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**The effects of a yoga training program with fit ball on the physical fitness and body composition of overweight or obese women**Arunya Buttichak<sup>1</sup>, Naruemon Leelayuwat<sup>2</sup>, Sauwanan Bumrerraj<sup>2</sup>, Yodchai Boonprakob<sup>3,\*</sup><sup>1</sup> Graduate school, Khon Kaen University, Khon Kaen, Thailand.<sup>2</sup> Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand.<sup>3</sup> Faculty of Associated Medical Science, Khon Kaen University, Khon Kaen, Thailand.

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**Abstract**

A quasi-experimental study was to determine the effects of a yoga training program with fit ball on the physical fitness and body composition of overweight or obese women. Thirty participants were recruited in this study. The participants were aged between 30 to 45 years, and with 23.0 to 29.9 kg/m<sup>2</sup> of BMI. The study was divided into three phases, namely, the pre-training period (the 1<sup>st</sup> week to the 8<sup>th</sup> week), training period (the 9<sup>th</sup> week to the 16<sup>th</sup> week), and home program period (the 17<sup>th</sup> week to the 24<sup>th</sup> week). The outcome measurements were physical fitness (flexibility, balance, muscular strength and muscular endurance) and body composition (weight, height, body mass index (BMI), waist circumference (WC), waist-hip ratio (WHR), fat percentage and muscle mass). A one-way ANOVA with repeated measures and Bonferroni were used. After training period and home program period, outcome measurements showed significant improvement except in the WHR case. It was found that the results of the yoga training program with fit ball increased after the 16<sup>th</sup> week and the 24<sup>th</sup> week. The physical fitness increased as follows: flexibility, balance, muscular strength and muscular endurance ( $p=0.001^{**}$ ). More importantly, the body composition decreased: the weight ( $p=0.001^{**}$ ); the BMI ( $p=0.001^{*}$ ); waist circumference (WC) ( $p=0.001^{*}$ ); waist-hip ratio (WHR) ( $p= 1.000$ ); fat percentage ( $p=0.001^{**}$ ); and the muscular muscle mass increased ( $p=0.001^{*}$ ). Therefore, the eight-week training of yoga with fit ball can improve some parameters of physical fitness and body composition in overweight or obese women.

**Keywords:** yoga, fit ball, physical fitness, body composition, overweight or obese.

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**1. Introduction**

Obesity is a major health problem generally, which can contribute to various diseases including hypertension, type II-diabetes, obstructive sleep apnea (OSA) and chronic joint arthritis [1]. In the United States, the prevalence of obesity has steadily increased over the past three decades [2]. The evidence states that by 2048, over 50% of the American population will be obese [3], as well as Thailand. Therefore, government should concern for prevention. Although causes of obesity involve with family history, metabolism, exercise habits, and dietary consumption, the common causes are lack of physical activities and excessive intake of calories [4 & 5]. They affect physical fitness such as decreased flexibility, balance, muscle strength, and endurance [6-9].

Exercise is an important procedure to tackles obesity. Various types of aerobic exercises have been used, such as running, walking, aerobics dance, and cycling [10]. However, obese people perform these exercise with difficulty. Much evidence has suggested that an appropriate exercise for this group is yoga. Yoga is a slow mode of exercise which stimulates muscle contraction and stretching at the same time. Moreover, body and mind connection is a key in this exercise [11]. The benefits of yoga include increased metabolism, improvement of respiratory performance, lowered blood pressure [12-15], BMI reduction, and lowering of blood sugar levels [16-18].

Interestingly, fit ball is a popular exercise which is also used for obesity. Previous studies have revealed that regular use of a fit ball program can improve core muscle strength, aerobic capacity, muscle power, body composition, postural control and balance, muscular strength, flexibility and endurance [19-23]. The application of yoga with fit ball is a new trend of exercise for obese people, but it needs many scientific studies to prove its effect on weight control. According to previous studies, fit ball can alter the proper activation of core stability muscles for the appropriate functioning of the lumbo-pelvic complex, and improve the restoration of spinal segmental stability in patients with chronic low back pain (CLBP) [24]. Henceforth, the purpose of this study was examined the combination effect of yoga with fit ball on alteration of physical fitness and BMI in females with obesity. Obese females were good candidates for this study because as adult females age, their body size and composition differ from those of adult males. That is, their body contains 10-15 more pounds of adipose tissue than men do. Their average weight (excluding fat) is, however, 40-45 pounds lower than that of men [25]. Overweight or obese women have decreased muscle functioning, decreased muscle mass. In addition, increase of adipose tissue from being overweight results in reduced balance control, slowed walking ability, and fatigue due to constant pressure on the joints [26]. Consequently, they are more likely to suffer from osteoarthritis than those within a healthy weight range. Exercising with little pressure on joints such as yoga may be appropriate for obese women. For this reason, the researchers were thus interested in examining the effects of a yoga training program with fit ball on the improvement of overweight or obese women. Having overweight or obese women as the focus, the study also wished to determine the effectiveness of core muscle exercise to enhance their physical fitness, which could be a new approach to exercising safely and appropriately.

