P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 5.38
IJPESH 2021; 8(3): 38-42

www.kheljournal.com
Received: 04-03-2021
Accepted: 29-04-2021

Jusak Syaranamual
Physical Education Study Program, Pattimura University, Indonesia

Ztella Rumawatine
Physical Education Study Program, Pattimura University, Indonesia

Corresponding Author:
Jusak Syaranamual
Physical Education Study Program, Pattimura University, Indonesia

Influence of training programs uphill-downhill fast running interval to 100 meters running speed

Jusak Syaranamual and Ztella Rumawatine

Abstract
This study aims to explore the effect of modification of the training system above and specifically aims to: (1) examine the effect of an interval training program for angled uphill sprinting at a distance of 10 meters and an angled downhill sprint interval at a distance of 20 meters plus a stride of 80 meters with a rest ratio. 1: 5, (2) Assessing the effect of an angled uphill sprint interval training program at a distance of 10 meters and an angled downhill sprint interval at a distance of 20 meters plus an 80 meter stride with a rest ratio of 1:10, (3) Knowing the difference in influence between training programs angled uphill sprint intervals at a distance of 10 meters and angled downhill sprint intervals at a distance of 20 meters plus an 80 meter stride with a rest ratio of 1: 5 and 1:10 seen from the time of 100 meters running speed, leg muscle strength and thigh muscle hypertrophy. This research is an experiment using the "Randomized Control Group Pretest-Posttest Design". The population of this research is the athlete candidates for beginner male sprint athletes aged 14-15 years, the results of PASI KONI Ambon City, totaling 33 athletes. The athletes were then divided into three groups, each consisting of 11 people. The experimental group I was given a measured uphill downhill interval training program with a rest ratio of 1: 5, the experimental group II was given a measured uphill-downhill interval training program with a resting ratio of 1:10, and the control group carried lout conventional training activities.

Keywords: Running speed, uphill-downhill training

Introduction
Sport is one of the means to form mentality and build the character (mental and character building) of a nation or society. In a broader context, sport has helped the development of culture and civilization in human life. sports activities can minimize differences in understanding of the interests of groups or groups and promote togetherness, thereby creating a spirit of unity and integrity at the regional, national and international levels. Sports coaching and development is an effort to improve the quality of Indonesian people who can support sports achievements which in turn can lead to a spirit of nationalism in the Indonesian people.

Achievement in sports is an ability that reflects the characteristics of a region or nation in responding to the challenges of globalization in all fields today, both at the national and international levels (Beachle, 2020) [1]. Athletics is one of the sports that has been designated as Indonesia's ambassador for activities at the international level. One of the numbers prepared in athletics is the sprint number. Nowadays, the progress of the sprint number achievement has decreased in terms of sports science. The decline in sprint achievement is seen from the achievement of time and not the acquisition of a gold medal in a championship. Emphasis on time achievement indicates how the current coaching process for the sprinter is to be able to solve the time achievements that have been achieved by previous sprinter (Poerwanto & Firdiansyah, 2019) [6].

Biomotor ability training that is programmed objectively, measurably, and is carried out systematically and continuously will make changes to the athlete's physiology (Dahoney *et al*., 2012) [2]. These changes are related to muscle volume (skeletal muscle and cardiorespiratory muscle hypertrophy), intensity and frequency of muscle contraction (speed and resistance of muscle contraction) and nervous system work. In this case, an increase in the amount of actin and myosin filament proteins (thin and thick filaments) per muscle fiber increases the diameter of the muscle fibers so that the number and size of myofibrils increases, and this occurs in the cross-sectional area which causes increased strength (force).

muscle. If the repetition of muscle contractions is faster, it will increase the speed. If the repetition of muscle contractions is maintained for a long time, it will increase muscle endurance (Subagio *et al*., 2019) [9].

