FAKULTET ZA TJELESNI ODGOJ I SPORT
UNIVERZITET U TUZLI

SPORT SCIENTIFIC & PRACTICAL ASPECTS

INTERNATIONAL SCIENTIFIC JOURNAL OF KINESIOLOGY

TUZLA, DECEMBER, 2019. VOL.16, ISSUE 2

Sport Scientific and Practical Aspects

Country	Bosnia and Herzegovina - SIR Ranking of Bosnia and Herzegovina
Subject Area and Category	Health Professions Physical Therapy, Sports Therapy and Rehabilitation
Publisher	Sport Tuzla University
Publication type	Journals
ISSN	18404561, 18404413
Coverage	2014-2015
Scope	Sport Scientific And Practical Aspects is an international journal of sport science and kinesiology. The journal publishes scientific, theoretical and empirical articles and other written material related to following kinesiology fields: Biomechanics, Kinesiology Assessment, Training Theory, Management in Sport, Physical Education, Methodology, Statistics and Research Methods, Sport and Health, Adaptive Physical Activity, Sport. The aim and intention of the journal is to increase theoretical and practical knowledge of above mentioned kinesiology fields, to enable and encourage young researchers to publish their articles and to provide practical information, useful for kinesiology practitioners, coaches, PE teachers, athletic trainers, physical therapists and athletes.

1

H Index

Homepage

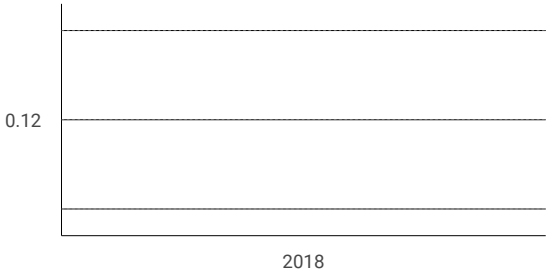
How to publish in this journal

Contact

Join the conversation about this journal

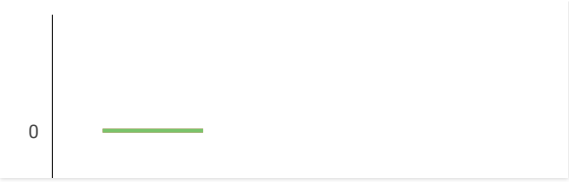
Quartiles

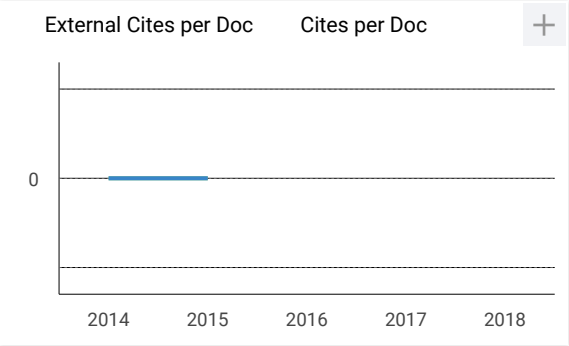
SJR

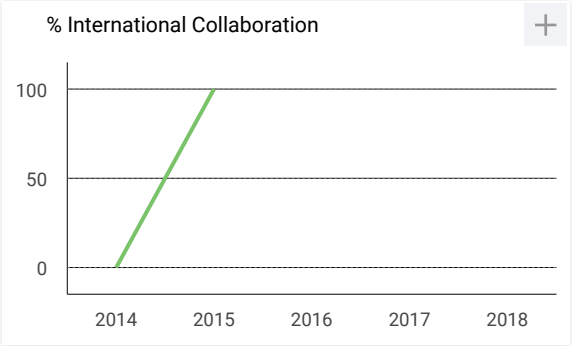


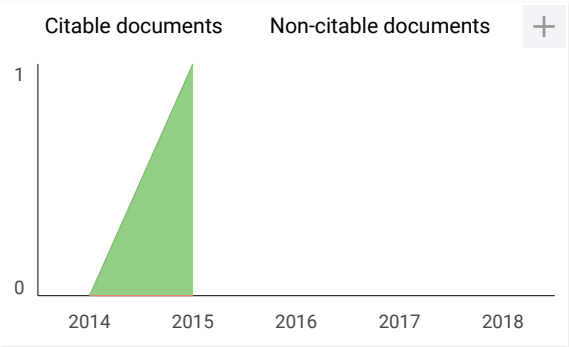
Citations per document

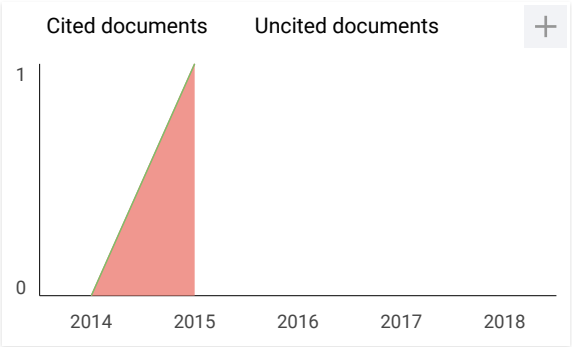
Total Cites Self-Cites











← Show this widget in your own website

Just copy the code below and paste within your html code:

<a href="https://www.scimag

Z **zahra aminiroshan** 5 months ago

Dear Melanie
thanks for your response
but i don't know how can I communication with Scopus database
Can you guidence me?

