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Original Article

Comparing the Effects of Progressive Muscle Relaxation and Physical Activity on Pregnant Women's General Health

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Abstract

Background: Pregnancy is important because maternal health and well-being directly affects another person's life. This study aimed to compare the effects of progressive muscle relaxation (PMR) and physical activity (PA) on the general health of pregnant women. **Materials and Methods:** This randomized clinical trial was conducted among 96 primiparous women enrolled in a prenatal clinic in Tehran (Iran) between May 3, 2013 and August 7, 2013. The participants were selected through convenience sampling over 3 weeks and randomly assigned to the PMR, PA, and control groups, comprising 32 participants each. Six participants did not complete the follow-up measurement ($N = 90$). The PMR group underwent three sessions of 1.5–2 h in theoretical and practical training, and in the PMR group, training was given in groups of three to four persons. Both groups performed exercises at home for 8 weeks and recorded them in daily report sheets. The general health of all three groups was assessed before and after intervention by using the General Health Questionnaire-28. **Results:** Differences in the mean (SD) general health scores obtained before and after intervention in the PMR, PA, and control groups were 15.63 (5.73), 19.11 (7.79), and 8.27 (2.14), respectively. One-way analysis of variance test showed a significant difference between the three groups ($F = 28.10$; $p < 0.001$). **Conclusions:** As the study results confirm the positive effects of PMR and PA on the subscales of the general health of pregnant women, the two techniques are recommended to promote the general health of pregnant women.

Keywords: *General health, Iran, physical activity, pregnancy, progressive muscle relaxation*

Introduction

Pregnancy is important because maternal health and well-being directly affects another person's life. The well-being of people who have prospects in life depends upon healthy women and mothers.[1] Till a few years ago, many women were advised to reduce daily activities during their final months of pregnancy. Recently, however, physical activity (PA) during pregnancy is recommended, and many studies have indicated the positive influence of exercise, especially light-to-moderate exercises.[2] Prenatal maternal stress leads to several adverse outcomes such as enhanced risk for preterm delivery, fetal growth constraint, and low birth weight.[3] Some studies have shown that there is a correlation between mental health of women throughout the prenatal period and the outcomes of pregnancy.[4] Psychological pressures during pregnancy, delivery, and breast feeding may lead to harmful outcomes.[4-6]

A healthy lifestyle that incorporates ordered levels of PA in the course of pregnancy may contribute to progressed pregnancy outcomes.[7] Regular PA during pregnancy appears to be useful to the maternal–fetal unit and may prevent maternal disorders such as hypertension.[8] Despite variations in the specific amount of PA recommended during pregnancy, pregnant women worldwide often do not meet the recommendations. Studies have shown that many pregnant women do not perform as much PA as recommended.[5,9] Given the mutual effects of physical and mental health, many researchers have been interested in nonmedical and applicable methods that can affect the physical and mental health of pregnant women.[10]

Nowadays, different methods of relaxation are being used. Muscle relaxation techniques (PMRT) that include progressive muscle relaxation (PMR) exercises are among the physiological mechanisms that join the mind and the body, and as a nonmedicinal method, have positive effects on stress management in the physical, mental, and social aspects of general health

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as well as anxiety. These techniques are extensively used in research, and stress reduction and muscle tension control constitute the basis of treatment.[11] During pregnancy, PMR exercises cure the mother's body and soul of fatigue, which is reported to soothe minor and common pregnancy discomforts.[12]

A review study of all published articles on the relationship between PA and pregnancy depression from 1985 to 2010 stated that the antidepressant effect of PA was supported by the majority of studies, and concluded that PA increased people's self-esteem and improvement against anxiety and depression of general health domains.[13] Moreover, some studies reported that PMR training could improve the quality of life and reduce pain in pregnant women with low back pain[14,15] as well as reduce stress among pregnant women.[16]