The increase in muscle hypertrophy anatomically of a sprinter will contribute to the endurance of his muscles during running. Anatomically, muscle hypertrophy means a balance between the size of the muscles from one body segment to another. Measurements were carried out based on Kluwer (2018) [8], that measuring muscle circles manually can use a band with a better steel material, but a band with a material made of plastic is sufficient (Hernawan, 2016) [5].

Based on the empirical facts as explained above, it can be seen that there are many problems in the process of building special achievements at sprint numbers that must be addressed immediately in order to objectively improve athlete achievement. The problems described above seem very complex, so theoretical considerations are solutions to overcome problems in the coaching process (Firdiansyah, 2017) [3]. One solution to overcome the coaching process for beginner athletes at sprint numbers without depending on existing facilities (track and weight machines) is to modify the training field that can accommodate all training components in terms of biomotor, mechanics and phases in the sprint (Hernawan & Widyaningsih, 2018) [10]. The intended modification of the training field in the natural training system is a modification of the uphill-downhill training field (Hargreaves, 2014) [7]. Observations in the field are related to the use of the uphill-downhill form of training, that the training process is only carried out in the general preparation phase with the aim of forming athletes' fitness, and the process of carrying it out over long distances with uncertain heights or slopes of hills. The running performance could be improved as the step parameters at each phase are being increased. For this purpose, various training methods to increase the running performance were developed. One of the most frequently used training methods is running on a flat surface. However, it was recently demonstrated that uphill and downhill training methods with different gradients also some changes on the kinetic characteristics of running (Hary & Firdiansyah, 2020) [4].

Research Methods

This study aims to determine the effect of a measured uphill-downhill sprint interval training program plus 80 meter stride on an increase in running speed of 100 meters, leg muscle strength and thigh muscle hypertrophy. This type of research is experimental research, using the Randomized Control Group Pretest-Posttest Design.

Results and Discussion

The results obtained in this study are a collection of empirical facts to describe the measured paradigm of modifying the uphill-downhill training field in supporting the sprinter's appearance. What should be studied is the quantity and quality of white muscle (fast twitch fiber), but the ethical constraint is that the research subject is a human (athlete), so this study only determines the relationship between the three dependent variables, namely running speed, leg muscle strength and thigh muscle hypertrophy that can be formed through a measurable modification of the uphill-downhill training field.

The relationship between the three dependent variables is determined on the basis of the premise that the hypertrophy of the thigh muscles will contribute a great deal of strength to the thrust of the leg muscles when the athlete runs. During running, the muscles contract dynamically with the maximum contraction intensity. Therefore it takes resistance to the contraction of the thigh muscles.

Data obtained through tests and measurements of the dependent variable to answer the problems in this study. The tests and measurements carried out on the dependent variable consisted of three groups. The experimental group I was given a treatment program of measured uphill-downhill sprint interval treatment plus 80 meter stride with a rest period of 1: 5, that is, after one five-minute rest treatment. The experimental group II was treated with a measured uphill-downhill sprint interval treatment program plus 80-meter stride with a rest period of 1:10, that is, after one treatment was given ten minutes of rest.

Whereas the treatment in the control group, as group III, followed the conventional process, namely the speed endurance treatment program within a distance of 140 meters with a rest period that is often used is 1: 3, namely after one treatment was given a three-minute break. The test was carried out twice, namely the initial test and the final test, with the same test material. The tests given include a running speed test of 100 meters, a leg muscle strength test and a measurement of thigh muscle hypertrophy. The basis for the administration of 1: 5 and 1:10 interval training doses is based on the results of research on the rest period between reps to recover from origin when carrying out an anerobic treatment program.

