www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)
Budapest Institute

The Effect of Circuit Core Stability Training Towards The Strength of Abdominal Muscles and Balance

Luh Putu Tuti Ariani
Faculty of Sports and Health, Ganesha University of Education, Indonesia
tuti.ariani@undiksha.ac.id

Abstract

Several aspects affect an athlete's improvement in achievements, such as physical, technical, strategical, and psychological aspects. One of the physical aspects observed in this research is circuit core stability training. This research aims to find out the use of interval 1:1 and interval 1:2 of the circuit core stability techniques towards the improvement of abdominal muscles' strength and balance. This research uses the randomized pre and post-test design. The sample was 20 students of the Sports Training and Education study program, Surabaya State University. The abdominal muscles strength is tested by doing 30 minutes sit-up, while the balance is tested through Balance Beam Test. The result of the homogeneity test shows that the samples are normal and homogeneous. Paired sample T-test is used to find out the mean among the samples. The circuit core stability training is done in 18 meetings, pre-test and post-test are done before and after the treatment. It is found that the circuit core stability test can improve the abdominal muscles' strength and balance. The result shows the improvements before and after the treatment. It is found that there is improvement in average abdominal strength from 22,4 to 24,2, and balance from 39.5 to 42.8 seconds in the core stability 1:1 group. Meanwhile, in the core stability 1:2 group, it was found that there is an improvement of abdominal muscles strength from23.4 times, to 25.2 times. The balance test shows that there is improvement in the average from 79 to become 85,40 seconds. From the result, it can be concluded that circuit core stability 1:1 and 1:2 can significantly improve the strength of the abdominal muscles and balance.

Keywords
circuit core stability; amdominal muscles strength and balance

I. Introduction

Sport achievement training involves the combination of physical, techniques, strategy, and psychological aspects. It is done simultaneously in accordance with the training periodical phases. The physical component is the main aspect as the base to improve sport achievement. Strength is one of the physical aspects. Strength is the main aspect in improving agility, speed, and accuracy (Chan Faisal, 2012). Strength exercises, such as weight pushing, lifting, and pulling are the best way to improve body strength (Sucito Eko, Widiyanto, 2016). Abdominal muscles strength is very important in giving good body postures and keep the body organ balance. A trained abdominal muscle fixes the backbones, stabilizes movement, and helps the back and leg muscles to perform better (Moningka Maya, dkk.2020). An athlete with good strength needs to have a good balance as well, which can be gained through strength exercises (Sidik, et al. 2019). Balance is the ability to interact fastly and efficiently to keep stability before, during, and after movement, also in responding to external distractions (Supriyono Eko, 2015). It is important to concern about the body parts target, such as backbones, and the other parts

that contribute to forming the ideal body postures, to reduce the injury risk (Sidik, et. al., 2019). Therefore, circuit training is chosen to create a quality training program. This training is done by doing different movements at the same time. According to Pratama Indra Gunawan (2020), in the circuit training, there are different zones set in the training area, which has to be done as fast as possible. It is a core stability circuit consist of six areas, (1) Bridge, (2) Bridge and leg extension, (3) Hip Ups, (4) Prona Bridge, (5) Prona bridge and leg lift, (6) Side bridge and hip flexion (Graham, 2005). Core stability exercises maintain lower back health, static stability, and dynamic trunk. Moreover, it prevents back injuries and lower extremities, especially in improving functional activity (Pramita Indah, et. al., 2015). Based on this explanation it is expected that core stability with intervals 1:1 and 1:2 able to improve abdominal muscles strength and balance.

II. Review of Literature

Success in the learning process is obtained by a good process between students and teachers and the purpose of the learning itself can be delivered well by the teacher and processed or well received by students (Siregar and Eswarny, 2020). One characteristic of learning that is widely embraced in the renewal of learning is fun learning. Learning must run in a pleasant atmosphere, there is no longer a scary atmosphere for students or a stressed learning atmosphere (Silalahi and Hutauruk, 2020).

