

Effect of Customized Resistance Training on Body Mass Index and Quality of Life in Individuals with Polycystic Ovarian Syndrome - A Randomized Clinical Trial

Chinmayee Shah¹, Dr. Sanskruti Tahakik²

^{1,2}MGM Institute of Physiotherapy, MUHS University, Aurangabad, India

Corresponding Author: Chinmayee Shah

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ABSTRACT

Background: Polycystic Ovarian Syndrome is known to affect a broad spectrum of clinical manifestations associated with it are significant and include reproductive dysfunction. Many forms of physiotherapeutic interventions have been tried and tested to alleviate the symptoms. Currently, there are no studies that show a significant effect of resistance exercise and lifestyle modification as a combination to create an impact on the symptoms of Polycystic Ovarian Syndrome.

Purpose of the study: To study whether resistance exercises can alleviate the symptoms of PCOS in women of age 18-40 and compare the effectiveness of resistance exercise training in alleviating symptoms of PCOS over aerobic training and lifestyle modification.

Study design: Randomized Controlled Trial

Method: 78 individuals, aged 18-40, medically diagnosed with Polycystic Ovarian Syndrome were included in the study based on inclusion criteria with a randomized sampling technique. Women were randomly assigned into two groups. Group A (aerobic training and lifestyle modification) and Group B (resistance training). They all were given 4 weeks of treatment. Outcome measures included PCOSQ.

Results: 78 patients were included. 39 patients to lifestyle modification and 39 patients to resistance training. At the end of 4 weeks, individuals of Group A and Group B had no significant difference in all together symptoms but weight and BMI were better managed in the group with Resistance training.

Conclusion: The present study concludes that both the treatment groups had equal effectiveness in individuals with polycystic ovarian syndrome. However, the Body Mass Index and menstrual regularity were found to have a more significant positive effect in individuals with polycystic ovarian syndrome than in the group with aerobic exercise and lifestyle modification.

Keywords: Polycystic Ovarian Syndrome, Body mass index, Aerobic exercises, Lifestyle modification, Resistance training

INTRODUCTION

PCOS is striking 8-12% of women of reproductive age [4] which affects the broad spectrum of clinical manifestations associated with it are significant and include reproductive dysfunction [2].

Polycystic Ovarian Syndrome is an endocrine disease that affects the usual functioning of ovaries [1]. The symptoms that are seen in PCOS include oligo-ovulation or anovulation, hyperandrogenism, and polycystic ovaries. Other symptoms seen include menstrual

disturbance, obesity, hirsutism, androgenic alopecia, acne, acanthosis nigricans, oligomenorrhoea/amenorrhoea, mental health problems, and thinning scalp hair [1]. It is the leading cause of anovulatory infertility [6]. The associated problems of PCOS are obesity, cardiovascular disease, type II diabetes, metabolic syndrome, and breast and ovarian cancer [1].

Statistically, it is believed that 7% - 15% of women are affected worldwide. In India, 2.2%- 26% of women are affected by PCOS. According to Rotterdam criteria, the prevalence of PCOS is 10%. Health and the androgen excess and PCOS society, the prevalence is 6%. Factors that worsen the adverse effects of PCOS are; sedentary lifestyle, poor eating habits, and obesity. [1] [2] [6].

Genes and the environment are partly responsible for PCOS.

Genetics and lifestyle affect hormonal changes, insulin resistance, and androgen increase and both can also affect the ovarian follicles which may cause anovulation and increased estrogen levels, which then cause menstrual disturbances and subfertility [1]. Also, insulin resistance can cause diabetes and metabolic syndrome, which in turn may also increase cardiovascular risk. An increase in androgen levels can cause hirsutism and acne. All the above resultantly cause psychological issues related to body image, self-esteem, depression, and anxiety [1]. Lifestyle-related metabolic diseases, like overweight or obesity and insulin resistance cause exacerbation of PCOS. Sedentary behavior and excess calorific intake also contribute to it [1].