The tests and measurements were carried out over two days. On the first day, a 100 meter running speed test was carried out, then on the second day, a leg muscle strength test and a thigh muscle hypertrophy measurement were performed. The 100 meter running speed test was carried out at the Karang Panjang Mandala Youth Stadium, Jalan Martha Kristina Tiahahu Ambon. The time for the 100 meter running speed test is carried out in the morning, starting at 07.00 until 10.30 WIT. The implementation of the running speed test is designed in the form of a competition based on the IAAF regulations regarding the mechanism of short-distance running (start, run, finish, manual timing and the draw) which is simplified based on the conditions of the test site. When the leg muscle strength test and thigh muscle hypertrophy measurements were carried out in the morning, 07.00 to 10.00 WIT.

1. Experiment Group I

The dependent variable of the experimental group I consisted of running speed, leg muscle strength and thigh muscle hypertrophy. The research data from the experimental group I are presented in Table 1 below.

Table 1: Data on pre-test and post-test from the experimental group I

The Experimental group I				
	100 Meter Run Speed (seconds)		Thigh Muscle Hypertrophy (cm)	
No.	Pre Test	Post Test	Pre Test	Post Test
1	13,65	12,10	34,3	50,1
2	13,66	12,11	34,4	49,2
3	13,66	12,13	33,2	49,5

4	13,67	12,15	34,3	49,1
5	13,61	12,12	32,5	49,3
6	13,65	12,16	31,3	49,1
7	13,63	12,14	31,3	48,3
8	13,64	12,16	33,2	48,2
9	13,71	12,18	34,2	48,2
10	13,70	12,19	34,4	48,3
11	13,64	12,17	33,3	48,5
Average	13,66	12,15	33,31	48,89

a. Thigh Muscle Hypertrophy

Thigh muscle hypertrophy data is obtained from the measurement results of the muscle circle of the left and right thigh muscles. The baseline and final test data show an improvement. This can be seen from the final test mean figure of 48.89 cm, greater than the initial test figure of 33.31 cm. The mean number of pre-test and post-test for thigh muscle hypertrophy is the result of calculating the mean measurements of the right and left thigh muscles of the study subjects. If the increase in hypertrophy in that muscle type which is focused on the thigh muscles is caused by an objective training process, it will contribute a great deal of thrust from the legs when the research subject runs.

Thigh muscle hypertrophy data is an empirical fact from the treatment program treatment of measured uphill-downhill sprint intervals plus 80-meter stride interspersed with 1: 5 rest periods. So this muscle hypertrophy, formed based on loading from within, uses body weight with resistance to the training field and a sufficient rest period for the recovery process and energy metabolism processes, so that muscle adaptation can occur according to biological age, training age and the ability of the research subject. This shows that the measured uphill-downhill sprint interval treatment program plus 80-meter stride interspersed with a 1: 5 rest period can increase the thigh muscle hypertrophy of the study subjects, without having to use a weight machine. To clarify the description above can be seen in Figure 1 below.

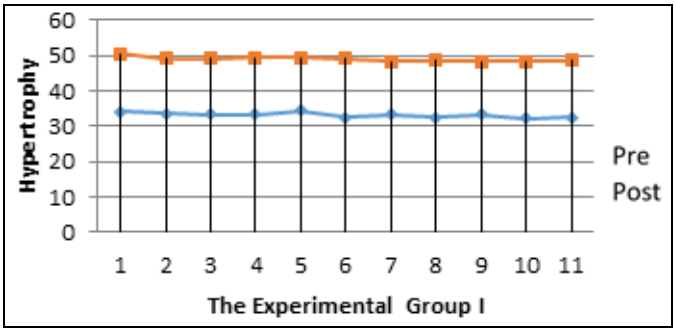

Fig 1: Graph of pretest and final test of thigh muscle hypertrophy experimental group I.

