipping training was 4.240. The two-way p-value was 0.000, which is less than 0.05, indicating a significant difference in the 100-meter running speed before and after the exercise.

Conclusions

Bench climbing exercises can increase the strength of the primary leg muscles used in sprinting, such as the quadriceps, hamstrings, and calves. These exercises improve body balance and coordination, which are crucial for efficient running posture and technique. Meanwhile, skipping can enhance explosive power and the ability of leg muscles to generate power quickly and efficiently. Skipping also improves coordination between hands and feet, aiding in maintaining rhythm and efficiency in running movements. Overall, bench climbing exercises are more effective in improving 100-meter running performance compared to skipping exercises.

Keywords: running, 100 meters, training, going up, down, bench, skipping

Introduction

Achieving optimal performance in the 100-meter dash remains a significant challenge for many athletes. Despite rigorous training, some struggle to reach their maximum potential due to a variety of factors. Identifying the most effective training methods to overcome these challenges is essential. The 100-meter running speed is one of the most critical performance measures in athletics and is often the main indicator of an athlete's ability in competition [1]. Increasing running speed over this distance requires not only high muscle strength and explosive power but also optimal coordination, agility, and physical endurance. Therefore, choosing the right training method is crucial for achieving the best performance [2, 3]. Plyometric training

is widely recognized as an effective method for increasing explosive ability and speed [4]. Two common forms of plyometric training are bench up and down exercises and skipping exercises. Bench up and down exercises focus on strengthening leg muscles and developing explosive power, while skipping exercises improve coordination, agility, and overall muscle strength [5]. Both methods have significant potential in enhancing 100-meter running performance, but their comparative effectiveness in short-distance running still needs further exploration [6].

The up and down bench exercise effectively strengthens the leg muscles, including the thighs and calves. This strength is crucial for increasing thrust during running, thereby enhancing maximal speed [7, 8]. By increasing leg muscle strength through up and down bench training, the body's ability to produce greater power in a short time improves,

which is essential for the 100-meter sprint [9]. This exercise develops explosive movement speed, vital for reaching maximum speed quickly after the start [10]. Additionally, bench climbing exercises enhance body coordination and overall stability, leading to increased movement efficiency while running [11].

Skipping exercises involve complex coordinated movements between the legs and arms, which help improve motor skills and body balance. This is essential for increasing movement efficiency while running [12]. Skipping exercises strengthen the leg muscles, particularly the calves and thighs, and enhance body stability. This contributes to stronger thrust during fast running [13, 14]. Skipping increases stride frequency, a key factor in boosting sprint speed. This exercise also develops the spring or propulsive strength of the legs, necessary for reaching maximum speed quickly. Incorporating skipping into a regular interval training program can improve aerobic and anaerobic capacity, which is crucial for endurance and quick recovery between sprints.

Previous research has shown that strengthening muscles through plyometric training can improve leg propulsion and movement efficiency, which are essential for sprinting. However, there are differences in how these two methods influence the physical components that support running speed [15]. Up and down bench training, focusing on strength and explosive power, is more effective in increasing initial acceleration [16]. Meanwhile, skipping exercises, which improve agility and coordination, contribute to maximum speed and stride efficiency [17]. Previous studies often focus on one type of plyometric training, such as only bench climbing or only skipping. This study combines these two methods and evaluates their synergistic effect on 100-meter running speed. This approach seeks to understand how combining these exercises can produce more significant performance improvements than using either method alone.

Focus on developing leg strength and body propulsion by performing up and down bench movements, which require strength and coordination. This method places more emphasis on developing coordination, movement speed, and the ability to increase stride frequency [18, 19]. The study analyzed the differences in leg strength gains between these two methods by measuring calf and thigh muscle strength before and after exercise. Evaluation of improvements in 100-meter sprint speed, along with contributing factors such as stride frequency and reaction time, was part of the analysis [20, 21]. Sprint time was measured using a stopwatch, and biomechanical measurements were used to analyze running technique [23]. The focus was on measuring the development of leg muscle strength and its influence on running speed [24]. Additionally, the evaluation included participants' ability to improve

body coordination and stability during training and its impact on running performance [24, 25].

