Comparison of the Effects of Trained and Untrained Futsal on Vital Signs

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***Abstract*—Futsal is a high-intensity sport that can affect changes in vital signs. The research aimed to find out the comparison of futsal effects on trained and untrained vital signs. There are five variables in this research: Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Body Temperature (T), Pulse Frequency (PF), and Respiratory Rate (RR). This research used a pre-experimental pretest-posttest design method with the training of futsal sports 2 x 20 minutes in 3 weeks. The location of the experiment was Litha Indoor Soccer Makassar. The number of samples was 20 respondents aged 18-25 years old, selected by purposive sampling. Data were analyzed by the Paired-Samples T-Test and Wilcoxon test with a significance level of p <0.05. The statistical analysis showed that the futsal affects the SBP, DBP, PF and RR of the trained group. In contrast, there is a significant influence of futsal on diastolic blood pressure, body temperature, and pulse frequency in the untrained group. The research concluded that there were no significant effects of vital signs on the trained group. At the same time, there were significant effects of crucial signs on the untrained group. Otherwise, there was no significant effect on SBP and RR. It means there is a comparison of futsal effects on trained and untrained vital signs in young adults. The changes in vital signs for unskilled are greater than for trained.**

Keywords*—*futsal, trained, untrained, vital signs

I. INTRODUCTION

Health is the fundamental right of every human being. Therefore, in maintaining health, it is essential to attend to several factors that can support health conditions. In monitoring body functions and determining a person's health condition, it is necessary to have a statistical examination or measurement. The statistical analysis that familiar with is the measurement of vital signs. Several measures of vital signs or basic signs include blood pressure, pulse, breathing frequency, and body temperature [1].

Exercise affects changes in vital signs. When exercising slowly, systolic blood pressure can rise to 150-200 mmHg from systolic pressure at the rest of 110-120 mmHg. As soon as the exercise is finished, your blood pressure will drop below normal and last for 30 - 120 minutes. This decreasing blood pressure occurs because blood vessels experience widening and relaxation [2]. The results of the study found an aerobic exercise carried out for 2 x 30 minutes can increase the frequency of activity, blood pressure, blood lactic acid, body temperature, and pulse rate [3].

Likewise, the frequency of pulses increases synergistically with increasing exercise intensity. The previous study revealed the effect of physical exercise on pulse frequency and found that the more the power of the exercise increases, the more frequency of the exercise pulse increases [4].

The pulse rate is a picture of the palpable heart rate at arteries located under the skin, such as the wrist and neck. Heart rate is caused by the contraction of the heart muscle when it pumps blood [5]. The resting pulse rate in adults is 60-80 minutes per minute, and the mean resting pulse for boys aged 21-28 years is 73 beats per minute. The increased frequency of the resting pulse is caused because, during exercise, the need for blood to transport O_2 to active body tissue will increase. Besides the acute effects, exercise also has a chronic impact in the form of a decrease in the frequency of resting pulses [6].

In physical or strenuous exercise, oxygen consumption and carbon dioxide formation can increase up to 20 times. If one starts to practice, a significant increase in total ventilation begins immediately after physical exercise, before all the blood chemicals have time to change. Most of the increase in breathing is likely caused by neurogenic signals transmitted directly into the respiratory center of the brain stem at the same time, together with signs directed to the muscles of the body to cause muscle contractions [7].

Respiratory frequency means counting the respiratory frequency and inspiration followed by expiration within one minute. Humans breathe about 6 liters (6x10-3m3) of air to get a fresh supply of oxygen (O_2) into the lungs and expel carbon dioxide (CO_2). When breathing, humans breathe air through the nose. The air that is inhaled contains oxygen and other gases. First, the air enters the throat, then into the lungs. Then the air flows to the alveoli, the end of the respiratory channel [8].

An average respiratory volume of 500 ml/breath and respiratory rate of 12 times/minute [9]. Commonly, the process of breathing occurs automatically and without effort. The method of inspiration in healthy adults lasts for 1-1.5 seconds, and the process of expiration lasts for 2-3 seconds [10]. The results of research on respiratory frequency during physical exercise concluded that respiratory rate responds quickly to variations in workload during high-intensity interval training with potentially important implications for sports activities.