b. Leg muscle strength test

Leg muscle strength data obtained from the results of the dynamometer leg test. The baseline and final test data show an improvement. This can be seen from the final test mean of 92.91 which is greater than the initial test mean of 58.64. The leg muscle strength data above is an empirical fact from the provision of a measured uphill-downhill sprint interval treatment program plus an 80-meter stride interspersed with a rest period of 1: 5. So leg muscle strength is formed based on loading from within, using body weight with resistance from the training field and providing adequate rest periods, so that muscle adaptation can occur according to biological age, training age and the ability of the research subject. The above shows that the measured uphill-downhill sprint interval treatment program plus the 80-meter stride interspersed with a 1: 5 rest period can increase the leg muscle strength of the study subjects, without having to use weight machines. To clarify the description above can be seen in the Figure below:

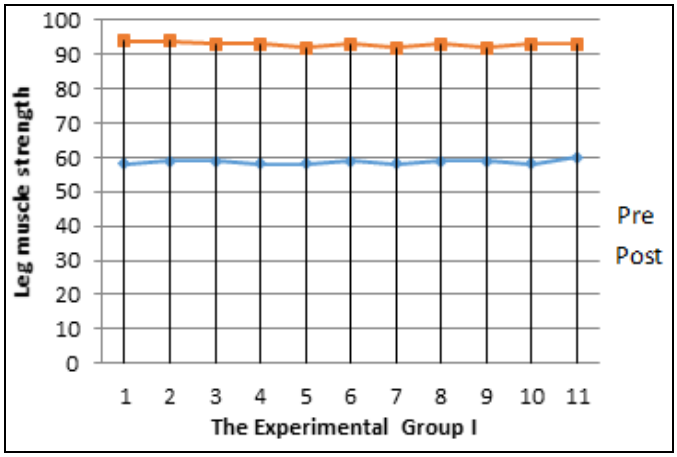

Fig 2: Graph of pretest and final test leg muscle strength of experimental group I

c. 100 meters running speed

Running speed data is obtained from the results of the 100 meter running test. The baseline and final test data show an improvement. This can be seen from the figure of the final test time of 12.15 seconds which is lower than the initial test time figure of 13.66 seconds. Thus, it can be explained that the measured uphill-downhill sprint interval treatment program plus an 80 meter stride interspersed with a 1: 5 rest period can increase the 100 meter running speed of the research subject. To clarify the description above can be seen in Figure 3 below.

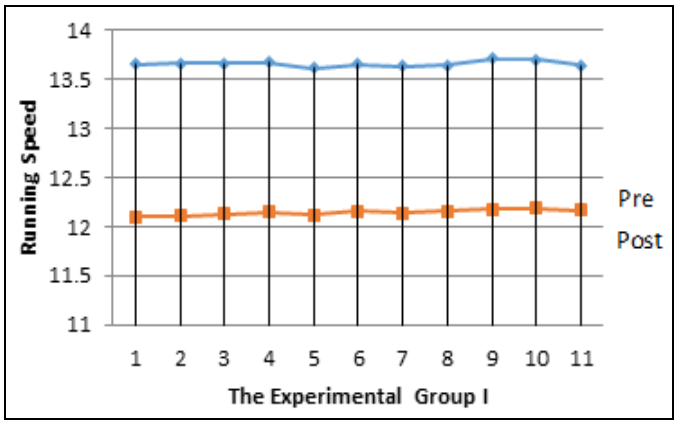

Fig 3: Graph of pre-test and final test data of experimental group's running speed I.

2. Experiment Group II

The dependent variable of the experimental group II consisted of running speed and thigh muscle hypertrophy. The research data can be presented in Table 2 below.

Table 2: Initial and final test data from Experiment Group II

The Experimental group II				
	100 Meter Run Speed (seconds)		Thigh Muscle Hypertrophy (cm)	
No.	Pre Test	Post Test	Pre Test	Post Test
1	13,65	12,10	34,3	50,1
2	13,66	12,11	34,4	49,2
3	13,66	12,13	33,2	49,5
4	13,67	12,15	34,3	49,1
5	13,61	12,12	32,5	49,3
6	13,65	12,16	31,3	49,1
7	13,63	12,14	31,3	48,3
8	13,64	12,16	33,2	48,2
9	13,71	12,18	34,2	48,2
10	13,70	12,19	34,4	48,3
11	13,64	12,17	33,3	48,5
Average	13,66	12,44	33,47	45,23

