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Impact of Running Techniques through the Sprint Ability in Athletes during the COVID-19 Pandemic

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Abstract With the spread of the Covid-19 virus that is increasingly widespread, athletes cannot train optimally. This study aims to determine the effect of sprint running techniques on the ability of the 100-meter sprint in athletes during the COVID-19 pandemic. The method in this study was a true experiment with a pretest-posttest control group design. The total participants were 38 male athletes with an age range of 15-18 years (M = 17.3; SD: 1.26). Data analysis in this study is descriptive analysis and hypothesis testing. The results of the study are: 1) For the control group, the H0 (not significant) statement "There is no effect and difference of sprint running technique on the athlete's 100 meters running ability", is not rejected. Then, there was a decrease in the mean of 0.23 or 1.78%; 2) For the experimental group, the H1 (significant) statement "There is an effect of sprint running technique on the athlete's 100-meter running ability during the COVID-19 pandemic", is not rejected. Then supported by an increase in the mean of 0.44 or 3.42%, the conclusion is that there is an effect of sprint running techniques on the ability of the 100-meter sprint in athletes. This finding can have implications, namely being a reference for coaches or teachers in compiling training programs to improve the achievement of the 100-meter sprints in athletic sports during the COVID-19 pandemic. Further researchers should be able to modify other types of exercise and conduct research with a wider sample and population and

add different variables.

Keywords Running Technique, 100-Meter Sprint, Sprinter Athlete, Athletics, COVID-19

1. Introduction

With the spread of the Covid-19 virus, which is increasingly widespread, athletes cannot train optimally. The Covid-19 case first appeared at the end of 2019, this virus is dangerous for humans because it attacks the severe acute respiratory system [1], [2]. This virus quickly spread throughout the world and was designated a pandemic by the World Health Organization. This situation causes all activities in various fields that should be running to be stopped, including sports activities [3], [4]. For this reason, online learning and independent home training activities are carried out to maintain fitness and increase stamina with limited tools, of course, by following health protocols during this pandemic.

During this pandemic, athletes generally undertook independent training as an alternative at this time. Independent training is an exercise that can be done individually using tools or not, done to achieve good individual goals, society including athletes is forced to

find ways how to train independently [5], [6]. How can athletes prepare themselves independently, and be able to maintain body fitness independently? Independent training is very beneficial for health during the current Pandemic or Covid 19 outbreak.

The 100-meter sprint is one of the events that are contested in short distance running in athletics [7], [8]. The 100-meter sprint is a run in which the athlete must cover the entire 100-meter distance at the maximum possible speed [7], [9]. For that athletes must be able to run as fast as possible by exerting all their speed from the start (starting from the start) to crossing the finish line [7].

Running a 100 m sprint is a forward movement that is endeavored to reach the goal (finish) as quickly as possible or in the shortest possible time [10], [11]. So, it can be said that the 100 meter sprint is a run that is attempted or carried out as fast as possible (maximum speed) from the start point to the finish in the shortest time possible to cover a distance of 100 meters.

Speed plays a very important role in reaching the finish line. The essence of the 100m sprint achievement lies in running speed [9], [12]. Speed is the result of a period of work [7], [13]. Physically, speed is defined as the distance to time, whereas physiologically, speed is defined as the ability based on the ability to move [9], [14].

The COVID-19 pandemic that is currently occurring worldwide has an impact on all aspects of life, including sports clubs, especially in athletics [15], [16]. All activities are subject to strict health protocols, including sports training, including 1) Sports activities involving large numbers of people are suspended due to government policies to limit crowds, and; 2) Sports clubs cannot immediately revive even though they are allowed to run with strict health protocols, this is because the competition is not ready and the lack of sponsorship [1], [17]–[19]. This condition must be addressed by athletes by training independently to maintain their physical abilities, especially the ability to sprint 100 meters.

The success of the 100-meter sprint runner lies in the use of maximum force to push the body forward, knee height, and placing the foot just below the point of weight [20]. The speed of short-distance runners also depends on the athlete's ability to combine the strength of the legs, upper arms, forearms, palms, torso, and other parts in one

coordination [21], [22]. Also, the determining factors for a short runner are the strength of the muscles worked, the length of the legs, the frequency of movement, and the perfect running technique.