## **2. Materials and methods**

This study was a quasi-experimental study, an assessor blind. It was approved by the Ethics Committee in Human Research, Khon Kaen University, HE592168.

### *2.1 Participants*

Thirty obese women with a BMI level of 23.0-29.9 kg/m<sup>2</sup> and aged between 30-45 years participated in this study. All the participants were full-time staff at Ubon Ratchathani University, Thailand, and were recruited for the study by a purposive selection method. Inclusion criteria consist of female aged between 30-45 years, BMI between 23.0-29.9 kg/m<sup>2</sup>, waist-hip ratio (WHR) between 0.75-0.85, and waist circumference (WC) 80-90 cm. Exclusion criteria were as follows: muscles, bones, ligaments and joints pain, less than 80% participation of the yoga fitness ball program sessions, and unwilling to participate in the study. Other exercises and food consumption were recorded daily.

### *2.2 Experimental training*

Data were collected during four periods: the 1<sup>st</sup> week, the 8<sup>th</sup> week, the 16<sup>th</sup> week, and the 24<sup>th</sup> week of the experiment. The research instruments included four yoga training programs with fit ball: a sit and reach test, a stork stand test, a functional reach test, a back and leg dynamometer test, and a sit-up test. The body composition measurement tools included: a body composition analyzer (TANITA MC 980), height tape, and waist circumference tape. The test periods were performed for 24 weeks and included physical fitness in terms of flexibility, balance, muscular strength, and muscular endurance; and body composition including weight, height, BMI, WC, WHR, fat percentage, and muscle mass. The data collection was administered four times in the 1<sup>st</sup> week, the 8<sup>th</sup> week, the 16<sup>th</sup> week and the 24<sup>th</sup> week of the experiment. For the 1<sup>st</sup>-8<sup>th</sup> weeks of the experiment the participants lived their normal lives. During the 9<sup>th</sup>-16<sup>th</sup> weeks they participated in the yoga training program with fit ball. Finally, the 17<sup>th</sup>-24<sup>th</sup> weeks made up the follow-up period.

#### *2.2.1 Yoga with fit ball training program*

The participants were asked to perform the 8-week training program (the 9<sup>th</sup> week to the 16<sup>th</sup> week) by doing yoga with fit ball for 60 minutes per time, 3 times a week on Monday, Wednesday and Friday. This program was conducted from 5 pm to 6 pm. The data was collected periodically, at the end of the 8<sup>th</sup> week, the 16<sup>th</sup> week and the 24<sup>th</sup> week of the program. The training program was performed at the ILC Building, Room 204, Faculty of Liberal Arts, Ubon Ratchathani University. In this program, the first researcher was the sole instructor. But in each training session there were 10 qualified fitness trainers to ensure safe training (preventing injuries and falls). These trainers also acted as research assistants, who gather relevant data under the direct supervision of the researcher. They were also given proper instructions and practice for conducting the actual measurements.

### 2.2.2 Measurement of outcomes

Flexibility, balance, muscular strength and muscular endurance were measured. Also, the assessment of body composition was carried out through the measurement of weight, height, body mass index (BMI), waist-hip ratio (WHR), waist circumference (WC), fat percentage (Fat %) and muscle mass. Also, the data were collected prior to, between, and after the program was completed. The anthropometric measures were collected by which each participant's body mass was assessed by a balance scale. The participants' height (without shoes) was measured by a stadiometer. The BMI was calculated by dividing body mass in kilograms by height in square meters ( $\text{kg}/\text{m}^2$ ). The waist girth was measured at the level of the umbilicus horizontally without clothing, while the hip girth was measured at the level of the greatest protrusion of the gluteal muscles with underwear. Waist-hip ratio (WHR) was calculated by dividing the waist girth by the hip girth.