Exercise is a systematic and simultaneous process to improve physical fitness according to the expected target (Lumintiarso Ria, 2020). According to Sidik, et al., 2019), exercise is a body activity that is done systematically, staged, and improved in weight based on the exercise norms and principles. A systematic and repetitive exercise in an average long time, completed with progressive weighing, can fix the physiology and psychology body system so it can perform best in sports (Nala, 2011). The effectiveness of the exercise depends on several factors, such as frequency, the timing for each session, the number of repetitions, weight, intensity, and density (Matjan, Bastinus, 2009). Circuit training is a combination of continuous, endurance, and aerobic training which give maximum impact to the physical condition of the athlete's performance (Pratama Indra Gunawan. 2020). Several instructions have to be followed in doing circuit training, such as (1) the training frequency should be done three times in a week, (2) the training should be done at least six weeks, (3) the circuit is done in two or three times each session, (4) the area should consist 6 – 15 station, (5) exercise period 15 – 30 seconds and break period 15 – 60 seconds (Fox, 1993).

Circuit core stability is a set of exercises consist of six stations, (1) Bridge, (2) Bridge and leg extension, (3) Hip Ups, (4) Prona Bridge, (5) Prona bridge and leg lift, (6) Side bridge and hip flexion (Graham, 2005). Core stability exercise improves the performance and prevents injuries, and as a healing therapy exercise. This exercise focuses on certain muscles, such as rectus abdominals, internal oblique muscles, and transverse abdominal (Lippert 2011).

Physical components become a central role in improving the athlete's achievement. The physical exercises components consist of flexibility, the speed of the movement, the quality of muscles strength, and cardiorespiratory quality. A good physical quality performs better quality of techniques and skill (Sidik, et. al. 2019). It is important to concern about the components and principles of the exercise to improve physical performance. Several points that have to be concerned are exercises volume, intensity, interval, complexity, recovery, and density (Tirtawirya Devi, 2012).

Strength is one of the most important physical components that support the other physical aspects. Strength is defined as the ability of muscles motion to evoke stress toward a certain weight (Khoriah, et. al. 2020). Strength is a demanded physical condition to improve the achievement in movement learning (Chan Faisal 2012). According to Brittenham (2010), the abdominal muscles' strength, can maintain someone's posture, agility, and movement condition. 50% of the body mass is located in the abdominal area. It is important to strengthen the body center and abdominal area to reduce the injury effect in the backbone. The abdominal muscles are rectus abdominous, internal and external obliques (Kardiawan, Kusuma, 2014)

Balance is the ability to control muscles nervous organs, during fast movements with a rapid change of body weight points, both in static and dynamic movement (Sudrajat, Soetardji, 2014). Balance obstruction is caused by problems in body development (Supriyono Eko, 2015). Exercises on balance can be done to build strength through retrieval on gestures and body structure as it is done at a younger age (Sidik Zafar, et al. 2019). Balance is very important in doing everyday activities. Problems in balance are usually caused by a lack of physical activities (Supriyono Eko, 2015). Some activities, such as walking, cycling, house cores activities, sports, and gym are highly recommended to maintain balance (WHO, 2010). Improving balance performance can be done by taking a set of training programs systematically. The balance needs the interaction between the musculoskeletal nervous system and environmental contextual effect since it controls the body complex motoric integrated with sensory information in a certain situation (Kisner and Colby, 2007)

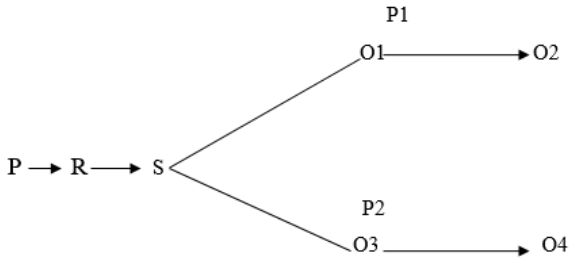
III. Research Methods

3.1 Data Collection

The data of abdominal muscles strength is gained through 30 minutes sit-up test. This test is done before and after the treatment. The data of the balance ability is gained by conducting a balance beam test. The treatment is given 18 times in six weeks in total. Specifically, the treatment is given three times each week. There are six core stability exercises done by the samples, namely 1) bridge, 2) bridge & leg extension, 3) hip ups, 4) prone bridge, 5) prone bridge & leg lift, and 6) side bridge.

