



## Strength and Balance Improvement with Plank Exercise Variations

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### ABSTRACT

*This study aims to determine the effect of core stability exercises (Elbow Plank, High Plank, and Elbow Plank With Legs Open) on abdominal muscle strength and balance. Quasi-experimental research and research design using nonequivalent control group design. The purposive sampling technique was used in this study to determine the research subjects where the total number of research subjects obtained was 32 people. The research instruments used were the sit-up test (30 seconds) to measure abdominal muscle strength and the standing stork test to measure balance. The results of the MANOVA test showed that there was a significant difference, while the post hoc test showed that the results did not have a significant difference in influencing abdominal muscle strength and balance. The results of plank training showed a significant difference, both in abdominal muscle strength and balance. This study concludes that the plank core stability variation training method has a more significant effect on increasing abdominal muscle strength and balance.*

**Keywords:** Core Stability; Plank; Abdominal Muscle Strength; Balance; Badminton.

### INTRODUCTION

Exercise is a physical activity that aims to strengthen and keep the organs in the body working according to their function (Lasmita et al., 2018). At this time sport has become a basic need that must be fulfilled because a fit body will affect performance in the daily environment (Putra et al., 2019). Exercise is a certain pattern of exercise that is organized and structured into a part that must be done by every individual so that blood vessels become smooth and become productive (Sahabuddin, 2017). In Indonesia, it is undeniable that sport is an important activity and a unifying tool for the nation which is a system for producing a healthy and fit society (Ishak et al., 2022).

Based on (Suharjana, 2013) Exercise is a systematic sporting activity over a long period, progressive and individually improved which leads to the characteristics of

psychological functions and human physiological functions to achieve predetermined goals (Syahputri, 2021). In the training process, athletes need adaptation to adjust to the load to be given (Putra et al., 2019). Systematic training has a significant impact so it becomes a reference for providing correct and appropriate training (Hammado et al., 2020). Physical exercise is an activity that is planned repeatedly according to a certain intensity to gradually improve athlete performance (Alwin et al., 2020). Exercise will cause motor changes in the body, such as increased muscle strength and endurance. To develop the ability of the athlete's motor system, the functional response to a motion in the physical condition component can be considered (Maulana et al., 2020).

Based on (Bompa & Buzzichelli, 2019) Training is a process of improving and perfecting athletes with a scientific approach from a regular and planned training program to improve ability and readiness during training. It can be seen from training is a systematic and planned arrangement to improve athletes and can be a progress of training load over time. An important physical component that is the basis of the formation of techniques, tactics, and strategies in the world of sports (Ibrohim et al., 2022). According to (Sidik et al., 2019) An athlete is required to develop functional abilities in the body. The components required in sports are quite complex and almost all are included in the training program. Physical exercise requires the interaction of the body's physiological mechanisms that make the body's organ systems optimal and work hard to provide the energy needs used in muscle contractions (Krismon et al., 2022). Physical condition is a very important factor in performing physical activities that take place gradually. Muscle strength is the capacity of the muscles to contract successively at a certain time according to the need. Muscle strength is the ability or group of muscles to do work by holding the weight it lifts (Pangemanan et al., 2012). Strong muscles will facilitate the efficiency of movement by making muscle performance shape the body to be even better (Muladi & Kushartanti, 2019). Trained muscles will produce a mass of muscle fibres that function to strengthen body tissues so that internal organs will also be trained and get stronger because the human body is designed in such a way as to move and rest (Zulvikar, 2016). Balance is one of the basic human needs that explains the dynamism of posture with the ability to control the body's centre of mass or centre of gravity against a balanced fulcrum (Risangdiptya & Ambarwati, 2016). Balance is a form of attitude to maintain a body position in its position with core stability training which is a physical activity using the body as a burden (Rosalina et al., 2019).

