

## Effectiveness of swiss ball exercises along with aerobic exercises among college girls with polycystic ovarian syndrome

Jayabalan Prakash<sup>1</sup>, Tittu Thomas James<sup>2\*</sup>, S Sivakumar<sup>3</sup>, S Dharini<sup>4</sup>

<sup>1,3</sup>Professor, <sup>2</sup>Physiotherapist, <sup>4</sup>Intern, <sup>1,3,4</sup>KMCH College of Physiotherapy, Coimbatore, Tamil Nadu, <sup>2</sup>National Institute of Mental Health and Neuro Sciences (NIMHANS), Bengaluru, Karnataka, India

**\*Corresponding Author: Tittu Thomas James**

Email: tittutalks@gmail.com

### Abstract

**Aims:** Polycystic ovarian syndrome (PCOS) is a common disorder seen in women at their reproductive age. Oligomenorrhea, hyperinsulinaemia, obesity, and hyperandrogenism are common in individuals with PCOS. Lifestyle modification through exercises and diet modifications are the major non-pharmacological strategies in PCOS management. There is a paucity of evidence supporting the role of Swiss ball exercises in the management of PCOS. We intended to identify the effect of Swiss ball exercises in addition to aerobic exercises in the management of PCOS among college girls in their fertile period.

**Settings and Design:** We recruited 20 college girls with the diagnosis of PCOS and were divided into two equal groups. The mean age of the participants for the study were  $23.05 \pm 1.2$  years, with mean BMI of  $28.5 \pm 1.5$  kg/m<sup>2</sup>.

**Methods and Material:** Group A received combined aerobic and Swiss ball exercise programme whereas Group B received only aerobic training. Interventions were given for 12 weeks, 6 days per week. Changes in body weight, abdominal fat measured using girth measurement, and menstrual irregularity questionnaire (MIQ) were used as outcome measures.

**Statistical analysis used:** Descriptive statistics were done to analyse demographic details. The group wise comparison were performed using t test analysis.

**Results:** We identified a significant reduction in body weight, abdominal fat and MIQ values in group A ( $p < 0.05$ ), whereas group B also demonstrated significant change except for body weight.

**Conclusions:** Addition of Swiss ball exercise programme along with aerobic training is beneficial in women with PCOS in reducing body weight, abdominal fat and irregular menses.

**Key Messages:** Swiss ball exercise along with aerobic exercise training provides beneficial effects in women with PCOS in reducing body weight, abdominal fat and in improving menstrual irregularities.

**Keywords:** Polycystic ovarian syndrome, Aerobic Exercises, Swiss Ball Exercises, Menstrual Irregularity Questionnaire.

### Introduction

Polycystic ovarian syndrome (PCOS) is a common disorder seen in women at their reproductive age with a prevalence rate of 4 to 12%.<sup>1</sup> Diagnosis of hyperandrogenism or chronic anovulation without any adrenal or pituitary conditions can be called as PCOS.<sup>2</sup> The condition was first described by Stein and Leventhal in 1935, which was a combination of oligo-amenorrhea and polycystic ovaries often associated with hirsutism, obesity or acne.<sup>3</sup> Thus the key findings in subjects with PCOS are hyperandrogenism and chronic anovulation.<sup>2</sup> Clinical features also include acanthosis nigricans and male pattern alopecia.<sup>4</sup>

The diagnostic criteria put forward by Rotterdam workshop (2003) consider two of the three following criteria to be present; chronic anovulation or oligomenorrhea, polycystic ovarian morphology, and hyperandrogenism.<sup>5</sup> Hyperinsulinaemia due to insulin resistance leading to the production of excess ovarian androgen is considered to be one of the aetiology of PCOS.<sup>6</sup> This may predispose to non-insulin dependent diabetes as well as cardiovascular diseases in their later life.

The strategies adopted in the management of PCOS include steps to control irregular menses, treatment of hirsutism by decreasing the production of testosterone and its action, using vagina creams, laser or electrolysis in the management of hirsutism, managing infertility, and the management of insulin resistance or the risk of type 2

diabetes through lifestyle modification or with weight loss strategies.<sup>2</sup>

Lifestyle modification through exercises and diet programmes is considered to be important in the management of PCOS, especially in subjects with obesity.<sup>7,8</sup> This also helps in improving their psychological well-being, self-esteem, anxiety, etc.<sup>9</sup> Thus exercises are beneficial in both acute and long-term clinical and metabolic health.<sup>7</sup> In the study by Pitchai et al, 62% of the subjects were aware of the beneficial effects of exercises in the management of PCOS, 39% were performing exercises regularly. 95% of the study population were willing to undergo lifestyle modifications as part of the management of PCOS.<sup>8</sup>

Studies have identified the effect of diet and exercises in improving hirsutism, fertility and metabolic profiles of PCOS.<sup>10</sup> Weight loss methods adopted by subjects helps in the normalising androgen, gonadotropin and insulin levels and helps in resumption of menstrual functions.<sup>11</sup> Exercise also has beneficial effects in reproductive function and improving cardiorespiratory fitness.<sup>12</sup> Maiya et al, identified that aerobic exercises are effective in weight reduction in obese infertile women with PCOS in reducing the size of the cyst and improving ovulation and chances of being pregnant.<sup>13</sup>

Although literature supports the use of aerobic exercises in PCOS, there is a paucity in evidence supporting the exercises performed using Swiss ball in the management.

