



Training Programs for Reducing Body Circumference of Patients with Obesity

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ABSTRACT

Obesity is a disease with a significant increasing prevalence that affects body circumference and becomes an indicator of health measurement. Exercise programs need to be given to determine the effectiveness of the program on the changes in body circumference of patients with obesity status, such as PIR Fit Journey which applies High Intensity Interval Training exercise with 2-month duration. The research method used quantitative approach with pre-experimental one group pre-test post-test design. Subjects were employees of Pertamina International Refinery with adiposity. The total samples were 11 samples taken from 63 population. The main characteristics included body weight exceeding 70kg for men and women. The subjects were selected using purposive sampling technique. The data obtained included age, gender, upper arm, waist, and thigh circumference measured using a body meter. The data analysis test used in the study was a non-parametric test because the subject $n < 30$. The appropriate non-parametric test is the Wilcoxon paired test because the pre-test and post-test data were from the same subject. The results showed the effectiveness of the exercise program with significant changes. The upper arm circumference was 39.27 ± 10.77 for pre-test data and $32.64 \pm 2.96 \Delta -6.64$ $p < .05$ for post-test data. The waist circumference was 106.44 ± 11.39 for pre-test data and $96.36 \pm 9.10 \Delta -10.08$ $p < .05$ for post test data. However, the data were not significant in thigh circumference. The pre-test result was 52.63 ± 13.72 and the post-test result was $56.60 \pm 7.46 \Delta +3.98$ $p > .05$. It concludes that PIR Fit Journey program was effective in reducing upper arm and waist circumference, but there was no significant change in thigh circumference of the subjects.

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INTRODUCTION

In the modern era, the prevalence of obesity has drastically increased worldwide among the youths and older people. Obesity is a global non-communicable disease caused by excessive fat accumulation, which increases the risk of health problems (Agung et al., 2020; Cleven et al., 2020). A lack of physical activity is also a major factor contributing to the rise in obesity cases (Buechler et al. 2019; Kuswari et al. 2022; Lontoh et al. 2024). Obesity harms both personal health and the economy. Data from 2013 and 2018 show that obesity rates in Indonesia are increasing. This highlights the need for actions to reduce obesity in the country (Avisa et al., 2020). The obesity rate is rising globally, not only in Indonesia, with each passing decade. Pertamina International Refinery (PIR) is one of the leading energy companies facing similar challenges. It also has employees with obese status, thus it is necessary to provide treatments to reduce the obesity.

Individuals with obesity tend to have larger body measurements compared to those with normal weight, particularly in specific areas such as the upper arm, waist, and thighs (Avisa et al. 2021; Nurul Adha et al. 2019; Ross et al. 2020; Septiyanti and Seniwati 2020). Body measurements can help assess a person nutrition and health status. A study found a strong link between waist size and Body Mass Index (BMI) in both men and woman (Lawira et al., 2021). BMI can serve as a sign of nutritional factors, with lack of physical activity and poor diet potentially leading to obesity or being overweight (Beleigoli et al. 2019; Stikes, Medika, and Masyarakat 2021).

The subjects were joining the program called Pertamina International Refinery Fit Journey (PIR Fit Journey) program developed by Eminence Main Clinic in Jakarta with the team named Corporate Wellness Program (CWP). This initiative aimed to address obesity issues among employees at Pertamina International Refinery. This PIR Fit Journey incorporated various physical activities, including aerobic, anaerobic, calisthenics, and High Intensity Interval Training (HIIT) exercises.

Aerobic exercise is a type of workout that raises heart rates and helps the body use more oxygen to get energy. Previous studies have shown that doing this exercise at low intensity for long periods of time can help with weight loss (Putu and Dharma Hita 2020). A simple aerobic movement method, which is performed regularly every day, will also affect body weight (Fepriyanto, Helaprahara, and Rasyid 2019; Jia and Li 2020). Through aerobic exercises, the body metabolism will work and manage the breakdown of fat used as an energy source, that leads to muscle adaptation in the body (Martinez-Canton et al. 2021; Muscella et al. 2020). The design of this program was not only fixated on one type of exercise. PIR Fit Journey also added the anaerobic exercise as an option to implement the compiled program. Calisthenics is a type of exercise that does not need much equipment. Studies from Stellar Powerhouse shows that using calisthenics in workout programs can help with losing weight and improving overall health (Roifah and Jatmiko, 2021)

Participating in High Intensity Interval Training (HIIT) can significantly boost overall fitness levels and lead to noticeable changes in the body composition. This type of exercise not only helps build muscle and increase strength but also effectively reduce the percentage of body fat. By consistently incorporating high-intensity workouts into routines, a leaner and more toned physique can be achieved while improving the cardiovascular health and physical endurance (Khodadadi et al. 2023; Viana et al. 2019).

