

ORIGINAL ARTICLE



# The Effects of Isotonic and Isometric Training on Young Women's Waist Circumference

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## ABSTRACT

**Background.** Abdominal fat accumulation, also known as central obesity, is a major risk factor for many degenerative diseases, including cardiovascular disease and diabetes. Isotonic and isometric workouts can be used to avoid the buildup of fat in the belly, and young ladies should measure their waist circumference regularly. **Objectives.** This study showed how isotonic and isometric exercise affected waist circumference measurements in overweight or obese young women. **Methods.** This study adopted a quasi-experimental design. Participants were divided into two treatment groups, isotonic (n=34) and isometric (n=34) groups. The exercise treatment lasted three months, taking measurements at regular intervals. **Results.** Both isometric and isotonic treatments reduced waist circumference by about the same amount. **Conclusion.** Isotonic or isometric workouts can be done by young ladies as long as they are done regularly. Isotonic and isometric exercise, done three times a week for one hour, can help lower waist circumference, which will reduce the risk of central obesity.

**KEYWORDS:** *Isotonic Training, Isometric Training, Waist Size, Central Obesity.*

## INTRODUCTION

Overweight and obesity remain among Indonesia's most severe health problems (1). This issue existed before the outbreak of the pandemic. However, the limited activity conditions during the pandemic have made the obesity problem even worse (2). Obesity in people > 15 years is on the rise, with a global prevalence of 13.1 percent in 2016, 11.7 percent in 2012. Between 2012 and 2016, the prevalence of adult obesity increased in all sub-regions, putting them on track to miss the 2025 World Health Assembly's aim of halting the rise (3). Currently, 50 percent of obese people live in ten countries: the United States, India, China, Russia, Germany, Brazil, Mexico, Egypt, Pakistan, and Indonesia. According to the Indonesian Ministry of Health, obesity in Indonesia is increasing year by year. According to

the Basic Health Research of Indonesia, adult overweight has doubled from 19.1% in 2007 to 35.4% in 2018 (4). Obesity has spread all over the world, not only in Indonesia. Obesity rates among young women are higher than in men during the pandemic COVID-19 (5).

As new habits and characteristics change with the increase of time at home, during the COVID-19 epidemic, young women, especially female college students, have an increased incidence of overweight and obesity. They are not only conducting online learning activities at home, but they are also munching more, trying new recipes, ordering meals through apps, and doing less exercise (6,7). Robinson, Boyland, and Chisholm et al. (2021) stated that the reduction in physical activity has led to young people in the United

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States and the world engaging in physical activity, and overweight female cases have increased, especially in developing countries such as Indonesia (8).

The overweight problem must be addressed immediately because it will lead to central obesity if it is not controlled. The accumulation of fat around the abdomen, also called central obesity, can cause the swelling of the stomach. Up until now, bloating has been primarily considered a cosmetic issue. However, bloating can be pretty harmful, leading to serious illness. Visceral fat, which settles in the intestines and is the most dangerous to one's health, generates a swollen stomach. If a person's waist circumference is more than 90 cm (men) or 80 cm (women) in Asia, they are said to have a bloated stomach (women). Central obesity is caused by the accumulation of fat caused by high carbohydrate, cholesterol, and fat intake patterns, which are not balanced by adequate physical activity (9). Central obesity must be prevented immediately because it can lead to the emergence of non-communicable diseases such as high blood pressure, diabetes, cardiovascular disease, and dyslipidemia, leading to substantial health problems (10). Measures that can be taken to prevent overweight and obesity are through physical activity (11).

The physical activity that young women can efficiently perform during the quarantine period between studying or working at home is weight training. Weight training can help weight-loss while beautifying and tightening your muscles or body shape to maintain the attractiveness and reduce stress (12). There are isotonic and isometric training methods in weight training based on muscle contraction. Exercise programs for isotonic are related to moving the limbs to produce tension; on the other hand, isometric contractions produce tension without movement. Training methods that use isotonic muscle contractions are generally associated with increased strength, and isometric contractions are associated with increased endurance (13).

