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Effects of High Intensity Interval Training on Increasing Explosive Power, Speed, and Agility

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Abstract. High Intensity Interval Training (HIIT) is a type of exercise that combines high-intensity exercise and low intensity exercise in a certain time interval. This type of training is very effective and efficient to improve the physical components. The process of improving athletes achievement related to how the process of improving the physical components, so the selection of a good practice method will be very helpful. This study aims to analyze how is the effects of HIIT on increasing explosive power, speed, and agility. This type of research is quantitative with quasi-experimental methods. The design of this study used the Matching-Only Design, with data analysis using the t-test (paired sample t-test). After being given the treatment for six weeks, the results showed there are significant increasing in explosive power, speed, and agility. HIIT in this study used a form of exercise plyometric as high-intensity exercise and jogging as mild or moderate intensity exercise. Increase was due to the improvement of neuromuscular characteristics that affect the increase in muscle strength and performance. From the data analysis, researchers concluded that, Exercises of High Intensity Interval Training significantly effect on the increase in Power Limbs, speed, and agility.

1. Introduction

Achievements of an athlete is always related to how he/she practices, what is practiced and what its purpose. Selection methods and the right kind of exercise will support the success of the exercise itself. High Intensity Interval Training (HIIT) is one of the methods and the right kind of exercise because it is very effective and efficient way to improve the desired physical components. HIIT workouts can improve cardiac performance and impact on the body's metabolism is also increased sharply. Metabolism herein relates to the body's ability to convert fat into energy. In addition to increased metabolism during practice, at rest also increased the metabolism so that the body remains at rest in a state of energy production [1]. For example, HIIT workout is to combine sprint exercise with jogging. For example, 60 seconds of jogging and then after 60 seconds continue with sprint for 30 seconds and so on.

Some researches have proved the effectiveness of HIIT workouts, which include research conducted by Racil et al. [2] revealed that the addition of exercises plyometric in a HIIT program would be beneficial for weight loss in obese female adolescents. Sperlich et al. [3] revealed that HIIT workout increases VO₂ Max significantly and improve the performance of football players in the games, and research by Pushparajan [4] which is designed to determine the effects of HIIT workout on the lower extremities and the strength of the extremities on the basketball players with the age group 18 to 23 year, revealed that HIIT workouts group gave a significant improvement compared to the control group.



Based on the above brief background, this study aims to analyze how much HIIT influence on the desired physical component, in this case, the Explosive Power, Speed, and Agility. This study used quantitative approach. The method used is a quasi-experimental method to the study design Matching-Only Design. Sample were 30 basketball players aged 18-23 years. Results obtained after doing research for 6 weeks with 3 sessions of exercise a week, showed that the experimental group given a HIIT workout experienced a significant increase. In the dependent variable Explosive Power increased by 15.9%, Speed by 5.9%, and Agility 6.3%. In the control group also experienced increased, but not so great. Explosive Power increased by 3.8%, Speed by 1.3%, and Agility 1.5%. Thus the conclusions of this study are: Exercise of high intensity interval training (HIIT) significantly effects on the increasing Explosive Power, Speed, and Agility.

2. Methods

This study is of quantitative approach with a quasi-experimental method. This study uses - Matching-Only Design, with data analysis using the t-test (paired sample t-test). The process of data collection is done by explosive power tests using Sargent Jump, Speed tests using the Speed Test 30 Meters, and Agility tests using the Illinois Agility Run Test in pre-test and post-test. Furthermore, the data is analyzed using SPSS 20.0 series.

3. Results

The results obtained after the collection and analysis of data showed: (1) There is a significant effect of HIIT to increase Explosive Power, proven results mean explosive power pretest of 97.97 kg-m/sec and the mean posttest of 113.50 kg-m/sec with increase percentage of 15.9% and yield sig <0.05. (2) There is a significant effect of HIIT to increase Speed, proven results mean the posttest of 4.32 seconds is smaller than the mean of the pretest of 4.58 seconds with percentage increase of 5.9% and the sig < 0.05. (3) There is a significant effect HIIT to increase agility, proven results mean the posttest of 15.96 seconds is smaller than the mean of the pretest of 16.97seconds with percentage increase of 6.3% and the sig < 0.05. The following tables display data and results of the t-test (paired sample t-test)