Swiss ball is a commonly used mode of exercise in both therapeutic and recreational setup. Exercises performed in Swiss ball increases muscular demand in adopting various postures performed with less perceived exertion.<sup>14</sup> It is safe as well as interesting for women of all ages, and does not require specific area to perform or financial demands.<sup>15</sup> Swiss ball exercises improves strength, endurance, balance, proprioception, joint stability, coordination and flexibility.<sup>16</sup> It demands the activation of both global and local muscles, thus assists in improving muscle stimulation and contraction of the major muscle groups.<sup>17</sup> We intended to identify the effect of Swiss ball exercises in addition to aerobic exercises in the management of PCOS among college girls in their fertile period.

### Materials and Methods

The study was conducted in our institution during the period of November 2019 to March 2020. We adopted a quasi-experimental study design to recruit 20 college girls with confirmed diagnosis of PCOS, having two of the three criteria present. Girls within the age group of 20 to 25 years, between the BMI of 25 to 35 kg/m<sup>2</sup> were selected for the study. Subjects with any concomitant neurological or orthopaedic illness, undergoing regular physical training, those who had underwent any recent abdominal surgeries, those with any systemic illness such as hypertension, or those who undergoing medical management for PCOS were excluded from the study. The subjects were randomly divided into two groups; Group A consist of 10 subjects, who underwent combined aerobic and Swiss ball exercise programme, and Group B consisted of equal number of participants, underwent aerobic exercises alone. The exercise protocols of two groups are detailed in Table 1. The treatment duration was for a period of 12 weeks, 6 days per week, single supervised session of 60 minutes per day. The exercises were instructed by a physiotherapist who was qualified to provide supervised training programmes in clinical set-up. Outcome measures used for the study were changes in body weight, abdominal fat assessed using girth measurement, and Menstrual Irregularity Questionnaire (MIQ). Outcomes were measured at the baseline during the recruitment of subjects, and after 12 weeks at the end of treatment sessions.

**Table 1:** Exercise Protocol for Group A and Group B

Exercise Protocol – Group A	Exercise Protocol – Group B
Warm Up (10 Minutes)	Warm Up (10 Minutes)
Breathing Exercises	Breathing Exercises
Stretching Exercises	Stretching Exercises
Pectoralis Major stretching	Pectoralis Major stretching
Triceps stretching	Triceps stretching
Biceps stretching	Biceps stretching
Calf and Hamstrings stretching	Calf and Hamstrings stretching
Quadriceps stretching	Quadriceps stretching
Dynamic Phase	Dynamic Phase
Aerobic Exercises	Aerobic Exercises

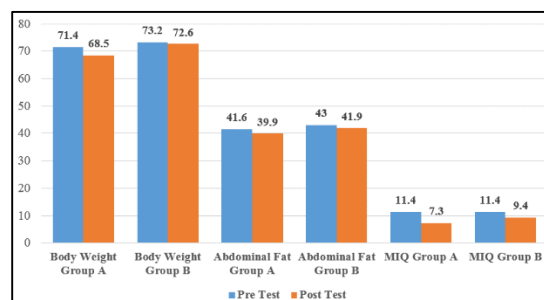
[20 minutes, 3 Circuits, Intensity – Borg Scale 12-13 (somewhat hard)]	[40 minutes, 6 Circuits, Intensity – Borg Scale 12-13 (somewhat hard)]
Jumping jacks	Jumping jacks
Wall sit	Wall sit
Step up onto chair	Step up onto chair
Squats	Squats
High knees/running in place	High knees/running in place
Lunges	Lunges
Swiss Ball Exercises (20 minutes, 3 Circuits)	
Abdominal curl ups	
Abdominal oblique curl up	
Knee tuck	
Back extension	
Side plank	
Front plank	
Cool Down (10 minutes)	Cool Down (10 minutes)
Breathing exercises	Breathing exercises
Ankle-toe movements	Ankle-toe movements

### Statistical analysis

The analysis was done using SPSS (IBM Version 22.0) software. Descriptive statistics were done to analyse demographic details. The group wise comparison were performed using t test analysis. The level of significance was kept at  $p < 0.05$ .