Besides that, the core temperature will also increase during exercise due to muscle heat production. Previous studies revealed relative humidity's effect on exercise body temperature changes [11], [12]. The sustained increase in body heat can be caused by prolonged physical exercise in a room with high humidity. Decreased body fluids can cause increased body temperature due to excessive sweating.

Sports are generally beneficial for maintaining and increasing mobility and independence of movement (healthy dynamic) to hold and increase independence in human bio-psycho-sociologic life. In addition, exercise prevents, impedes travel, and relieves the symptoms of non-infectious diseases, including curing physical weakness and controlling weight, regulating diet, increasing morale, and quality of sleep.

Futsal has become one of the most popular sports branches in the game and is in high demand by various circles of the world. Futsal is a sport that uses highly physical techniques and tactics on the players. Futsal has the same period as basketball at 2x 20 minutes and is played on a 40 x 20 m field with 3 x 2 m wickets [13]. Futsal can be one of the sports that can improve the body's physiological functions in efforts to maintain health, fitness, heart quality, and components of the lungs, agility, speed, and strength [14].

One of the causes of sudden death in athletes is the immediate cessation of heart work. The incident was triggered by high-intensity exercise carried out for a long time. Cases of people dying suddenly after exercising, especially playing futsal, have occurred several times. In fact, in plain view, the person looks healthy.

Based on these assumptions, then this research was conducted to know the extent to which futsal can affect changes in vital signs. The purpose of this study was to examine the comparison of futsal effects on trained and untrained vital signs.

II. MATERIAL AND METHOD

a. Design of Research

This type of research is an observational analytic study with a pretest-posttest design on a pre-experimental research plan by giving a pretest (initial observation) before being given an intervention, then given a response, then a posttest (final inspection) in the trained and untrained groups.

b. Subject of Research

The number of samples was 20 respondents selected by purposive sampling with inclusion criteria: male gender aged 18-25 years old, adult in good health (no flu, coughing, and fever), whereas exclusion criteria: not following the futsal competition session until the set time. Then they divided into trained and untrained groups.

c. Data Collection Location

The vital signs of the pretest and posttest futsal intervention were measured in the Makassar Litha Indoor Soccer field.

d. Data Collection

The research began by preparing the examining team under expertise. Furthermore, the researcher develops the measuring tools (mercury thermometers, clocks, sphygmomanometers, and stethoscopes) and determining the time and place allocation of futsal for conducting experiments. Research subjects are people who are willing to participate in research. Next, the researcher assigned the subjects to the trained and untrained groups. In the first week, the researcher conducted a pretest to measure vital signs (blood pressure, body temperature, pulse, and breathing frequency) in the trained and untrained groups. Then there will be 2x20 minutes of futsal sports intervention in the two groups for three consecutive weeks (1x / week). Until the set time, each group will be given a posttest after 30 minutes of futsal sports intervention (week 3) to see the changes in both vital signs.

e. Data Analysis

Data analysis used SPSS 22.0 to determine the data's normality and compare of futsal effects on trained and untrained vital signs.

III. RESULT AND DISCUSSION

This study was conducted for approximately two months. The respondents were 20 young male adults with an age range of 18-25 years. Before the intervention, the respondent's vital signs were checked (blood pressure, body temperature, pulse frequency, and respiratory rate). Likewise, 30 minutes after the intervention was completed, vital signs were examined (blood pressure, body temperature, pulse frequency, and respiratory rate). The respondent table can be seen in table 1.