All these measurements were conducted by the 10 research assistants mentioned earlier. The assistants measured all 30 participants for each category of data collected. Thus, there were no inter-rater reliability tests. However, these research assistants were fully trained to ensure accuracy of their measurements prior to the data collection phase.

The research tools used in this study were the lesson plans for the 8-week yoga training program with fit ball, dietary recording, tools for yoga training with fit ball including; yoga mats, fit balls or Swiss balls which were big and inflatable with a diameter of 65 cm, note pads, physical fitness test; stadiometer, sit-and-reach test box, stop watches (stock stand test and muscular endurance sit-up test), measurement tape (dynamic balance test). The Tkk (Model 5402) back and leg dynamometer (muscle strength test) and body composition analyzers: TANITA MC 980 which is a scale from Japan were also used. Ten research assistants who are staff from the Ubon Ratchathani University Hospital, consisting of 2 physiotherapists, 2 nurses and 6 physical education teachers tested and recorded the data.




### 2.2.3 Procedures

The 15 positions of the yoga training were derived from the Hatha Yoga style, and adapted by with fit ball. The exercise sessions were divided into three sessions; a 15-minute warm-up session performing basic postures of fit ball yoga, including Figures 1 to 3, a 35-minute work-out session performing the other 12 positions, and a 10-minute cool down session using the same positions contained in the warm-up session. The participants were asked to perform each position four times until the completion of the exercise. The protocol of this exercise is shown in Table 1.



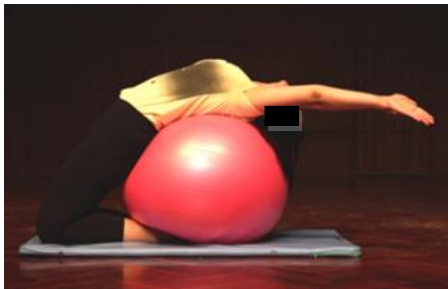

### 2.3 Sample size calculation

The sample size of this study was calculated from previous study [27]. It was a comparative study between yoga and aerobic exercises on the pulmonary function of obese people. Therefore, thirty participants were chosen for this study. The researcher used a study of a continuous response variable from matched pairs of study subjects. Previous data indicates that the difference in the response of matched pairs is normally distributed with standard deviation 4.12 if the true difference in the mean response of matched pairs is  $2.74 \text{ kg}/\text{m}^2$ . There are 32 pairs of subjects are needed to be studied in this research in order to be able to reject the null hypothesis that this response difference is zero with probability (power) at 90% ( $Z_{\beta}(0.2) = 1.28$ ). The Type I error probability associated with this test of this null hypothesis is .05. Therefore, the data causing the error were eliminated. As a result, 2 samples in this study were cut out. Therefore, thirty participants were chosen for this study.

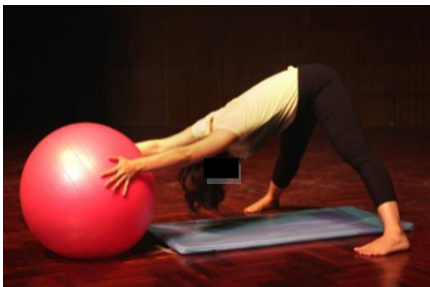



**Table 1** Yoga training program with fit ball protocol.

Day	Training	Yoga with fit ball exercise protocol	Duration (minutes)
Monday, Wednesday, Friday	Warm-up	5-minute walk (easy pace) and static stretching of major muscle groups (2 x 10 s).	15
	Work out	1. Poses of sun (2x5), (3x5), (4x6), (5X5)	35
			
		2. Utthita parsvakon asana (2x5), (3x5), (4x6), (5X5)	
			
		3. Arms raised mountain Mountain pose (2x5), (3x5), (4x6), (5X5)	
			
	Cool-down	5-min walk (easy pace) and static stretching of major muscle groups (2 x10 s).	10



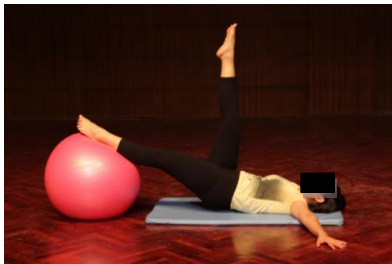

\*The yoga training program with fit ball; 3 days per week: for 1<sup>st</sup> to 2<sup>nd</sup> week (2 sets of 5 repetitions), 3<sup>rd</sup> to 4<sup>th</sup> week (3 sets of 5 repetitions), 5<sup>th</sup> to 6<sup>th</sup> week (4 sets of 6 repetitions) and 7<sup>th</sup> to 8<sup>th</sup> week (5 sets of 5 repetitions)