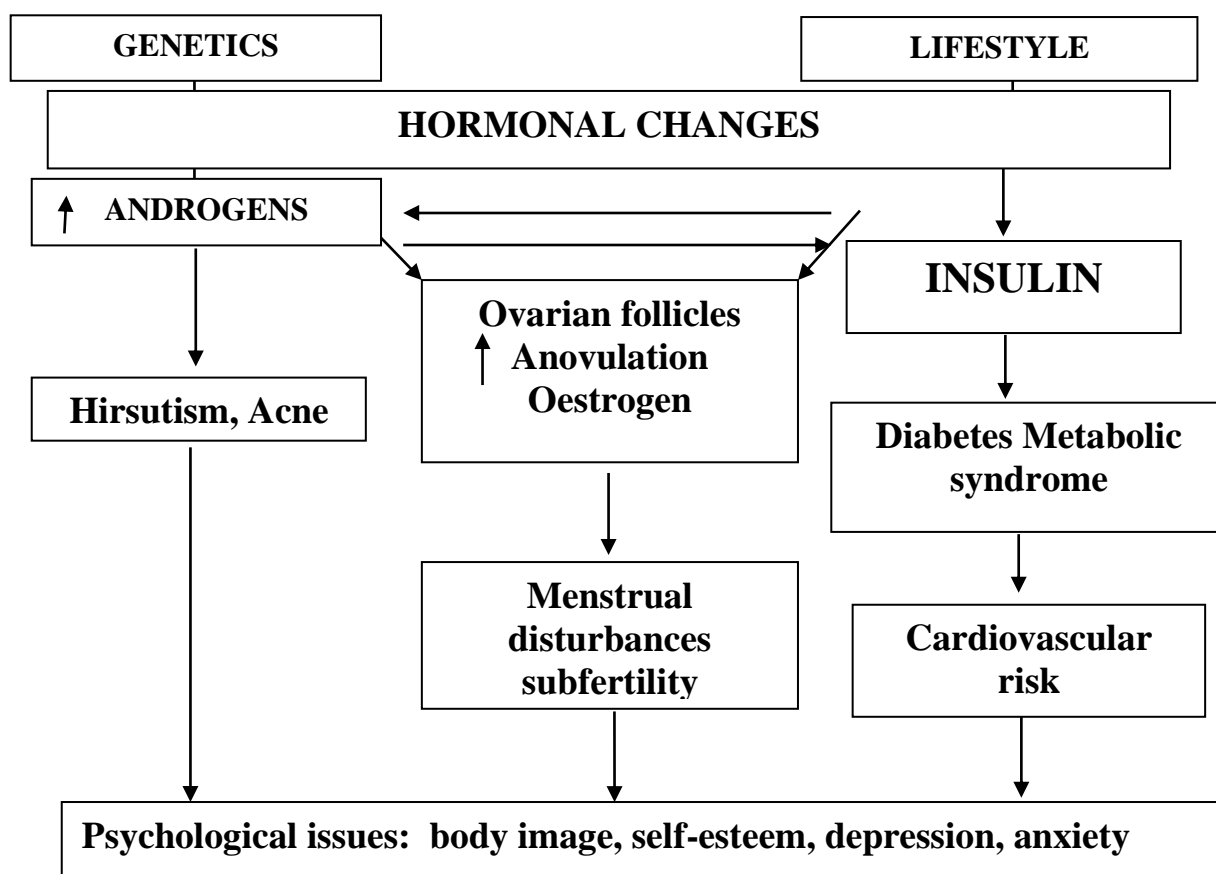


Figure 1. The aetiological, hormonal, and clinical features of polycystic ovary syndrome [7].

The Androgen Excess and Polycystic Ovary Syndrome Society determined the evidence of lifestyle modification for women with

PCOS. It was found that regular exercise and lifestyle modification minimize hormonal and reproductive complications,

reduce the long term risks of chronic diseases such as CVD and DM2, and consequently improve quality of life [2].