Table 1. Data of Pretest and Posttest Experiment Grop

No	Initials	Explosive Power (kg-m/Sc)		Speed (Second)		Agility (Second)	
		Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
1	MI	86.80	109.97	4.35	4.15	16.00	15.12
2	MR	98.75	118.27	4.21	3.70	16.24	15.23
3	RR	90.34	115.12	4.42	4.22	16.21	15.89
4	RRP	85.44	108.88	4.34	4.14	17.31	16.33
5	AS	75.75	107.06	4.91	4.71	16.62	16.23
6	MYS	98.39	113.34	4.57	4.37	16.78	16.32
7	MJ	87.65	108.76	4.51	4.31	17.51	16.45
8	OK	117.82	119.83	4.42	3.68	16.35	15.34
9	INA	91.54	115.74	4.54	4.34	17.52	16.45
10	AA	87.70	108.56	4.91	4.71	17.34	16.32
11	MRK	90.14	110.14	4.70	4.50	17.77	16.23
12	A	111.08	115.77	4.45	4.25	17.55	16.21
13	AM	114.45	115.43	4.75	4.55	16.89	15.12
14	MRM	114.85	115.77	4.79	4.59	17.24	16.11
15	RNF	118.83	119.83	4.81	4.61	17.28	16.11
Mean		97.97	113.50	4.58	4.32	16.97	15.96
% Enhancement		15.9 %		5.9 %		6.3 %	