Day	Training	Yoga with fit ball exercise protocol	Duration (minutes)
Monday, Wednesday, Friday	Warm-up	5-minute walk (easy pace) and static stretching of major muscle groups (2 x 10 s).	15
	Work out	4. Cobra-bhujang asana (2x5), (3x5), (4x6), (5X5)	35
			
		5. Vasisth asana (2x5), (3x5), (4x6), (5X5)	
			
		6. Bending over backwards (2x5), (3x5), (4x6), (5X5)	
			
		7. Variations (2x5), (3x5), (4x6), (5X5)	
			
	Cool-down	5-min walk (easy pace) and static stretching of major muscle groups (2 x10 s).	10

\*The yoga training program with fit ball; 3 days per week: for 1<sup>st</sup> to 2<sup>nd</sup> week (2 sets of 5 repetitions), 3<sup>rd</sup> to 4<sup>th</sup> week (3 sets of 5 repetitions), 5<sup>th</sup> to 6<sup>th</sup> week (4 sets of 6 repetitions) and 7<sup>th</sup> to 8<sup>th</sup> week (5 sets of 5 repetitions).

Day	Training	Training Yoga with fit ball exercise protocol	Duration (minutes)
Monday, Wednesday, Friday	Warm-up	5-minute walk (easy pace) and static stretching of major muscle groups (2 x 10 s).	15
	Work out	8. Downward facing dog (2x5), (3x5), (4x6), (5X5)	35
			
		9. Upward facing dog (2x5), (3x5), (4x6), (5X5)	
			
		10. Camel pose (2x5), (3x5), (4x6), (5X5)	
			
		11. Downward facing dog (Sit in a kneeling) (2x5), (3x5), (4x6), (5X5)	
			
	Cool-down	5-min walk (easy pace) and static stretching of major muscle groups (2 x 10 s).	10

\*The yoga training program with fit ball; 3 days per week: for 1<sup>st</sup> to 2<sup>nd</sup> week (2 sets of 5 repetitions), 3<sup>rd</sup> to 4<sup>th</sup> week (3 sets of 5 repetitions), 5<sup>th</sup> to 6<sup>th</sup> week (4 sets of 6 repetitions) and 7<sup>th</sup> to 8<sup>th</sup> week (5 sets of 5 repetitions).

Day	Training	Training Yoga with ball exercise protocol	Duration (minutes)
Monday, Wednesday, Friday	Warm-up	5-minute walk (easy pace) and static stretching of major muscle groups (2 x 10 s).	15
	Work out	12. Pigeon pose (2x5), (3x5), (4x6), (5X5)	35
			
		13. Clupart silhouette (2x5), (3x5), (4x6), (5X5)	
			
		14. Supine-bridge (2x5), (3x5), (4x6), (5X5)	
			
		15. Supine leg lifts (2x5), (3x5), (4x6), (5X5)	
			
	Cool-down	5-min walk (easy pace) and static stretching of major muscle groups (2 x10 s)	10

\*The yoga training program with fit ball; 3 days per week: for 1<sup>st</sup> to 2<sup>nd</sup> week (2 sets of 5 repetitions), 3<sup>rd</sup> to 4<sup>th</sup> week (3 sets of 5 repetitions), 5<sup>th</sup> to 6<sup>th</sup> week (4 sets of 6 repetitions) and 7<sup>th</sup> to 8<sup>th</sup> week (5 sets of 5 repetitions).

## 2.4 Statistical Analyses

For the data analysis, the statistical package SPSS Version 17 software was used. Data were presented as mean,  $\pm$  SD, changes within group and within-group variance of baseline data and after-training data. The baseline data were the data before the 1<sup>st</sup> week and after the 8<sup>th</sup> week. The after-training data were (after the 16<sup>th</sup> week: follow up after the 1<sup>st</sup> training session, after the 24<sup>th</sup> week: follow up after the 2<sup>nd</sup> training session). After that the normal distribution of data was tested by mean and standard deviation in order to test the error of the normal distribution. Shapiro-Wilk was employed to test the hypothesis. It was found that the data were normally distributed at 95% Confidence Interval (CI). The statistical significance was tested at the level of 0.05. F (test) was administered to find out the differences using Repeated Measures ANOVA. If there was any difference, it was tested by Bonferroni method test to compare the effect of a yoga training program with fit ball in controlling pre-training physical fitness; flexibility, balance, muscular strength and muscular endurance. More importantly, the body composition; weight, BMI, WC, WHR, fat percentage and muscle mass were considered as covariates. ANOVA was also used to examine significant differences in selected variables between within group.