Core stability or plank is an exercise to support strength, stability, and coordination that can be done by all ages because it only requires simple static movements, namely staying in place (Hardiansyah, 2018). This exercise is suitable because the load is given only uses the individual's body with minimal risk of severe side effects. The many variations of core stability exercises made the author compare three exercises core stability elbow plank, high plank, and elbow plank with open legs.

## METHOD

This study uses a quantitative approach to experimental research with experimental methods. The experimental method is a method used because it is necessary to supervise and check the process of conducting research (Maksum, 2014). What is particularly characteristic in experimental research is the administration of tests at the beginning and end of the study as a means of knowing the differences after the treatment of the research subjects. This method was chosen because the research design used was to provide treatment to all subjects. So that the results of giving treatment (treatment) can be seen based on the results of the pre-test and post-test. Menurut (Maksum, 2014) This research uses experimental research as well as a Nonequivalent Control Group design in the form of four groups pre-test and post-test, namely groups that are given treatment in 4 different types of treatment. The fourth group was used as a control group (variable control), and the other 3 groups were given different exercises including Elbow Plank, High Plank, and Elbow Plank With Legs Open, but before the treatment was given a pre-test, grouping with ordinal pairing and then at the end of the treatment at the end of the final test (post-test).

The subjects in this study were taken as a whole in the population of badminton extracurricular members of SMAN 12 Surabaya who were male with a total population of 42 students with a sampling of 32 children. Students who take part in badminton extracurricular activities carry out physical activities provided in the badminton extracurricular training program at school so that they have better physical abilities and endurance than other students at SMAN 12 Surabaya. From these 32 students, the researcher conceptualized to form into 4 experimental groups (T1 EP), (T1 EH), (T1 ER), and the control group (T1 VC). The four groups with different treatments will begin to follow all stages from pre-test, treatment, to post-test. After 18 meetings, the final test (post-test) was conducted on all groups.

## RESULTS AND DISCUSSION

The results of the descriptive analysis are ideas that are used as a description of the research that has been done. based on the research that has been done, it will be described, namely the results of the pre-test data (initial data before treatment) and the results of the post-test data (final data after treatment). This study uses two independent variables as aspects of research, namely abdominal muscle strength and balance. The test instrument used to measure abdominal muscle strength is using the Sit-Up method for 30 seconds and to measure balance using the Standing Stork Stand method.

Abdominal muscle strength statistics are measured using physical test parameters, namely Sit Up for 30 seconds and using units of sec (seconds). The graphical diagram of the average change in abdominal muscle strength in the graph above shows that the entire group that joined the research subjects experienced an increase from before treatment and after treatment even though the increase was different. The highest increase from before treatment and after treatment was experienced by group 3, namely the group given the Elbow Plank With Legs Open treatment. While the lowest increase from before treatment and after treatment was given by group 4, namely the control group. After the description stage of the differences that occur before treatment (Pre Test) and after treatment (Post Test) in the elbow plank, high plank, elbow plank with legs open, and control groups. Then the next thing to do is to describe the physical abilities of the next dependent variable, namely balance.

**Table 1.**  
Normality Test Results

Statistik		Statistic Data	Sig.	Keterangan
Abdominal Muscle Strength	Pretest	0,888	P > 0.05	Normal
	Posttest	0,892	P > 0.05	Normal
	Pretest	0,112	P > 0.05	Normal
	Posttest	0,153	P > 0.05	Normal
	Pretest	0,101	P > 0.05	Normal
	Posttest	0,060	P > 0.05	Normal
Balance	Pretest	0,165	P > 0.05	Normal
	Posttest	0,125	P > 0.05	Normal
	Pretest	0,956	P > 0.05	Normal
	posttest	0,992	P > 0.05	Normal
	Pretest	0,956	P > 0.05	Normal
	Posttest	0,831	P > 0.05	Normal

When viewed based on the Shapiro-Wilk test decision-making, data will be normally distributed if the significance value is  $> 0.05$ . Referring to the basis of decision-making, it can be concluded that overall the initial data (pre-test) and the final data (Post-test) are normally distributed.