In the study, the exercise plan in pregnancy had an effect on the type of delivery, which proved positive regarding vaginal births.[17] Nevertheless, some studies provide evidence that all pregnant women without medical risk can be physically active to obtain great health benefits. Therefore, the knowledge pertaining to PA during pregnancy is still very restricted and larger studies are required in this area. Research has shown that the amount of PA performed either during work or for obviation significantly decreases during pregnancy. Due to physical changes that occur during pregnancy, special precautions are also required.[18] Notwithstanding numerous studies on the relationship between maternal PA and pregnancy outcomes, there is a dearth of evidence on the consistent and significant impact of regular exercise throughout pregnancy on fetal growth.[19] Regular PA during pregnancy improves good physical and mental health.[20] The evolution of PA throughout pregnancy is controversial; while some studies describe a trend toward a gradual decrease as the pregnancy progresses, others show a decrease in PA during the first quarter with a gradual increase and then stability until the end of pregnancy[21] or no significant differences in PA variability by trimester.[22] On the contrary, several studies have reported that physical activity has few negative impacts on many pregnant women.[23] Therefore, healthy women who have not started doing strong intensity physical activity should get at least 2 hours and 30 minutes of moderate intensity aerobic activity per week during pregnancy.[24]

In the past, most pregnant women were anxious about doing physical training during pregnancy to achieve a safe pregnancy condition. However, this new perception about physical activity and exercise during pregnancy has changed considerably.[25] In the study, the exercise program during gestation had an influence on the type of delivery, which proved positive regarding vaginal births,[17] and in a cohort study, only 14.6% of the respondents followed the current recommendation for exercise during pregnancy.[26]

PMR and breathing exercises are among the physiological mechanisms that link the mind and the body, and as a nonmedicinal method they have positive effects on stress management in physical, mental, and social dimensions of general health.[10] Some studies have reported that PMR training could improve the quality of life and decrease pain in pregnant women with low back pain[14] and reduce stress in pregnant women.[16]

Considering the mutual relationship between the body and psyche, excessive vulnerability of pregnant women, the direct effect of mental stress on the health of the mother and the fetus, the emphasis on the effectiveness of social support and nursing care for pregnant women on mental health after child birth, there is a lack of similar studies in this regard. Although few studies have investigated separate effects of relaxation and exercise in Iran, no comprehensive study has been carried out yet to compare the effects of PMR and physical activity on the general health of pregnant women. Knowledge about the physical activity in pregnancy is still very limited, and hence, more and larger studies are required in the area where much scientific knowledge is missing. Through a generous attitude to physical activity and exercise during pregnancy, women's future health can be promoted. Therefore, our study question is which of the method is more effective?

Thus, the present study was conducted to investigate the effects of PMR and PA on the general health of pregnant women. This study was conducted to investigate and compare the effects of PMR and PA on the general health of pregnant women.

Materials and Methods

This study used a randomized, clinical trial design which has been registered with the code IRCT20135159764N1 in the Clinical Trial Registration Center and approved by the Research Deputy of Baqiyatallah University of Medical Sciences. It was conducted among 96 primiparous women who were selected through nonprobable sampling with reference to the prenatal clinic of Baqiyatallah hospital in Tehran, Iran. The study started on May 3, 2013 and ended on August 7, 2013. The sample size was obtained by using Altman's nomogram and considering the previous studies as samples,[10] with power = 90%, β = 10% and α = 5%, following screening and written consent, the participants were divided into equal numbers of three groups, using a ball inside a bag. They were requested to participate actively in the random assignment. Consequently, each participant was invited to choose a ball inside a bag containing the group's name. So, we selected participants for each group by randomization. The inclusion criteria were nulliparous and maximum of 12 weeks of gestational age (first trimester) according to the previous study,[10] minimum literacy required for reading and understanding the stages of PA, single pregnancy, low-risk pregnancy,

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no use of antidepressants, and no addiction to cigarettes, opioids, or alcohol.

