

Effects of S-Curve Runs and Sprint In-Out Exercise Methods Against The Increase of Speed, in 100 Meters Sprint Observed from Foot Length and Height Ratios

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ABSTRACT

The purpose of this study was to find the effect of differences between S-Curve Runs and Sprint In-Out exercise methods against the increase of speed in 100 meters sprint; the different increases of speed in 100 meters sprints for the runners with big, medium, and small ratios of foot length and height; and the differences of interactions between S-Curve Runs and Sprint In-Out exercise methods and foot length and height ratios against the increase of speed in 100 meters sprint. This research was conducted at Chevron Football School in Pekanbaru for 8 weeks by using the experimental method of 2 x 3 factorial designs. The research population contained students of the school. Purposive Random Sampling was utilized as the sampling method included 42 students with big, medium, and small ratios of foot length and height, for each took 14 students as the samples. ANOVA was employed as the data analysis technique. Prerequisite tests of data analysis were conducted beforehand by using the sample normality test (Lilliefors Test at $\alpha = 0.05$) and homogeneity of variance test (Bartlett's Test at $\alpha = 0.05$). Results of data analysis indicated that there were significant differences between S-Curve Runs and Sprint In-Out exercise methods against the increase of speed in 100 meters sprint with $F_{count} = 10.54758 > F_{table} = 4.07$ in which the effects of S-Curve Runs exercise have better improvement than Sprint In-Out exercise, with the average increases for each are 2.17 and the 1.7; there were significant differences between the runners with big, medium, and small ratios of foot length and height with $F_{count} = 14.16068 > F_{table} = 3.22$. The increase of 100 meters sprint result on samples with big ratios of foot length and height was better than samples with medium and small ratios, for each having average increase of 2.43, 1.89 and 1.51; and there was no correlation effect between the S-Curve Run and Sprint In-Out training methods and the foot length and height ratios against the increase of running speed, in which the $F_{count} = 0.29174 < F_{table} = 3.22$.

Keywords: S-Curve Run; Sprint In-Out; Antropometri; Sprint.

INTRODUCTION

Football is one of the popular sports for children, teenagers, and adults from all social classes and genders (Supriyanto et al., 2016; Mubarak & Ramadhan, 2019). Football is a

sport that needs speed (Wibowo et al., 2016; Sudirman et al., 2022). Meanwhile, Michael Boyle (2004) says that football, gymnastic, and other sports, in general, require speed (Hadi et al., 2016). Therefore, a football player should master the techniques and the physical condition of the game (S. & Yulifri, 2019; Fatikhatusun, 2020). States that the purpose of training is to help the athlete in increasing maximum skill and performance (Akhmad & Suriatno, 2018; Erfayliana & Wati, 2020). To achieve it, four noteworthy training aspects should be done by the athletes, which are physical, technical, tactical, and mental training (Junaidi et al., 2018) Samosir & Aditya, 2022).

Mentions that running speed ability is confined by certain factors, including Anthropometry (Cahyono et al., 2017) Sahabuddin et al., 2020). The physical human features like the comparison of leg length, height and arm length have significance in increasing the speed yet it cannot be trained (Juliyanto, 2016; Pratama & Nurrochmah, 2022). This is because the anthropometry for every person develops naturally and hereditarily (Pradana & Bulqini, 2018; Pradana & Bulqini, 2018; Putra, 2021).

The comparison of foot length and height is the size ratio that biomechanically (Rahadian, 2018) may be an attributive variable for the increase in running speed in football (Alfi et al., 2019). In running, those parts are directly related to producing movements (Giyatno, 2017; Kardiyono, 2017; Hidayat, 2019). A long foot and a tall body enable one to produce long and wide pushes (Evitamala et al., 2019), thus this matter will affect the running speed (Kusuma, 2019).

I want to examine this case by taking samples from the students of Chevron Football School in Pekanbaru. To broaden the observation, I entitle this research “Effects of S-Curve Runs and Sprint In-Out Exercise Methods against the Increase of Speed in 100 Meters Sprint observed from Foot Length and Height Ratios (An Experimental Study towards the students of Chevron Football School in Pekanbaru)”.