Both isotonic and isometric contraction training methods are often used to increase endurance and muscle strength in athletes' physical preparation (14). Isotonic and isometric exercises are also commonly used for injury therapy, such as the research conducted by Salamifar, Nasermeli, and Namin (2019) uses isotonic and isometric methods to treat basketball

players with patellofemoral joint injuries (15). In contrast to previous research, the goal of this study is to determine the effect of isotonic and isometric contraction training methods on waist circumference in overweight female students, which will be measured repeatedly to see if the two treatments can effectively reduce waist circumference and, if so, which treatment is better. Besides being more sensitive to measuring central obesity, waist circumference measurements were chosen because they are easy to do and inexpensive. In addition, two pre-test and post-test measurements were performed in previous studies, whereas this study used five measurements performed every three weeks for three months. This is done in order to obtain more complete data for each measurement in each treatment group. Based on this explanation, researchers are interested in researching the impact of isotonic and isometric exercise on young women's waist circumference.

## **MATERIALS AND METHODS**

**Ethical declaration.** The Ethics Committee accepted this study, given the number KE/FK/0670/EC/2021.

**Research Design.** The research method adopted in this study is a quasi-experimental non-equivalent control group design. This study was carried out by treating the experimental group and comparing them to a control group. The classification of this research as quasi-experimental is based on the fact that it uses humans as research subjects. Humans are not all the same and are prone to instability. As a result, the study's desirable variables cannot be controlled as closely as they could in a pure experimental study.

**Participants.** The study is divided into female students receiving isotonic treatment and female students receiving isometric treatment (control). The waist circumference of the female students in the two groups was measured five times to find out if there was a difference in the average waist circumference of each group.

**Training protocol.** The meeting was conducted by providing two trainers in each treatment group (isotonic and isometric). Because the Covid-19 pandemic was still ongoing, the training was conducted online via Zoom Meeting. The training lasted three months and included five waist circumference measurements. The following is the sequence of training techniques carried out by each treatment group:

1. Divide the group into two isotonic and isometric groups, each with 34 people.
2. Before treating respondents in both groups, waist circumference was measured as the first measurement.
3. Instruct the isotonic group to do three types of exercises, namely twist, side bend, and good morning dynamically
4. Instruct the Isometric group to do three exercises: twist, side bend, and good morning with static movements, namely by holding each movement for 6 seconds for each exercise movement.
5. Tell each treatment group to do the activity for one hour three times a week.
6. Take participants' waist circumference measurements. The waist circumference was measured every three weeks. Friends or relatives not related to the research measure participants' waist circumference, which is then entered into a google form sheet.

**Data Collection Procedure.** The data required for this study is the waist circumference value of each measurement. Measurements were taken once before giving treatment and then continued every three weeks for three months, so five measurements were taken. To obtain these data, the first thing to do is determine the research population. The population is the topic of study, having traits almost the same, allowing the results of population-based research to be generalized. In this study, all non-sports female students who enrolled in the physical education curriculum of the Indonesian University of Education in 2021 were included. The following criteria were used to choose the participants for this study: 1) female non-sports faculty students from

2021-2022 who are registered as students at the Universitas Pendidikan Indonesia; 2) female student who has contracted sports courses in 2021; 3) 19-20 years old; 4) not engaging in strenuous exercise; 5) not currently following a strict diet plan; 6) overweight or obese (BMI > 23 kg/m<sup>2</sup>); 7) have a waist circumference of >80 cm; 8) Willing to participate in research from start to finish.

**Statistical Analysis.** The greater the sample from the existing population, the better, although there is a minimum number of samples that researchers must take, which can be as few as 30 (16). According to Serdar, Cihan, and Serdar (2021), the minimal sample size for statistical data research is 30 people. So that each group has a sample of 34 female students, the number of representative samples for each group is 34. STATA software version 17 was used to analyze the data using General Linear Model Repeated Measure (GLM RM) methodology. All of the GLM-RM prerequisites and assumptions were met, including normal data, homogeneity of covariance, homogeneity of variance, and sphericity (17).