Some problems experienced by athletes when performing up and down bench exercises include the intensive use of leg muscles, which can increase the risk of injury to joints such as the knees and ankles. This risk is especially high if the athlete does not warm up sufficiently or does not pay attention to correct technique [27]. The same applies to skipping exercises, where poor coordination or excessive repetition can lead to foot or ankle injuries. Proper technique is essential for both exercises to prevent injury and maximize their benefits [28]. Athletes who are not adequately trained in the techniques of bench climbing or skipping will not achieve optimal results and may risk injury. Consistency in training is crucial for increasing 100-meter running speed. However, athletes often struggle to maintain consistency due to various reasons such as busy schedules, fatigue, or lack of motivation towards monotonous training.

The analysis of existing research indicates that most of the studies reviewed were primarily focused on professional athletes. Regarding the level of collegiate sports, the recommendations reviewed are not always adaptable. Therefore, there is a need to seek alternative solutions. The aim of the research is to determine the increase in speed for running 100 meters using bench and skipping training methods.

Materials and Methods

Participants

This test was carried out by male students who were actively involved in sports activities, able to perform running techniques well, and willing to participate in the training. A total of 30 students participated. Initially, students underwent a pretest to determine the treatment groups. Based on the pretest scores, the students were ranked and then divided into two groups using ordinal pairing: 15 students participated in the bench climbing exercise (Group A), and 15 students in the skipping exercise (Group B).

Research Design

This research is a type of experimental study aiming to find cause-and-effect relationships in one or more experimental groups through different training treatments. The design used is a two-group pretest-posttest design [29], where a pretest is conducted before the treatment and a posttest after the treatment. The research design is illustrated in Figure 1.

The pretest and posttest involved a 100-meter running test. Group A performed the up-and-down bench exercise, and Group B performed skipping exercises. Each group followed a training program consisting of 18 sessions over 6 weeks. For maximum performance, participants in Group A performed

the bench exercise 54 times per session, while those in Group B did the skipping exercise 56 times per session. The intensity levels were moderate (70%), heavy (80%), and light (60%).

The 100-meter running test involved students starting behind the starting line and performing a squat start. Upon the ready signal, students ran as fast as possible to the finish line [30].

Statistical Analysis

Data analysis included prerequisite tests, starting with the normality test using the Kolmogorov-Smirnov test. If the significance level is above 0.05, the data can be considered normally distributed. A homogeneity test was then performed to determine the distribution of values to be analyzed, using the F-test on the pretest and posttest data. To test the hypothesis, a t-test was used to compare the averages of Group A and Group B, with the analysis conducted using SPSS 26.

Results

The research findings were obtained based on inferential descriptive statistical analysis, explaining the results of the pretest and posttest implementation at 100-meter running speed. The results include the average score, median, mode, standard deviation, variance, frequency distribution, percentage, and histogram. The descriptive statistics for the 100-meter running speed test during the pretest and posttest are presented in Table 1.

Based on Table 1, differences are observed in the descriptive statistical tests. Specifically, the average

pretest 100-meter running speed was 15.00 seconds, while the posttest speed was 14.70 seconds using the bench up and down exercise. In contrast, the pretest 100-meter running speed with skipping training averaged 15.00 seconds, and the posttest averaged 13.08 seconds. These results suggest that the bench up and down exercise led to a better improvement in 100-meter running speed compared to the skipping exercise. The results of the data normality test are shown in Table 2.

The data normality test, using the Kolmogorov-Smirnov test, indicated that each variable had a significance value greater than $\alpha = 0.05$, suggesting a normal distribution. The variance homogeneity test results are presented in Table 3.