These exercises help with losing weight and improving fitness, which can reduce obesity (Oroh, Wungow, and Engka 2021). Being physically fit is the key to prevent and manage obesity. A regular exercise speeds up metabolism, helps reduce body fat, and improves body shape (Jeong and Chun 2021). Studies have shown that exercise programs could help with weight loss and body shape improvement. Similarly, hypnotherapy has been found to help obese teenagers lose weight, showing a strong link between hypnotherapy and weight loss (Rini, Hardika, and Suryani 2020). Research by Jean-Michel Oppert and his team showed that obese patients should do moderate to high-intensity exercise to lose weight. The goals include reducing fat, keeping lean muscle, and improving muscle fitness (Kramer et al. 2023; Oppert et al. 2021).

The PIR Fit Journey program used a combination of different physical exercises and balanced nutrition that had been designed and become a mandatory program for Pertamina International Refinery employees with obesity. The purpose of this study was to determine the effectiveness of the physical exercise program from the Corporate Wellness Program (CWP) team on changing body circumferences, including upper arm, waist, and thigh circumferences. Nutritional control was also provided by an outside nutritionist. The program was implemented through the PIR Fit Journey, which provided a uniform exercise program for 11 employees.

METHODS

The research used the quantitative method with pre-experimental one group pre-test post-test design. The study included employees from Pertamina International Refinery. The population was 63 assessed employees, while the samples were 11 employees with obesity. They followed a muscle strength training program for two months. The program was named PIR Fit Journey (Pertamina International Refinery Fit Journey) developed by Eminence Clinic Center in Jakarta with the good team called CWP (Corporate Wellness Program).

Participants

Table 1 shows that the samples of this study had a minimum age of 27 year old and a maximum age of 51 year old with the mean of $38,27 \pm 8,15$. The lowest weight of the subjects was 75.3 kg and the highest was 129.8 kg with the mean of $89,12 \pm 17,5$. Furthermore, the samples of the study involved 11 subjects from Pertamina International Refinery employees, consisting of 5 females and 6 males.

Table 1. Characteristics Data of the Samples

Variable		Average \pm SD
Age (y.o)		38,3 \pm 8,15
Body Weight (kg)		89,12 \pm 17,5
Gender	Male	6/11
	Female	5/11

Sampling Procedures

The samples were selected from a population consisting of 63 employees by taking body weight measurements. A total of 11 respondents with obesity, having weight between 75.3kg – 129.8kg, were selected as samples of this study.

Materials and Apparatus

Body measurements were conducted by using Sakura Body Circumference measuring tape, in centimeters, provided by Eminence Main Clinic Jakarta. The measurement was carried out

by wrapping the measuring tape around the upper arms, waist, and thighs. The recorded measurement was taken at the point where the tape intersected with 0 mark.

The PIR Fit Journey program followed the FIIT (Frequency, Intensity, Time, Type) training model. The core training was conducted three times a week with the intensity set at 65%-85% of maximum heart rate and the duration of 60 minutes for each session, which would increase according to the progress and have additional exercise programs on other days due to the progressive overload principle. This approach focused on building strength, endurance, speed, and flexibility to improve motor skills. Table 2 shows the schedule of the training program carried out by the subjects simultaneously.

Table 2. Training Programs

Frequency	Intensity	Time	Type
Monday	Light	Walk 10000 steps	Aerobic training
Thursday	Medium	Warm up (15 minutes) Dynamic stretch (5 minutes) Compound movement (25 minutes) Core (10 minutes) Asis static stretch (5 minutes)	Aerobic, Anaerobic, and Calisthenics trainings
Wednesday	Light	Walk 10000 steps	Aerobic training
Tuesday	High	Warm up (15 minutes) Dynamic stretch (5 minutes) HIIT (30 minutes) Asis static otoric (5 minutes)	HIIT (High Intensity Interval Training)
Friday	Medium	Warm up (15 minutes) Dynamic stretch (6 minutes) Compound movement (25 minutes) Core (10 minutes) Asis static stretch (5 minutes)	Aerobic, Anaerobic, and Calisthenics trainings
Saturday	Medium	Workout (60 minutes) Stretching (10 minutes) Core (15 minutes) Compound movement (25 minutes) Static stretch assist (5 minutes)	Anaerobic and Calisthenics trainings
Sunday	Light	Walk 10000 steps	Aerobic training

Data Analysis

The research method used the quantitative approach with pre-experimental one group pre-test post-test design. The normality test, using the Shapiro-Wilk test, showed that the data were normally distributed since the result was greater than 0.05, leading to the use of non-parametric methods. To compare the measurement results before and after the program for the same people, the Wilcoxon Paired Test was performed.

