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Comparison of Uphill and Downhill Training Against 100 Meter Sprint Travel Time

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Abstract

Short distance running or *sprinting* is one of the race numbers in athletics. The achievements of sprint runners can be seen from the results of the time they achieve when running on the track. This study aims to determine the effect of *uphill* and *downhill training* on the travel time of the 100 meter sprint in the MAN 7 Jombang athletic extracurricular. In addition, to find out the difference in the effect of *uphill* and *downhill* training on the travel time of the 100-meter sprint in extracurricular athletics MAN 7 Jombang. The method used in this study is a quasi-experiment *with* the Two group Pretest and Posttest Design *research design*. A total of 20 subjects were taken as participants and divided into two exercise groups, each consisting of 10 people. The instrument in this study used a 100 meter sprint test. Then the data that has been obtained will be tested using *the Paired Sample Test t test to* determine the effect of treatment, Independent sample test t test to analyze the average difference between the two groups. The results showed that (1) There was a significant influence on *uphill* training and *downhill* training on the 100-meter *sprint* travel time in MAN 7 Jombang athletic extracurriculars. (2) There was no significant difference between the *uphill* and *downhill training groups on the 100-meter* sprint *travel time* in the MAN 7 Jombang athletic extracurricular.

Kata kunci: Uphill Training, Downhill Training, Sprint 100 meter.

INTRODUCTION

Short distance running or *sprint* is a race number in athletics where in this number, runners can cover a distance of 100 meters to 400 meters. In the opinion of Rahmat (2015) states that short distance running or *sprint* is running using the maximum speed as far as the distance that must be passed or until the specified distance has been reached. Meanwhile, in the opinion of Saputra (2001) explained that "short-distance running is the ability to run which involves moving the runner's body position from one place to another quickly, exceeding the basic movements in casual running or *jogging* skills. Short distance running or *sprint* is running using maximum speed along the distance of the track that must be traveled or up to a specified distance.

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The 100 meter sprint race is one of the most prestigious athletic competition numbers at both national and international athletic championships. The attraction of the 100-meter *sprint* number lies in how an athlete uses the speed he has when traveling the track distance (Marani, 2016). To get maximum achievement, a runner must be able to get the fastest travel time. According to Sujiono (2021), "A runner's achievement can be observed through the time records obtained from the results of his running speed while on the track". From this it can be interpreted that the best time record is obtained from the fastest travel time. Fast travel time in short-distance running is related to how runners use speed when covering the track distance. The faster the travel time, the more runners get the best time. Therefore, travel time is related to the running speed of the athlete.

Basically, elements of physical condition are interconnected with elements of other physical conditions. The element of speed cannot be obtained without other elements of physical condition. In Budiyanto's opinion (2010) speed is influenced by elements of other physical conditions, namely: muscle strength and power, movement coordination ability, agility and balance and mastery of movement techniques. Therefore, to increase speed in running, it is necessary to pay attention to the elements of physical condition that influence. Therefore, it is very important to provide treatment that is in accordance with the development of athletes.

There are various training methods that can be used by trainers to increase running time as well as runner speed, especially short distance running or *sprints*, one of which is *uphill* and *downhill* training. *Uphill* training is very suitable to be used as a *sprint* speed training method with respect to hilly areas or uphill plateaus. *Uphill* training is a method of running in inclined or uphill road areas by runners running as fast as possible and then decreasing leisurely as a recovery phase (Aliang et al., 2021). *Uphill* training is a form of exercise carried out in an uphill or uphill road area, runners must be able to run from a low road area to a high or peak road area at a repetitive medium speed, the goal is to train dynamic strength in leg muscles (Kurniawan, 2021). Exercises that develop dynamic strength train the strength of the leg muscles. When running, leg muscles have an important role to push the body forward, allowing the body to run quickly. If the leg muscles do not have strong energy then the focus will be weak, this can cause slow and short steps.