## 3. Results

At week 16<sup>th</sup>, all physical fitness variables were significantly different from baseline (Table 2). For example, the flexibility was increasing by 3.26 (unit) with a p value of  $< 0.001$ . All outcomes were also significantly increased from baseline at week 24. For example muscular strength was significantly increasing by 23.93 (unit) (p value  $< 0.005$ ). The outcomes variables were not different significantly between week 16 and week 24 (p value 0.999). But, the differences of flexibility and muscular endurance were found.

**Table 2** Differences of the flexibility, balance, muscular strength and muscular endurance tests.

Variable	Physical fitness							
	Baseline	8 <sup>th</sup> week	95% CI		16 <sup>th</sup> week	95% CI		24 <sup>th</sup> week
95% CI								
Flexibility (cm)	10.57 $\pm$ 5.15	11.17 $\pm$ 5.3(0.60)	1.33, 0.13	13.83 $\pm$ 4.59(3.26)**	4.09, 2.44	14.97 $\pm$ 4.18(4.40)**	5.24, 3.56	
Balance static (seconds)	2.61 $\pm$ 0.76	2.68 $\pm$ 0.8(0.08)	0.58, 0.43	4.13 $\pm$ 1.18(1.52)**	2.12, 0.93	4.84 $\pm$ 2.02(2.23)**	3.25, 1.21	
Balance dynamic (cm)	86.50 $\pm$ 6.64	85.93 $\pm$ 5.29(0.57)	1.68, 2.82	93.50 $\pm$ 7.08(7.0)**	9.67, 4.33	94.33 $\pm$ 7.7(7.8)**	10.69, 4.97	
Muscular strength (kg)	67.62 $\pm$ 8.56	66.99 $\pm$ 5.91(0.63)	3.11, 4.37	88.52 $\pm$ 10.37(20.90)**	25.96, 15.84	91.55 $\pm$ 13.55(23.93)*	30.50, 17.36	
Muscular endurance (times)	10.97 $\pm$ 4.75	11.50 $\pm$ 4.94(0.53)	1.60, 0.53	14.30 $\pm$ 4.14(3.33)**	4.47, 2.19	15.50 $\pm$ 3.88(4.53)*	5.73, 3.34	

The data are presented by means  $\pm$ SD; \*statistically significant difference when compared within group, mean scores at point comparisons from baseline: \* $p < 0.005$  and \*\* $p < 0.001$ ; numbers in parenthesis indicated mean difference from baseline.

Regarding body composition outcomes, there were significant changes from baseline at week 16 except WHR and at week 24 except WHR and fat percentage (Table 3). For example, WC was significantly reduced by 2.23 cm at week 16 and 2.47 cm at week 24.

**Table 3** Differences of the weight, BMI, WC, WHR, fat percentage and muscle mass tests.

Variable	Body composition							
	Baseline	8 <sup>th</sup> week	95% CI		16 <sup>th</sup> week	95% CI		24 <sup>th</sup> week
Weight (kg)	62.97 $\pm$ 4.76	62.84 $\pm$ 4.78(0.123)	0.42, 0.67	61.33 $\pm$ 5.27(1.64)**	0.87, 2.41	61.96 $\pm$ 5.14(1.01)*	0.00, 2.02	
BMI (kg/m <sup>2</sup> )	25.43 $\pm$ 1.55	25.31 $\pm$ 1.57(0.12)	0.11, 0.36	24.63 $\pm$ 1.72(0.80)**	0.51, 1.09	24.88 $\pm$ 1.77(0.55)*	0.17, 0.93	
WC (cm)	83.47 $\pm$ 2.90	83.63 $\pm$ 3.06(0.17)	0.55, 0.22	81.23 $\pm$ 3.06(2.23)**	1.42, 3.05	81.00 $\pm$ 3.03(2.47)*	1.56, 3.37	
WHR	0.82 $\pm$ 0.03	0.82 $\pm$ 0.03(0.0)	0.01, 0.01	0.81 $\pm$ 0.03(0.0)	0.0, 0.01	0.81 $\pm$ 0.03(0.0)	0.01, 0.01	
Fat % (percent/kg)	35.45 $\pm$ 3.08	35.39 $\pm$ 2.64(0.067)	0.50, 0.63	34.04 $\pm$ 2.93(1.42)**	0.57, 2.26	34.54 $\pm$ 3.01(0.9)	0.07, 1.89	
Muscle mass (kg)	36.90 $\pm$ 3.00	36.99 $\pm$ 3.03(0.09)	0.63, 0.45	38.24 $\pm$ 2.68(1.33)*	2.42, 0.25	38.11 $\pm$ 2.92(1.21)**	1.84, 0.58	

The data are presented by means  $\pm$ SD; \*statistically significant difference when compared within group, mean scores at point comparisons: \* $p < 0.005$  and \*\* $p < 0.001$ ; numbers in parenthesis indicated mean difference from baseline.