**Table 2.**  
Homogeneity Test Results

Variabel dan Test		Statistic Data	Sig.	Keterangan
Abdominal Muscle Strength and Balance	Pretest	0,697	$P > 0.05$	Homogenous
	Posttest	0,804	$P > 0.05$	Homogenous
	Pretest	0,736	$P > 0.05$	Homogenous
	Posttest	0,725	$P > 0.05$	Homogenous

Based on the results of the homogeneity test described above, it can be seen the value of the test results of the analysis of the average pre-test and post-test scores on all variables. Based on decision-making, the value will be homogeneous if the sig.  $> 0.05$ . Then, the average data of the initial scores (pre-test) and (post-test) are homogeneous.

**Table 3.**  
Results of Paired Sample T-Test Group Elbow Plank

Statistics	Pre-test & Post-test	N	Correlation	Sig.
Elbow	Abdominal Muscle Strength	8	0,986	0,000
Plank	Balance	8	0,995	0,000

Data significance from the results of data analysis using paired sample t-test with a strength of 0.000 in the sense of  $<$  value of 0.05. So  $H_0$  accepted, based on these data it can be concluded that the provision of elbow plank treatment has a significant effect on abdominal muscle strength. The significance value by the balance is obtained at 0.000 in the sense of a value of  $< 0.05$ . So it can be concluded that the treatment of the elbow plank group has a significant effect on balance.

**Table 4.**  
Results of Paired Sample T-Test Group High Plank

Statistics	Pre-test & Post-test	N	Correlation	Sig.
High	Abdominal Muscle Strength	8	0,992	0,000
Plank	Balance	8	0,932	0,000

Data significance from the results of data analysis using paired sample t-test with a strength of 0.000 in the sense of  $<$  value of 0.05. So  $H_0$  accepted, based on these data it can be concluded that the provision of high plank treatment has a significant effect on abdominal muscle strength. The significance value by the balance is obtained at 0.001 in the sense of a value of  $< 0.05$ . So it can be concluded that the treatment of the high plank group has a significant effect on balance.

**Table 5.**  
Results of Paired Sample T-Test Group Elbow Plank With Legs Open

Statistics	Pre-test & Post-test	N	Correlation	Sig.
Elbow Plank	Abdominal Muscle Strength	8	0,981	0,000
With Legs Open	Balance	8	0,945	0,000

Data significance from the results of data analysis using paired sample t-test with a strength of 0.000 in the sense of < value of 0.05. So Ho accepted, based on these data it can be concluded that the provision of elbow plank treatment with legs open has a significant effect on abdominal muscle strength. The significance value by the balance is obtained at 0.001 in the sense of a value of < 0.05. So it can be concluded that the treatment of the elbow plank group with legs open has a significant effect on balance.

**Table 6.**  
Box's Test Of Equality of Covariance Matrices

Box's Test of Matricesa	Equality of Covariance
Box's M	6,234
F	0,896
df1	6
df2	10991,077
Sig.	0,497

**Table 7.**  
Levene's Test of Equality of Error Variances

	Levene Statistic	df1	df2	Sig.
Abdominal Muscle Strength	2,214	2	21	0,134
Balance	1,013	2	21	0,380

The results of data analysis using Manova above, obtained the homogeneity value of variance does not change. This is because overall the score of the dependent variable has the same variance or is homogeneous. So this will be continued with post hoc analysis tests and Bonferroni analysis tests.