3.2 Research Methodology

This experimental research uses the randomized pre and post-test design (Pocoock, 2008). The research scheme is presented as follows.



P: Population
R: Random
S: Sampling
P1: treatment group I, core stability exercise interval 1:1
P2: treatment group II, core stability exercise interval 1:2

O1: Observations on abdominal muscles strength and balance, group -1 before core stability exercise interval 1:1
O2: Observations on abdominal muscles strength and balance, group -1 after core stability exercise interval 1:1
O3: Observations on abdominal muscles strength and balance, group -2 before core stability exercise interval 1:2
O4: Observations on abdominal muscles strength and balance, group -2 after core stability exercise interval 1:2

IV. Results and Discussion

4.1 Results of Data Analysis

The data of abdominal muscle strength test from Core Stability interval 1:1 group can be described as follows. The mean from the pre-test is 22.4 points with a deviation standard ± 3,81. The lowest point is 17, and the highest point is 28. The post-test shows a mean of 24.2 points, with a deviation standard ± 2,66, with the lowest of 20 points and 28 points as the highest. The delta results in 1.8 points with a deviation standard ± 1,93, the lowest point 0 points, and the highest of 6 points.

From the Core Stability interval 1:2 group, the mean gained from the pre-test is 23.4 points, with a deviation standard ± 2,41, and with the lowest point of 19 and the highest of 27 points. The mean of the post-test is 25.2 points with a deviation standard ± 1,48, and the lowest point of 23, and the highest of 27 points. Delta shows 1.8 points with a deviation standard ± 1,75, and the lowest point of 0 and the highest of 5 points.