One of the most important basic factors in determining your 100-meter running speed is the perfect running technique [21]. Increasing the achievement of sprint 100-meter requires improvement and development of technical elements in sprinting. The use of the good technique will increase efficiency so that the 100-meter sprint achievement can be improved.

A good 100-meter sprint athlete needs to master the basic techniques of running. 100-meter sprint athletes who have good basic technique tend to good perform [23]. There are three basic techniques for sprinting, namely the squatting start, running movements, and techniques for entering the finish line [21]. The goal of a 100-meter sprint is to do horizontal speed with the maximum 100-meter distance and as fast as possible as a result of the body pushing forward [24]. The 100 m sprint run consists of several stages, namely the reaction and boost stage, the acceleration stage, the transition stage, the maximum speed stage, the speed maintenance stage, and the finish stage. Starting techniques and running techniques are very important aspects because they form the basis for sprinting or sprinting. The basic technique of running the 100-meter sprint aims to learn the systematic basics of sprinting [21], [25].

100-meter sprinter athletes generally make mistakes in running techniques, especially in footsteps such as thighs not lifting when the footsteps and steps are still too short or not optimal. This results in increased running speed that is less fast and results in slower time [11], [26]. This is the importance of why it is necessary to overcome sub-optimal footsteps.

When running, the technique of the footsteps of the 100 m sprint athlete must be longer and maximum, the thighs are raised more or at least closer to the hips so that a better running pace is created [2], [27]. When running fast, it is balanced with maximum and balanced hand swings, so that it can help increase running speed. Efforts to improve basic sprint techniques must pay attention to training principles for increasing the progress of the 100 m sprint.

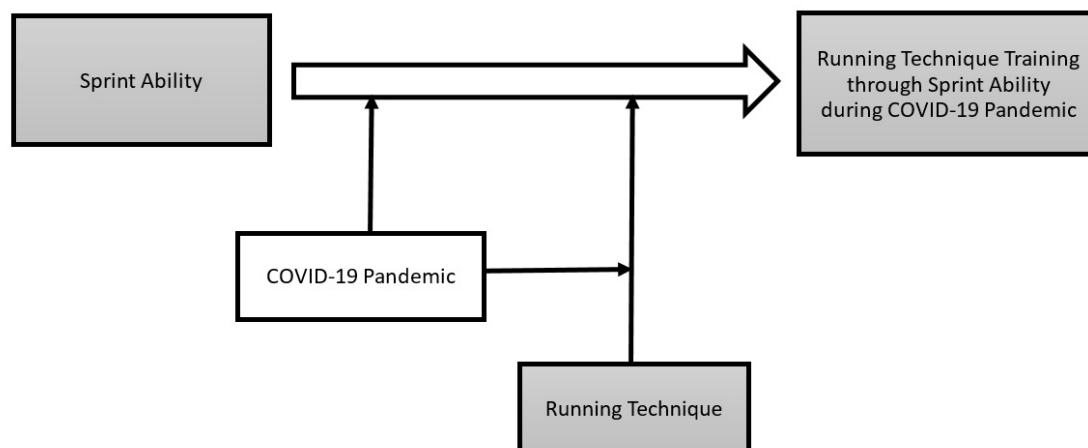


Figure 1. Gap Analysis of the Problem

The exposure conditions mentioned above certainly provide a major problem gap in athlete's sprint ability in the midst of the current COVID-19 pandemic. The main problem can theoretically be overcome with training in running techniques, which of course takes into account the conditions of the COVID-19 pandemic. Therefore, it is interesting to explore more about the impact of running technique training on sprinting ability during the COVID-19 pandemic.

2. Materials and Methods

2.1. Research Method

This study used a quantitative research approach, then the design used was a true experimental research design with a pretest-posttest control group design [13], [28]. The research design is as shown in Table 1 as follows.