**Table 8.**  
Manova Test Results Table

Effect		Value	F	Hypothesis Df	Error Df	Sig.
Intercept t	Pillai's Trace	0,921	116.117b	2,000	20,000	0,000
	Wilks' Lambda	0,079	116.117b	2,000	20,000	0,000
	Hotelling's Trace	11,612	116.117b	2,000	20,000	0,000
	Roy's Largest Root	11,612	116.117b	2,000	20,000	0,000
Method	Pillai's Trace	0,762	6,469	4,000	42,000	0,000
	Wilks' Lambda	0,350	6.894b	4,000	40,000	0,000
	Hotelling's Trace	1,532	7,277	4,000	38,000	0,000
	Roy's Largest Root	1,281	13,447c	2,000	21,000	0,000

Based on these data, the results of the multivariate test analysis as a whole obtained a

value of 0.000, so, the value is considered  $< 0.05$  which means that it has a significant effect and simultaneously affects abdominal muscle strength and balance. It can be concluded that the provision of exercises using the elbow plank, high plank, and elbow plank with legs open methods affects the increase in abdominal muscle strength and balance.

**Table 9.**  
Test Results Between Subjects Effects

Source	Delta	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	Abdominal Muscle Strength	46.583a	2	23,292	13,447	0,000
	Balance	24.333b	2	12,167	2,644	0,045
Intercept	Abdominal Muscle Strength	210,042	1	210,042	121,261	0,000
	Balance	590,042	1	590,042	128,237	0,000
Method	Abdominal Muscle Strength	46,583	2	23,292	13,447	0,000
	Balance	24,333	2	12,167	2,644	0,045
Error	Abdominal Muscle Strength	36,375	21	1,732		
	Balance	96,625	21	4,601		
Total	Abdominal Muscle Strength	293,000	24			
	Balance	711,000	24			
Correct d Total	Abdominal Muscle Strength	82,958	23			
	Balance	120,958	23			

Furthermore, from the results of the analysis of the test table test of between-subjects effects using the Manova test. Based on the table, there are six values, namely corrected model value, intercept value, method value, error value, and total value. The corrected value of the model means that the influence of the whole variable simultaneously affects the dependent variable. If the significance result value  $< 0.05$ , the data is significantly influential. The intercept value means that the dependent variable changes without any influence by the existence of the independent variable, which means that the intercept value means that the value of the dependent variable can change without the influence of the independent variable. If the significance value on the intercept  $< 0.05$ , then the alpha value = has a significant effect on the influence of one independent variable, namely elbow plank, high plank, and elbow plank with legs open on each dependent variable, namely abdominal muscle strength and balance. The value  $< 0.05$  or read significance  $< 0.05$  can be seen in the table column.

## Discussion

The purpose of this study will discuss the evaluation of the results of the assessment of badminton extracurricular activities at SMAN 12 Surabaya, where several students participate in extracurricular badminton with problems with the quality of abdominal muscle strength and balance. To answer the results of the evaluation of badminton

extracurricular activities at SMAN 12 Surabaya, field data collection of students at school was carried out with the core stability training method which was considered to influence abdominal muscle strength and balance. Explanation by (Karter, 2005) in his book explores that the type of plank exercise can remind balance and maximize abdominal muscle strength that can support more productive activities. This is necessary to find out whether there is an effect of elbow plank exercises on abdominal muscle strength and balance. Second, whether there is an effect of High Plank exercises on abdominal muscle strength and balance. Third, why is there an effect of Elbow Plank With Legs Open training on abdominal muscle strength and balance? Furthermore, is there a difference between the effect of Elbow Plank, High Plank, and Elbow Plank With Legs Open exercises on abdominal muscle strength and balance? The research conducted is also based on the fact that many students spend almost half the day doing activities effectively in the school environment. Extracurricular non-compulsory learning activities are one of the places for students to be able to express themselves in healthy activities and have a positive impact (Yanti et al., 2016)

Research (Pratama, 2019) entitled "The Effect of Circuit Training Core Stability Dynamic on Balance and Abdominal Muscle Strength in SSB PSBK Junior, Brilliant: Journal of Research and Conceptual" discusses the importance of core stability training to improve the physical condition for both athletes and students who are members of extracurricular activities at school, it was also explained that this study uses core stability dynamic variables.

Exercise to increase abdominal muscle strength was also conducted in deeper research (Trisnowiyanto, 2016) which discusses how exercises using the Pilates core stability method can also increase abdominal muscle strength. It was found that the core stability exercise method can have a positive impact on a person to strength the abdominal muscles.