Resistance training (also called weight or strength training) is the type of exercise that requires the body to push against a force that is practiced against it. It includes bodyweight exercises, plyometrics, the use of resistance bands, free weights, or machine pieces of equipment [1].

The benefits of resistance training are that; benefits the musculoskeletal system, prevents osteoporosis, prevents lower back pain, improves insulin resistance, glucose metabolism, and resting metabolic rate, lowers body fat, increases insulin sensitivity in type II diabetes, and improves ovulation [1].

According to some authors, resistance training for 2-3 non-consecutive days per week, at 60% to 75-80% of 1RM, targeting all major muscle groups should be prescribed and should progress according to tolerance. It also improves the levels of FSH, sex hormone-binding globulin, total testosterone, androstenedione, and Free Androgen Index and Ferriman- Gallwey score [1].

Along with resistance training, lifestyle modification strategies have also shown a significant role in alleviating the symptoms of PCOS. It includes increased physical activity in everyday life which will in turn aid in weight loss and maintenance in patients with PCOS [4].

Moderate to high intensity physical exercise has been predominantly recommended as a treatment for PCOS. It is defined as an intensity between 50 and 85% of maximum oxygen consumption (VO₂ max) or 60-90% of maximal heart rate [4]. More recently a review presented evidence that progressive resistance training or strength training may also be beneficial for women with PCOS, promoting changes in body composition and associated factors [2].

Write Introduction section of your research paper here. Modify this section as applicable according to your research work.

Aims/objectives of the research article should be included in this section.

Add appropriate original references to the sentences/paragraphs taken from other media/sources.

LITERATURE REVIEW

1. Pericleous P, Stephanides S. conducted a study in the year 2018, to determine the effectiveness of resistance training on PCOS symptoms. They hypothesized that a combination of resistance training and appropriate lifestyle modification (eg. dieting routine) is important for alleviating symptoms of PCOS. They compared three different groups – resistance training, diet, and resistance training with diet, and though all of them had significant fat mass reductions only the resistance training group had an increase in lean mass.

Pericleous P, Stephanides S. Can resistance training improve the symptoms of polycystic ovary syndrome? *BMJ open sport & exercise medicine*. 2018 Aug 1;4(1):e000372.

2. Vizza L, Smith CA, et al. conducted a study in the year 2016, to determine the feasibility of progressive resistance training in women with PCOS and concluded that a randomized clinical trial of PRT in PCOS would be feasible to conduct, and this mode of exercise may elicit a therapeutic effect on a range of pertinent outcomes in this cohort. A suitably powered clinical trial is required to confirm these findings and answer novel research questions concerning prescribing PRT as a therapeutic intervention in PCOS. The success of a large scale trial required to confirm these findings would be contingent on addressing the feasibility hurdles identified in this study concerning recruitment, attrition, compliance, and collection of standardized clinical data.