Table 1. True experiment pretest-posttest control group design

Treatment Group	M ₁	O ₁	X	O ₂
Control Group	M ₂	O ₁	C	O ₂

Information:

M₁: The subjects of the treatment group with randomized

M₂: The subjects of the control group

O₁: Pretest

X: Providing treatment

C: Without treatment

O₂: Posttest

2.2. Participant

Participants in this study used 38 male athletes with an age range of 15-18 years (M = 17.3; SD: 1.26). Participants were divided into two groups without being randomized, namely 19 athletes as the treatment group and 19 athletes as the control group. Participants in this study will undergo a series of studies including 1) pretest; 2) treatment, and; 3) posttest. All activities have followed

health protocols according to the conditions of the COVID-19 pandemic, so that activities, both treatment and measurement tests, are conditioned to be carried out in the participant's home environment. The conditions for a place that must be fulfilled besides being close are outdoor fields or indoor fields that meet the 100 m long standard. This is because later it will be used to test the 100m sprint ability. Treatment group participants underwent an exercise program with guidance from researchers while observing the health protocols that were established during the COVID-19 pandemic.

2.3. Instruments

The research instrument used in this study was a 100-meter sprint speed test [29]. The participants ran a sprint from the start point to finish as far as 100-meter. Measurements using a stopwatch with standardized units of time. All study participants conducted the test independently with the provisions and guidelines of the researcher. The stipulation is that the participants/athletes are assisted by an examiner (preferably with the fellow athletes closest to their place of residence).

2.4. Data Collection Technique

The data collection techniques in this study were carried out by tests and measurements. The data collection process begins with giving an explanation of the test implementation and warming up. Data were collected 2 times, namely at the beginning of the study (pretest) and the end of the study (posttest). Measurements (pretest & posttest) using a stopwatch with standardized units of time for the 100 meters sprint test in the indoor room. Especially for the treatment group, after doing the pretest they followed the process of training activities.

The process of training activities in this study was carried out in 18 meetings in an indoor room. The process of training 18 times can be said to be trained because there have been permanent changes. Exercises in the sand in this study were carried out 4 times a week, namely on

Tuesday, Thursday, Saturday, and Sunday. The training will be held on Monday and Thursday from 15.30-17.00 WIB. Then Saturdays and Sundays are held at 06.00-08.00 WIB. Athletes in the treatment group followed a jump training program with rules based on theoretical standards in training, including:

1. Training load and speed of explosive training [22], [30] with an intensity of about 50-75%, the number of sets of 4-6, then intervals of 2-5 minutes, while the rhythm of the training is explosive/fast.
2. Maximum Repetition Calculation (RM) is the athletes/participants doing sprints with a time limit of 30 seconds [22].
3. The frequency of exercise in the treatment group was carried out with a duration of 6 weeks and a frequency of training 3 times a week [22].
4. The increase in training load is calculated every 2 weeks using the RM return test [22].
5. The increase in expenses is individual [22].

2.5. Data Analysis

Data analysis in this study is descriptive analysis and hypothesis testing. Descriptive analysis reveals descriptive data about the control and experimental groups. The prerequisite analysis test included the normality and homogeneity test, then test the research hypothesis using the t-test. The research hypothesis is as follows:

Hypothesis 0 (H0): There is no effect and difference of sprint running techniques on the ability of the 100 Meter Sprint in athletes during the COVID-19 pandemic.

Hypothesis 1 (H1): There is an effect and difference of sprint running techniques on the ability of the 100 Meter Sprint in athletes during the COVID-19 pandemic.

3. Results

3.1. Results of Descriptive Data of the Control Group Pretest and Posttest

The results of the descriptive statistics for the pretest and posttest of the athlete's 100-meter running ability in the control group (n = 19) can be seen in table 2.

Table 2. Statistics Descriptive of the 100-meter running ability of the control group athletes

Descriptive statistics	Pretest	Posttest
Mean	12.93	13.16
Median	13.16	13.21
Mode	11.29	11.67
Std. Deviation	1.09	1.12
Minimum	11.28	11.67
Maximum	14.42	14.60
The difference in Mean (time)	(+) 0.23	
Percentage of Decrease (speed)	1.78%	

The results of the description show that the pretest to a posttest Mean (time) from 12.93 increases to 13.16. This means that there is an increase in time 0.23 which means that the speed decreases 1.78%. This means that when viewed from the comparison of the mean, athletes in the control group experienced a decrease (speed) in their ability to sprint 100 meters. Further hypothesis testing is needed to strengthen these findings.