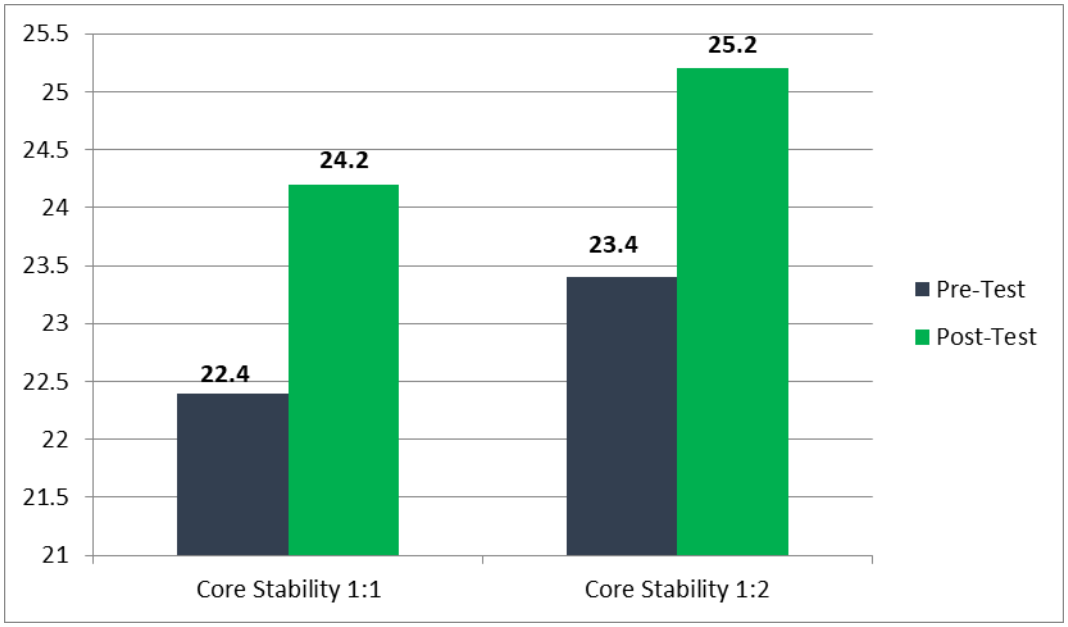


Figure 1. *The Result of the Abdominal Muscle Strength Test*

The data from the balance test for the Core Stability interval 1:1 group can be described as follows. The mean from the pre-test is 39.5 seconds, with a deviation standard ± 24,97, with the lowest point 12 points, and the highest of 87 seconds. Mean from the post-test 42.8 seconds with deviation standard ± 23,9, the lowest point of 19 seconds and the highest of 88 seconds. Delta of 3.3 seconds with deviation standard ± 1,83, with the lowest point of 1 second and the highest 7 seconds.

Meanwhile, the data gained from the Core Stability interval 1:2 group is described as follows. The mean from the pre-test is 79 seconds, with a deviation standard ± 21,7, having the lowest point of 46 seconds, and the highest 111 seconds. The post-test mean is 85.40 seconds with a deviation standard ± 21,83, having the lowest point of 49 seconds and the highest of 116 seconds. Delta of 6.4 seconds with deviation standard ± 2,76, having the lowest points of 2 seconds and the highest 10 seconds.

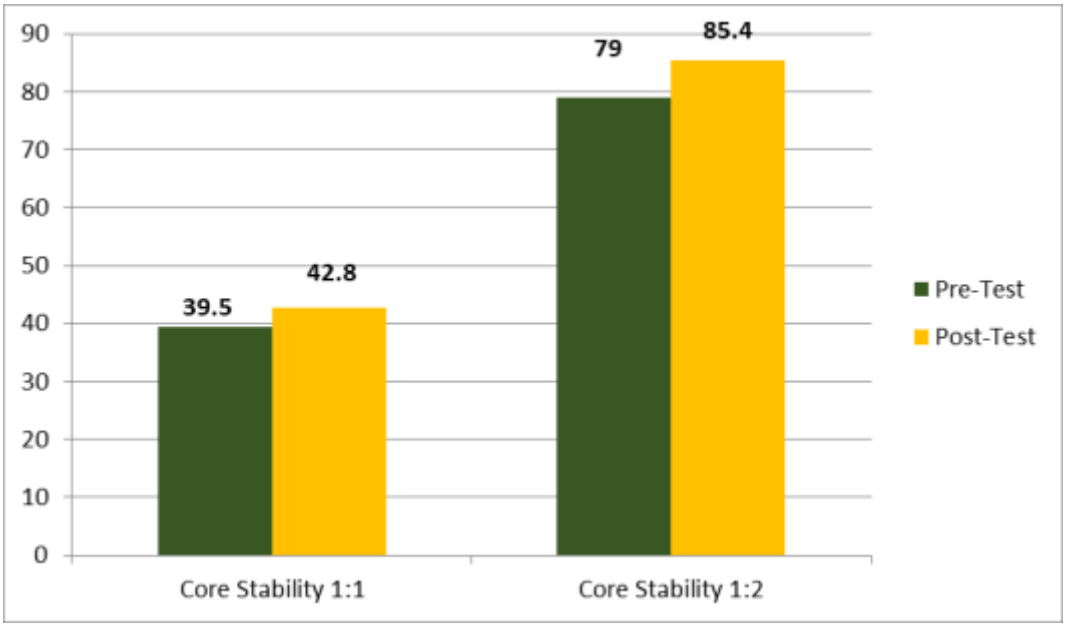


Figure 2. *The Result of the Balance Test*

The presented graph shows that there is an improvement in balance ability in both groups. It also presents the difference of the lowest mean from the Core Stability 1:1 group, and Core stability 1:2 group.