***Source*:** The results of measurement data

a. Thigh muscle hypertrophy

Thigh muscle hypertrophy data is obtained from the measurement results of the muscle circle of the left and right thigh muscles. The pre-test and post-test data show an improvement. This can be seen from the final test mean figure of 45.23 cm, greater than the initial test figure of 33.47 cm. The mean number of pre-test and post-test for thigh muscle hypertrophy is the result of calculating the mean measurements of the right and left thigh muscles of the study subjects. Theoretically, the moving speed in sprinting depends on the dominant muscle type. The dominant muscle type on sprints is the white muscle type or the fast twitch fiber type. If the increase in hypertrophy in that muscle type which is focused on the thigh muscles is caused by an objective training process, it will contribute a great deal of thrust from the legs when the research subject runs.

Thigh muscle hypertrophy data is an empirical fact from the measured uphill-downhill sprint interval treatment program plus 80-meter stride interspersed with 1:10 rest periods. So this muscle hypertrophy, formed based on loading from within, uses body weight with resistance to the training field and a sufficient rest period for the recovery process and energy metabolism processes, so that muscle adaptation can occur according to biological age, training age and the ability of the research subject. The above shows that the measured uphill-downhill sprint interval treatment program plus an 80-meter stride interspersed with a 1:10 rest period can increase the thigh muscle hypertrophy of the study subjects, without having to use a weight machine. To clarify the description above can be seen in the Figure below:

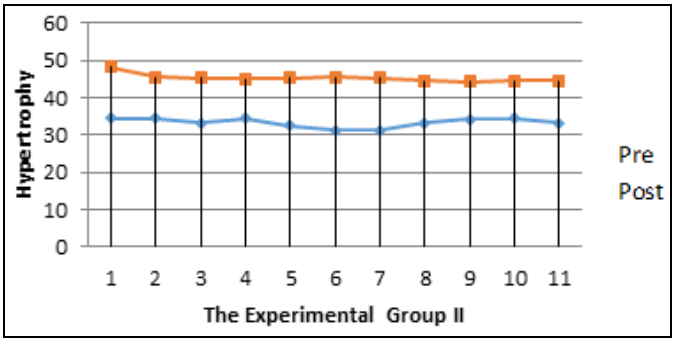

Fig 4: Graph of pretest and final test of thigh muscle hypertrophy experimental group II.

b. Leg muscle strength

Leg muscle strength data obtained from the results of the dynamometer leg test. The baseline and final test data show an improvement. This can be seen from the final test mean of 88.36 which is greater than the initial test mean of 59.18. If there is an increase in leg muscle strength as a result of objective training, then this increase will contribute to the thrust of the leg muscles when doing activities over a long distance with the maximum intensity of muscle contraction in a short time.

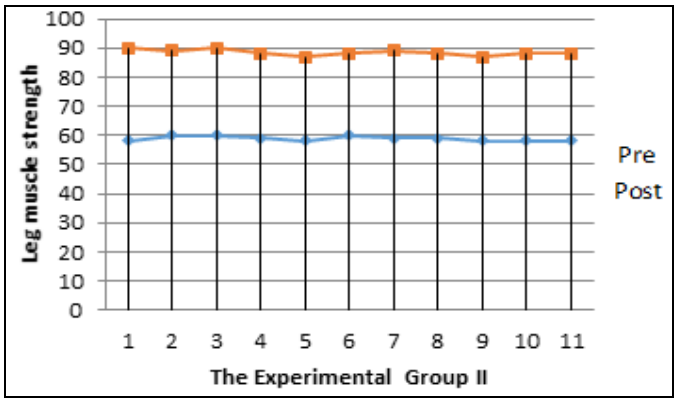

Fig 5: Graph data of pretest and final test leg muscle strength of experimental group II.

c. 100 meters running speed

Running speed data is obtained from the results of the 100 meter running test. The baseline and final test data show an improvement. This can be seen from the figure of the final test time of 12.44 seconds which is lower than the initial test time figure of 13.66 seconds. The above shows that the measured uphill-downhill sprint interval treatment program plus an 80 meter stride interspersed with a 1:10 rest period can increase the 100 meter running speed time of the research subject. To clarify the description above can be seen in Figure 6 below.