Speed is movement ability with the chance of the fastest speed (Sudirman, 2022). Observed from the movement systems, speed is the basic ability of the central nervous system (Hadi et al., 2016; Sahabuddin et al., 2022) and muscle parts' mobility in producing movements at a certain speed (Erfan, 2020). Defines speed from the mechanical viewpoint which is the ratio of distance and time (Udam, 2017). Mentions the changes caused by speed training, which are the change in muscle fibre (Allsabab & Harmono, 2022), anaerobic and aerobic power, and neuromuscular awareness of nerve and muscle (Wibowo et al., 2016). Furthermore, Nining W. Kusnanik, et al.

(2011) say that muscles also adapt to anaerobic training. In high-intensity activities, sprints and resistance, there are more recruited type II muscles though the type I one is also used. Consequently, the sections of muscle fibres for type IIa or type IIx increase (especially type IIa) while type I increases a bit. By doing sprint training, there are decreasing percentage of muscle fibre type I and an increasing percentage of muscle fibres type II. In some research in which the subject does sprint research for 15 and 30 seconds all out, the muscles type I has decreased from 57% to 48% and type IIa increases from 32% to 38%. Football is a sport that needs speed (Mulya & Millah, 2019; Aziz & Adityatama, 2020). To increase running speed, there are two training methods which are S-Curve Runs and Sprint In-Out.

Body height determines success in some sports, including the running speed for sprints. A taller athlete will get more advantage in which the footstep will be wider. The athletes who have ideal physical features may have mechanical advantages. Richard S. Snell (2006) says that the foot has two main functions, which are to support the weight and to leverage the body when walking or running.

METHOD

This research was conducted for two weeks in which the training frequency is three times a week. Based on Brooks dan Fahey (1984), this frequency will increase the training quality since the body has a chance to adapt to the training load.

Following the research purpose, this study employs an experimental method to examine the training effect. Sugiono (2008) states that the experimental research method can be used to find certain treatment effects towards others in controlled conditions. According to Sudjana (2002), the factorial experiment is an experiment related to factors with many levels. This study uses an experimental design of two factors and three levels. Sudjana (2002) notes that ANOVA (Analysis of Variance) can be employed as the data analysis technique with 2 x 3 factorial designs on $\alpha = 0,05$. Furthermore, Sudjana (2005) says that to answer the assumption, the Lilliefors Test and Homogeneity of Variance test (Bartlett's Test) were used. The normality test was conducted to see whether the used data comes from normal distributed samples or not while the Homogeneity of Variance test was conducted to see whether it comes from the population of homogeny variance or not. Then, a hypothesis test with two-way ANOVA was also employed.

Table 1.
ANOVA with 2 x 3 Factorial Experiment

Variance Source	DK	JK	RJK	Fo
Average Treatment	1	R_y	R	
A	a-1	A_y	A	A/E
B	b-1	B_y	B	B/E
AB	(a-1) (b-1)	AB_y	AB	AB/E
Error	ab(n-1)	E_y	E	

RESULTS AND DISCUSSION

There are six groups made from speed training methods (S-Curve Runs, Sprint In-Out) and the ratio of foot length and height. Three groups used the *S-Curve Runs* method which is the ratios of big, medium, and small ratios of foot length and height. Every cell (treatment group) has a different increasing speed of sprint. The value of the increase of each cell is shown in the table below.

Table 2.
 The Value of the Increasing Speed of Sprint of Each Cell

Ratios of Foot Length and Height (B)	Training Method (A)	
	S-Curve Runs (a1)	Sprint In-Out (a2)
Big Ratio (b ₁)	a1b1 (2.56)	a2b1 (2.29)
Medium Ratio (b ₂)	a1b2 (2.27)	a2b2 (1.50)
Small Ratio (b ₃)	a1b3 (1.69)	a2b3 (1.32)

To make the average value of the increasing sprint speed of every treatment group comprehensible, the increasing value is displayed on the histogram below.