thank you so much

Sport Scientific And Practical Aspects

International Scientific Journal of Kinesiology

NEW Issue

Tuzla, December 2019. Vol. 16, Issue 2

UDK: 796

print ISSN 1840-4413,

online ISSN 1840-4561

Catalogue: COBISS BH

IF 2014: 0.621

IF 2015: 0.743

Indexing

- Universal Impact Factor
- Global Impact Factor
- InfoBase Index
- WorldCat
- CAB Abstracts
- Physical Education Index
- Genamics Journal Seek
- Open J-Gate
- EBSCO Publishing Inc.
- DOAJ
- Directory of Research Journals Indexing
- Electronic Journals Index
- Academic Journals Database
- Index Copernicus
- getCITED
- Elsevier's EMCare database

Delivery Platforms

- Google Scholar Beta
- Scirus
- NewJour
- Zentralbibliothek K€ln

Sport Scientific And Practical Aspects
International Scientific Journal of Kinesiology

Management

(**For short information click on the member's name**)

UDK: 796

print ISSN 1840-4413,

online ISSN 1840-4561

Catalogue: COBISS BH

Indexing

InfoBase Index
WorldCat
CAB Abstracts
Physical Education Index
Genamics Journal Seek
Open J-Gate
EBSCO Sportdiscus
DOAJ
Directory of Research Journals Indexing
Electronic Journals Index
Academic Journals Database
Index Copernicus
getCITED
Elsevier's EMCare database

Delivery Platforms

Google Scholar Beta
Scirus
NewJour
Zentralbibliothek Köln

Links

- www.ftos.untz.ba
- www.untz.ba

Sport Scientific And Practical Aspects
International Scientific Journal of Kinesiology

Section Editors

Exercise Physiology

Monèm Jemni - United Kingdom, University of Greenwich

Biomechanics, Kinesiology Assessment

Milan Čoh - Slovenia, Ljubljana

Barry Munkasy - Georgia Southern University

Siniša Kovač - B&H

Training theory

Duško Bjelica - Montenegro, Podgorica

Ekrem Čolakhodžić - B&H, Mostar

Goran Bošnjak - B&H, Banja Luka

Management in Sport

Edita Kastratović - Serbia, Beograd

Stevo Popović - Montenegro

Tarik Huremović - B&H, Tuzla

Education

Jože Štihec - Slovenia, Ljubljana

Muriz Hadžikadunić - B&H, Sarajevo

Mladen Kvesić - B&H, Mostar

Ifet Mahmutović - B&H, Mostar

Methodology, Statistics and Research methods

Mihajlo Mijanović - Montenegro, Nikšić

Julijan Malacko - Serbia, Novi Sad

Sport and Health

Edvin Dervišević - Slovenia, Ljubljana

Farid Ljuca - B&H, Tuzla

Adaptive physical activity

Hana Valkova - Czech Republic

Suada Kapidžić-Duraković - B&H

Sport

Ivan Čuk - Slovenia, Ljubljana

Žarko Kostovski - Macedonia, Skoplje

UDK: 796

print ISSN 1840-4413,

online ISSN 1840-4561

Catalogue: COBISS BH

Indexing

InfoBase Index
WorldCat
CAB Abstracts
Physical Education Index
Genamics Journal Seek
Open J-Gate
EBSCO Sportdiscus
DOAJ
Directory of Research Journals Indexing
Electronic Journals Index
Academic Journals Database
Index Copernicus
getCITED
Elsevier's EMCare database

Delivery Platforms

Google Scholar Beta
Scirus
NewJour
Zentralbibliothek Köln

Links

- www.ftos.untz.ba
- www.untz.ba

Milovan Bratić - Serbia, Niš,

Hazir Salihu - Kosovo, Priština

Sport Scientific And Practical Aspects
International Scientific Journal of Kinesiology

International Editorial Board

(For short information click on the member's name)

UDK: 796
print ISSN 1840-4413,
online ISSN 1840-4561
Catalogue: COBISS BH

Indexing

InfoBase Index
WorldCat
CAB Abstracts
Physical Education Index
Genamics Journal Seek
Open J-Gate
EBSCO Sportdiscus
DOAJ
Directory of Research Journals Indexing
Electronic Journals Index
Academic Journals Database
Index Copernicus
getCITED
Elsevier's EMCare database

Delivery Platforms

Google Scholar Beta
Scirus
NewJour
Zentralbibliothek Köln

Links

- www.ftos.untz.ba
- www.untz.ba

Stevo Popović	Srećko Jovanović	Žarko Kostovski
Montenegro	*Serbia*	*Macedonia*
Nikšić	*Belgrade*	*Skoplje*

Sport Scientific And Practical Aspects
International Scientific Journal of Kinesiology

Current Issue

International Journal of Kinesiology; Tuzla, 2019 Vol. 16, Issue 2

Table of Contents

Sport Scientific and Practical Aspects

Tuzla, December 2019. Vol.16, Issue 2

IMPRESSUM

UDK: 796

print ISSN 1840-4413,

online ISSN 1840-4561

Catalogue: COBISS BH

Indexing

InfoBase Index
WorldCat
CAB Abstracts
Physical Education Index
Genamics Journal Seek
Open J-Gate
EBSCO Publishing Inc.
DOAJ
Directory of Research Journals Indexing
Electronic Journals Index
Academic Journals Database
Index Copernicus
getCITED
Elsevier's EMCare database