3.2. Results of the Experimental Group Pretest and Posttest Descriptive Data

Table 3. Descriptive statistics of the experimental group athlete's 100-meter run ability

Descriptive statistics	Pretest	Posttest
Mean	12.86	12.42
Median	12.48	12.34
Mode	11.28	11.07
Std. Deviation	0.99	0.98
Minimum	11.28	11.07
Maximum	11.42	14.28
The difference in Mean (time)	(-) 0.44	
Percentage of Increase (speed)	3.42%	

The results of the descriptive statistics for the pretest and posttest of the athlete's 100-meter running ability in the experimental group (n = 19) can be seen in table 3. The results of the description show that the mean pretest to posttest (time) from 12.86 decreased to 12.42. This means that there was a decrease in time 0.44 which means that the speed increased by 3.42%. This means that when viewed from the comparison of the mean, the athletes in the experimental group experienced an increase (speed) in the ability to sprint 100 meters. Further hypothesis testing is needed to strengthen these findings.

3.3. Prerequisite Analysis Test

3.3.1. Normality test

Table 4. Normality Test Results

Normality test	Shaphiro-Wilk	Sig.	Ket
Control Group - Pretest	0.925	0.484	Normal
Control Group - Posttest	0.934	0.601	Normal
Experiment Group - Pretest	0.894	0.186	Normal
Experiment Group - Posttest	0.906	0.314	Normal

The purpose of the normality test is to find out whether the data obtained from the test results follows the normal distribution pattern or not. The variable normality test was carried out with the Shaphiro-Wilk. The rule used to

determine whether a distribution is normal or not is if the significant value is greater than 0.05 (significant > 0.05), then normal and if the significant value is less than 0.05 (significant < 0.05) it is said to be abnormal [31]. The normality test can be seen in Table 4.

Based on Table 4 above, it can be seen that the overall significance values are all greater than 0.05 (significant > 0.05) in the sprint ability data (pretest-posttest control and pretest-posttest experiment), so the hypothesis which states that the data are normally distributed is accepted.

3.3.2. Homogeneity Test

The purpose of the homogeneity test is to determine whether the data obtained from the test results follow a homogeneous distribution pattern or not. Variable homogeneity test was done by using Levene Statistic. The rule used to determine whether a distribution is normal or not is if the significant value is greater than 0.05 (significant > 0.05), then homogenous and if the significant value is less than 0.05 (significant < 0.05) it is said to be inhomogeneous [31]. The homogeneity test can be seen in Table 5 below:

Table 5. Homogeneity Test Results

Homogeneity Test	Levene Statistic	Sig.	Ket
Sprint Ability			
Control Group (Pretest – Posttest)	2.455	0.115	Homogenous
Experiment Group (Pretest – Posttest)	1.455	0.206	Homogenous

Based on Table 5 above, it can be seen that the overall significance values are all greater than 0.05 (significant > 0.05) in the sprint ability data (pretest-posttest control and pretest-posttest experiment), so the hypothesis which states that the data are homogeneous is accepted.

3.4. Hypothesis Testing (Effect & Difference)

The results of the t-test pretest and posttest of the control group, as well as the experimental 100-meter running ability of the athletes, are presented in Table 6. After the t-test results are known, it is followed by hypothesis testing of the control and experimental groups.

Table 6. Hypothesinting Testing (Effect & Difference)

Pretest – Posttest	t	df	Sig. (2-tailed)
Control Group	1,877	18	0.010
Experiment Group	3.753	18	0.000

Based on the calculation of pretest and posttest data in the control group on the ability to run the 100-meter sprint, the value of p = 0.010 was obtained, meaning that p > 0.005 so that H0 was accepted and H1 was rejected. So for the control group, the H0 (not significant) statement "There is no effect and difference of sprint running

techniques on the ability of the 100-meter Sprint in athletes during the COVID-19 pandemic", is not rejected.

Based on the calculation of pretest and posttest data in the experimental group on the ability to run the 100-meter sprint, the value of p = 0.000 is obtained, meaning that p < 0.005, so H0 is rejected and H1 is not rejected (accepted). So for the experimental group, the H1 (significant) statement "There is an effect of sprint running techniques on the ability of the 100-meter Sprint in athletes during the COVID-19 pandemic ", is not rejected.