Research conducted by Angreini & Endriani (2022) shows that athletes who run uphill will experience enlargement of the muscle fibers and an increase in the number of blood capillaries, this will result in the quality of muscle contractions increasing. The extensor muscles in the ankle joints when running uphill will do their job harder to support body weight, this is influenced by the force of gravity. The changes experienced are a form

of body adaptation which will indirectly make the ankles get used to the load given by the uphill track. Research conducted by Roberts & Belliveau (2015) shows that the quad muscles of people who run on hills contain more aerobic enzymes, which enable these people to work at high intensity for long periods of time. This means that people who run on hills have better body endurance. This is a form of body adaptation. The way to adapt to hills is to cut and change your footsteps. Running uphill on a hill should be shorter compared to running on a flat place.

In addition to *uphill* training, there are *downhill exercises that can be used by trainers as a variety of exercises to increase travel time as well as running speed* Downhill training is one variation of exercise carried out in downhill areas or downhill roads. In Nanang's opinion (2020), downhill training is a form of exercise carried out by runners running down hills or in downhill areas with body positions following the force of gravity. The opinion of Kurniawan (Kurniawan, 2021) explained that downhill training is one way to train the speed and frequency of foot movements by going downhill at maximum speed without reducing speed and holding body weight. The main goal of this downhill exercise is to achieve maximum frequency of foot movement speed.

Research conducted by Maeo, et al. (2017) stated that during downhill running, the lower leg muscles, especially the knee extensors, mainly perform eccentric contractions, where force is generated while the muscle-tendon complex is extended to control walking speed and/or to absorb shock. Eccentric muscle contractions occur when the magnitude of the force applied to the muscle exceeds the force produced by the muscle itself (i.e. negative work), produces a lengthening action of the musculotendinous system. This was also conveyed by Neves, et al. (2014), states that downhill produces greater eccentric contractions of the extensor muscles of the lower limbs. Eccentric contractions play a role in increasing body strength and endurance, by practicing going downhill indirectly the body will adapt and increase endurance, especially in the muscle strength of the lower legs. Thus, downhill training is a form of variation in training methods carried out in hilly areas, especially on areas or roads that are downhill with the body position following the force of gravity.

MAN 7 Jombang is one of the State Madrasah Aliyah which organizes athletic extracurricular activities in Jombang Regency. This athletic extracurricular is a forum to facilitate students who have interest and talent in sports. This athletic extracurricular activity has received many awards and produced many athletes. This is proven by the achievements of MAN 7 Jombang athletes in championship events organized by the Jombang district government, especially in sprint athletics. In the last 5 years, MAN 7

Jombang athletics athletes have been able to contribute awards and win overall championships at district level athletics championships. However, this situation is inversely proportional to today, the achievements of athletic athletes are decreasing from year to yearIn 2017, athletes and members of the MAN 7 Jombang athletics extracurricular team donated four gold medals consisting of the men's 100 meter dash, the women's 100 meter dash, and the women's 400 meter dash. Then two silver medals consisting of the men's 400 meters and the women's 400 meters. In 2018, he won two gold medals, consisting of the women's 100 meters and the men's 100 meters. Then there was a silver medal in the women's 400 meter dash. And one bronze medal in the women's 400 meters. In 2019 the athletes donated one gold medal, namely the women's 100 meter dash. Then two silver medals consisting of the men's 100 meter and women's 400. In 2020, the athletes donated one gold medal, namely the men's 100 meter dash. Then he donated a silver medal, namely the women's 100 meters. From these results, it can be seen that the athletes' achievements in short distance runningsprinter MAN 7 Jombang has experienced a decline from year to year.

After conducting observations and interviews with coaches and running athletessprint. Information was obtained that currently the frequency of athlete training each week is only done once a week, namely on Saturday. According to Syarifuddin (in Fahmi & Irawan, 2017:91)To achieve satisfactory progress and development, the frequency of training per week should be no less than three times. Apart from that, the training program given by the coach currently only consists of horizontal training on the field. This is different from the training program given several years ago. Coach gives exercisesuphill as a variation of sprint training. In the opinion of Harsono (2015: 78) "in order to prevent boredom when doing training, trainers must have creativity and the ability to find and apply variations in training." This means that coaches have an important role in overcoming boredom or boredom when carrying out training. So trainers need to provide varied training.. Therefore, there is a need for varied training methods as a form of effort to increase travel time and speed on the track.