Delivery Platforms

Google Scholar Beta
Scirus
NewJour
Zentralbibliothek Köln

Links

- www.ftos.untz.ba
- www.untz.ba

Original scientific paper

DIFFERENCES BETWEEN SUCCESSFUL AND UNSUCCESSFUL BASKETBALL TEAMS AT THREE DIFFERENT LEVELS OF COMPETITION

Edin Užičanin and Vlatko Šeparović

Abstract   Full text (html) Full text (PDF)

The Instructions for Authors

The Instructions for Authors

THE EFFECT OF HOLLOW SPRINT AND SPRINT TRAINING ON LONG JUMP SKILLS

Aisah R. Pomatahu

State University of Gorontalo, Indonesia

Original scientific paper

Abstract
This experimental, field research is to find out whether or not both the hollow sprint and sprint training affect long jump skills and to explore the difference of the effects of these two types of training. Furthermore, the design of this study consisted of two tests, namely pre-test and post-test.The sample involved 20 students of public junior high school SMPN 4 Gorontalo, Indonesia. The results show that both hollow sprint and sprint training affects the students' long jump skills. In addition, there is no significant difference regarding the effect of both trainings on the students' skills in such an athletic sport.
Keywords: *hollow sprint, sprint training, long jump.*

INTRODUCTION

The long jump is among the sports of athletics. There are several styles of long jump, namely sit down in the air, walking in the air, and schnepper. According to Teguh Sutanto (2016:23-24), long jump, as the name suggests, is a sport in which the athlete leaps as far as possible. Feri Kurniawan (2012:44-46) argues that the athlete is required to perform several movements other than running before jumping; this is to maximize the distance of the jump.

A coach must pay attention to the training program for the athletes. Every program that s/he chooses must be in sync with types of sport and the condition of the athletes. There are several workouts for long jump athletes; some of them are a hollow sprint and sprint training. Hollow sprint is a drill program involves two interval sprints interrupted by a hollow period of regular workouts. The similar opinion regarding this type of training is also explained by Apta Mylsidayu and Febi Kurniawan (2015:122); they opine that the hollow period can involve jogging or walking. The distance for this hollow period is varied, but it is typically around 200m or less (2001:37). This involves (a) the target of running speed and (b) 40m of sprinting, 40m of jogging, 40m of sprinting, and 40m of walking.

Hollow sprint is a workout method comprising two sprints involving jogging or walking intervals between the sprints (Fox, Bowers & Foss, 1993: 178). RekHajeldine (1985: 102) regards the interval (walking or jogging) as a recovery period and further adds that the distance of the sprints and the interval ranges from 30 to 50 meter.

According to Mulyono B (1988:1), sprint is an exercise regimen that is performed repeatedly in a short time with relatively high intensity.

A person is demanded to run as fast as possible over a short distance to increase speed. Sukadiyanto (2005: 115) argues that this type of speed exercise is among the approaches to enhance anaerobic endurance.
An example of this exercise is 40 to 50 meter of sprint repeated over 16 to 20 times. Each repetition consists of complete recovery (t.r) and interval time (t.i).The ratio for t.r I and t.i I is 9 and 12-13 respectively. In other words, the recovery time is about 30 seconds for three seconds of sprinting with an interval of 36 seconds. This is to allow the athlete to regain and stabilize the energy and prevent fatigue during the next exercise or repetition. This concept also resonates to the argument proposed by Fox, Bowers, and Foss (1988:315) that a complete recovery is essential and should be performed in the interval of the exercises repeatedly.
Finding a suitable exercise method is important to improve the skills of both beginner and expert long jump athletes; it is believed that hollow sprint and sprint are applicable for the athletes. These training programs had been implemented by 23 students and the results show a positive outcome. It is shown that the exercises are effective to improve the long jump skills of the students who are new to the sport and those who already have the basics.

RESEARCH METHODOLOGY

This experimental, field study employed both pre-test and post-test design; it was conducted at public junior high school *SMPN* 4 Gorontalo for 2 months consisting of 16 meetings. Furthermore, 20 students in the research site were selected as the sample from a total of 200 students (research population). The samples had different characteristics and were selected randomly.

A pre-test and post-test were used as a research instrument to generate the required data. These tests were to measure the students' long jump skills and were administered before and after the two-month treatment (implementing the hollow sprint and sprint training).

RESULTS AND DISCUSSION

Description of Research Results

This section provides the description of findings and analysis regarding the difference of the effect between hollow sprint and sprint training on the students' long jump skills. The following table provides the data of the pre-test and post-test.

Table 1. Data of Research Results

No.	$X_{1.1}$	$X_{1.2}$	$X_{2.1}$	$X_{2.2}$	$X^2_{1.1}$	$X^2_{1.2}$	$X^2_{2.1}$	$X^2_{2.2}$
1	1.8	2.01	2.5	2.65	3.24	4.0401	6.25	7.0225
2	2.97	3.09	3.22	3.35	8.8209	9.5481	10.368	11.222
3	1.7	1.85	2.06	2.18	2.89	3.4225	4.2436	4.7524
4	3.43	3.52	2.17	2.23	11.764	12.390	4.7089	4.9729
5	2.17	2.25	2.01	2.1	4.7089	5.0625	4.0401	4.41
6	3.31	3.43	2.09	2.2	10.956	11.764	4.3681	4.84
7	2.96	3.05	1.75	1.9	8.7616	9.3025	3.0625	3.61
8	1.74	1.85	2.17	2.24	3.0276	3.4225	4.7089	5.0176
9	2.51	2.66	1.71	1.8	6.3001	7.0756	2.9241	3.24
10	3.05	3.21	3.2	3.35	9.3025	10.304	10.24	11.222
Total	**25.64**	**26.92**	**22.88**	**24**	**69.77**	**76.33**	**54.91**	**60.31**

Description:

$X_{1.1}$: Hollow Sprint Group (before treatment)
$X_{1.2}$: Hollow Sprint Group (after treatment)
$X_{2.1}$: Sprint Training Group (before treatment)
$X_{2.2}$: Sprint Training Group (after treatment)

Description of the Data of Hollow Sprint Group Variable

As the study is experimental, a pre-test was administered before starting the treatment. The data of this pre-test was represented by the symbol $X_{1.1}$. By the end of the experiment, a final evaluation of the students' long jump skills was conducted; the result of this test was represented by the symbol $X_{1.2}$.