Table 1. Respondent Characteristics

Group	**Age of Respondent (years)**					
	18	19	20	21	22	23
Trained	2	2	3	1	1	1
Untrained	3	1	2	2	1	1

The results of the Systolic Blood Pressure (SBP) measurements in both groups are presented in Figure 1

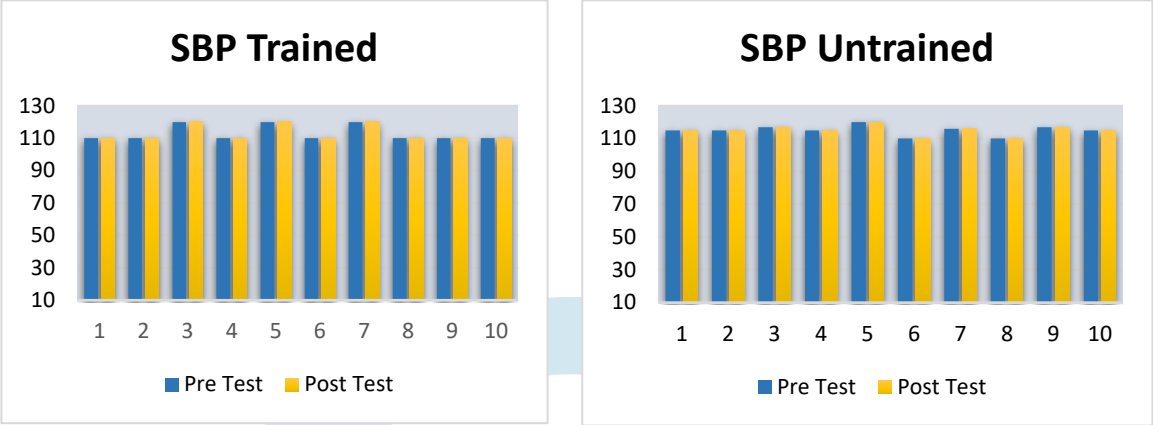

Figure 1. Variation of Systoloc Blood Pressure pada kedua kelompok eksperimen

Table 2 shows the effect of futsal on changes in systolic blood pressure. Based on the result of the normality test, shows that the data are not normally distributed. The nonparametric test was then performed using Wilcoxon analysis, as shown in the following table:

Table 2. Futsal Effect on the Change of Systolic Blood Pressure (SBP)

Group	n	Median		P-Value*
		Pretest	Posttest	
Trained	10	110	110	0.565
Untrained	10	115	115	0.366

P Value* = *Wilcoxon* test result

The mean value of systole blood pressure in the trained group in measurements before the futsal intervention showed a value of 110 mmHg, and measures after the futsal intervention showed a value of 110 mmHg. Furthermore, the statistical test using the Wilcoxon Test for this group obtained a value of 0.565 or p value> 0.05. The result shows no significant effect of systole blood pressure in the trained group before and after futsal intervention.

In the untrained group, the median systole blood pressure obtained at the initial measurement showed a value of 115 mmHg. For the next measure, it showed a value of 115 mmHg. Further, the statistical test using the Wilcoxon test for this group obtained a value of 0.366 or p> 0.05. This result indicates that there is a significant influence on systolic blood pressure in the untrained group.

The results of the Diastolic Blood Pressure (DBP) measurement in both groups are presented in Figure 2.