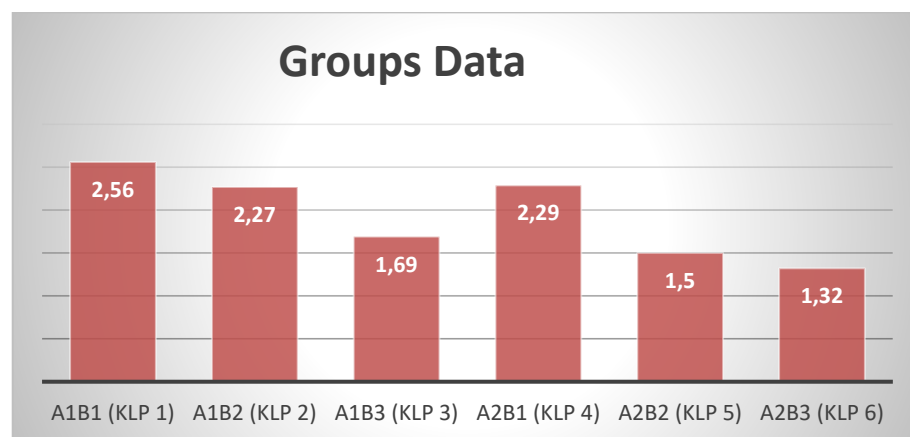


Figure 1.

Histogram of the Average Value of the Sprint Increasing Speed for Each

There are hypothesis tests conducted based on the data analysis result, which is:

Hipotesis I Test

The resulting study shows that *S-Curve Run* has a different increase with *S- Sprint In-Out* training methods. It is proven from $F_{\text{calc}} = 10.54758 > F_{\text{table}} = 4.07$ thus the null hypothesis (H_0) is rejected. Here, there is a significant effect difference on the sprint increase that can be accepted as true. The continuing analysis shows that *S-Curve Run* has a better increase than *S-Curve Run*, with the average increase for each being 2.17 seconds and 1.7 seconds.

Hipotesis II Test

The result shows that the sample with big, medium, and small ratios of foot length and height has different increases in sprint speed. It is examined from the value of $F_{\text{calc}} = 14.16068 > F_{\text{table}} = 3.22$ thus the null hypothesis (H_0) is rejected. There is a significant difference between the students with big, medium, and small ratios of foot length and height towards the increase of sprint speed result and it can be accepted as true.

Hipotesis III Test

The resulting study shows that the interaction between S-Curve Runs and Sprint In-Out exercise methods with the ratios of foot length and height is less significant. It is proven from the calculation result of the two-factor analysis of variance which is $F_{\text{calc}} = 0.29174 < F_{\text{table}} 3.22$ thus the null hypothesis (H_0) is accepted. In this context, there is no significant interaction between the S-Curve Runs and Sprint In-Out exercise methods with the ratios of foot length and height.

Table 3.
Summary of Variance Analysis Result

Variance Source	DK	JK	RJK	Fo	Ft
Average Treatment	1	157. 95	157. 95		
A	1	2.35	2.35		
B	1	6.31	3.155	10.54758*	4.07
AB	2	0.13	0.065	14.16068*	3.22
Error	36	8.02	0.2228	0.29174	3.22
Totals	42				

The resulting study shows that the samples of big ratios of foot length and height give a bigger impact towards the increasing sprint speed compared with the samples of medium and small ratios of foot length and height. The samples of the *S-Curve Runs* training method

also have a bigger impact in the increasing of sprint speed compared with the Sprint In-Out.

CONCLUSION

1. There is a significant difference effect between the S-Curve Runs and Sprint In-Out training methods in the increasing of sprint speed. The impact of the S-Curve Runs exercise method is better than Sprint In-Out one in the increasing sprint.
2. There is a significant increase in the sprint speed of the students with big, medium, and small ratios of foot length and height. The big ratio is better in the increasing sprint speed compared with medium and small ratios of foot length and height.
3. There is no significant interaction between S-Curve Runs and Sprint In-Out exercise methods and the ratios of foot length and height with the increase of sprint speed.