## 4. Discussion

There were three phases of this study; the pre-training period (1<sup>st</sup> week to 8<sup>th</sup> week), training period (9<sup>th</sup> week to 16<sup>th</sup> week), and home program period (17<sup>th</sup> week to 24<sup>th</sup> week). This study found that yoga with fit ball significantly improved both physical fitness and body composition in almost all variables (Table 2 and 3). The improvements were persisted at week 24 or home program as well.

According to anatomical and biomechanical properties, yoga with fit ball reflects to be core stabilizing exercise and balance exercise [13 & 14]. The results indicated that yoga with fit ball can stimulate contraction of



core stabilizing muscles, which provide strength and balance capacity, due to exercise on small base of support [11]. Additional data include he exercises on fit ball can increase core muscle strength, muscle endurance, and pain reduction in patient with low back pain [21]. Moreover, exercise with fit ball can improve oxygen use in building muscle power, and increase muscle strength ratio and endurance [19].

The yoga practice with fit ball provided better body composition outcomes in terms of weight, BMI, WC, and fat percentage after training period and post-training period. The changes in body composition were as follows; the body weight of the participants reduced significantly at the 16<sup>th</sup> week and 24<sup>th</sup> week of training. Because the yoga training program with fit ball continuously allowed metabolic processes to burn fat cells in the overweight and obese women more efficiently [28]. According to principle of aerobic exercise, the yoga training program with fit ball used is a one type of aerobic exercises. However, some researchers indicated this exercise al so similar to strengthening exercise use body weight resistance. From a previous study showed that exercise with a fit ball can decrease body mass, BMI, fat mass, waist-hip ratio, fasting plasma triglycerides, total cholesterol concentrations [29]. Recently, yoga can reduce body weight in overweight and obese women. On the other hand, yoga was associated with attenuated weight gain. It may involve with type of yoga. Therefore, whether yoga practice has a given effect on body weight or not can only be clarified through well-designed clinical trials [30]. In contrast, if one wants to achieve weight loss dietary intervention is also necessary. This should include either maintenance of baseline caloric intake, or a reduction in caloric intake to accompany the physical activity intervention. Weight change through physical activity should be in addition to those associated with caloric restriction [31].

The effect of exercise on BMI reduction may accelerate the process of fat burning in the body [32]. In this study, the waist-hip ratio (WHR) was not decreased significantly. It's possible to deal with many confounding factors, energy balance per day, type of foods, and sleeping time. These factors may affect to reduce weight indirectly. Therefore, other factors such as diet control along with exercise should be studied in order to gain more effective study results. The reduction in fat percentage may be resulted from the training which was provided the efficiency of oxygen use in muscles [31].

Yoga with fit ball uses body resistance and balance control on a small base of support. In this character seem to be resisted or strengthening exercise. In this study, the result showed the effectiveness of training program on muscle mass. It's possible that while fat percentage was reduced, trained muscle mass was increased instead. Moderate levels of exercise had the greatest effect on fat burning, which subsequently improved body composition and breathing processes [26]. In this study, we set up training program at the moderate level based on a previous study. These findings are consistent with previous studies that found that the effects of exercising with a fit ball training program positively affected physical fitness and overall body composition [20 & 21].

In this study, there are some limitations; it is very difficult to control additional activities, food intake, emotional status, and dietary supplementation. However, the randomized controlled trial of this procedure with other aerobic exercises should be performed. The main limitation of this study is that there was only one instructor (the first researcher). Therefore, it was challenging to ensure that all 30 participants strictly followed the training poses and seriously practiced during sessions. This could have affected the results of the study. Also, if there are many trainers, it may affect the accuracy of the evaluation. So, there was only one trainer in this study.

## 5. Conclusion

The eight-week training of yoga with fit ball can improve some parameters of physical fitness and body composition in overweight or obese women.

## 6. Acknowledgments

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