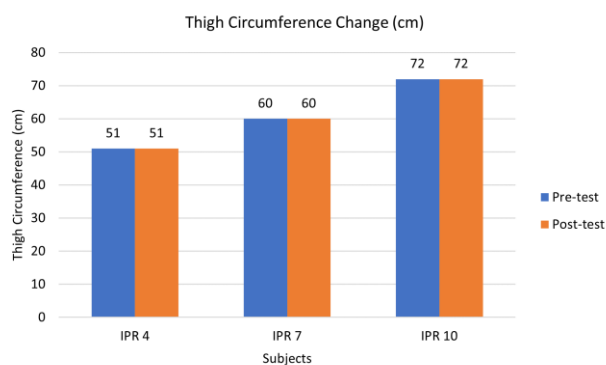
RESULTS

The results of this research were obtained after the samples consistently followed the exercise program, namely the PIR Fit Journey.

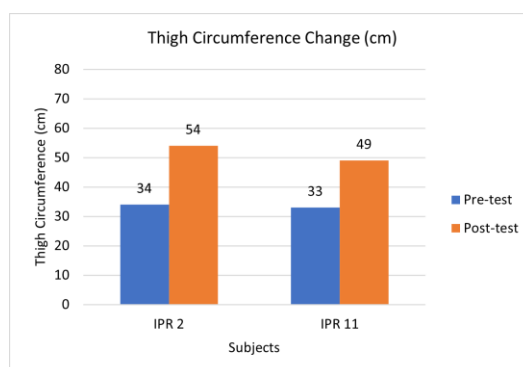
Table 3. Body Circumferences

Variable	Pre-test	Post-test	Δ
Upper Arm (cm)	39,27 \pm 10,77	32,64 \pm 2,96	-6,64
Waist (cm)	106,44 \pm 11,39	96,36 \pm 9,10	-10,08
Thigh (cm)	52,63 \pm 13,72	56,60 \pm 7,46	+3,98

Table 3 shows that there were significant changes in upper arm circumference, with pre-test data of 39,27 \pm 10,77 and post-test data of 32,64 \pm 2,96 Δ -6,64 $p < ,05$, and in waist circumference, with pre-test data of 106,44 \pm 11,39 and post-test data of 96,36 \pm 9,10 Δ -10,08 $p < ,05$. It is evident that the training program was successful in reducing upper arm and waist circumferences. However, there was no significant change in thigh circumference, with pre-test data of 52,63 \pm 13,72 and post-test data of 56,60 \pm 7,46 Δ +3,98 $p > ,05$. Table 3 shows that the change in thigh circumference was not significant with $p > ,05 = p .674$. The insignificant value of thigh circumference change might be influenced by 5 out of 11 subjects undergoing the program. The measurement of thigh circumference was carried out routinely, but some factors might influence the change in thigh circumference, which actually increased. The measurement results of thigh circumference are shown in Graphic 1 and Graphic 2. In this study, the subjects were named with initials that corresponded to their company, namely PIR (Pertamina International Refinery) from PIR 1 to PIR 11.



Graphic 1. Subjects with the Same Result



Graphic 2. Subjects with Increased Result

DISCUSSION

Corporate Wellness Program (CWP) is an exercise program provided to employees of Pertamina International Refinery. The goal is to help reduce body size, such as the size of the upper arms and other body parts. By providing exercise programs with different types of exercise emphasizing High Intensity Interval Training (HIIT) and nutritional programs designed by outside nutritionist, changes could occur due to various factors, both internal and external factors.

In physical training sessions, muscle strength was built by gradually increasing weights, especially for the upper arm muscles. Research had shown that this type of weight training could improve athlete performance in competitions. Weight training greatly boosts muscle strength, endurance, and speed, which can be measured by using handgrip strength test (Adi, Arbanisa, and Winoto 2023; Nasrulloh et al. 2022). Muscle training is necessary for everyone, not only athletes but even the elderly. Older adults can build muscle more effectively by doing resistance training and gradually increasing the number of sets and repetitions (Barakat et al. 2020; Gunawan and Saparia 2023).