Table 2. Data of Hollow Sprint Training

No.	Pre-test	Post-test	Gain (D)
1	1.8	2.01	0.21
2	2.97	3.09	0.12
3	1.7	1.85	0.15
4	3.43	3.52	0.09
5	2.17	2.25	0.08
6	3.31	3.43	0.12
7	2.96	3.05	0.09
8	1.74	1.85	0.11
9	2.51	2.66	0.15
10	3.05	3.21	0.16
Total	25.64	26.92	1.28
Mean	2.564	2.692	0.128

The above table shows that the average score of both pre and post-test describing the effect of hollow sprint exercise on long jump skills reaches 2.56, while the post-test score is 2.69indicating an increase of 0.13. Moreover, all of the aspects of measurement are increased in both of the tests.
This is represented in the following chart.

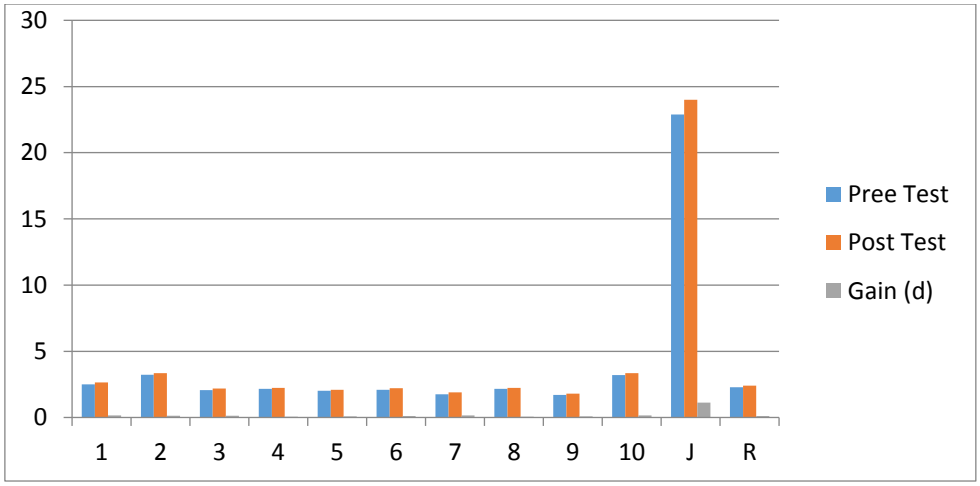


Figure 1. Data of Pre-test and Post-test of Hollow Sprint Group

Description of the Data Sprint Training Group Variable

A pre-test is required before proceeding to the treatment since this present study is experimental. The data of this pre-test was represented by the symbol X2.1. A final evaluation of the students' long jump skills was done after the treatment; the result of this test was represented by the symbol X2.2.

Table 3. Data of Sprint Training

No.	Pre-test	Post-test	Gain (D)
1	2.5	2.65	0.15
2	3.22	3.35	0.13
3	2.06	2.18	0.12
4	2.17	2.23	0.06
5	2.01	2.1	0.09
6	2.09	2.2	0.11
7	1.75	1.9	0.15
8	2.17	2.24	0.07
9	1.71	1.8	0.09
10	3.2	3.35	0.15
Total	22.88	24	1.12
Mean	2.288	2.4	0.112

The above table shows that the average score of both pre and post-test describing the effect of hollow sprint exercise on long jump skills reaches 2.29, while the post-test score is 2.4; this indicates an increase of 0.11. All the measurement aspects of long jump skills are improved.