Based on the description of the problem, it is important for researchers to develop exercise variation methods. Researchers choose exercisesuphill because this exercise was used as a training program several years ago. Researchers also selected exercisesdownhill as a variation of downhill walking training to increase running time. Therefore researchers wanted to compare better results between exercisesuphill and trainingdownhill. Based on the background above, the author is interested in conducting research entitled "Comparison

of TrainingUphill AndDownhill Against Travel TimeSprint 100 Meters in MAN 7 Jombang Athletics Extracurricular ".

METHOD

The method used in this study is a quasi-experiment with the research design Two groub Pretest and Posttest Design. A total of 20 subjects were taken as participants in this study and divided into two exercise groups, each consisting of 10 people. The division of groups is carried out using the ordinal pairing method or made a rank or ranking. The instrument in this study used a 100-meter sprint test. Then the data that has been obtained and collected through tests and measurements will be analyzed using descriptive tests with the help of the SPSS Version 25 application program. Furthermore, the data will be tested using the Kolmogorov-Smirnov normality test, the test is used to find out whether the data obtained in the study are normally distributed or not. Then for hypothesis testing using the Paired Sample Test T Test to determine the effect of treatment in each treatment group, the Independent sample test T Test to analyze the average difference between the two treatment groups.

RESULTS AND DISCUSSION

Result

This research was conducted at MAN 7 Jombang on sprinter athletes who participated in extracurricular athletics. This study was conducted on respondents aged 15-16 years with a total of 20 respondents, respondents aged 15 years as many as 7 students (32%), respondents aged 16 years as many as 8 students (32%), respondents aged 17 years as many as 5 people (26%). Descriptive data on each group can be seen in the following table:

Table 1. Descriptive Data on The *Uphill Treatment Group*

No		Pretest	Posttest	Delta
1	Mean	14,96	14,70	0,24
2	Deviation	1,970	1,964	0,01
3	Minimal	12,45	12,20	0,25
4	Maximal	17,72	17,48	0,24

Percentage increase of 1,71 %

The data shown in table 1 are descriptive data on the uphill treatment group using the help of SPSS Version 25. From the table data, it shows that the average pretest data is 14.96 SD 1.97 and has the lowest value of 12.45 seconds and the highest value of 17.72 seconds. Then the average posttest data was 14.70 SD 1.96 and had the lowest value of

12.20 and the highest value of 17.48 seconds. The percentage increase from the uphill treatment group was 1.71%.

Table 2. Descriptive Data On *The Downhill Treatment Group*

No		Pretest	Posttest	Delta
1	Mean	14,978	14,826	0,152
2	SD	2,017	2,014	0,003
3	Minimal	12,50	12,35	0,15
4	Maximal	17,64	17,50	0,14
Persentase increase 1,01 %				

The data shown in table 2 are descriptive data on the downhill treatment group using the help of SPSS Version 25. From the table data, it shows that the average pretest data is 14.97 SD 2.017 and has the lowest value of 12.50 seconds and the highest value of 17.64 seconds. Then the average posttest data was 14.82 SD 2.014 and had the lowest value of 12.35 and the highest value of 17.50 seconds. The percentage increase from the downhill treatment group was 1.01%.

Table 4. *Paired sample t-test* in the *Uphill Group*

	N	Mean	SD	Tcount	Sig. (2-tailed)	p
Pretest_Uphill	0	14,964	1,970	39,500	0,000	0,05
Posttest_Uphill	0	14,707	1,964			

The results of the data shown above are the results of an influence test using paired sample t-test. The test was used to test the effect of uphill training on sprint travel time. Data is said to have a significant influence if the p value < 0.05. Based on these data, the sig (2-tailed) value is 0.00, which means that p< 0.05. Thus, it can be said that there is a significant influence on uphill training on sprint running time.