Previous research (Wati and Jaenudin 2021) showed that doing high-intensity exercise could help muscles grow, but it is important to also get enough rest and proper nutrition to help the muscles recover and repair. In this study, the upper arm circumference of the subjects decreased slightly after the exercise program. This small change is because muscle growth happens gradually over time with consistent exercise. To reduce obesity, it is important to have good nutrition intakes along with exercise. Previous studies found that high-intensity workouts combined with nutritional advice could effectively improve diet and lower body fat (Gifari et al., 2021). Research in Ethiopia found that measuring the size of the upper arm (Mid-Upper Arm Circumference or MUAC) could be good alternative for checking obesity, as it is as accurate as using the BMI Z-score (Sisay et al. 2020)

The size of upper arm can be a good way to check a person fitness and health, especially for estimating their physical conditions. Research involving employees of Pertamina International Refinery showed that the exercise program worked well. Since intense trainings can cause muscles to grow, the PIR Fit Journey Program and CWP team also ensured that employees get enough nutrition to avoid muscle damage. High-intensity training works well for adults too. This study found that participants saw a decrease in the size of their upper arms.

In the High Intensity Interval Training (HIIT) program, some exercises involve repeated movements that use several muscles at once, working both the upper and lower body. Compound movements help improve various physical skills, boost endurance, and strengthen the heart and lungs (Hurst, Weston, and Weston 2019). Previous studies involving students from the 2019 class of the Faculty of Medicine, Islamic University of Bandung, showed how physical activity affected waist size. Researchers used waist circumference to help determine obesity status. Adding more physical exercises to a person routine will help reduce their waist size (Riza Nugraha et al, 2023).

Regular HIIT sessions can lower waist size, which indicates a reduction in harmful fat around the organs. This was demonstrated in a study with 44 obese participants (D'Amuri et al. 2021). HIIT improves heart and lung fitness, no matter a person body composition is, as long as they stick to the training program and not fall back into old habits. The continuity of the usual lifestyle might affect the effectivity of the program (Bruseghini et al. 2020; Jayo-Montoya et al. 2024). HIIT, which includes different exercises such as Compound Movements

that work both upper and lower body, can help with weight loss and significantly reduce waist size (Aprianto et al. 2020; Armstrong et al. 2022).

This study showed no significant change in thigh size among participants. This could be because metabolism of each individual is different and how well someone responds to the exercise varies (Lawson et al. 2021; Roberts, Law, and Thom 2019). Both personal factors, such as individual health and fitness levels, and environmental conditions, such as the availability of exercise facilities or support from others, can impact how well exercise changes thigh size.

The HIIT training program boosts strength and muscle size in the dominant leg (Caparrós-Manosalva et al. 2023). Although there are variations in strength responses at the start between different groups, these variations do not affect the overall results. In some research studies, the treatment did not result in any significant changes for the sample subjects. This means that despite the treatment being applied, the effects were not noticeable or impactful for those participants.

The exercise program in this study included aerobic exercise, such as running, swimming, or cycling. Previous research found that doing aerobic exercise could help lower obesity rates, meaning that including such exercise in the program could be effective in reducing obesity (Brellenthin et al. 2021). The training program included both aerobic exercises (such as running) and anaerobic exercise (such as weightlifting). Anaerobic exercises help improve and build muscle strength and affect how muscles respond to the workout (Evangelista et al. 2021; Hargreaves and Spriet 2020; Pratama and Olahraga 2023). Weight training is a type of anaerobic exercise. Studies found that moving slowly while doing weight training could help increase muscle growth in the thighs (Sial et al. 2024.; Vadivel and Maniazhagu 2022; Wellis 2019).

Providing an exercise program to reduce body size does not always result in a real reduction in thigh size. In this study, some participants actually got larger thigh sizes even though they participated in the PIR Fit Journey. How an individual body process energy and their exercise program can affect muscle growth. This could be the reason why there was no significant change in thigh size.

The research found that the PIR Fit Journey training effectively reduced the size of the upper arm and waist circumferences. However, it did not have a noticeable effect on thigh circumference size because some participants did not see any reduction. Furthermore, the 11 samples were still active in their work. The work carried out approximately 7-8 hours per day coupled with a routine exercise program would allow a person to have muscle hypertrophy, especially in the thighs because the activities use the thighs more than other parts. Nutritional control was also given to all research subjects, but the researchers did not have the authority to use the nutritional record data.

CONCLUSION

This study shows the effectivity of the Pertamina International Fit Journey (PIR Fit Journey) exercise program with significant reductions in upper arm circumference and waist circumference. However, it did not significantly reduce thigh circumference. The thigh circumference actually increased that might be caused by the body metabolism and physical activities carried out by the samples outside the physical exercise schedule.

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AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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