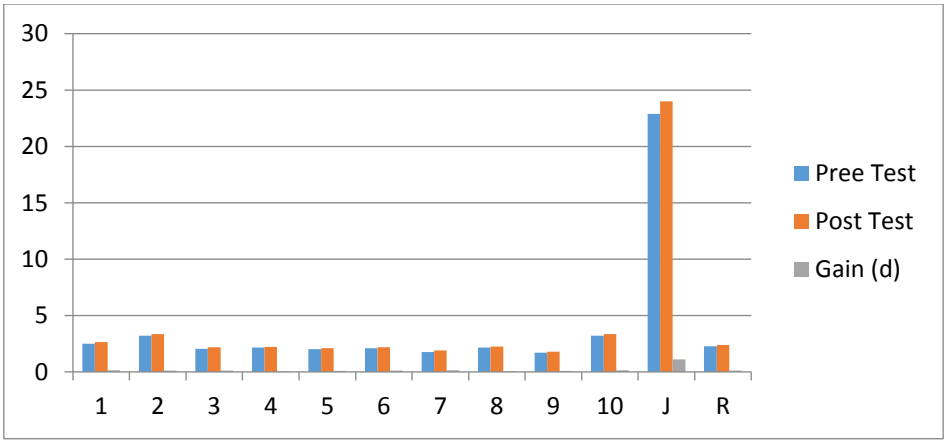


Figure 2. Data of Pre-test and Post-test of

Sprint Training Group

Calculation of Variant and Standard Deviation

Table 4. Calculation of Variant and Standard Deviation

No.	X1.1	X1.2	Gain	X2.1	X2.2	Gain
1	1.8	2.01	0.21	2.5	2.65	0.15
2	2.97	3.09	0.12	3.22	3.35	0.13
3	1.7	1.85	0.15	2.06	2.18	0.12
4	3.43	3.52	0.09	2.17	2.23	0.06
5	2.17	2.25	0.08	2.01	2.1	0.09
6	3.31	3.43	0.12	2.09	2.2	0.11
7	2.96	3.05	0.09	1.75	1.9	0.15
8	1.74	1.85	0.11	2.17	2.24	0.07
9	2.51	2.66	0.15	1.71	1.8	0.09
10	3.05	3.21	0.16	3.2	3.35	0.15
Total	25.64	26.92	1.28	22.88	24	1.12
Mean	2.564	2.692	0.128	2.288	2.4	0.112
Std. Dev	0.669298	0.655283	0.039944	0.533871	0.548776	0.033599
Variant	0.44796	0.429396	0.001596	0.285018	0.301156	0.001129

The above table shows the calculation of the variant and standard deviation of both hollow sprint and sprint training. The score of the variant and standard deviation of pre-test of a hollow sprint is 0.45 and 0.43 respectively, while the variant and standard deviation of the post-test score reaches 0.67 and 0.66 correspondingly. The calculation of the pre-test of the sprint training is 0.29 and the post-test is 0.30. The standard deviation reaches 0.53 (pre-test) and 0.55 (post-test).

Data Prerequisite Test

Normality Test
Normality Test of Hollow Sprint Group

The results of the normality test of hollow sprint variable show that the highest deviation value or L observation (Lo) reaches 0.1487. According to the table of L critical values of Liliefors at α = 0.05 ; n = 10, the value of L table (Lt) measures at 0.258, meaning that Lo is less than Lt. The testing criteria asserts that if Lo ≤ Lt, Ho is accepted. This signifies that the sample is from the normally distributed population.

Normality Test of Sprint Training Group

The results of the normality test of sprint training variable show that the highest deviation value or L observation (Lo) reaches 0.1082. According to the table of L critical values of Liliefors at α = 0.05 ; n = 10, the value of L table (Lt) measures at 0.258, meaning that Lo is less than Lt. The testing criteria asserts that if Lo ≤ Lt, Ho is accepted. This signifies that the sample is from the normally distributed population.

Homogeneity Test

The following formula was used to test the homogeneity of the variants of the population selected as the research sample.

$$F = \frac{Highest\ variant}{Smallest\ variant}$$

The result of the homogeneity test of variants in group 1 and group 2 reveals that the value of F observation (Fo) of these groups is 1.04 and 1.06 respectively. The value of table of F distribution or Ft at α = 0.05, dk = 10 - 1 = 9 reaches 3.18. According to the criteria of testing, Ho is accepted if Fo ≤ Ft. Thereby, the hollow sprint and sprint training is similar or homogenous. The summary of the calculation is provided in the following table.

Table 5. Summary of Homogeneity Test Calculation

Group	Largest Variant	Smallest Variant	Fcount	Ftable	Description
Hollow Sprint	0.45	0.43	1.04	3.18	Homogenous
Sprint Training	0.30	0.29	1.06	3.18	Homogenous

Hypothesis Testing Analysis

Hypothesis Testing of the Effect of Hollow Sprint on Long Jump Skills

A t-test was used to examine the hypothesis regarding the impact of the hollow sprint on students' long jump skills.

The result of the test shows that t-count = 13, meaning that this value outnumbers the t-table = 1.812 at α = 0.05; dk = n-1 (10-1 = 9). Therefore, the alternative hypothesis Ha is accepted as the test result reveals that the H0 is rejected if t-count > t-table; and hence, the hypothesis that "the hollow sprint impacts on the students' long jump skills" is accepted.