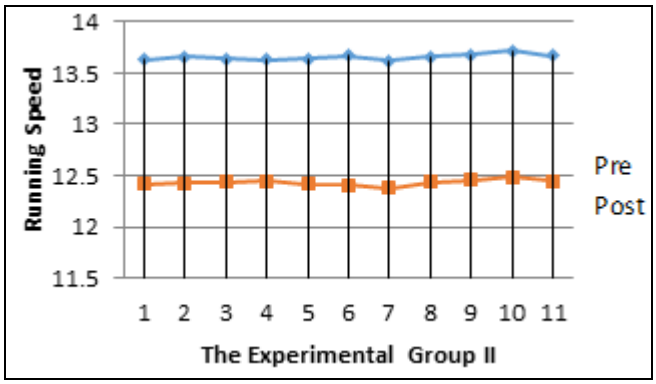

Fig 6: Graph of the pre-test and final-test running speed of the experimental group II.

The results of the descriptive analysis carried out include the mean test, delta mean test, normality test and homogeneity test of data from the research variables of thigh muscle hypertrophy, leg muscle strength and running speed. The testing process is a prerequisite before proceeding with inferential statistical analysis.

1. Description of the inter-group thigh muscle hypertrophy data.

Data descriptions in the form of the number of research subjects (N), the mean (mean) of the pre-test and the delta (difference between the final test scores and the pre-test) of the thigh muscle hypertrophy variable for each study group are presented in Table 3 below.

Table 3: Recapitulation of pre-test data descriptions of inter-group thigh muscle hypertrophy.\

Thigh Muscle Hypertrophy				
Groups	N	Initial test mean	Final test mean	Delta mean
Experiment I	11	33,31	48,89	15,58
Experiment II	11	33,47	45,23	11,75

***Source*:** The results of data processing

a. The pre-test and final test data for experimental group I showed a difference, namely that the mean of the final test was greater than the mean of the initial test. This can be seen also from the mean number of the initial test and the final test of thigh muscle hypertrophy.
b. The pretest and final test data for experimental group II showed a difference, that the mean of the final test was greater than the mean of the initial test. This can be seen also from the calculation of the mean of the initial test and the final test of thigh muscle hypertrophy. The mean of the thigh muscle hypertrophy pre-test data was 33.47 cm, the mean of the thigh muscle hypertrophy final test data was 45.23 cm, while the delta mean of thigh muscle hypertrophy data was 11.75 cm. This shows that the measured uphill-downhill sprint interval treatment program plus 80-meter stride interspersed with a 1:10 rest period can increase the thigh muscle hypertrophy of the study subjects without having to use a weight machine.
c. Based on the mean, delta pretest and final test of thigh muscle hypertrophy variables showed an increase. Thus, it can be said that the training program for each study group can improve the hypertrophy of the thigh muscles. To clarify the description above can be seen in Figure 7 below.

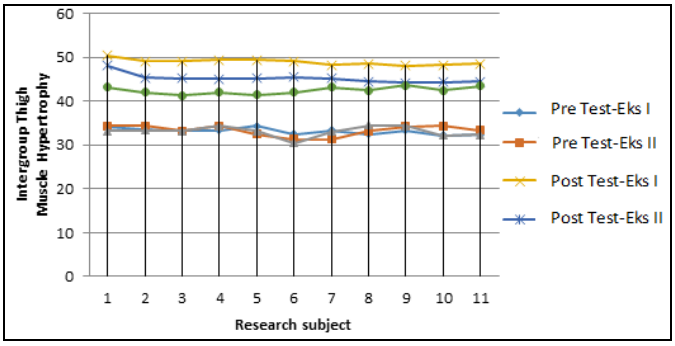

Fig 7: Graph recapitulation description preliminary test data description of thigh muscle hypertrophy between groups.