4. Discussion

The results showed that technical training had a significant impact on the ability to sprint 100-meter during the COVID-19 pandemic. This means that this technical training method is very suitable for use by athletes during the COVID-19 pandemic, even though it is done independently.

A 100-meter sprint is a sprint with a distance of 100-meter [32]. The speed in the 100-meter sprint produces strong and fast contraction of the muscles which is converted into a smooth, efficient motion that is indispensable for runners to achieve high speed. The goal of a sprint is to do the maximum and fastest possible horizontal speed that results from the body pushing forward. Short distance running consists of several stages, namely the reaction and boost stage, the acceleration stage, the transition stage, the maximum speed stage, speed maintenance, and finish. The speed component is one of the most important factors for all athletic numbers, especially the 100-meter sprint [33].

To achieve this goal in a sprint event, the athlete must focus on achievement and maintaining maximum running speed [32]. As it is well known that the most obvious requirement of all sprints is speed. Speed in sprinting is the result of strong and fast contraction of the muscles, converted into a smooth, efficient movement, this activity is required in running at high speed.

Many of the characteristics of the human body play a large role in the 100-meter run ability. The skill of running 100 meters seems simple, it depends on the ability of an athlete to combine movements of the legs, arms, body, and so on throughout in a smoothly coordinated manner.

We have to consider aspects of human anatomies, such as height, frequency, stride, stride length, speed, energy production, somatotype, anthropometry, power, and muscle fiber composition, when analyzing a 100-meter run [32]. It should also take into account external contributing factors such as footwear, injury history, running performance, and variation in horizontal power, if we analyze the running motion within 100-meter.

A running speed is determined by stride length and stride frequency [32]. The optimal stride length is largely

determined by the physical properties and by the force applied to each stroke. The main requirement of sprinting is speed, speed in sprinting is from strong, fast contractions of the muscles which are converted into smooth, smooth, and efficient movements that are needed to be able to run at high speeds. The 100-meter run that is achieved 9–10 seconds requires perfect technique and arrangement of running elements, the slightest mistake will reduce the result of the time achieved.

What can be learned, trained, and developed is the need for skill or dexterity and the techniques involved in converting muscle contractions into efficient movements

from a good sprint [32]. The training of the sprint running techniques can improve other biomotor abilities such as strength, flexibility, coordination, and special endurance that contribute to a successful sprint. Previous research on the effect of sprint running techniques on the ability to run 100 meters, can see in Table 5.

Sprint technique is one aspect that affects sprint ability, especially the 100-meter number. The Sprint technique is at the core of these factors because it is integrated with other factors [32]. According to the IAAF [32], The factors that play a role in sprint running achievement are described in Figure 2.

Table 5. Previous research on the effect of sprint running techniques on the ability to run 100 meters

Researcher	Title	Relevance of Findings
Bezodis, et al [23]	Sprint Running Performance and Technique Changes in Athletes During Periodized Training: An Elite Training Group Case Study	The sprint technique influences the results of the athlete's sprint ability.
Rumpf, et al [34]	Effect of Different Training Methods on Running Sprint Times in Male Youth	The training method in improving running technique will improve and affect the sprint time.
Maćkała, et al [27]	Selected Determinants of Acceleration in the 100m Sprint	One aspect that affects the sprint acceleration of 100-meter is the use of the right running technique.
Majumdar & Robergs [35]	The Science of Speed: Determinants of Performance in the 100-meter Sprint	The performance of the 100-meter sprint ability is influenced by the sprinter running technique.
Morin, et al [36]	Mechanical determinants of 100-meter sprint running performance	The 100-meter sprint performance works in synergy with motion mechanics and is closely related to the sprint running technique.