Table 5. *Paired Sample T-test* In *Downhill Group*

	N	Mean	SD	Tcount	Sig. (2-tailed)	p
Pretest_Downhill	0	14,978	2,0179	23,516	0,000	0,05
Posttest_Downhill	0	14,826	2,0146			

The results of the data shown above are the results of an influence test using paired sample t-test. The test was used to test the effect of downhill training on sprint travel time. Data is said to have a significant influence if the p value < 0.05. Based on these data, the sig (2-tailed) value is 0.00, which means that p< 0.05. Thus, it can be said that there is a significant influence on downhill training on sprint travel time.

Table 6. ***Independent sample t-test Uphill*** **Group and** ***Downhill Group***

		Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Rsult *posttest* of Sprint	Equal variances assumed	.910	-.10300	-1.98903	1.98902	1.78302
	Equal variances not assumed	.910	-.10300	.89771	1.78303	1.78303

Based on the data shown in the table above, which is the result of a different test using an independent sample t-test. Where the test is used to determine the difference between the two groups. The data is said to have a significant difference if the p value < 0.05. In the table it is explained that the value of sig (2-tailed) has a value of 0.91 which means p > 0.05. Thus, it can be concluded that there is no significant difference between the uphill running group and the downhill running group over the distance of the 100 meter sprint.

Discussion

After examining the data that has been described in the results of the study, researchers discuss the results of the data obtained during the study. The purpose of this study was to determine the effect of uphill and downhill training on the 100-meter sprint travel time in MAN 7 Jombang athletic extracurriculars, and to determine the difference in the effect of *uphill* and downhill training on 100-meter sprint travel time in MAN 7 Jombang athletic extracurriculars . In *sprints*, travel time is defined as the time it takes for runners to pass the track from *start* to *finish*. In Sujiono's opinion (2021), a runner's achievement can be seen from the time record achieved from the results of his running speed. From this it can be interpreted that the best time record is obtained from the fastest travel time.

The exercise discussed first is *uphill training against* sprint *running time*. *Uphill* training is a method of running on an inclined road or on an uphill road by running as fast as possible and then decreasing leisurely as a recovery phase (Aliang Haetami and Noviayanti, 2021). The exercises carried out also focus on increasing leg strength, because running movements are influenced by leg movements in order to obtain good pounding and speed (Raharja &; Komarudin, 2020). In this study, *uphill training* has an effect on increasing running travel time, this can be seen in a series of statistical tests in the previous discussion, namely descriptive tests, homogeneity tests, paired t-tests. The results of the data on the statistical *paired sample t-test* show that the sig (2-tailed) value is 0.000 which means that p < 0.05. Thus, it can be said that there is a significant influence on *uphill*

training on sprint *travel time*. In a previous study by Hangga Nafiansyahputra Kusuma (2019) entitled "The Effect of *Uphill Training on the 60-Meter* Sprint Performance of *Male Students of SMPN 2 Kembar Banyumas Regency" that there is a significant influence between* uphill training methods *on* sprint running performance 60 meters of male students at SMPN 2 Kembar after receiving increased treatment. One of the factors that affect the increase in running speed in *uphill* training is leg strength so that athletes are able to create better travel time (Kusuma, 2019).