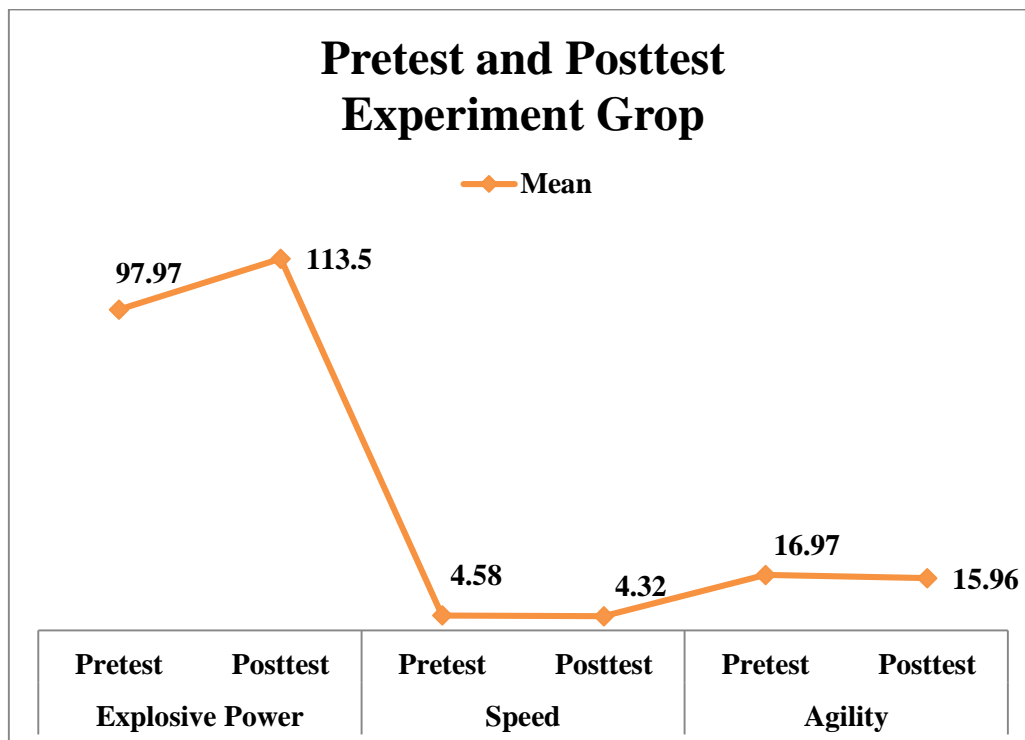


Figure 1. Chat of Pretest and Posttest Experiment Grop

Table 2. Data of Pretest and Posttest Control Grop

No	Inisial	Power Tungkal (kg-m/sec)		Speed (second)		Agility (second)	
		Awal	Akhir	Awal	Akhir	Awal	Akhir
1	M	105.25	108.25	4.24	4.21	15.63	15.43
2	S	94.15	100.23	4.22	4.22	16.34	16.14
3	RA	94.27	98.78	4.56	4.48	16.25	16.05
4	BP	110.15	110.94	4.19	4.16	16.35	16.15
5	IK	110.81	109.81	4.49	4.47	15.91	15.71
6	MRF	100.01	102.01	4.43	4.38	16.89	16.69
7	MRS	90.96	99.23	4.67	4.61	16.96	16.76
8	SA	110.34	110.89	4.45	4.39	16.57	16.37
9	RRS	105.74	108.74	4.76	4.68	16.30	16.10
10	DY	87.51	99.31	4.87	4.70	17.39	17.19
11	AB	83.33	97.97	4.98	4.95	17.59	17.39
12	FA	95.62	99.11	4.78	4.75	17.51	17.31
13	YRD	108.17	108.17	4.69	4.61	17.59	17.39
14	F	103.78	103.89	4.93	4.85	17.32	17.12
15	ISK	109.95	109.99	4.94	4.86	17.54	17.34
Mean		100.67	104.49	4.61	4.55	16.81	16.56
% Enhancement		3.8%		1.3%		1.2%	

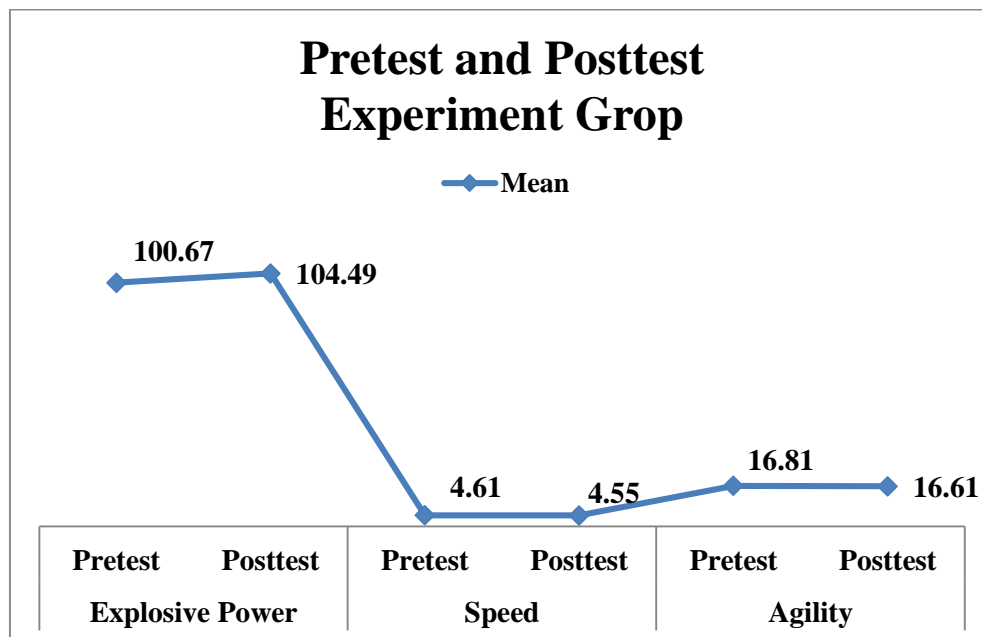


Figure 2. Chat of Pretest and Posttest Control Grop

Table 3. Paired Samples Test of Experiment Grop

Variable	Pair	Mean	N	t	Df	Sig.(2-tailed)
Explosive Power	posttest - pretest	1.55293	15	5692	14	0,000
Speed	posttest - pretest	-.25667	15	-6.383	14	0.000
Agility	posttest - pretest	-1.01000	15	-9.880	14	0,000

Table 4. Paired Samples Test of Control Grop

Variable	Pair	Mean	N	t	df	Sig. (2-tailed)
Explosive Power	posttest - pretest	3.81867	15	3.213	14	0,006
Speed	posttest - pretest	-.05867	15	-5 609	14	0,000
Agility	posttest - pretest	-.24467	15	-5 478	14	0.000

4. Discussion

This is done on Linux basketball club Dompou, 30 people were divided into two groups and each group consists of 15 people. HIIT workout program used in this study consists of six high-intensity forms of exercise are: Squat Jump, Lateral Jump Over Barrier, Crossover Shuffle, Icky Shuffle, Z-Pattern Run, and Z-Pattern Cut. While mild exercise being used is jogging. Jogging is done at the time of recovery between high-intensity forms of exercise or as an active recovery. Brow (2005) and Chu (2013), in his book explains that the nature of explosive exercises can improve power, speed, and agility[5], [6]. Kusnanik and Ben [7] in his research also revealed some of the ways or methods of exercise that can be used to improve the speed and agility of athletes is with Ladder Speed Run and Repeated Sprint.