### Results

The mean age of the participants for the study were  $23.05 \pm 1.2$  years, with mean BMI of  $28.5 \pm 1.5$  kg/m<sup>2</sup>. All the participants had two of the three criteria for confirming the diagnosis of PCOS, with 4 of them having all three. There was a significant difference in body weight measurements ( $p < 0.05$ ) after 12 weeks of treatment in group A. Group B did not demonstrate a significant change in body weight measurement. The mean difference in Group A and B were -2.9kg and -0.6kg, respectively. The abdominal fat assessed using measurement of girth significantly reduced in both the groups, with mean difference in Group A and B being -1.7cm and -1.1cm, respectively. The MIQ showed significant difference in both groups after 12 weeks of intervention, with mean difference of -4.1 in Group A and -2 in Group B. The mean values of all the outcome measures in both groups at baseline, and after 12 weeks of intervention is illustrated in Fig. 1.



**Fig. 1:** Pre-test and Post-test mean values of outcome measures in both groups

## Discussion

There is a paucity in evidence supporting the role of Swiss ball exercises in the management of PCOS in women in their fertile age. We identified that addition of Swiss ball exercises along with aerobic exercise programme significantly reduces body weight, abdominal fat and irregularity in menstruation in women with PCOS. Addition of Swiss ball exercises found to reduce body weight in subjects more than that of their counterparts who did aerobic exercises alone.

There is an increase in the incidence of type II diabetes as well as obesity in children.<sup>18</sup> Identifying PCOS and its management in adolescent stage is considered to be important due to changes in the lifestyle and sedentary behaviours.<sup>2</sup>

Exercises and diet modifications are considered to be the key factors in achieving weight loss and reducing the risk of cardiovascular diseases in subjects with PCOS.<sup>2</sup> The misconception of comparing increased physical activity to vigorous exercises is to be changed. We identified Swiss ball exercises of moderate intensity, which are safe and interesting helps in reducing the symptoms in subjects with PCOS. Weight reduction through the exercise regime benefits the individuals by improving hormonal balance, promoting ovulation, and correcting irregular menses.<sup>6</sup>

The adaptation to physical conditioning is found to be the same in both men and women, with an increase in aerobic capacity and anaerobic threshold, reduction in heart rate and blood pressure, and other physiological changes.<sup>19,20</sup> Lefebvre et al have identified favourable changes in cholesterol, body fat stores and bone mineral content in women with exercises.<sup>21</sup> It also improves endothelial functions in those with cardiovascular risk.<sup>12</sup> Sprung et al, postulated the improved bioavailability of Nitric Oxide (NO), reduction in Oxygen free radicals, and up-regulation of endothelial NO synthase to be the factors leading to the reduction of cardiovascular risk with exercises.<sup>12</sup> Improvement in menstrual cycles and ovulation along with better body composition are found to be achieved by 50% women diagnosed with PCOS with exercise training.<sup>22</sup> It also improves insulin sensitivity by increasing the concentration of intramyocellular triacylglycerol, leading to increased lipid uptake by muscles, utilization and oxidation.<sup>22</sup> Improved blood supply to skeletal muscles though physical exercise also aid in improving insulin sensitivity.<sup>23</sup>

It is found that obesity commonly occur in women with PCOS, which may lead to decrease in strength, postural control and altered biomechanics of lower limbs.<sup>24</sup> Swiss ball exercises, through its activation of global and local core muscles, significantly improves the postural control of individuals with PCOS along with weight reduction. Physical activities demanding greater amplitude of joint motion may put excessive stress on the joints of those who are obese, and may be a major factor leading to non-compliance.<sup>24</sup> Swiss ball exercises are found to be a better alternative which is safe for the joints, and also demands moderate physical exertion without loading joints to stress. A combined aerobic and Swiss ball exercise protocols help in muscle strengthening, preventing loss of lean muscle mass, reducing obesity, and

improves disease-related hyperandrogenism and insulin sensitivity in PCOS.

We conclude that the addition of Swiss ball exercise programme along with aerobic training is beneficial in women with PCOS in reducing body weight, abdominal fat and irregular menses. It is also a safe alternative to high load exercises, avoiding stress over joints. Swiss ball exercises also improves postural control in subjects with PCOS. Thus the exercise protocols help in providing a non-pharmacological alternative in women with PCOS in modifying their lifestyle and in the management of their condition.