The homogeneity of variance test showed that each variable had a significance value greater than $\alpha = 0.05$, indicating that the data is homogeneous. The hypothesis testing results are shown in Table 4.

Based on the hypothesis testing using pretest and posttest t-tests, the 100-meter running speed using bench up and down training showed a t-value of 4.621. The pretest and posttest data for the 100-meter running speed with skipping training showed a t-value of 4.790. Meanwhile, the posttest for running 100 meters using both bench up and down and skipping exercises resulted in a t-value of 4.240, with a significance value (p-value) of $0.000 < 0.05$. This indicates a significant difference in the 100-meter running speed before and after the exercises. The histogram of the average differences in 100-meter running speed is presented in Figure 2.

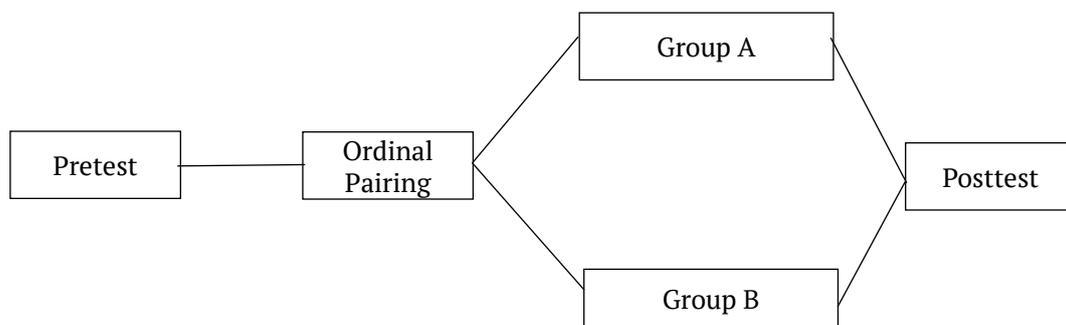


Figure 1. Two groups pretest posttest research design

Table 1. Descriptive statistical test of the pretest and posttest for 100 meter running with bench and skipping exercises

Data	N	Mean	Median	Mode	Standard Deviation	Variance	Minimum	Maximum
Pretest (bench up and down)	15	15.09	14.90	13.10	1.52	2.33	13.10	17.81
Posttest (bench up and down)	15	13.08	12.80	12.50	0.68	0.47	12.17	14.22
Pretest (skipping)	15	15.11	14.90	13.00	1.52	2.30	13.06	17.78
Posttest (skipping)	15	14.70	14.51	13.01	1.31	1.71	13.01	17.40

Note: N - Number of participants

Table 2. Results of the data normality test

Variable	df	Statistical
Pretest score (bench up and down)	15	0.128
Posttest score (bench up and down)	15	0.168
Pretest score (skipping)	15	0.102
Posttest score (skipping)	15	0.156

Note: df - Degrees of freedom

Table 3. Results of the data homogeneity test

Variable	Statistical	Significance
Pretest and posttest data for running 100 meters (bench)	6.773	0.105
Pretest and posttest data for running 100 meters (skipping)	0.654	0.425
Posttest data for 100 meters running (bench and skipping)	2.836	0.103

Note: Significance level (α) - 0.05

Table 4. Test results before and after the bench up and down exercise and skipping exercise on 100 meter running speed

Variable	F	Sig.	t	P-Value
Pretest and posttest data on 100 meter running speed (bench)	6.773	0.105	4.621	0.000
Pretest and posttest data on 100 meter running speed (skipping)	0.654	0.425	4.790	0.000
Posttest data on 100 meter running speed (bench and skipping)	2.836	0.103	4.240	0.000