The study instruments consisted of two parts including a demographic questionnaire such as age, gestational age, occupation, educational status, and married life duration. The general health questionnaire-28 (GHQ-28) was used for measuring the general health of pregnant women. It is a self-administered questionnaire and can detect minor, nonpsychotic psychiatric disorders in general practice. The validity and reliability have been evaluated in various studies, even in Iran, with Cronbach's alpha of 0.9 which is of good reliability and item scale correlated.[27] This is a self-reporting screening questionnaire with four subscales (physical symptoms, anxiety and insomnia, social functioning disorder, and depression) and consists of 28 questions. All the items are scored with a 4-point Likert style (0–3). The total score of each participant is the sum of scores of the four subscales, which ranges from 0 to 84 (20). GHQ-28 had been previously used to determine the general health of pregnant women.[10]

In this study, first, the general health of all participants was assessed using the GHQ-28 in a prenatal clinic. Participants were selected in 3 weeks. Next, the participants were randomly assigned to the PMR, PA, and control groups (N = 32). Randomization was performed with two blind clinical trials by the researcher. The training for PMR was administered by conducting three theoretical and practical sessions every other day of a week, with a duration of 1.5–2 h for each session. In the sessions, pregnant women were familiarized with the concept of the PMR and the role and importance of performing it in prenatal clinic; following this, the research units were requested to practice the technique step by step. After teaching and making sure that the participants had learnt the practical training, the training Compact Disc was prepared and the participants were prepared with the contents of the abovementioned method, so that they could listen to it while practicing at home. The trainer was a qualified person and had expertise in the instruction and training of PMR.

In the group that was undergoing physical activity (walking) intervention, the training was conducted by the researcher in lectures, questions, and answers for 1.5–2 h. The participants practiced for 8 weeks, at least twice a day at home, and recorded the results of the practice in a daily report sheet. Meanwhile, during these 8 weeks, the researcher kept telephone contacts with the participants to answer their questions as well as to follow them up to ensure that they were practicing in Table 1. Finally, after the end of 8 weeks of training, the general health of all three groups was appraised using the GHQ-28.

The data were entered into the SPSS version 15 IBM Corporation Analytics. The normality of distribution variables was assessed according to the Kolmogorov–Smirnov test. To interpret and analyze the data, descriptive statistics such as mean and standard deviation, and inferential statistics, such as Chi-square, were used to match the demographical variables in the three groups, the paired t-test was used for determining the differences in the mean scores of general health before and after intervention, the one-way analysis of variance test was used to compare the difference in mean between groups, and also Tukey's test was applied to clarify which specific groups among the sample have significant differences. A p value less than 0.05 was considered as statistically significant. The attrition in follow-up stage was that six participants did not complete the follow-up measurement due to spotting and inevitable or threatened abortion [Figure 1].

Table 1: Walking program for physical activity group

Week	Duration of walking time			
	Common walk	Walking fairly fast	Walking slowly	Total time
First	5 min	5 min	5 min	15 min
Second	5 min	8 min	5 min	18 min
Third	5 min	10 min	5 min	20 min
Fourth	5 min	13 min	5 min	23 min
Fifth	5 min	15 min	5 min	25 min
Sixth	5 min	18 min	5 min	28 min
Seventh	5 min	20 min	5 min	30 min
Eighth	5 min	20 min	5 min	30 min

Ethical considerations

The Ethics Committee of Baqiyatallah University of Medical Sciences approved the proposal for this study (IR.BMSU.REC.1395.375) and raised no objections from an ethical viewpoint. The interventions have no complications. In accordance with research ethics, all the participants signed the informed written consent forms after receiving sufficient information about the research and its objectives, and those who did not want to continue with the study were excluded. Both interventions did not harm.