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## Conflicts of Interest

There are no conflicts of interest

## References

1. Knochenhauer ES, Key TJ, Kahsar-Miller M, Waggoner W, Boots LR, Azziz R et al. Prevalence of the polycystic ovary syndrome in unselected black and white women of the southeastern United States: a prospective study. *J Clin Endocrinol Metab* 1998;83:3078-82.
2. Sheehan MT. Polycystic ovarian syndrome: diagnosis and management. *Clin Med Res*. 2004;2(1):13-27.
3. Rosenfield RL, Ehrmann DA. The pathogenesis of polycystic ovary syndrome (PCOS): the hypothesis of PCOS as functional ovarian hyperandrogenism revisited. *Endocr Rev*. 2016;37(5):467-520.
4. Homburg R. What is polycystic ovarian syndrome? a proposal for a consensus on the definition and diagnosis of polycystic ovarian syndrome. *Hum Reprod*. 2002;17(10):2495-9.
5. The Rotterdam ESHRE ASRM-sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. *Fertil Steril*. 2004;81:19-25.
6. Hopkinson ZEC, Sattar N, Fleming R, Greer IA. Polycystic ovarian syndrome: the metabolic syndrome comes to gynaecology. *BMJ*. 1998;317:329-32.
7. Moran L. Effects of lifestyle modification in polycystic ovarian syndrome. *Reprod Bio Med Online*. 2006;12(5):569-78.
8. Pitchai P, Sreeraj SR, Anil PR. Awareness of lifestyle modification in females diagnosed with polycystic ovarian syndrome in India: explorative study. *Int J Reprod Contracept Obstet Gynecol*. 2016;5(2):470-6.
9. Galletly C, Clark A, Tomlinson L, Blaney F. A group program for obese, infertile women: weight loss and improved psychological health. *J Psychosom Obstet Gynaecol*. 1996;17(2):125-8.
10. ACOG. Management of infertility caused by ovulatory dysfunction. *Int J Gynaecol Obstet*. 2002;77(2):177-88.
11. Guzick DS, Wing R, Smith D, Berga SL, Winters SJ. Endocrine consequences of weight loss in obese, hyperandrogenic, anovulatory women. *Fertil Steril*. 1994;61(4):598-604.
12. Sprung VS, Cuthbertson DJ, Pugh CJA, Aziz N, Kemp GJ, Daousi C, et al. Exercise training in polycystic ovarian syndrome enhances flow-mediated dilation in the absence of changes in fatness. *Med Sci Sports Exerc*. 2013;45(12):2234-42.

13. Maiya AG, Sheela RK, Kumar P. Exercise-induced weight reduction and fertility outcomes in women with polycystic ovarian syndrome who are obese and infertile: a preliminary report. *J Exer Sci Phys Ther.* 2008;4(1):30-34
14. Marshall P, Murphy B. Changes in muscle activity and perceived exertion during exercises performed on a swiss ball. *Appl Physiol Nutr Metab.* 2006;31:376-83.
15. Seo BD, Yun YD, Kim HR, Lee SH. Effect of 12-week swiss ball exercise program on physical fitness and balance ability of elderly women. *J Phys Ther Sci.* 2012;24:11-5.
16. Kim MS. Effects of swiss ball exercise on moire topography and detraining in high school female students with scoliosis. *JKPEAW.* 2010;21:29-39.
17. Sekendiz B, Cug M, Korkusuz F. Effects of swiss-ball core strength training on strength, endurance, flexibility, and balance in sedentary women. *J Strength Cond Res.* 2010;24(11):3032-40.
18. Sinha R, Fisch G, Teague B, Tamborlane WV, Banyas B, Allen K, et al. Prevalence of impaired glucose tolerance among children and adolescents with marked obesity. *N Engl J Med.* 2002;346:802-10.
19. Lawson S, Webster JD, Pacy PJ, Garrow JS. Effects of 10 week aerobic exercise programme on metabolic rate, body composition and fatness in lean sedentary females. *Br J Clin Pract.* 1987;41(4):684-8.
20. White MK, Yeater RA, Martin RB, Rosenberg BS, Sherwood L, Weber KC et al. Effects of aerobic dancing and walking on cardiovascular function and muscular strength in post-menopausal women. *J Sports Med Phy Fitness.* 1984;24(2):159-66.
21. Lefebvre P, Bringer J, Renard E, Boulet F, Clouet S, Jaffiol C. Influences of weight, body fat patterning and nutrition on management of PCOS. *Hum Reprod.* 1997;12(1):72-81.
22. Shetty D, Chandrasekaran B, Singh AW, Oliverraj J. Exercise in polycystic ovarian syndrome: an evidence-based review. *Saudi J Sports Med.* 2017;17:123-8.
23. Jung UJ, Choi MS. Obesity and its metabolic complications: The role of adipokines and the relationship between obesity, inflammation, insulin resistance, dyslipidemia and nonalcoholic fatty liver disease. *Int J Mol Sci.* 2014;15:6184-223.
24. Kogure GS, Reis RM. Progressive resistance training as complementary therapy for polycystic ovarian syndrome. *Rev Bras Ginecol Obstet.* 2017;39:255-7.

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