Note: Sig. - Significance; P-Value - Probability value

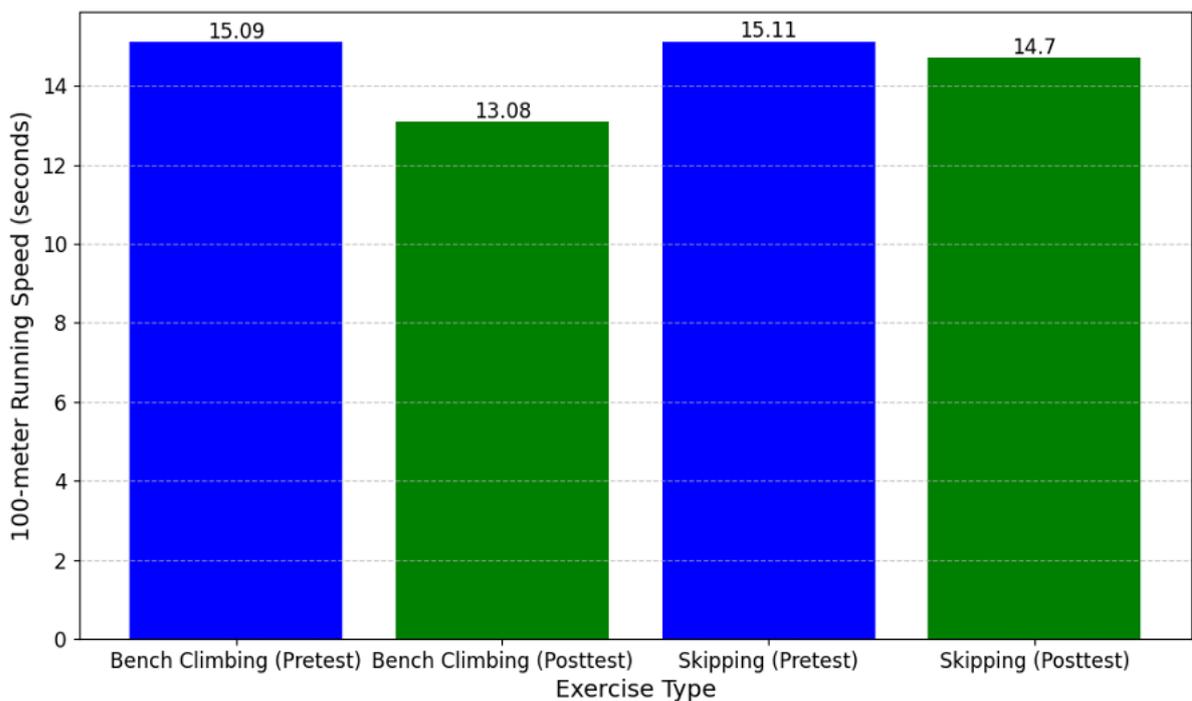


Figure 2. Histogram comparing 100-meter running speed before and after training with bench climbing and skipping exercises

Discussion

This research was conducted to explore the effectiveness of two training methods, namely bench climbing and skipping exercises, in increasing 100-meter running speed. Up and down bench training has been proven to increase leg muscle strength more significantly than skipping training. This is due to the more intense movement against gravity in the up and down bench exercise. Both training methods showed an increase in 100-meter running speed. However, the group that underwent up and down bench training experienced greater improvements compared to the skipping group.

Skipping exercises provide greater benefits in improving coordination and balance than bench climbing exercises [31]. Skipping involves rhythmic movements that help develop coordination skills [17, 31]. This exercise is also effective in increasing leg muscle strength, an important factor in running speed [33]. Increased leg muscle strength directly correlates with the ability to push the body faster in the 100-meter run. Although skipping is not as effective as bench climbing in terms of increasing muscle strength, it still makes a positive contribution in terms of balance and coordination. These skills are crucial for optimizing running technique and minimizing the risk of injury.

Based on the findings, combining both training methods may be the optimal approach. Up and down bench exercises can focus on developing muscle strength, while skipping exercises can complement by improving coordination and balance. This research shows that a structured and focused training approach can significantly improve athletes' running performance. Coaches can consider integrating these two methods in their training programs to maximize performance improvements in 100-meter sprint athletes.