Results

Regarding demographic information, the results showed that the mean (SD) age of mothers was 23.78 (3.60) years, most study participants were housewives (70%) and had educational qualifications of lower secondary (40%); and 45.50% participants had gestational age of 9–12 weeks [Table 2]. The duration of married life was less than 4 years (70%). The participants had been regularly referring to the prenatal clinic for routine care and there was no significant difference between the characteristics of the control and experimental groups. Before intervention, the total mean (SD) scores of general health of the PMR and the PA groups as well as the control group were 35.83 (6.92), 38.06 (7.48), and 29.64 (8.30), respectively, and after intervention, they were 20.20 (5.61), 19.20 (7.78), and 24.50 (8.27), respectively. Paired t-test showed a significant difference

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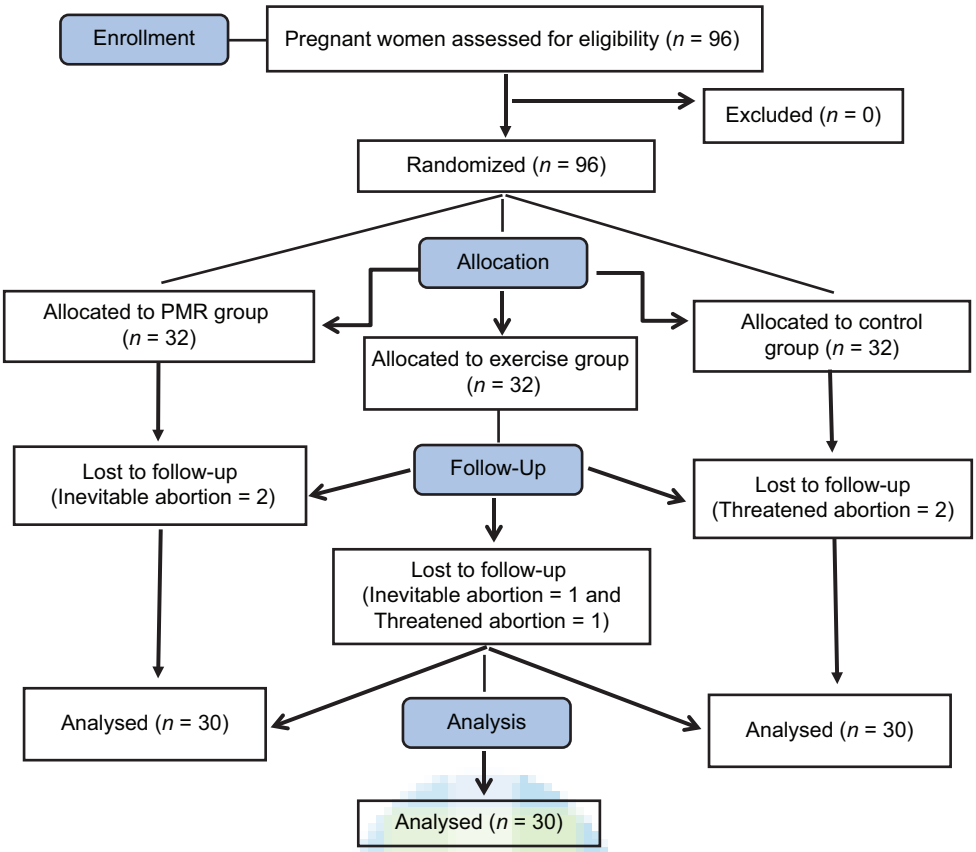

Figure 1: Flow diagram of the participants' assignment and withdrawals for patients in PMR and physical exercise and control groups

Table 2: Distribution of control and experimental groups based on demographic information

Group variable	PMR* *n* (%)	Physical activity *n* (%)	Control *n* (%)	*p***	df***
Age (year)					
18-23	12 (40)	11 (36.67)	5 (16.66)	0.233	2
24-29	10 (33.33)	11 (36.67)	11 (36.67)		
30-35	8 (26.67)	8 (26.66)	14 (46.67)		
Gestational age (week)					
6-8	16 (53.33)	18 (60)	15 (50)	0.150	87
9-12	14 (46.67)	12 (40)	15 (50)		
Occupation					
Employee	8 (26.67)	12 (40)	7 (23.33)	0.810	87
Housewives	22 (73.33)	18 (60)	23 (76.67)		
Educational degree					
L-secondary****	13 (43.33)	12 (40)	11 (36.67)		2
Up-secondary*****	9 (30)	9 (30)	10 (33.33)	0.141	
H-education******	8 (26.67)	9 (30)	9 (30)		
Marital life (year)					
≤4	23 (76.67)	21 (70)	19 (64.33)	0.844	87
>4	7 (23.33)	9 (30)	11 (36.67)		