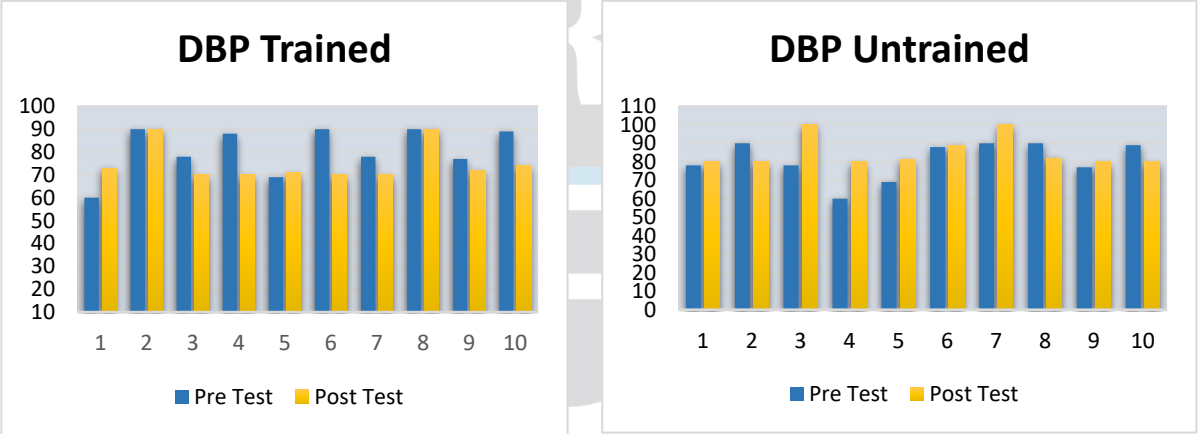

Figure 2. Variation of Diastoloc Blood Pressure in the two experimental groups

Table 3 shows the influence of futsal on changes in diastolic blood pressure. Based on the results of the normality test, it shows that the data are not normally distributed. The nonparametric test was then performed using Wilcoxon analysis, as shown in the following table:

Table 3. The Effect of Futsal on Changes in Diastolic Blood Pressure (DBP)

Group	n	Median		P-Value*
		Pretest	Posttest	
Trained	10	80	75	0.527
Untrained	10	80	85	0.020

P Value* = *Wilcoxon* test result

The mean value of diastolic blood pressure in the trained group on measurements before the futsal intervention showed a value of 80 mmHg and after the futsal intervention showed a value of 75 mmHg. Furthermore, the statistical test using the Wilcoxon Test for this group obtained a value of 0.527 or p value> 0.05. This result shows that there is no significant effect of diastolic blood pressure before and after futsal intervention in the trained group.

From the untrained group, the median diastole blood pressure at the initial measurement showed a value of 80 mmHg, and for the next analysis, it showed a value of 85 mmHg. Furthermore, the statistical test using the Wilcoxon test for this group obtained a value of 0.020 or p-value <0.05. This result indicates that there is a significant influence on diastolic blood pressure in the untrained group, as shown in Figure 2 below:

The third parameter is temperature measurement. The results of temperature measurement (T) are presented in Figure 3.

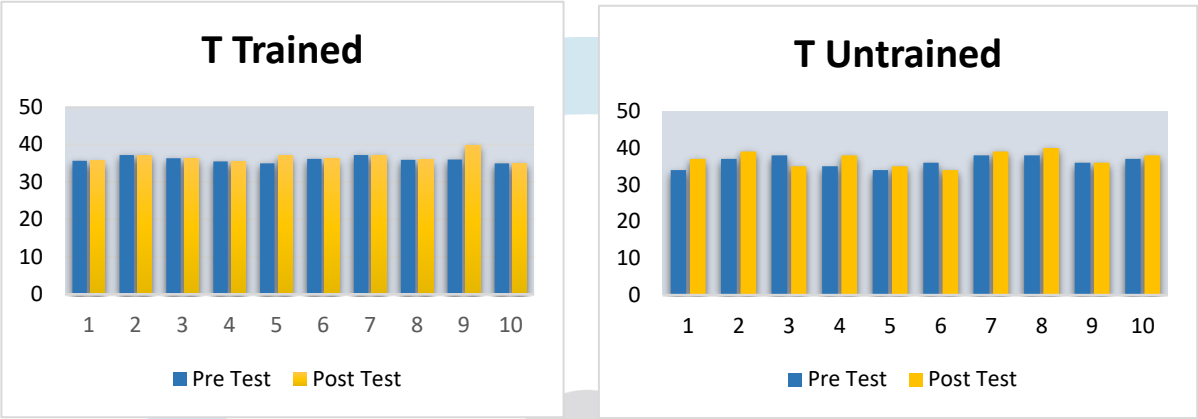

Figure 3. Variation of Temperature (T) in the Two Experimental Groups

Table 4 shows the influence of futsal on changes in body temperature. Based on the results of the normality test, shows that the data in the trained group is not normally distributed. The nonparametric test was then performed using Wilcoxon analysis, as shown in the following table:

Table 4. The Effect of Futsal on Changes in Body Temperature (T)

Group	n	Median		P Value*
		Pretest	Posttest	
Trained	10	36.3	37	0.050a
Untrained	10	36.35	37.1	0.001b

P Values = *Wilcoxon* test result, pb = *Paired-Samples T Test* test result

The median body temperature in the trained group before the measurements of the futsal intervention showed a value of 36,3oC and after the futsal intervention showed a value of 37 oC. Furthermore, the statistical test using the Wilcoxon Test for this group obtained a value of 0.050 or p = 0.05. This shows no significant effect on body temperature before and after futsal intervention in the trained group.