Conclusion

Based on the results of the research and discussion described in the previous chapter, the following research conclusions can be stated:

1. The paradigm of measurably modifying the uphill-downhill training field plus the 80 meter stride actualized in the sprint interval training program with rest periods of 1: 5 and 1:10 can simultaneously increase running speed, thigh muscle endurance and thigh muscle hypertrophy.
2. 2.The effect of the measured uphill-downhill sprint interval training program plus the 80-meter stride with a 1: 5 rest period given to the experimental group I is more effective in increasing thigh muscle hypertrophy when compared to the effect of a measured uphill-downhill sprint interval training program plus 80 meter stride with 1:10 rest period given to experimental group II.
3. The measured uphill-downhill sprint interval training program plus the 80-meter stride with a 1: 5 rest period given to the experimental group I is more effective in increasing leg muscle strength when compared to the effect of the measured uphill-downhill sprint interval training program plus stride 80 meters with a rest period of 1:10 given to the experimental group II.

References

1. Beachle TR, Earley RW. Fitness Testing. Essentials of Strength Training and Condition. From 2020. http//:www.topandsports.com. (diakses tanggal 01 Mei 2021).
2. Dahoney P, Chromiak JA, Lemire D, Abadie BR, Kovacs C. Prediction of One Repetition Maximum (1-RM) Strength From A 4-6 RM and A 7-10 RM Submaximal Strength Test in Healthy Young Adult Males. Journal of Exercise Psychology 2012;5(3):54-59.
3. Firdiansyah B. Latihan high interval intensity dan moderate continuous intensity terhadap kadar leptin pada tikus DM dengan injeksi STZ (Doctoral dissertation, Universitas Negeri Malang) 2017.
4. Hary V, Firdiansyah B. Training Model for Attacking in Football of 16 Years Old. JUARA: Jurnal Olahraga 2020;5(1):8-18.
5. Hernawan H. Model Kegiatan Outdoor Games Activities Untuk Mahasiswa Program Studi Olahraga Rekreasi Fakultas Ilmu Keolahragaan Universitas Negeri Jakarta. In Prosiding Seminar dan Lokakarya Fakultas Ilmu Keolahragaan Universitas Negeri Jakarta 2016;1(1):28-35.
6. Poerwanto S, Firdiansyah B. effectiveness of game model on tsunami disaster anticipation in two provinces of indonesia, year 2019. Science of Tsunami Hazards, 2019, 38(4).
7. Hargreaves M. Muscle Metabolites and Performance During High Intensity, Intermittent Exercise. Journal Appl Physiol 2014;84(5):1687-16 91.
8. Kluwer W, Williams L, dan Wilkins. Health-Related Physical Fitness Assessment Manual. Second Edition. American College Of Sports Medicine. ACSM Group Publisher 2018.
9. Subagio R, Rihatno T, Hernawan I, Firdiansyah B. Volleyball Smash Skill Training Model Using Rubber Tire Aids For Students Of Smk. International Journal of Engineering Technologies and Management Research 2019;6(10):1-10.
10. Hernawan H, Widyaningsih H. Model Outdoor Games Activities Untuk Pemuda Karang Taruna Tenaga Penggerak Olahraga Rekreasi. Fakultas Ilmu Olahraga. Universitas Negeri Jakarta. 2018. In Prosiding Seminar dan Lokakarya Fakultas Ilmu Keolahragaan Universitas Negeri Jakarta 2018;3(01):28-33.