*Progressive Muscle Relaxation; **Chi-square test was used. ***degree of freedom. $p<0.05$ were considered as statistically significant. ****Lower-secondary, *****Upper-secondary; ******Higher education

in the comparative mean scores of women's general health before and after intervention in the experimental groups ($p < 0.001$) and in the control group ($p = 0.030$), as illustrated in Table 3. In addition, the mean (SD) difference of general health in the PMR and the PA groups before and after intervention were 15.63 (5.73) and 19.11 (7.79), respectively, whereas it was 8.27 (2.14) for the control group, and one-way ANOVA test showed a significant difference between the three groups in the mean general health scores ($F = 28.10$; $p < 0.001$).

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Tukey's test showed significant differences between the two groups in the mean general health scores before intervention in the four subscales and overall score with the control group, but there was no significant difference between the two intervention groups in the mean general health score after intervention. Tukey's test also showed that there was a significant difference between the control and intervention groups ($F = 28.10$, $p < 0.001$), as shown in Table 4.

Discussion

The main findings from this study demonstrate equal effects between the PMR and PA on the general health of pregnant women. Physical exercise affected the general health dimensions of physical, anxiety and insomnia, social dysfunction and depression in pregnant women. Thus, studying the effect of PA while pregnant showed that physical exercise improved physical and mental parameters.[28] Another study that assessed the effect of moderate physical exercise on healthy feeling and well-being of pregnant women reported greater percentage of participants in the trial group that described their health as "very good."[29] Some studies showed that PA during pregnancy had a clinically significant reduction in pelvic pain, lower back pain[14] and depression.[4] Moreover, while some other studies are consistent with our results,[29] some others have reported that light-to-moderate physical exercise during pregnancy did not indicate any effect.[30]

The other results of the present study on the effects of relaxation training on different aspects of pregnant women's general health, including anxiety and insomnia showed a significant difference between the general health scores of pregnant women before and after intervention.

Pregnancy, as an essential event in the life of a woman and her family, causes major changes in the woman physically and psychologically. Nevertheless, studies on the psychological aspect of the changes are lesser than those on

Table 3: Comparison of mean scores before and after intervention in the three groups

	Physical symptoms	Anxiety and insomnia	Social functioning disorder mean (SD)	Depression	Total score
PMR**					
Before	10.07 (2.55)	10.53 (2.70)	11. 03 (1.97)	4.20 (2.88)	35.83 (6.92)
After	5.53 (2.54)	5.77 (3.30)	6. 97 (2)	1.93 (1.36)	20.20 (5.61)
*p****	<0.001	<0.001	<0.001	<0.001	<0.001
t statistic	10.70	8.10	12	5.40	15
Physical activity					
Before	11.77 (2.77)	10.30 (2.66)	11.74 (2. 67)	4.50 (2.86)	38.06 (7.48)
After	5.73 (2.81)	4.33 (2.35)	6.97 (3.13)	2.17 (1.84)	19.20 (7.78)
*p****	<0.001	<0.001	<0.001	<0.001	<0.001
t statistic	10.90	12.40	9.50	6.90	13.50
Control					
Before	8.60 (3.11)	8.60 (2.97)	8.63 (2.25)	3.63 (2.37)	29.64 (8.30)
After	8.67 (2.86)	7.30 (2.96)	8.50 (2.76)	3.01 (2.34)	24.50 (8.27)
*p****	0.820	0.002	0.740	0.080	0.030
t statistic	−0.13	2.20	0.28	1.50	21.20
df****	29	29	29	29	29

*Standard deviation; **Progressive Muscle Relaxation. ***Paired *t*-test used: $P<0.05$; ****Degree of freedom