REFERENCES

- Akhmad, N., & Suriatno, A. (2018). Analisis Keterampilan Dasar Sepakbola Pemain Klub Bima Sakti. *JUPE, Jurnal Pendidikan Mandala*, 3(3), 10–27. <http://ejournal.mandalanursa.org/index.php/JUPE/article/view/517>
- Alfi, M. R., Kurniawan, A. W., & Amiq, F. (2019). Pengaruh Latihan Skipping dan Zig-Zag Run terhadap Peningkatan Kelincahan dalam Permainan Sepakbola. *Sports Science and Health*, 1(2), 116–125. <http://journal2.um.ac.id/index.php/jfik/index> <http://fik.um.ac.id/%0APengaruh>
- Allsabab, M. A. H., & Harmono, S. (2022). Survey of Gross Motor Skills on Students of State Elementary School 2 Mojoroto , Kediri City. *COMPETITOR : Jurnal Pendidikan Keperawatan Olahraga*, 14(2), 273–282. <https://doi.org/10.26858/cjeko.v14i2.35508>
- Aziz, O. A., & Adityatama, F. (2020). Penerapan Model Taktis dalam Permainan Sepak Bola Guna Meningkatkan Keterampilan Bermain. *Journal of Physical Education and Sport Science*, 2(3), 24–28. <http://jurnal.upmk.ac.id/index.php/jpress/article/view/1308>
- Cahyono, I. T., Sugiarto, T., & Amiq, F. (2017). Pengaruh Latihan Ladder Drill Terhadap Peningkatan Kecepatan Lari Peserta Ekstrakurikuler Sepakbola SMA. *Gelanggang Pendidikan Jasmani Indonesia, Jurusan Pendidikan Jasmani Dan Kesehatan, Fakultas Ilmu Keolahragaan, Universitas Negeri Malang*, 1(2), 282–290. <https://doi.org/http://dx.doi.org/10.17977/um040v1i2p282-290>
- Erfan, M. (2020). Pengaruh Latihan Plyometric (Pullover Toss) Terhadap Hasil (Throw In) Dalam Permainan Sepak Bola. *Jurnal Porkes*, 3(2), 110–118. <https://doi.org/10.29408/porkes.v3i2.2968>
- Erfayliana, Y., & Wati, O. K. (2020). Tingkat Keterampilan Dasar Bermain Sepakbola Peserta Didik Kelas Atas Sekolah Dasar. *TERAMPIL: Jurnal Pendidikan Dan*