## RESULTS

The study results can be seen in table 1 and table 2, where Table 1 shows the average value and Standard Error of Mean obtained for each group (isotonic and isometric) and each waist circumference measurement. In contrast, in table 2, we can see the difference in the results' waist circumference for each measurement (within-subjects factors) as well as the interaction between the results of the value for each measurement (within-subjects factors) with each different treatment group (between the subject factor).

**Table 1. Participants' average waist circumference per observation based on treatment**

Dependent Variable	Mean	SE of mean	N
<b>Zero Measurement (Before Treatment)</b>			
Isotonic Group	86.21	2.28	34
Isometric Group	85.85	2.17	34
<b>First Measurement</b>			
Isotonic Group	85.35	2.25	34
Isometric Group	85.32	2.14	34
<b>Second Measurement</b>			
Isotonic Group	84.24	2.22	34
Isometric Group	84.62	2.15	34
<b>Third Measurement</b>			
Isotonic Group	83.38	2.22	34
Isometric Group	84.06	2.17	34
<b>Fourth Measurement</b>			
Isotonic Group	82.50	2.20	34
Isometric Group	83.38	2.14	34

**Table 2. The difference in the average waist circumference based on the time of observation, and the treatment group**

Dependent Variable	P
<b>Time</b>	
Before treatment/ vs Measurement1	0.001*
Measurement 1 vs Measurement 2	0.001*
Measurement 2 vs Measurement 3	0.001*
Measurement 3 vs Measurement 4	0.001*
<b>Time*treatment group</b>	
Before treatment/ vs Measurement1	0.196
Measurement 1 vs Measurement 2	0.086
Measurement 2 vs Measurement 3	0.218
Measurement 3 vs Measurement 4	0.285

\*. Significant at  $p < 0.05$ .

The Table 1 showed a decrease in the mean waist circumference between the isometric and isotonic groups at each observation level.

It can be seen from Table 2 that there is a significant difference in the observation time. The average decrease in waist circumference was seen in contrast 1, which is between before treatment and the first month of treatment ( $p = 0.001$ ), contrast 2, which is between the first month and second month of treatment ( $p = 0.001$ ), contrast 3, which is between the second and third months of treatment ( $p = 0.001$ ), and contrast 4, which is between the third and fourth months of treatment ( $p = 0.001$ ). Meanwhile, in the interaction variable between the time of observation and the treatment group, there was no significant difference in the average decrease in waist circumference between the time of observation between the isometric and isotonic groups ( $p > 0.05$ ). The difference in the average waist circumference in each observation group (isometric and isotonic) obtained a  $p = 0.920$ , which means no difference in the average waist circumference of the isometric and isotonic groups. Therefore, the results can be concluded that there is no better treatment. Therefore, it can be concluded that there is no better treatment. Isotonic and isotonic treatments can reduce waist circumference with the same effect.

## DISCUSSION

Being overweight and obese are still health problems for young women today. However, the situation of activity restriction during the pandemic Covid-19 exacerbates the problem of overweight and obesity (2). According to the World Health Organization in 2020, the decline in

physical activity is mainly due to inactivity during leisure time and sedentary behaviour at work and home. A rise in the usage of “passive” modes of transportation contributes to a lack of physical activity. Young women aged 18 and over are not active enough globally. Young women are less physically active than young men, with 85% of young women failing to meet the World Health Organization’s recommendation of at least 60 minutes of moderate-to-vigorous physical activity a day, compared with 78% of young men (4).

There is a lack of physical activity, but enacting regulations to keep people active at home has also led to eating mistakes among young women, such as snacking heavily, trying new dishes, and ordering food through apps. This eventuality has led to an increase in young women who are obese, especially in central obesity (6). Central obesity, in particular, is characterized by bloating caused by the accumulation of abdominal fat. Excess fat in subcutaneous adipose tissue and visceral fat in the abdomen can cause this buildup. Excessive body fat can lead to health problems such as cardiovascular disease, type 2 diabetes, gallstones, high blood pressure and dyslipidemia, and other non-communicable diseases (24).