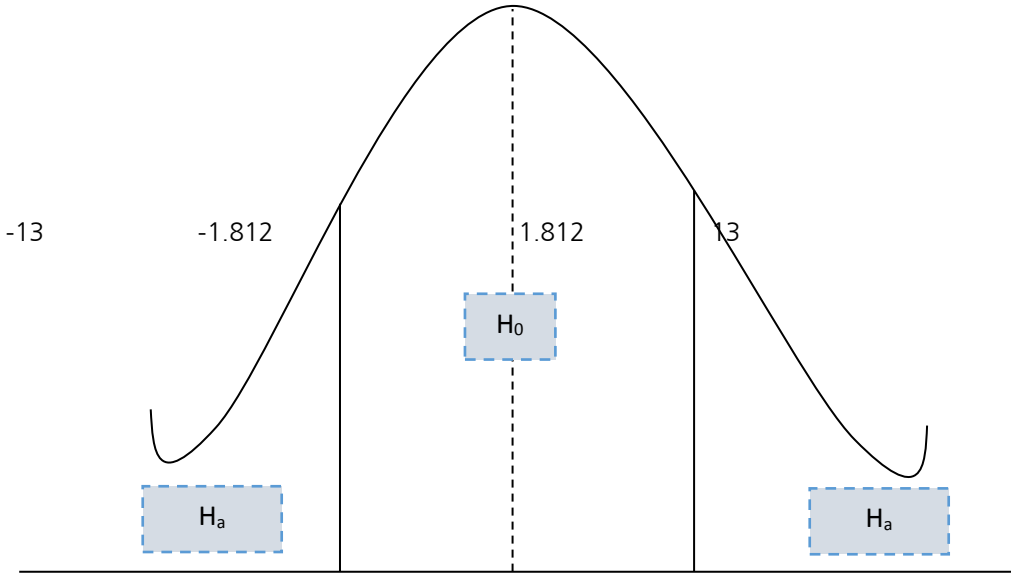


Figure 3. Acceptance and Rejection of Hypothesis Curve

Hollow Sprint Group

Hypothesis Testing of the Effect of Sprint Training on Long Jump Skills

A t-test was used to examine the hypothesis regarding the impact of sprint training on students' long jump skills.

The result of the test shows that t-count = 11, meaning that this value outnumbers the t-table = 1.812 at α = 0.05; dk = n-1 (10-1 = 9). Therefore, the alternative hypothesis Ha is accepted due to the result of the test reveals that the H0 is rejected if t-count > t-table. This confirms that the hypothesis "the sprint training impacts on the students' long jump skills" is accepted. This is represented by the following Figure 4.

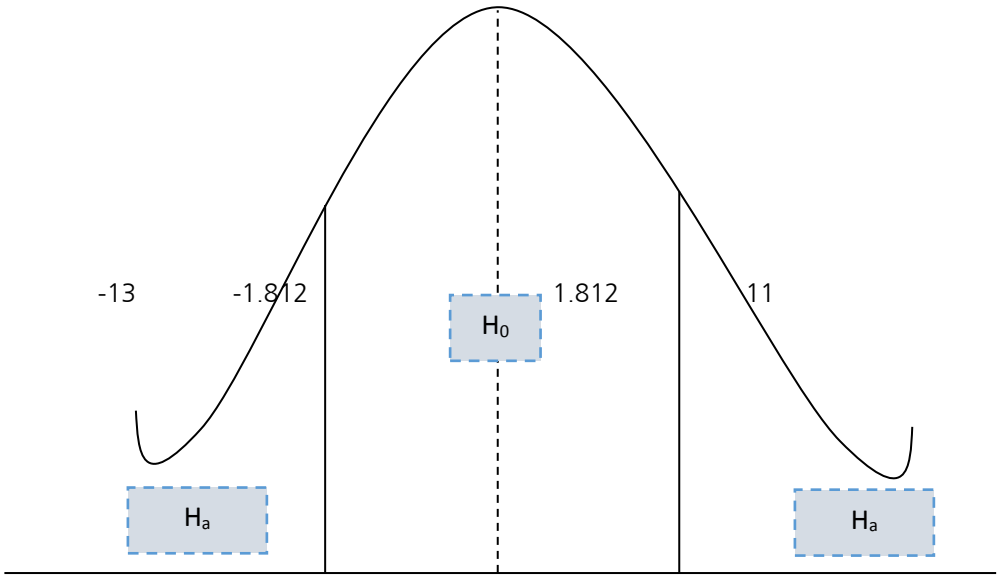


Figure 4. Acceptance and Rejection of Hypothesis Curve

Sprint Training Group

Hypothesis Testing of the Effect of Hollow Sprint and Sprint Training on Long Jump Skills

The hypothesis of this present study states that "there is a difference regarding the impact of hollow sprint and sprint training on the students' long jump skills"; according to the analysis, this hypothesis is accepted. This study assumes that both exercises have the same effect on long jump skills. Still, it is shown that hollow sprint exercise affects the long jump skills more than sprint training. This is seen from the increase in the deviation result in the pre-test and post-test of both of the exercises.

The calculation results show that the value of $t_{count} = 0.07$. The value of t_{table} reaches 1.73 at $\alpha = 0.05$; dk n1 + n2 - 2 = 18. In other words, the $t_{count}$is less than t_{table} (0.07 < 1.73). The criteria explain that the H0 is rejected as the $t_{count} > t_{table}$ and this also signifies that the Ha is also rejected. Considering these conditions, this study finds out that the impact of hollow sprint and sprint training on the students' long jump skills is similar.

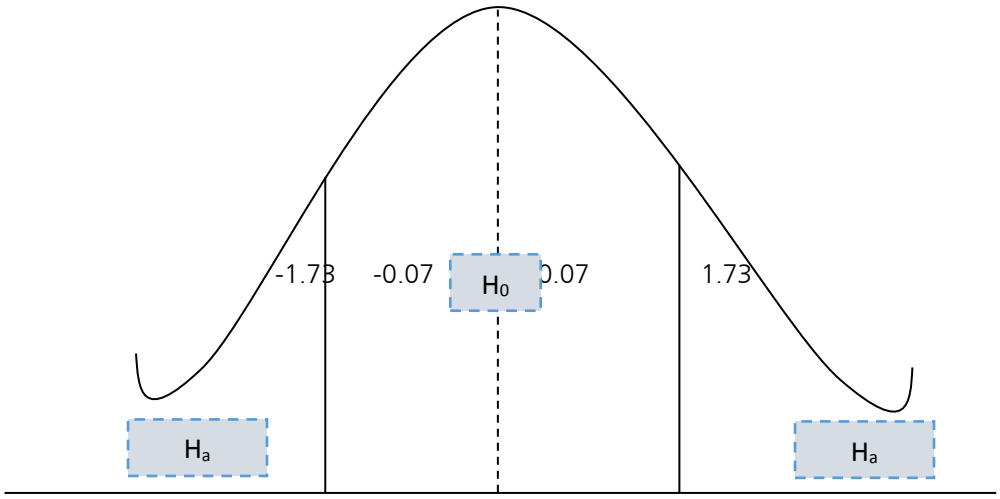


Figure 5. Acceptance and Rejection of Hypothesis of Hollow Sprint Group and Sprint Training Group

The third hypothesis of this present study states that "there is a difference regarding the impact of hollow sprint and sprint training on the students' long jump skills." However, according to the assumption of the researcher, both the impact of both exercises are not significantly

different.