- Pembelajaran Dasar*, 7(2), 159–166.
<http://ejournal.radenintan.ac.id/index.php/terampil/article/view/8119>
- Evitamala, L., Adiputra, I. N., Sundari, L. P. R., Adiputra, L. M. I. S. H., Griadhi, I. P. A., & Purnawati, S. (2019). Efek Pelatihan Lari Akselerasi dan Pelatihan Lari Interval di Pantai Berpasir Dalam Meningkatkan Kemampuan Anaerobik, Power Otot Tungkai dan Kecepatan Lari 100 Meter pada Siswa Kelas X SMA Negeri 1 Suela Lombok Timur Tahun Pelajaran 2018/2019. *Sport and Fitness Journal*, 7(3), 38–44.
<https://ojs.unud.ac.id/index.php/sport/article/download/52663/31188>
- Fatikhatun. (2020). Pengembangan Keterampilan Gerak Dasar Permainan Sepakbola Melalui Penggunaan Bola Plastik. *Dinamika: Jurnal Praktik Penelitian Tindakan*, 10(3), 131–139. <https://doi.org/https://doi.org/10.47403/dp.v10i3.33>
- Giyatno. (2017). Penerapan Latihan Akselerasi Untuk Meningkatkan Kecepatan Lari 100 Meter Pada Siswa Kelas IV di SD Negeri IV Giriwoyo. *Jurnal Sportif*, 3(1), 29–43.
https://doi.org/https://doi.org/10.29407/js_unpgri.v3i1.615
- Hadi, F. soffan, Eko, H., & Amiq, F. (2016). Pengaruh Latihan Ladder Drills Terhadap Peningkatan Kelincahan Siswa U-17 Di Persatuan Sepakbola Jajag Kabupaten Banyuwangi. *Jurnal Pendidikan Jasmani*, 26(1), 213–228.
<http://journal.um.ac.id/index.php/pendidikan-jasmani/article/view/7748>
- Hidayat, A. T. M. (2019). Peningkatan Kemampuan Lari Cepat Siswa Melalui Pendekatan Latihan Akeselrasi dan Hollow Sprint Kelas XI IPA SMA Negeri 1 Cipatat. *Simpul Juara*, 1(1), 1–8.
<https://doi.org/https://doi.org/10.35880/simpuljuara.v1i1.4>
- Juliyanto, O. D. (2016). Pengaruh Latihan Ladder Drill Icky Shuffle Terhadap Peningkatan Kecepatan. *Jurnal Kesehatan*, 7(3), 45–52.
<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwinwebxuv7pAhUWXisKHbWBvkQFjAAegQIARAB&url=https%3A%2F%2Fjurnalmahasiswa.unesa.ac.id%2Findex.php%2Fjurnal-kesehatan-olahraga%2Farticle%2Fdownload%2F17838%2F16252&usg=>
- Junaidi, A., Sugihartono, T., & Sutisyana, A. (2018). Pengaruh Latihan Variasi Shooting Ke Arah Gawang Terhadap Akurasi Shooting Dalam Permainan Sepakbola Pada Pemain U-14 Tunas Muda bengkulu. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, 2(2), 1–6. <https://ejournal.unib.ac.id/index.php/kinestetik/article/view/6490>
- Kardiyono. (2017). Pengaruh Latihan Uphill Terhadap Hasil Akselerasi 30 Meter Club Atletik Gelagah Wangi Demak. *Sosio Dialektika (Jurnal Sosial - Humaniora)*, 2(1), 57–64.
https://scholar.google.co.id/scholar?hl=id&as_sdt=0%2C5&q=Pengaruh+Latihan+Uphill+Terhadap+Hasil+Akselerasi+30+Meter+Club+Atletik+Gelagah+Wangi+Demak&btnG=
- Kusuma, H. N. (2019). Pengaruh Latihan Uphill Terhadap Prestasi Lari Sprint 60 Meter Siswa Putra SMPN 2 Kembaran Kabupaten Banyumas. *SKRIPSI*, 1–68.
https://eprints.uny.ac.id/67177/1/Skripsi_Hangga Nafiansyahputra K_136022044025.pdf
- Mubarok, M. Z., & Ramadhan, R. (2019). Analisis Tingkat VO2 Max Pemain Sepak Bola Darul Ma'arif Indramayu. *Journal PASSER, Jurnal Kependidikan Jasmani Dan Olahraga*, 3(1), 39–45.