Vizza L, Smith CA, Swaraj S, Agho K, Cheema BS. The feasibility of

- progressive resistance training in women with polycystic ovary syndrome: a pilot randomized controlled trial. *BMC sports science, medicine, and rehabilitation*. 2016 Dec;8(1):1-2.
- Harrison CL, Lombard CB, et al 2011, conducted a study to determine the effectiveness of exercise therapy in polycystic ovary syndrome. They evaluated exercise therapy as an independent treatment against a comparison group. Outcomes measures included cardiovascular risk factors and reproductive measures. They concluded that women with PCOS should be advised to engage in at least 90 min of exercise per week at moderate intensity (60-70% VO₂max) to achieve improved reproductive and cardiometabolic outcomes.
Harrison CL, Lombard CB, Moran LJ, Teede HJ. Exercise therapy in polycystic ovary syndrome: a systematic review. *Human reproduction update*. 2011 Mar 1;17(2):171-83.
 - Ramos FK, Lara LA, et al 2016 conducted a study to check the quality of life in women with polycystic ovary syndrome after a resistance exercise training program. They carried out 16 weeks of case control study and enrolled 43 women with PCOS and 51 healthy pre-menopausal controls aged 18-37 years. All women underwent a supervised RET program for 16 weeks and were evaluated on two different occasions: week-0 (baseline), and a week-16 (after RET). Quality of life was assessed using the 36-Item Short Form Health Survey (SF-36). They concluded that supervised RET is an effective therapeutic regimen that could be included in the protocols for the treatment of women who have PCOS and require interdisciplinary care.
Ramos FK, Lara LA, Kogure GS, Silva RC, Ferriani RA, Silva de Sá MF, Reis RM. Quality of life in women with polycystic ovary syndrome after a program of resistance exercise training. *Revista Brasileira de Ginecologia e Obstetrícia*. 2016 Jul;38(7):340-7.
 - Hiam D, Patten R et al 2019 conducted a study to determine the effectiveness of high intensity interval training on metabolic, reproductive, and mental health in women with PCOS. They employed a three arm, parallel group randomized control trial recruiting 60 women diagnosed with PCOS aged between 18-45 with BMI greater than 25 kg/m². Two groups were compared, one was given moderate intensity exercise and the other was given high intensity interval training for 12 weeks under supervision. They concluded that HIIT in PCOS promises greater metabolic benefits.
Hiam D, Patten R, Gibson-Helm M, Moreno-Asso A, McIlvenna L, Levinger I, Harrison C, Moran LJ, Joham A, Parker A, Shorakae S. The effectiveness of high intensity intermittent training on metabolic, reproductive and mental health in women with polycystic ovary syndrome: study protocol for the iHIT-randomised controlled trial. *Trials*. 2019 Dec;20(1):1-9.

Literature review should be written here with proper citation.

MATERIALS & METHODS

PROCEDURE:

The prior permission of the individuals being included in the study will be taken. The purpose and the objective of the study will be explained to individuals. Based on the inclusion and exclusion criteria, the individuals will be selected and a consent form will be given and filled by them. A detailed general physical examination will be done to rule out medical, surgical, or cardiopulmonary complications.

PCOSQ will be given to all the participants to fill in before the protocols are given. The subjects will then be divided into two

groups for carrying out the further procedure.

GROUP A PROTOCOL:

Based on the RM (repetition maximum), the exercises will be allotted to the subjects. All exercises will be demonstrated and supervised repetitions will be done.

Week wise program for Group A:

Week 1:

Day 1: Demonstration of all exercises

Day 2: Set of all exercises with 5 repetitions

Day 3: Set of all exercises with 10 repetitions

Day 4: 2 Sets of all exercises with 5 repetitions

Day 5: 2 Sets of all exercises with 10 repetitions

Day 6: 3 Set of all exercises with 5 repetitions

Day 7: Rest

From week 2-8: 3 set of all exercises with 10 repetitions (with 7th day as a rest day)

The exercise session consists of a total 60 min duration of which 10 min warm up, 40 min core exercises, and 10 min cool-down exercises.

The resistance exercises include exercises of the upper body, abdomen, and lower limb

I. Warm-up exercises (10 min):

- Easy to moderate aerobic activity (slowly elevate the pulse and body temperature)
- AROM exercises

II. Exercise protocol (40 min):

According to the day of the week, exercise for the particular segment will be given.