In another study (Pratama, 2020) entitled "The Effect of Circuit Training Using Core Stability Static Exercise on Balance and Abdominal Muscle Endurance, Brilliant: Journal of Research and Conceptual" the type of circuit training wrapped in the core stability static method can have a fairly good influence in improving biomotor balance and endurance of abdominal muscle strength. The volume and intensity of core stability exercises that are sufficient will have a good impact on someone by providing a stimulus to increase the feeling of balance and stimulate the performance of abdominal muscles.



This study discusses more deeply by using the same two dependent variables, namely abdominal muscle strength and balance, however, using different exercise methods, namely core stability exercise which is divided into three independent variables, among others, elbow plank, high plank, and elbow plank with legs open. The three variations of exercise variables will be the basis for the formulation of the problem in this study.

Core Stability Plank exercises on abdominal muscle strength and balance because this plank exercise uses contractions that are centred on the abdominal muscles continuously for a determined time according to the student's ability. Thus the muscles trained will experience an increase from the increase in load given every 2 weeks, besides that the plank exercises in this study use the weight of one's own body so that carrying out movements according to ability can be done optimally in line with the nature of strength and balance. Core stability plank exercise

Plank exercises have a fairly good tendency to influence the strength of the abdominal muscles which are centred on static exercises that are carried out continuously by maintaining the body in the same position by using the ability of muscle power in humans to contract to generate tension against a resistance according to the explanation (Pangemanan et al., 2012) muscle strength is the ability of muscles or muscle groups to do work by bearing the weight it lifts. The trained muscles will make daily work efficient. From this theory, it is known that there is a significant effect of Core Stability Plank exercises on abdominal muscle strength.

Plank exercises on balance influence one of the basic human needs to maintain the dynamics of body posture according to the explanation (Risangdiptya & Ambarwati, 2016) of balance as the ability to control the centre of body mass or centre of gravity against the fulcrum point by maintaining stability so as not to fall. Thus, this study will provide novelty to some pre-existing research, by adding variations to the core stability training method.

### **Exercise Group 1 (Elbow Plank)**

Based on the results of elbow plank exercises that have been carried out by group 1 (K1) samples, there is a significant increase in strength of 0.000 in the sense of a value of  $< 0.05$ . So, based on these data, it can be concluded that the provision of elbow plank treatment has a significant effect on abdominal muscle strength. The balance significance value is obtained at 0.000 in the sense of a  $<$  value of 0.05. So it can be concluded that

the treatment of the elbow plank group has a significant effect on balance.

Elbow Plank is a form of exercise variation of core stability which can have a significant influence on abdominal muscle strength. In providing a positive stimulus to improve balance, this elbow plank exercise is also scientifically proven to be quite significant. The exercise program applied in this exercise is not complicated and can be done using body weight, to get maximum results, it is necessary to control the perfection of the technique in doing elbow plank exercises so that the results of exercises that have been adjusted to the exercise program given can provide maximum results to increase abdominal muscle strength and balance. In the book compiled (Karter, 2005) plank exercises can support the quality of the upper muscles of the body, especially the shoulders, chest, neck and abdominal muscle strength, in addition to plank exercises that use focus as one of the techniques in the implementation of exercises that can support a person to improve the ability to balance the body. In the theory that has been discussed, eating can be known if the core stability plank exercise can have a significant influence on increasing abdominal muscle strength and balance.

Another study by (Cavaggioni et al., 2015) also shows the suitability that core stability plank exercise will have a good impact if the consistency of the exercise program is carried out seriously for 6 weeks will show a significant impact on abdominal muscle strength. Thus, it can be scientifically proven based on the data presented in this study that core stability plank exercises can contribute to maximizing abdominal muscle strength and balance. It is also corroborated based on previous studies that already exist and discuss the same problem.