In addition to examining *uphill training on* sprint *travel* time, this study discusses *downhill* training on running travel time. In Nanang' s opinion (2020), downhill training is a form of exercise carried out by runners running downhill or in a downhill road area with body position following the force of gravity. When doing *downhill running* exercises, the body position follows the force of gravity, the legs will directly accelerate the frequency of steps in order to achieve body balance. *Downhill* training is one of the exercise methods carried out in hilly areas, especially in areas or downhill roads with body position following the force of gravity. In this study, *downhill* training has an effect on increasing running travel time, this can be seen in a series of statistical tests in the previous discussion, namely descriptive tests, homogeneity tests, *paired t-tests*. The results of the data on the statistical *paired sample t-test* show that the sig (2-tailed) value is 0.000 which means that $p < 0.05$. Thus, it can be said that there is a significant influence on *downhill training on* sprint *travel time*. In a previous study by Nanang (2020) entitled "The Effect of *Downhill* Running Training on the 50-Meter Running Speed of Special Sports Class Students of SMA Negeri 1 Tanjungsari". The results showed that there was a significant influence of *downhill* running training on the 50-meter running speed of students of the special sports class of SMA Negeri 1 Tanjungsari. Increasing speed by using *downhill* training has a significant effect because the exercise stimulates runners' *overspeed* movements so that it can increase step frequency and step length (Nanang, 2020).

In this study, subjects carried out treatment for six weeks. In Bowers' opinion (in Bafirman & Wahyuri, 2019), training that lasts 6-8 weeks will have enough effect for athletes. In order to achieve satisfactory progress and development, the frequency of exercise per week is no less than three times. (Yusuf and Syarifuddin, 1997:135). Therefore, the frequency of exercise in this study was carried out for three times during the week, namely on Tuesday, Thursday, Saturday. As for each exercise program can be seen in the appendix table. According to khoiruzzaman in setyo (2016) "Success can be achieved if training is carried out in accordance with the principle of exercise which includes gradual, programmed improvement, which has a specific purpose". The increase in travel time from

both uphill and downhill treatments showed that each treatment group had implemented appropriate training principles.

For the results of the percentage increase in travel time, *pretest and* posttest *data for uphill and* downhill *training* there is almost the same difference. Travel time in 10 subjects with *uphill* treatment had a percentage increase of 1.71%. Travel time in 10 subjects with *downhill treatment* had a percentage increase of 1.01%. As for testing the hypothesis of the independent t sample *t-test, the t-test* shows the sig value (2-tailed) has a value of 0.91, which means $p > 0.05$. So it can be interpreted that there is no significant difference between the *uphill* running group and *the downhill* running group on the distance of *the 100-meter sprint* or the two exercises are equally good at increasing running time. This is in accordance with Tekriwal's (2022) opinion that uphill and downhill training combines stimulation and accelerates running routines so as to increase speed, strength, elasticity, frequency of length and footsteps. Uphill and downhill training methods are significantly more effective in increasing maximum *sprint* speed and kinematic characteristics related to *sprinting* (Paradisis et al., 2009).

The results of this study are in line with previous research conducted by Ahmad Ramdani entitled Comparison of Uphill Training and *Downhill* Training to Increase Running Speed (Experimental Study on Members of the Upi Karate Student Activity Unit) in 2017 that *uphill* and *downhill* training can increase running speed, but there is no significant difference between the two exercises. There is no difference in *uphill and* downhill *training* influenced by the similarity in duration and intensity of exercise programs and exercise characteristics. Similarly, in this study on *uphill and* downhill *exercise programs,* especially in this study, duration and intensity have similarities. As well as for the characteristics of respondents taken have similarities. *Both uphill* training and *downhill* training have an influence on increasing running time. So, when compared to *uphill training and* downhill *training,* there is no significant difference in increasing running travel time or both exercises both have an influence and increase running travel time.

CONCLUSION

Based on the research that has been done and the data obtained. Data can be collected, processed, and analyzed using statistical formulas with the help of SPSS Version 25, so it can be stated that there is a significant influence on *uphill training* on the travel time of the 100-meter *sprint* in the MAN 7 Jombang athletic extracurricular. And there is also a significant influence on *downhill* training on the 100-meter *sprint* travel time in MAN 7 Jombang athletic extracurriculars. *Uphill* and *downhill* training methods have a significant

influence on the travel time of the 100-meter sprint. However, when compared to uphill training and downhill training, there is no significant difference in increasing running travel time or both exercises both have an influence and increase running travel time. So the conclusion of this study is that there is no significant difference in the effect between *uphill* and *downhill* training on 100-meter running time in MAN 7 Jombang extracurricular members.

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