4.2 The Analysis Prerequisite Test

The prerequisite test is done to determine the hypothesis test. The parametric hypothesis test is done when the data have normal and homogeneous distribution. However, the non-parametric procedure is done when the data do not have normal and homogeneous distribution.

a. Normality Test

The *Shapiro-Wilk* test is done to find out whether the data has a normal distribution. The following is requisite in the result decisión in *the Shapiro-Wilk* normality test. Error margin $\alpha = 0.05$ with sig. value > 0.05, means that the data has a normal distribution, However, sig. value < 0.05, means that the data do not have a normal distribution.

Table 1. The Result of Normality Test *Shapiro-Wilk*

***Core Stability* 1:1**			***Core Stability* 1:2**		
Abdominal Muscle Strength	Pre-Test	Post-Test	Abdominal Muscle Strength	Pre-Test	Post-Test
Sig.	0.571	0.484	Sig.	0.875	0.225
Balance	Pre-Test	Post-Test	Balance	Pre-Test	Post-Test
Sig.	0.151	0.117	Sig.	0.068	0.116

The table shows that the overall significant value is above 0.05, which means that the data has a normal distribution.

b. Homogeneity Test

The homogeneity test is conducted to find out the variation in the population of the sample. The resulting requirement should follow the following points. Error margin $\alpha = 0.05$, sig. value < 0.05, means the population is heterogeneous. Sig. value > 0.05, means that the population of the sample is homogeneous.

Table 2. The result of Homogeneity Test

Test of Homogeneity of Variances			
Abdominal Muscles Strength			
	Pre-Test	Post-Test	Delta
Sig.	0.233	0.146	0.361
Balance			
	Pre-Test	Post-Test	Delta
Sig.	0.414	0.272	0.950

Based on the data in Table 2, the significant value shows above 0.05, which means that the data variant has homogeneity. It can be concluded that the data gained from pre-test, post-test, the delta of both treatment groups have homogeneous variants. Therefore, the parametric test is conducted for the hypothesis testing.

c. Hypothesis Testing

The hypothesis testing is done to answer the research questions. The hypothesis testing is conducted based on the data gained in the previous step. The data were analyzed statistically to test the research hypothesis.

d. Paired Sample T-Test

This analysis is done to figure out whether there is a difference in the paired simple. The result is decided base on the following requisite. Error margin $\alpha = 0.05$, with a significant value > 0.05, means no significant difference between the variable before and after the treatment. However, Ha is accepted or Ho is rejected, with a significance value < 0.05, means that there is a significant difference between the variables before and after the treatment.

Table 3. The Result of Paired Sample T-Test

Paired Samples Test			
Core Stability 1:1			
Pair 1	Pre_Sit – Post_Sit	0.002	Different
Pair 2	Pre_Bal – Post_Bal	0.003	Different
Core Stability 1:2			
Pair 1	Pre_Sit – Post_Sit	0.010	Different
Pair 2	Pre_Bal – Post_Bal	0.000	Different

Table 3 shows the result of paired sample T-test. It can be seen that in the Core Stability interval 1:1 group and Core Stability interval 1:2 group, muscle strength variable (sit), and balance (bal), has average significant value < 0.05. It can be concluded that Ho is rejected, which means that there is a significant difference in the variable before and after the treatment.

V. Conclusion

From the data analysis, it can be concluded as follows.

1. The Circuit Core Stability exercises with intervals 1:1 and 1:2 can improve the abdominal muscles' strength and balance.
2. There is no significant difference in the circuit core stability exercise between intervals 1:1 and 1:2 in improving abdominal muscles strength and balance. However, circuit core stability exercise with interval 1:2 gives better average improvement than interval 1:1.

References

Brittenham, G. (2010). Conditioning for Basketball. University of Virginia. Human Kinetics. 45

Chan Faisal. 2012. Strengt Trainning (Latihan Kekuatan). *Cerdas Sifa Edisi no 1 Mei-Agustus 2012*

Fox .E.L., Bowers.R.W., and Foss. M.L. 1993. *The Physiological Basic For Exercise and Sports*, Fifth edition. Iowa: Brown and Benchmark Publishers PP:19,21,55,126.