### **Exercise Group 2 (High Plank)**

Based on the results of high plank exercises that have been carried out by group 1 (K1) samples, there is a significant increase in strength of 0.000 in the sense of < value of 0.05. So, based on these data, it can be concluded that the provision of high plank treatment has a significant effect on abdominal muscle strength. The significance value of the balance is obtained at 0.001 in the sense of a value of < 0.05. So it can be concluded that the treatment of the high plank group has a significant effect on balance.

High plank exercise data shows a significant effect on improving biomotor ability, abdominal muscle strength, and balance. The program applied in this exercise is not complicated and can be done using body weight, to get maximum results, it is necessary to control the perfection of the technique in doing high plank exercises so that the impact

of the exercise has been adjusted to the exercise program given can provide maximum results to increase abdominal muscle strength and balance. High plank exercise consistency is a form of core stability exercise that can be easily set to create a physical improvement exercise program supported by a proper exercise program this exercise can more specifically encourage the performance of abdominal muscles and forms of exercise that have activation of the 4-point technique will help a person to improve mastery of balance (Bolgia et al., 2018).

Another study conducted (Sannicandro, 2015) also explained the results of the impact analysis of core stability high plank exercises had a significant effect on forming abdominal muscles by 68.1% with exercise three times a week for two months.

Thus, according to several related scientific studies in this study, it can be scientifically proven that core stability exercises in high plank variations significantly affect abdominal muscle strength and also biomotor balance in students who take part in extracurricular badminton at SMAN 12 Surabaya.

### **Exercise Group 3 (Elbow Plank with legs open)**

Based on the data obtained based on the treatment given to group 3 (K3) of 0.000 in the sense of a value of  $< 0.05$ . So, the data can be concluded that the administration of elbow plank treatment with legs open has a significant effect on abdominal muscle strength. The significance value by the balance is obtained at 0.001 in the sense of a value of  $< 0.05$ . So it can be concluded that the treatment of the elbow plank group has a significant effect on balance.

The exercise program given to the elbow plank with legs open group showed scientific data on the significant effect on improving physical condition, abdominal muscle strength and balance. Treatment given for 8 weeks with meetings 3 times every week shows that the effective period of exercise can be seen to affect aspects of the physical condition of the K1 sample.

Exercises with plank variations are very necessary where conventional plank exercises are considered still lacking in providing an effect on improving balance (Snarr & Esco, 2014) elbow plank exercises with legs open can be more effective besides being an exercise for balance, this exercise can also play a role in strengthening the abdominal muscles. Another study that said the same thing (Lee et al., 2022) said that plank exercises carried out for 4 weeks of treatment on samples were found to be reduced saturated fat levels in the body, and there was an increase in muscle mass which

primarily worked during exercise, including abdominal muscle strength.

The study (Sifaq et al., 2020) used the same research concept design as this study, where the results of the study concluded that there was a significant increase in muscle strength related to plank exercises obtained based on pre-test and post-test. Thus the scientific data of this study can show a significant increase in abdominal muscle strength. Based on a theoretical study that corroborates the results of this study, shows that the biomotor aspect of balance is also significantly affected by the provision of core stability elbow plank with legs open exercise treatment regularly for 8 weeks.