- https://ejournal.stkipnu.ac.id/public_html/ejournal/index.php/jkjo/article/view/55
- Mulya, G., & Millah, H. (2019). Pengaruh Latihan Ladder Drill Terhadap Peningkatan Kelincahan Pemain Sepakbola. *Jurnal Segar*, 8(1), 1–10. <https://doi.org/doi.org/10.21009/segar/0801.01>
- Pradana, P. D. Y., & Bulqini, A. (2018). Analisis Antropometri Dan Kondisi Fisik Siswa SSB Rheza Mahasiswa KU-16. *Jurnal Prestasi Olahraga*, 1(1), 1–9. <https://jurnalmahasiswa.unesa.ac.id/index.php/jurnal-prestasi-olahraga/article/view/24441>
- Pratama, D. N., & Nurrochmah, S. (2022). Survei Keterampilan Gerak Dasar Lokomotor, Nonlokomotor dan Manipulatif pada Siswa Kelas VII Sekolah Menengah Pertama. *Sports Science and Health*, 2(9), 430–439. <https://doi.org/10.17977/um062v2i92020p430-439>
- Putra, D. S. (2021). Exercise barrier hops on the sand to improve the ability to shoot long ball soccer players. *Prosiding Seminar Nasional Pendidikan Jasmanin Dan Kesehatan*, 1(1), 41–50. <http://ejournal.fkip.unsri.ac.id/index.php/semnaspenjas/article/view/185>
- Rahadian, A. (2018). Aplikasi Analisis Biomekanika Untuk Mengembangkan Kemampuan Lari Jarak Pendek (100 M) Mahasiswa PJKR UNSUR (Kinovea Software). *Jurnal Maenpo*, 8(1), 1–14. <https://doi.org/https://doi.org/10.35194/jm.v8i1.912>
- S., M. E. D. F., & Yulifri. (2019). Tinjauan Kondisi Fisik Pemain Sepakbola SMP Negeri 27 Padang. *JPO: Jurnal Pendidikan Dan Olahraga*, 2(6), 389–394. <http://jpdo.pppj.unp.ac.id/index.php/jpdo/article/view/566>
- Sahabuddin, Bismar, A. R., & Ad'dien. (2020). Pengaruh Latihan Akselerasi Terhadap Kemampuan Lari 50 Meter. *Jurnal SPEED, Program Studi Pendidikan Jasmani, FKIP, Universitas Singaperbangsa Karawang*, 3(1), 51–57. <https://doi.org/http://dx.doi.org/10.35706/jurnal%20speed.v3i1.3574>
- Sahabuddin, Hakim, H., & Muslim. (2022). Contribution Of Hand Reaction Speed And Feet Movement Speed With Table Tennis Playing Skills. *JCES, Journal Coaching Education Sports*, 3(1), 1–12. <https://doi.org/https://doi.org/10.31599/jces.v3i1.775>
- Samosir, F., & Aditya, R. (2022). Model Pendekatan Bermain Dalam Upaya Meningkatkan Kebugaran Jasmani. *JUMPER (Jurnal Mahasiswa Pendidikan Olahraga)*, 2(2), 71–81. <http://jurnal.stokbinaguna.ac.id/index.php/JUMPER/article/view/559>
- Sudirman. (2022). Paired and Unpaired Passing Practice Against the Ability to Pass the Ball in Football Games. *COMPETITOR : Jurnal Pendidikan Kepelatihan Olahraga*, 14(1), 149–158. <https://doi.org/doi.org/10.26858/cjpko.v14i1.32526>
- Sudirman, Syahrudin, & Sahabuddin. (2022). Tingkat Keterampilan Gerak Dasar Sepakbola Pada Siswa SMA Negeri 2 Majene. *JOKER, Jurnal Olahraga Kebugaran Dan Rehabilitasi*, 2(1), 43–52. <https://doi.org/https://doi.org/10.35706/joker.v2i1.6479>
- Sudjana. (2002). Desain dan Analisis Eksperimen. Edisi IV. Bandung: Penerbit Tarsito.
- Sugiono. (2008). Metode Penelitian Pendidikan Pendekatan Kuantitatif Kualitatif. Bandung

- Sugiyono. (2015). *Metode Penelitian & Pengembangan Research and Development*. Bandung: Alfabeta.
- Supriyanto, E., Koestoro, B., & Djasmi, S. (2016). Pengaruh Pendekatan Teknis dan Taktis Terhadap Keterampilan Teknik Dasar Permainan Sepakbola Pada Siswa SMPN 1 Kotabumi. *Jurnal Teknologi Informasi Komunikasi Pendidikan*, 4(2), 1–10. <http://jurnal.fkip.unila.ac.id/index.php/JT/article/view/11675>
- Udam, M. (2017). Pengaruh Latihan Shuttle Run dan Zig-Zag Run Terhadap Kemampuan Dribbling Bola Pada Siswa Sekolah Sepakbola (SSB) Imanuel Usia 13-15 Di Kabupaten Jayapura. *Jurnal Pendidikan Jasmani Olahraga Dan Kesehatan*, 3(1), 58–71. https://scholar.google.com/scholar?hl=id&as_sdt=0%2C5&q=Pengaruh+Latihan+Shuttle+Run+dan+Zig-Zag+Run+Terhadap+Kemampuan+Dribbling+Bola+Pada+Siswa+Sekolah+Sepakbola+%28SSB%29+Imanuel+Usia+13-15+Di+Kabupaten+Jayapura&btnG=
- Wibowo, A., Hariyanto, E., & Tomi, A. (2016). Pengaruh Latihan Plyometric Frog Jump dan Single Leg Speed Hop Terhadap Kemampuan Shooting Sepakbola Siswa SMPN 21 Malang. *Jurnal Pendidikan Jasmani*, 26(2), 398–411. <https://doi.org/http://journal.um.ac.id/index.php/pendidikan-jasmani/article/view/7519>