DISCUSSION

The Effect of Hollow Sprint on Long Jump Skills

The hypothesis of this study states that "the hollow sprint training impacts on the students' long jump skills."
Hollow sprint is a set of more than two sprint exercises with an interval of a hollow period, i.e., jogging or walking, between the sprints. The distance for this hollow period is varied, but it is typically around 200m or less (Harsono, 2001:37). This comprises (a) the target of running speed and (b) 40m of sprinting, 40m of jogging, 40m of sprinting, and 40m of walking.
Hollow sprint is a workout method comprising two sprints involving jogging or walking intervals between the sprints (Fox, Bowers & Foss, 1993: 178). RekHajeldine (1985: 102) regards the interval (walking or jogging) as a recovery period. Furthermore, the distance of the sprints and the interval ranges from 30 to 50 meter.
The result of the test shows that t-count = 13, meaning that this value outnumbers the t-table = 1.812 at $\alpha = 0.05$; dk = n-1 (10-1 = 9). Therefore, the alternative hypothesis Ha is accepted since the test results reveal that the H0 is rejected if t-count > t-table; and thereby, the hypothesis that "the hollow sprint impacts on the students' long jump skills" is accepted.

The Effect of Sprint Training on Long Jump Skills

The hypothesis of this study states that "the sprint training impacts on the students' long jump skills."
Sprint is an exercise regimen that is performed repeatedly in a short time with relatively high intensity. A person is demanded to run as fast as possible over a short distance to increase speed. Sukadiyanto (2005: 115) argues that this type of speed exercise is among the approaches to enhance anaerobic endurance.
An example of this exercise is 40 to 50 meter of sprint repeated over 16 to 20 times. Each repetition consists of complete recovery (t.r) and interval time (t.i).The ratio for t.r I and t.i I is 9 and 12-13 respectively. In other words, for three seconds of sprinting, the recovery time is about 30 seconds with an interval of 36 seconds. The result of the test shows that t-count = 11, meaning that this value outnumbers the t-table = 1.812 at $\alpha = 0.05$; dk = n-1 (10-1 = 9). Therefore, the alternative hypothesis Ha is accepted as the test result reveals that the H0 is rejected if t-count > t-table. This signifies that the hypothesis "the sprint training impacts on the students' long jump skills" is accepted.

The Difference of the Effect of Hollow Sprint and Sprint Training on Long Jump Skills

The objective of this study is to improve students' long jump skills by implementing hollow sprint and sprint training program. The effect of both trainings on the students' skills in such an athletic sport is similar and has no significant difference. This is based on the result of the testing of the third hypothesis.
The calculation results show that the value of $t_{count} = 0.07$. The value of t_{table} reaches 1.73 at $\alpha = 0.05$; dk n1 + n2 - 2 = 18. In conclusion, the t_{count} is less than t_{table} (0.07 < 1.73). The criteria explain that the H0 is rejected as the $t_{count} > t_{table}$ and this also signifies that the Ha is also rejected. Considering these conditions, this study finds out that the impact of hollow sprint and sprint training on the students' long jump skills is no difference. This also signifies that the hypothesis stating that the two training programs have a different effect on the skills of such an athletic sport is rejected as the effects of both trainings are relatively the same.

CONCLUSION

The objective of this study is to find out whether or not both the hollow sprint and sprint training affect long jump skills and to explore the difference in the effect of both training programs. The results reveal that both hollow sprint and sprint training contributes to the students' long jump skills. On top of that, the effect of both trainings on the students' skills in such an athletic sport is similar and has no significant difference.

REFERENCES

1. Abbas Asadi, Rodrigo Ramirez-Campillo, Hamid Arazi & Eduardo Sáez de Villarreal. 2018. *The effects of maturation on jumping ability and sprint adaptations to plyometric training in youth soccer players*, Journal of Sports Sciences, DOI:10.1080/02640414.2018.1459151
2. Asadi A, Ramirez-Campillo R, Arazi H, Sáez de Villarreal E. 2018. *The effects of maturation on jumping ability and sprint adaptations to plyometric training in youth soccer players*. J Sports Sci. 2018 Nov;36(21):2405-2411. doi: 10.1080/02640414.2018.1459151. Epub 2018 Apr 3
3. Azhar, 2015. *Jurnal administrasi Pendidikan [Journal of Education Administration]. ISSN*: Vol.3 No.1