For biceps and triceps:

1. Biceps curl
2. Triceps exercise with dumbbells

For chest:

1. Chest press

For abdomen:

1. Plank exercises
2. Crunches (forward and reverse)

For Glutes, Hamstrings, and Quadriceps:

1. Squatting exercises
2. Lunges
3. Hamstring curls
4. Quadriceps curls

Day wise work out for group A after 1st week (40 min):

Day	Work Out
Day 1	Abdominals and lower limb
Day 2	Upper limb and chest
Day 3	Abdominals and lower limb
Day 4	Upper limb and chest
Day 5	Abdominals and lower limb
Day 6	Upper limb and chest
Day 7	Rest

III. Cool-down exercises (10 min):

- Full body stretching
- Savasana

GROUP B PROTOCOL:

The protocol for group B will completely depend on the lifestyle modification.

The modifications will be primarily done in the diet and additional advice on how an active routine should be maintained.

Additional advice for an active routine:

- a. Working hours and positions attained while working
- b. Breaks are taken during working hours
- c. Simple aerobic activity (e.g. Walking, jogging, stretching, etc.)

After completion of 8 week program, the assessment will be done of individuals who have successfully completed the protocol with 90% participation and an analysis of outcome measures will be done to compare the effectiveness of both protocols.

STATISTICAL ANALYSIS

Data will be entered in Microsoft Excel and analyzed using SPSS version 24.0th. Normality of data will be assessed for quantitative variables and data will be represented in a statistical form (eg. A bar diagram or a pie chart). The mean and standard deviations will be calculated for the quantitative variables and proportions will be calculated for categorical variables. For comparison of the two groups mean unpaired t-test will be applied. A paired t-

test will be used to check the significant difference between pre and post treatment in each group. P- value of <0.05 will be considered statistically significant.

RESULT

Subject Information:

There are two groups, Group A (N=39) lifestyle modification, and Group B (N=39) resistance training was taken.

Statistical tests:

The mean and standard deviation for the outcomes of PCOSQ were taken for groups A and B.

The value of the mean PCOSQ score for Group A was 103 ± 21.009 with 96.98 to 110 of 95% CI. The value of the mean PCOSQ score for group B was 103.89 ± 21.08 with 96.95 to 110.8 of 95% CI.

Unpaired t-test:

A comparison between the mean PCOSQ score has been done for Group A and Group B using the Unpaired 't' Test. And the result was found to be not significant.