In the untrained group, the median body temperature at the initial measurement showed a value of 36,35 oC and for the next measure, it showed a value of 37,1 oC. Furthermore, the statistical test using the Paired Samples T Test for this group obtained a value of 0.001 or a value of p <0.05.

The Pulse Frequency (PF) measurement results on twenty subjects resulted in the variations presented in Figure 4.

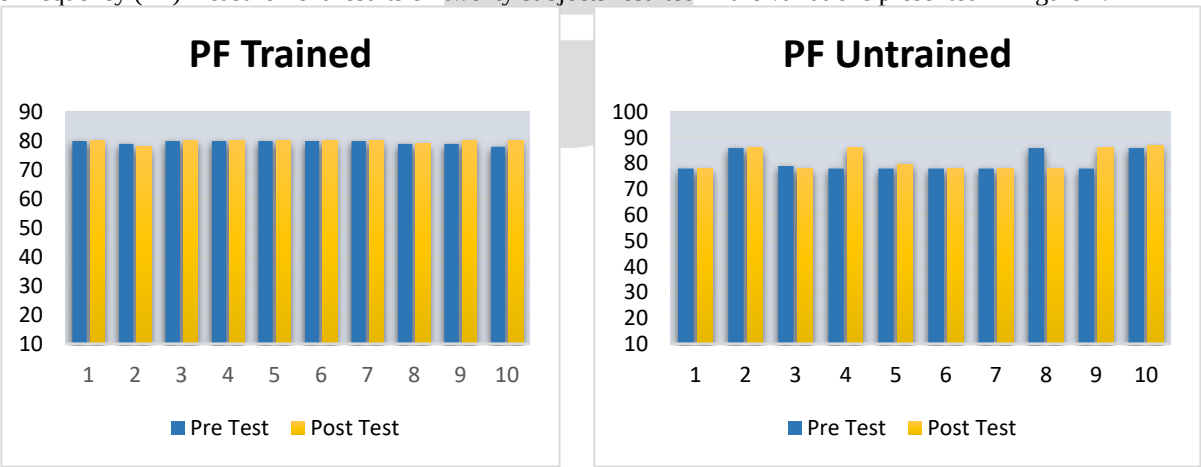

Figure 4. Pulse Frequency (PF) Variation in the two groups

Based on the results of the normality test, the results show that the data in the trained and untrained groups are normally distributed, then the comparison means test is performed using the Paired Samples T-Test, as shown in the following table:

Table 5. The Effect of Futsal on Changes in Pulse Frequency (PF)

Group	n	Average (Std. Deviation)		Gap (Std.Deviasi)	IK95%	P-Value*
		Pretest	Posttest			
Trained	10	79.40 (6.61)	78.80 (5.88)	0.60 (7.39)	5.89 – 4.69	0.803
Untrained	10	78.60 (6.53)	86 (6.18)	7.40 (8.64)	1.21 – 13.58	0.024

Explanation: p-value* = *Paired-Samples T Test* test result

The mean value of the pulse frequency in the trained group in measurements before the futsal intervention showed a value of 79.40x / min (std. Deviation 6.61) and after the futsal intervention showed a value of 78.80x / min (std. deviation 5.88). Furthermore, the statistical test using the Paired Samples T-Test for this group obtained a value of 0.803 (p> 0.05) with a difference of 0.60 standard deviations of 7.39 (IK95% 5.89 to -4.69). This shows no significant effect on the frequency of pulse before and after futsal intervention in the trained group.