Graham, Ian. USATF. *Level II Sprints and Hurdles*. www. Athletic Body Conditioning.com.

Kardiawan H. Kusuma Candra A.2014. Pembentukkan dan Pembinaan Kondisi Fisik. Graha Ilmu

Kisner.Colby.2007. Therapeutic Exercise: Foundations and Techniques.

Khoriah Nur.S. Sulistyorini, Fadli Riyadh N.2020. Pengembangan Variasi Latihan Kekuatan Otot Tungkai dan Otot Perut Untuk Atlet Futsal pada Tim Putri Universitas Negeri Malang

Kibler, W.B., J. Press and A. Sciascia (2006) " The Role of Core Stability in Athletic Function' *journal Sport Medicine* 36 (3) ; 189-198.

Lippert L. 2011. Clinical Kinesiology and Anatomy. Philadelphia: F.A. Davis Company

Lumintiarso Ria. 2020.Pembinaan Multilateral bagi atlet Pemula. UNY Press. Perpustakaan Nasional: katalog Dalam Terbitan (KDT)

Matjan N. Bastinus. 2009. Komponen-Komponen Latihan dan Factor-Faktor Pendukung Kualitas Peak Performance Atlet. Jurnal Kepelatihan Olahraga vol 1 no 1 Juni 2009.issn 2086-339X

Mackenzie, B. 2005. 101 Performance Evaluation Tests**.** London

Moningka M. Lintong F, Dondokambey G. 2020. *Pengaruh Latihan Sit-Up Terhadap Massa Otot*.eBiomedik.2020:8(2):196-201.DOI.https;//doi.org/10.35790/ebm.8.2.2020.31693

Ngurah Nala.2011. *Prinsip Pelatihan Fisik Olahraga*.Udayana University Pressy

Pratama Indra Gunawan. 2019. Pengaruh Menggunakan Core Stability Static Exercise Terhadap Keseimbanagan dan Daya Tahan Otot perut. Http:www.jurnal.unublitar.ac.id/Index.php/brilliant. 20 February.2019 .DOI: http:/dx.doi.org/10.28926/brilliant.v3i3.261

Pramita Indah, Pangkahila A,Sigijanto. Core stability Exercise lebih Baik Meningkatkan Aktivitas Fungsional daripada Williams Flexion Exercise pada Pasien Nyeri punggung Bawah Miogenik. Sports and fitness journal vol 3 no 1; 35-49 januari 2015.

Silalahi, T.F., and Hutauruk, A.F. (2020). The Application of Cooperative Learning Model during Online Learning in the Pandemic Period. Budapest International Research and Critics Institute-Journal (BIRCI-Journal). P. 1683-1691.

Siregar, M. and Eswarny, R. (2020). Improving Students' Achievement in Speaking Monologue Text by Using Video. Budapest International Research and Critics Institute-Journal (BIRCI-Journal). P. 1343-1351.

Sucipto Eko dan Widiyanto. 2016. *Pengaruh Latihan Beban dan Kekuatan Otot terhadap Hypertropy Otot dan Ketebalan Lemak.* Jurnal Keolahragaan vol 4 no 1 April 2016 (111-121).

Sudrajat.W.A. Soetardji.2014. Efek Pemberian Latihan Keseimbangan dalam Mempertahankan Kemampuan keseimbanagan Manula Panti Wredha Rindang Asih Unggaran.. Journal of Sport Science and Fitnes.JSSF 3(1).2014

Supriyono Eko. 2015: Aktivitas Fisik Keseimbangan Guna Mengurangi Resiko Jatuh Pada Lansia. Jurnal olahraga Prestasi, Vol 11 No 2. Juli 2015

Sidik Zafar D. Pesurnay P. Afari Luki.2019.Pelatihan Kondisi Fisik. PT. Remaja Rosdakarya.Bandung

Tirtawirya Devi.2012. Intensitas Dan Volume Dalam Olahraga, jurnal ISSA.2012. th.1no 1. Issn.2252. 3375