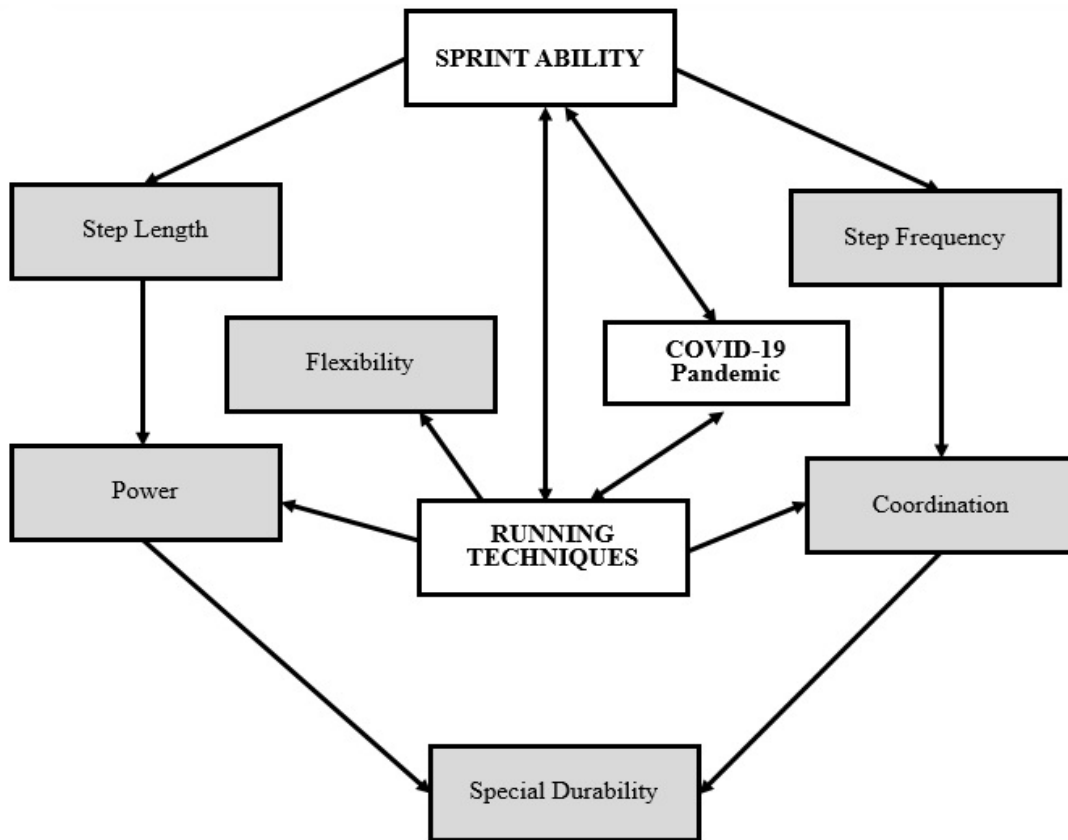


Figure 2. Parameters related running technique through sprint ability during pandemic COVID-19

According to this chart, it is explained that sprint achievement is influenced by stride length and stride frequency. The stride length influencing factor is power. Good power needs to be aligned with running movements so that harmonizing the ability to use power is a technique and to get a stable stride length for a long time requires special endurance. The frequency of steps is influenced by the ability to coordinate movements; the better the coordination of the movements, the better the frequency of steps taken, the frequency of steps taken for a long time, special resistance is required. Good coordination is influenced by how the running movement technique is effective in its implementation so that these components affect each other's sprint running achievement. Good running technique is the main parameter related to the achievement of a sprint (100-meter) because this will also affect other parameters.

5. Conclusions

Based on the above conclusion, it is known that there is an effect of sprint running techniques on the ability of the 100-meter Sprint in athletes during the COVID-19 pandemic. This finding can have implications, namely being a reference for coaches or teachers in compiling training programs to improve the achievement of the 100-meter sprint in athletic sports.

This research has implications for the 100-meter sprinter trainer with the data the findings of this study can be used as a reference to improve their training activities to improve the performance of the sprinter athletes.

This research is not without limitations in its implementation. Limitations of the study include: 1) Researchers cannot control the activities of athletes outside of training which can affect test results, such as body conditions, psychological factors, and so on; and 2) The weather often changes drastically and the wind direction is unpredictable so that during the implementation of tests and exercises or treatment is quite constrained.

For further researchers, they should be able to modify other types of exercise and conduct research with a wider sample and population as well as the addition of different variables so that the treatment given to affect the performance of the 100-meter sprint can be identified more broadly in increasing the ability of sprinter athletes.

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Conflict of Interest

All authors state that there is no conflict of interest in

this study.

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