4. Bahagia, Y., 2001. *Pembelajaran Atletik [Athletic Learning]*. Jakarta: Departemen Pendidikan Nasional Direktorat Jenderal Pendidikan Dasar Dan Menengah, Direktorat Pendidikan Luar Biasa.
5. Bompa, Tudor O & Gregory Haff . 2009. *Periodization, Theory and Methodology of Training*. York University: Human Kinetics
6. Bridgett, L. A., & Linthorne, N. P. 2006. *Changes in long jump take-off technique with increasingrun-up speed*. J Sports Sci, 24(8), 889-897.
7. Canavan, P. K., & Vescovi, J. D. (2004). *Evaluation of power prediction equations: peak vertical jumping power in women*. Med Sci Sports Exerc, 36(9), 1589-1593.
8. Doré E, Bedu M, Van Praagh E. 2008. *Squat jump performance during growth in both sexes: Comparison with cycling power.* Res Q Exer Sport. 2008;79(4):517–524
9. El-Ashker, S., Hassan, A., Taiar, R., & Tilp, M. 2019. *Long jump training emphasizing plyometric exercises is more effective than traditional long jump training: A randomized controlled trial*. Journal of Human Sport and Exercise, *14*(1), 215-224. doi:https://doi.org/10.14198/jhse.2019.141.18
10. Fatouros, I. G., Jamurtas, A. Z., Leontsini, D., Taxildaris, K., Aggelousis, N., Kostopoulos, N., & Buckenmeyer, P. 2000. *Evaluation of plyometric exercise training, weight training, and their combination on vertical jumping performance and leg strength*. J Strength Cond Res, 14(4), 470-476.
11. Fleck, S. J., & Kraemer, W. 2014. *Designing Resistance Training Programs*: 4th Edition, Champaign IL, USA:Human Kinetics.
12. Fox E.L, Bowers R.W, Foss M.L. 1993. *The Physiological Basis for Exercise and Sport*. 5th. Ed. Boston-USA. WCB/McGraw-Hill.
13. Herrero, J., Izquierdo, M., Maffiuletti, N., & Garcia-Lopez, J. 2006. Electromyostimulation and plyometric training effects on jumping and sprint time. Int J Sports Med, 27(07), 533-539
14. Ismaryati. 2009. *Tes & Pengukuran Olahraga*. Surakarta: Sebelas Maret University Perss
15. Jasmani. 2012. *Perbandingan Pengaruh Metode Latihan Acceleration Sprints, Hollow Sprints, dan Repetition Sprints terhadap Peningkatan Prestasi Lari 100 Meter Ditinjau Dari Klasifikasi Tinggi-berat Badan: (Studi Eksperimen Mahasiswa Putra Jurusan Pendidikan Olahraga Kepelatihan Fakultas Keguruan dan Ilmu Pendidikan Universitas Tunas Pembangunan Surakarta)*. Jurnal Ilmiah SPIRIT, Vol. 12 No. 1 Tahun 2012
16. Javier Yanci, Asier Los Arcos, Daniel Castillo, and Jesús Cámara. 2017. *Sprinting, Change of Direction Ability and Horizontal Jump Performance in Youth Runners According to Gender* J Hum Kinet. 2017 Dec; 60: 199–207
17. Kotzamanidis, C. 2006. *Effect of plyometric training on running performance and vertical jumping in prepubertal boys*. J Strength Cond Res, 20(2), 441-445.
18. Kumar, Rajesh.2013. *A Study on the effect of Plyometric Training for development of Speed among Long Jumpers of Hyderabad District in Telangana* International Journal of Health, Physical Education and Computer Science in Sports Volume No.14, No.1.pp28-29
19. Kurniawan Feri, 2012. *Buku Pintar Pengetauan olahraga [A Handbook of Sports],* Jakarta Timur: LASKAR ASKARA.
20. Mulyono B. Atmojo. 2008. *Tes dan Pengukuran Pendidikan Jasmani/Olahraga*. Surakarta: Sebelas Maret University Perss
21. Mylsidayu Apta dan Febi Kurniawan, 2015. *Ilmu Kepelatihan Dasar [Basic Coaching]*. Bandung: ALFABETA.cv.
22. Salaj S, Markovic G. 2011. *Specificity of jumping, sprinting, and quick change of direction motor abilities.* J Strength Cond Res. 2011;25(5):1249–1255
23. Sidik, Dikdik Zafar. 2010. *Mengajar dan Melatih Atletik*. *Bandung*: PT Remaja Rosdakarya Bandung.Syarifuddin, A., 1997. *Pendidikan Jasmani Dan Kesehatan [Physical and Health Education]*. Jakarta: Departemen Pendidikan Dan Kebudayaan Proyek Pengembangan Buku Dan Minat Baca. PT. Gramedia Widiasarana Indonesia.
24. Singh, D., & Singh, S. 2012. *Effects of vertical, horizontal, and combination depth jump training on long jump performance*. Biomed Hum Kinet, 4, 107-111
25. Tan, J. C., & Yeadon, M. R. 2005. *Why do high jumpers use a curved approach?* J Sports Sci, 23(8), 775-780
26. Sharma, S. K., Saiyad, S., & Nandwani, R. 2013. *Effect of Plyometiic Training on Long Jump Performance in Athletes.* Indian J Physiother Occup Ther, 7(2), 176
27. Suharto *et.al*. 2005. *Petunjuk Teknis Pengukuran Kebugaran Jasmani*. Jakarta: Departemen Kesehatan RI.
28. Sukadiyanto. 2005. *Penghantar Teori dan Metodelogi Melatih Fisik*. Yogyakarta: PKO-FIK-UNY.
29. Sutanto Teguh, 2016. *Buku Pintar Olahraga [A Handbook of Sports]*. Yogyakarta: Pustaka Baru Press.