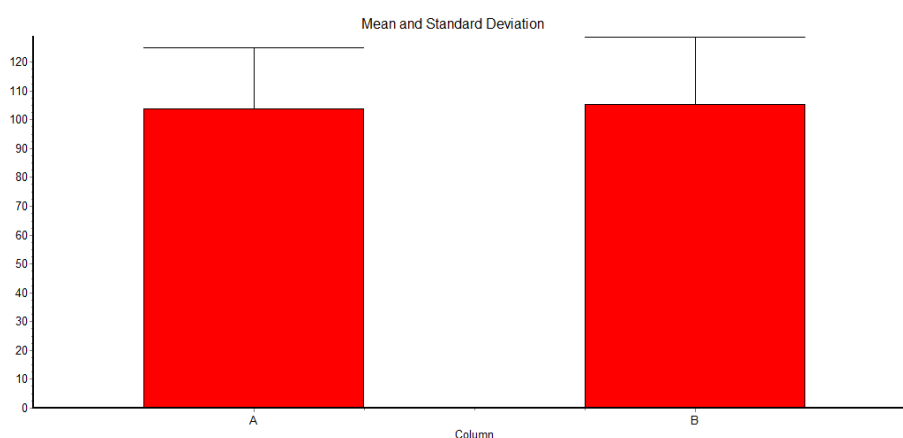
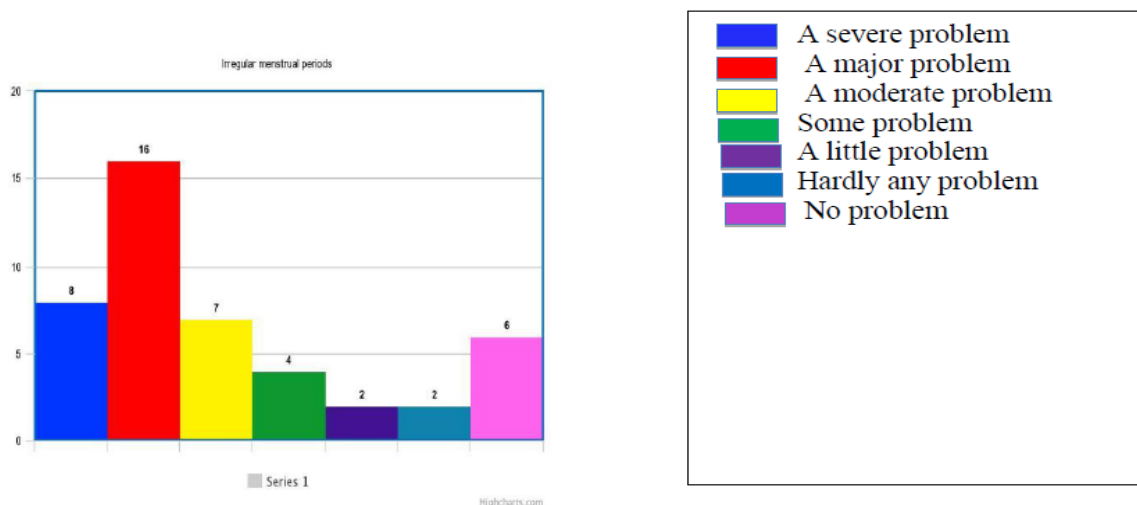
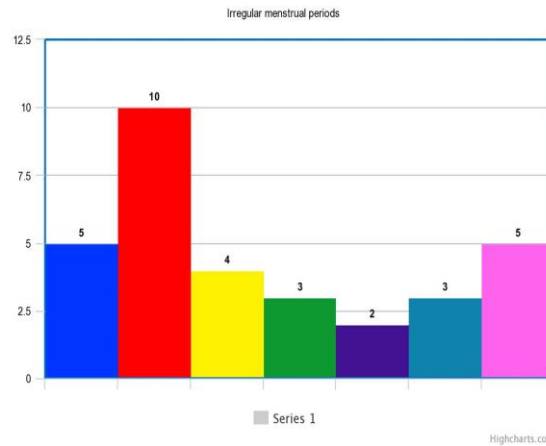


Table 1: Inter-Group comparison of Symptoms of Polycystic Ovarian Syndrome derived from PCOSQ for Group A and Group B (Unpaired 't' Test)

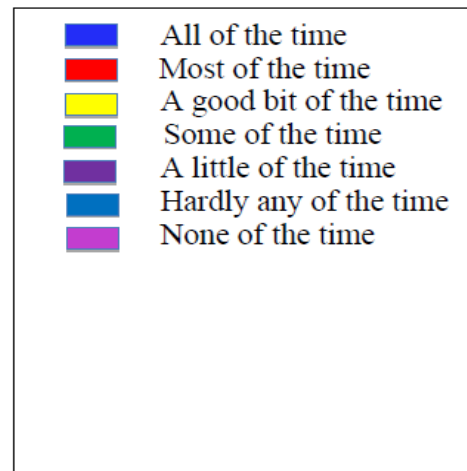
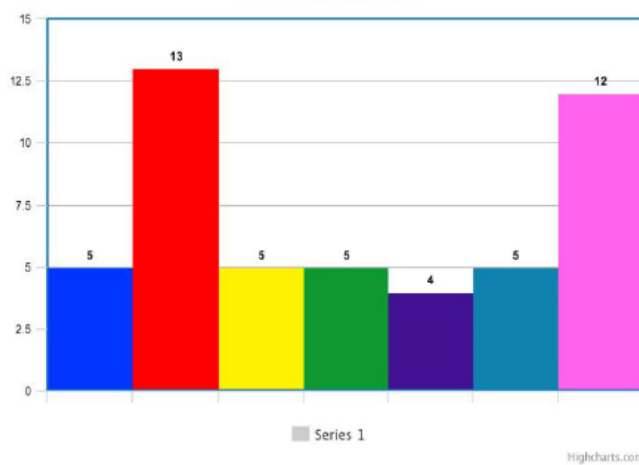
GROUP	N	Mean x SD	95% of Confidence Limit	t- value	P-value	Significance
GROUP A	39	103.59±21.009	96.98 to 110	0.242	0.501	Not Significant
GROUP B	39	103.89±21.08	96.95 to 110.8			