In the untrained group, the mean value of the pulse frequency at the initial measurement showed a value of 78.60x / min (std. Deviation 6.53) and for the subsequent measurements showed a value of 86x / min (std. Deviation 6.18). Furthermore, the statistical test using the Paired Samples T-Test for this group obtained a value of 0.024 (p <0.05) with a difference of 7.40 standard deviations of 8.64 (IK95% 1.21 to 13.58).

The last variable is the respiratory rate (RR), with variations in measurement results presented in Figure 5.

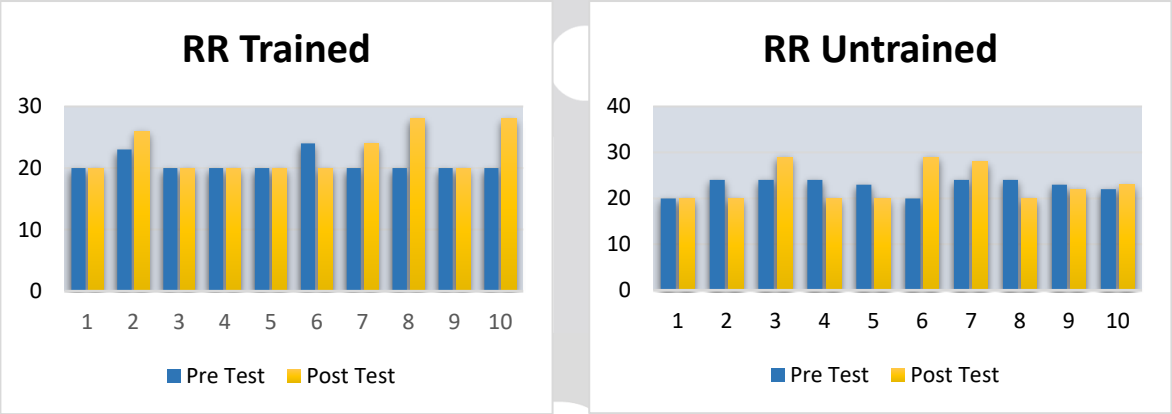

Figure 5. Respiratory Rate (RR) Variation in the Two Groups

Table 6 shows the influence of futsal on changes in respiratory frequency. Based on the results of the normality test, shows that the data are not normally distributed. The nonparametric test is then performed using Wilcoxon analysis, as shown in the following table:

Table 6. The Effect of Futsal Sports on Changes in Respiratory Rate (RR)

Group	n	Median		P-Value*
		Pretest	Posttest	
Trained	10	20.5	22	0.103
Untrained	10	22	22	0.526

P Value* = *Wilcoxon* test result

The mean respiratory frequency in the trained group in the measurement before the futsal intervention showed a value of 20.5x / minute, and measures after the futsal intervention showed a value of 22x / minute. Furthermore, the statistical test using the Wilcoxon Test for this group obtained a value of 0.103 or a value of p> 0.05. The result shows no significant effect on the frequency of pulse before and after futsal intervention in the trained group.

In the untrained group, the median respiratory frequency was obtained at the initial measurement showing a value of 22x / minute and for subsequent measurements showing a value of 22x / minute. Furthermore, the statistical test using the Wilcoxon test for this group obtained a value of 0.526 or p value> 0.05. This result indicates no significant effect on respiratory frequency in the untrained group.

This research aimed to find out the comparison of futsal effects on trained and untrained vital signs. Futsal interventions were carried out three times for three consecutive weeks (1x / week). Also, two groups were measured by pretest and posttest for the changes in their vital signs, namely the trained group (regularly playing futsal every week) and the untrained group (never or rarely playing futsal), each of which was given an intervention.

Changes in systole and diastolic blood pressure in the trained group before and after futsal intervention was decreased compared to the untrained group which tended to be more elevated. As seen in graphs 1 and 2 shows that there was a decrease in systole and

diastolic blood pressure in the trained group and an increase in systole and diastolic blood pressure in the untrained group. What happened in the field shows that it turns out that people who are trained or regularly exercise have a high level of stamina, are not easily tired. The movements in the game are also fast and energized, in contrast to untrained groups who are very tired, the movement of the game is slow and less energetic in completing futsal during 2x20 minutes.