Exercise is a weight loss technique, especially in central obesity. In addition to calorie restriction and weight loss, many studies have shown that structured training positively affects central obesity (24). Exercise has become one of the most important aspects of any fat loss strategy. As part of physical activity, strength training offers many advantages. Reciprocal aspects of weight loss programs, including exercise in long-term and

short-term interventions, found immediate clinical benefit (25). Strength training can be classified into two types: dynamic (isometric) strength training and static (isometric) strength training, depending on the type of movement (18).

Isometric muscular contraction provides muscle tension without causing limb movement, whereas isotonic muscle contraction causes movement without causing muscle tension. The majority of physical activities contain a mix of both types of muscular contraction, although one usually takes precedence. Walking, jogging, swimming, and cycling are examples of isotonic exercise (also known as aerobic, dynamic, or endurance exercise). It involves high-repetition movements against low resistance. Weight lifting and bodybuilding are isometric exercise examples (also known as resistance exercise or strength training). It consists of low-repetition actions against solid resistance. Isometric and isotonic exercises have been confirmed to positively affect many factors, including increased muscle mass, strength, and endurance (18).

Isometric and isotonic training techniques are used by many groups, including athletes and the general public, to lift weights. In addition to athletics, isotonic exercise is commonly used in healthcare settings (13). While medically isometric exercises are aimed at early treatment and pain management, clear evidence to support this approach is lacking (26). However, Isometric exercise is another exciting way to improve muscle function. One of the limitations of isometric training is that it increases the strength of the specific muscle groups used (13). Despite the disadvantages of isometric exercises, they are convenient, can be performed anytime, anywhere, and are easy to perform for people with limited mobility (27).

Isometric and isotonic exercises can be used as part of a progressive loading program because they may be beneficial for specific individuals (22); as in this study, the results of the analysis showed a decrease in the average waist circumference in women who had a waist circumference >80 cm and experiencing overweight or obesity problems by doing exercises in both the isometric group and the isotonic group in each level of observation. While the results of this study did not find any significant differences in waist circumference between weight training using isometric and isotonic methods, weight training using isometric

and isotonic methods has been shown to reduce waist circumference.

Strength training to lower central adiposity might be isotonic or isometric workouts (28). This is also supported by Mirmoezzi, Yousefi, and Salmanpour (2019). They said that isotonic and isometric exercises are beneficial in regulating body composition and optimal weight, increase dynamic flexibility balance, and delaying fatigue (29).

Isometric exercise is a sort of exercise in which the length of your muscles does not vary when you contract them. Isometric exercises do not produce apparent movements. Isometric contractions are frequently held for a few seconds or minutes. Isometric training can be a significant part of any weight loss program because of its effectiveness in improving strength. Holding muscle contractions allows blood to restore muscle tissue while also putting metabolic demand on the muscles. It can help you gain muscle and endurance while lowering your fat level. Meanwhile, in isotonic exercise, muscle movement is dynamic/continuous and helps burn fat (29).

The thing that underlies this research using Side Bends, Russian Twist, and good morning movements in both the isotonic and isometric groups is that fat retention occurs around certain body areas; in this case, the study focuses on fat accumulation in the abdomen. Fat cells accumulate when a person consumes more calories than they burn. Over time, this excess consumption can lead to fat accumulation in any part of the body, and fat accumulation is more common in areas such as the abdomen, back, and buttocks. If someone is overweight or obese and wants to do isotonic and isometric exercises to reduce the size of their waist circumference, for most obese patients, exercise should be started slowly, and the intensity should increase gradually, but it must also be balanced with a healthy diet (30).

## CONCLUSION

While the results of this study did not find any significant differences in waist circumference between weight training using isometric and isotonic methods, weight training using isometric and isotonic methods has been shown to reduce waist circumference. The main limitation of this study was the lack of a without-training control group. So, it is suggested to cover this limitation in the future study.

### APPLICABLE REMARKS

- The information obtained in this study can be used as a reference for those who want to reduce their waist circumference, especially those with central obesity. Depending on their comfort level, they can choose isometric or isometric exercises to reduce their waistline. This exercise is cheap and easy so anyone can do it.

- In addition, the results obtained will help government programs to prevent obesity and improve healthy lifestyles in the community.

### CONFLICT OF INTERESTS

There are no conflicts of interest to declare by any of the authors of this study.

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