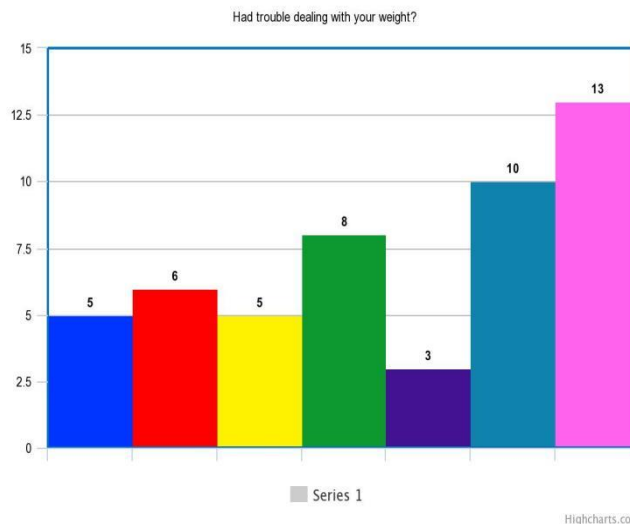
Graph 1. Pre treatment representation of irregular menstruation symptom



Graph 2. Post treatment representation of irregular menstruation symptom



Graph 3. Pre treatment representation of weight maintenance symptom



Graph 4. Post treatment representation of weight maintenance symptom

DISCUSSION

The present study was designed to find out the comparative effectiveness of lifestyle modification and aerobic exercises with resistance training. This is the first

comparative study to compare lifestyle modification with resistance training among women medically diagnosed with Polycystic Ovarian Syndrome. In our perspective, comparative study, we found that there was

no significant difference in both the groups on the treatment of Polycystic Ovarian Syndrome in terms of symptomatic alleviation and quality of life. Both the treatment groups had an equal effect on individuals with Polycystic Ovarian Syndrome.

Our findings are in agreement with previous research by Pericleous P, and Stephanides S., who conducted a study in the year 2018, to determine the effectiveness of resistance training on PCOS symptoms. They hypothesized that a combination of resistance training and appropriate lifestyle modification (eg. dieting routine) is important for alleviating symptoms of PCOS. They compared three different groups – resistance training, diet, and resistance training with diet, and though all of them had significant fat mass reductions only the resistance training group had an increase in lean mass.

Our results are also similar to Vizza L, Smith CA, et al., who conducted a study in the year 2016, to determine the feasibility of progressive resistance training in women with PCOS and concluded that a randomized clinical trial of PRT in PCOS would be feasible to conduct, and this mode of exercise may elicit a therapeutic effect on a range of pertinent outcomes in this cohort. A suitably powered clinical trial is required to confirm these findings and answer novel research questions about prescribing PRT as a therapeutic intervention in PCOS. The success of a large scale trial required to confirm these findings would be contingent on addressing the feasibility hurdles identified in this study concerning recruitment, attrition, compliance and collection of standardized clinical data.

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CONCLUSION

The present study concludes that both the treatment groups showed equal effectiveness on the symptoms in individuals with Polycystic Ovarian Syndrome. However, the group with resistance training with lifestyle modifications showed better improvement

in Body Mass Index and menstrual regularity.

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Conflict of Interest: None

Source of Funding: None

Ethical Approval: Approved by the ethical committee of MGM Institute of Physiotherapy.

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