Physical activity in the form of futsal exercise routinely in the trained group is done every week causing a chronic response, so physiologically the body has adapted. Where the heart compensates by increasing its size therefore, the heart's contractions did not increase because there was already a lot of blood supply that was accommodated and ready to carry O_2 from the lungs throughout the body to meet energy needs. Whereas in the untrained group, the body's acute response to physical activity stimulus in the form of futsal has never been done. As a result physiologically, there are several systems in the body responding to the stimulus with the aim of homeostasis. One of which is the cardiovascular system The nervous system also plays a role in this response, the higher the intensity of exercise the body needs the more energy, then with the help of the sympathetic nervous system which then results in increased heart contractions so that blood pressure will increase.

The analysis is consistent with Baker et al. that the chronic effects of exercise cause an increase in heart size, especially the left ventricle, increase blood supply, normalize blood pressure and improve blood distribution [15]. So, when there is a stimulus in the form of exercise, there will be no increase in blood pressure. Regular training and following the rules can produce (adaptation) that supports the achievement of these strengths. Exercise stimulates the contraction of large muscle groups, thus causing large acute responses/changes in the cardiovascular system.

Changes in body temperature in the trained group before and after the intervention increased. Still, the untrained group tended to improve more. The graph shows an increase in body temperature in both groups, but more in the untrained group. The changes because when the skeletal muscle is active with a sufficiently long duration of 2x20 minutes for futsal, the result of muscle contraction will increase the basal metabolic rate so that heat will be produced. Also, the incident on the field showed that both groups experienced excessive sweating, causing the clothes to be worn wet and also thirsty even though the weather was training at that time.

Increased body temperature is influenced by exercise due to decreased body fluids due to excessive sweating. [3]. Also, most of the energy during activity is converted to heat. Apart from exercise, the air's relative humidity also influences body temperature changes. The results of the research conducted found that there is a positive relationship between the relative humidity of the air with body temperature during physical exercise.

Changes in pulse frequency in the trained group before and after the intervention decreased compared to the untrained group, which tended to increase. As can be seen in graph 4, it shows that there is a decrease in the pulse frequency in the trained group and an increase in the pulse frequency in the untrained group. The change is due to the chronic response that occurs in the trained group. While the acute response that occurs in the untrained group. Changes in pulse frequency synergize with changes in blood pressure, and if an increase in blood pressure occurs, the pulse frequency will also increase and vice versa.

In the trained group, there was a clear decrease in pulse frequency. It synergy with a reduction of systole and diastolic blood pressure. In the untrained group, increased pulse frequency synergizes with increased systole and diastolic blood pressure. It is undeniable that the pulse frequency is a picture of heart rate contraction, which is why the change in pulse frequency synergizes with changes in blood pressure.

Heart rate is produced due to heart muscle contraction when pumping blood [16]. Sandi in his research also said that physical exercise carried out regularly and continuously for a long period. There will be a decrease in the frequency of resting pulse rate, so that when there is a stimulus in the form of exercise it will not increase the frequency of the pulse. [3]

Changes in respiratory frequency in the trained and untrained groups before and after the intervention increased. As can be seen in graph 5, it shows that there is an increase in respiratory frequency in the trained group, but more in the untrained group. The increase is due to the chronic response experienced by the trained group and the acute response experienced by the untrained group. What happened in the field shows that it turns out that the trained group in taking breaths appears to be regular and deep, whereas in the untrained group it appears fast in breathing and is short so that the breathing frequency in the untrained group increases more.

In theory regular aerobic exercise exercises improve VO_2 max by making the heart and respiratory system more efficient thereof, the distribution of O_2 to the muscles becomes better [9]. When starting to exercise, active muscle cells use more oxygen to support the increased energy needs of these muscles [17].

IV. CONCLUSION

Based on the result of the study and discussion, it can be concluded that there is a comparison of futsal effects on trained and untrained to vital signs in young adults. The changes of vital signs in untrained respondents are higher than trained.

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