The use of other forms of plyometric exercises in a HIIT workout program is very convenient and effective to improve the power, speed, and agility. In addition to adding jogging as an active recovery, working time arrangements and resting time with high intensity (80% -95%) become key to the success of this exercise program. Evidently after the process of data collection and processing, data processing results showed no significant increase in the dependent variable is 3, explosive power, speed, and agility.

The results are consistent with previous studies such as Naimo et al. [8], which called High-Intensity Interval Training Has Positive Effects on Performance In Ice Hockey Players reveal the same thing that the High-intensity Interval Training (HIIT) is able to provide a significant improvement to the output power in athletes. Astorino et al. [9] revealed that HIIT workout can improve endurance and increase the speed of the athlete. Icano et al. [10] revealed that HIIT workout able to increase significantly the ability of speed, agility, power, and performance team sport.

5. Conclusion

Influential biomotor an exercise to the components you want to upgrade cannot be separated from the implementation plan and exercise program is good, true, and using a scientific approach. This study proves that with the preparation of a good exercise program and use the scientific approach is able to provide a significant effect on improving the physical components that are expected. Coupled with the seriousness in the implementation and administration of the exercise menu will be maintaining the success of the exercise program. High Intensity Interval Training (HIIT) workout is prepared using a scientific approach and implemented very seriously. High Intensity Interval Training (HIIT) effects on the increasing Explosive Power, Speed, and Agility.

References

- [1] Miramonti Amelia A et al 2015 The effects of four weeks of high intensity interval training and [beta]-hydroxy-[beta]-methylbutyric free acid supplementation on the onset of neuromuscular fatigue *J. of Strength & Conditioning Research*
- [2] Racil G, Zouhal H, Elmontassar W, Abderraouf Ben Abderrahmane A B 2015 Plyometric exercise combined with high-intensity interval training improves metabolic abnormalities in young obese females more so than interval training alone. *Applied Physiology, Nutrition, and Metabolism* (pnm-2015-0384.R2)
- [3] Sperlich B, Mare M D, Koehler K, Holmberg H C 2011 Effects of 5 weeks of high-intensity interval Training vs volume training in 14-year-old Soccer players *Journal of Strength and Conditioning Research* **25**(5) 1271–1278.
- [4] Pusparajan, 2012 Effect Of High Intensity Interval Training (HIIT) On Strength Of Female Basketball Players *International Journal of Innovative Research & Deflopment* (ISSN: 2278 – 0211)
- [5] Brown L E and Ferrigno V A 2005 *Training for Speed, Agility, and Quickness* (Unites States: Human Kinetics)
- [6] Chu Donald A, Myer Gregory D 2013 *Plyometrics* (United States: Human Kinetics)
- [7] Kusnanik N and Rattray Ben 2017 Effect Of Ladder Speed Run And Repeated Sprint Ability In Improving Agility And Speed Of Junior Soccer Players *Acta Kinesiologica* **11** (1) 19-22.
- [8] Naimo M A, Souza E O 2014 High-intensity Interval Training Has Positive Effects on Performance In Ice Hockey Players *Int J Sports Med* (Doi: 10.1055/s-0034-1382054)
- [9] Astorino T A, Alen R P, Roberson D W, Jurancich M 2012 Effect Of High-Intensity Interval Training On Cardiovascular Function, Vo2 Max And Muscular Force *Journal of Strength and Conditioning Research* **26**(1) 138–145
- [10] Iacono A D, Eliakim A, Meckel Y 2015 Improving Fitness of Elite Handball Players: Small-Sided Games Vs. High Intensity Interval Training *Journal of Strength and Conditioning Research* **29**(3) 835–843.