### **Differences in Influence between groups (Elbow Plank, High Plank, Elbow Plank with legs open)**

It can be concluded based on data obtained from testing in Chapter iv that significantly the dependent variable is influenced by the provision of treatment, namely core stability elbow plank, high plank, and elbow plank with legs open. It can be concluded that core stability exercises are quite impressive given to students of SMAN 12 Surabaya who are members of badminton extracurriculars, these exercises are very suitable to be given as an alternative to improve abdominal muscle strength and balance. As stated by (Muladi, 2018) the provision of core stability exercises significantly affects abdominal muscle strength and dynamic balance. The study also explained that continuous exercise to meet the needs of abdominal muscle strengthening can be done using the core stability exercise method. Improving one's dynamic balance will increase after doing core stability training (Abdul Rozaq et al., 2022) it is necessary to provide this exercise to badminton extracurricular participants of SMAN 12 Surabaya considering that the evaluation value data shows that the balance results are still lacking. One of the other advantages of using plank exercises to improve balance and abdominal muscle performance is the practice of exercises that are easy to learn by students of SMAN 12 Surabaya. The variations given to the plank exercise method also make it easier for teachers and students to understand the correct technique (Penjakora et al., 2021). Because the three variables both have a significant influence, each student can choose one of the elbow plank, high plank, or elbow plank exercises with legs open. Students are facilitated by a variety of exercises that are influential when done seriously.

Research by (Puji Ratno et al., 2019) states that easy exercises to help increase muscle strength are plank exercises, with simple methods and variations. Some students will be able to adjust based on difficulty after trying to do variations of elbow plank, high

plank or elbow plank with legs open. It will be found which variety of exercises suits the student's ability, if the shoulder strength is felt strong, the student will be more optimal if using high plank exercises. Elbow plank with legs open variations are easier for students who have just tried plank exercises and can continue to try elbow plank exercise variations. The focus of several exercise methods will adjust to the motor work of the muscles (Pramita et al., 2023). By knowing the physiological aspects that are the main points, it can be done variations of exercises according to the needs of each muscle work. If each student already knows which variations of exercises are suitable and in demand, it can be done regularly to get the results of exercises to increase abdominal muscle strength and balance.

Data from the multivariate covariance test show scientific results that can be interpreted on differences between variables in providing increased abdominal muscle strength and balance which is influenced by several variables of core stability exercise. This evidence is due to the type of exercise independent variables that influence the choice of different variations of exercise. Although simultaneously the same can have an influence, the value given is not one hundred percent the same.

Elbow plank exercises have characteristics where the focus is on both elbows and the position of the legs is straight and tight, so it is different from the elbow plank exercise with legs open where there is a difference in the position of the legs that are opened shoulder-width apart but with the same fulcrum position using both elbows. The contraction obtained at the time of holding this position results in significant contractions in the abdominal muscles so that a more significant increase in abdominal muscle strength occurs.

Different characteristics are shown in variations of high plank exercises where the support uses hands that are positioned straight to support the body facing down although characteristics are compatible with variations of elbow plank exercises where the position of the legs remains straight and tight. A higher position and a smaller fulcrum cause this exercise to be more likely to significantly improve balance. When doing plank exercises, many muscles play a role in practice. It's just that the intensity and impact given to each muscle are different. The position of the technique of performing movements perfectly will provide space and flaws for the body to be able to feel relaxed, in heal – excel helps students' psychological concepts fight boredom during the exercise process.

## CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and discussion that has been discussed in the previous chapter, it will be concluded that there is a simultaneous influence of the three training methods given both elbow plank, high plank, and elbow plank with legs open. Based on the results of the analysis, it was found that the elbow plank with legs open exercise had the greatest influence among the training methods given to all samples. Increasing the strength of the abdominal muscles and also the balance of the high plank exercise also has an effect, but the significance is still below the elbow plank with legs open exercise. Based on the results of the research that has been done, it can be concluded that plank training can increase abdominal muscle strength and balance. Based on the conclusions above, several things can be recommended, namely as follows:

- a. Further research is needed on exercises that can improve abdominal muscle performance and balance by more specifically discussing each method of elbow plank, high plank, and elbow plank with legs open with different sample conditions.
- b. Trainers, who handle extracurricular students pay attention to the characteristics of students, so they are expected to sort out the suitability of the training methods given to students which will have an impact on the smooth running of activities.
- c. Increasing abdominal muscle strength must be improved, considering that in the current era, many young people make ideal bodies and attractive abdominal shapes able to add confidence to a person.
- d. Improving the balance aspect needs to be continuously trained for students and general people because almost all daily activities today require good balance from walking, cycling, cooking, and working in the office.

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