Up and down bench training significantly increases leg muscle strength compared to skipping training. This exercise involves movements against gravity that place additional load on the leg muscles, thereby increasing muscle strength. Previous research by Deng et al. [34] showed that plyometric exercises, such as going up and down a bench, effectively increased leg muscle strength and endurance. These findings are consistent with our results, indicating that bench up and down exercises provide greater strength gains compared to skipping exercises, which focus more on improving coordination and balance.

Both training methods (up and down the bench and skipping) showed an increase in 100-meter running speed. However, the group that did the up and down bench exercise experienced more significant improvements. This suggests that increased muscle strength through bench up and down training has a direct impact on sprint performance. The study

by Jiang et al. [35] stated that increases in muscle strength are directly correlated with sprint speed. These findings support our research results, showing that bench up and down training, which increases muscle strength, also enhances running speed more effectively compared to skipping.

Skipping exercises provide greater benefits in terms of improving coordination and balance compared to getting up and down on a bench. Skipping involves complex rhythmic movements, helping in the development of coordination and balance skills, which are also important for running performance. According to research by Ma et al. [36], exercises involving rhythmic movements, such as skipping, are effective in improving coordination and balance. The results of this study are consistent with our findings, indicating that skipping can be a useful addition to a running training program to improve aspects of coordination and balance.

Combining up and down bench and skipping exercises can provide optimal results. Up and down bench training focuses on increasing muscle strength, while skipping strengthens coordination and balance. This combination can produce more comprehensive performance improvements in the 100-meter dash. The study by Nash et al. [37] showed that a balanced training program, which includes different types of exercise, provides better results in athletic performance. The results of our study support this approach, showing that the combination of different training methods can optimize training results.

This research confirms the importance of variety in athletic training programs. Up and down bench training provides a significant increase in muscle strength, which is important for running speed. Skipping, on the other hand, improves coordination and balance. The combination of these two methods shows optimal results, supporting existing literature regarding the effectiveness of balanced and structured exercise programs. This research makes an important contribution to understanding how different types of training can be combined to improve overall running performance.

The limitation of this research is that it uses a limited sample size, so the results cannot be widely generalized. Additionally, the duration of the training used in this study was relatively short, with only 18 sessions, which may not be sufficient to observe the long-term effects of the up and down bench and skipping training methods on running speed. The research was conducted in environmental conditions that differ from real competition settings, such as weather variations or different field conditions. Individual differences in basic physical abilities, motivation, and health conditions can influence results, making it difficult to ensure that the results obtained are purely due to the training method applied.

In conclusion, this study demonstrates that combining up and down bench exercises with skipping exercises can significantly enhance 100-meter running speed by improving both muscle strength and coordination. These findings support the implementation of varied training methods to optimize athletic performance. Future research should focus on involving larger and more diverse samples to enhance the generalizability of the results. Additionally, extending the duration of the training programs will help observe long-term effects on running performance. Comparing the effectiveness of bench climbing and skipping exercises with other established training methods can provide a broader understanding of their relative advantages. Finally, conducting studies in conditions that closely mimic real competition environments will yield more applicable results for athletes.

Conclusions

Getting up and down the bench can increase the strength of the main leg muscles used in sprinting, such as the quadriceps, hamstrings, and calves. It also improves body balance and coordination,

which are important for efficient running posture and technique. Meanwhile, skipping can increase explosive power and the ability of leg muscles to produce power quickly and efficiently. It improves coordination between hands and feet, helping to maintain the rhythm and efficiency of running movements. Up and down bench training is more effective in improving the 100-meter run compared to skipping training. The implications of such training include improved strength, explosive power, coordination, and cardiovascular condition, allowing athletes to achieve and maintain high speeds during the 100-meter run more effectively. Additionally, exercises that strengthen muscles and improve balance help prevent common injuries in sprinters, such as hamstring strains or injuries to the knee and ankle joints.

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