Table 4: Comparison of the mean difference scores of general health in the three groups before and after intervention

	Physical symptoms	Anxietyand insomnia	Social functioning disorder mean (SD)	Depression	Total score
PMR**					
Difference	4.53 (2.30)	4.76 (3.14)	4.06 (1.85)	2.26 (2.28)	15.63 (5.73)
Physical activity					
Difference	6.04 (3.03)	5.97 (2.64)	4.77 (2.72)	2.33 (1.86)	19.11 (7.79)
Control					
Difference	−0.07 (2.98)	1.20 (2.96)	0.13 (2.50)	0.60 (2.35)	8.27 (2.14)
*p****	<0.001	<0.001	<0.001	0.003	<0.001
F statistic	37.70	20.90	31.80	5.80	28.10
df_1, df_2****	2.87	2.87	2.87	2.87	2.87

*Standard deviation; **Progressive Muscle Relaxation. ***One-way ANOVA test was used; *Post hoc* test was used Tukey's test.
****Degree of freedom

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the physical aspect of changes.[3] In a study that examined the effect of mind–body interventions on pregnant women's temperament, perceived stress, and pregnancy outcomes, the results show effects such as increased birth weight, decreased duration of delivery, lesser use of instruments for delivery, and reduction of perceived anxiety and stress.[11]

Although there is no similar study, the results agreed with those of related studies, including the study which examined the effects of relaxation on mental health during pregnancy and showed useful effects of relaxation on physical and psychological systems.[11]

Our findings showed that, despite the effectiveness of both methods in enhancing the study participants' general health, there were insignificant differences between the PMR and the PA groups. Given that there are no similar comparative studies, or they have not been reported, depending on personal and family circumstances, each technique can be used to enhance the general health of pregnant women, but more extensive studies in this area are still needed. Women who regularly engage in high amounts of exercise can continue their activity provided that their condition remains unchanged.[24] Due to the abundance of different stresses during pregnancy as well as the physical and mental adverse effects of stress on pregnant women and their fetuses, learning the methods for coping with stress is of special importance during this period.[11,31]

Furthermore, in comparing the mean general health scores before and after intervention, it was demonstrated that PMR had positive effects on the general health of pregnant women. However, pregnant women are often encouraged to reduce their levels of PA and even to stop working due to the belief that physical exercise may reduce placental circulation and, consequently increase the risk of disorders. Furthermore, concerns have been expressed about other potential negative effects of PA during pregnancy.[19] Thus, past studies indicate that PA among pregnant women declines during this period, and the biggest changes occur during this period and in the intensity of physical exercise in the third trimester as compared to the activity levels before pregnancy or in the first trimester, it seems that women replace strenuous activities with activities of slight intensity as their pregnancy progresses, which leads to a decrease in the total volume of activity.[32] On the other hand, the moderate exercise training performed over the second and third trimesters of pregnancy does not negatively affect one of the main pregnancy outcomes.[29]

The results of this study should be interpreted with respect to its limitations. The study population may not be generalizable to other pregnant populations; women with moderate risk pregnancy and associated with substance abuse were excluded. Another limitation of this trial was that the personal and individual differences in the participants' mental and emotional aspects were controlled with randomization and statistical tests.

Due to the existence of only few relevant studies, there was limited chance of comparison of results with other studies, and the lack of generalizability of results was among the other limitations of this study, necessitating more comprehensive studies in future. Despite the limitations, the current study has a number of strengths the data already exist, complete study populations minimizing selection bias, and independently collected data.

Conclusion

This study showed that PMR and PA cause improvement in the general health of pregnant women. However, no differences were observed between the effects on the experimental groups. Therefore, either of these methods could be employed based on pregnant women's conditions, because they are cost-effective and economical, may not have side-effects, require no advanced training, effective in enhancing the physical and mental health of pregnant women, and can be conducted in remote regions where there is limited access to medical methods and professionals. Therefore, further scientific evidence for the effects of physical activity on maternal and neonatal outcomes seems necessary. Moreover, it is recommended that the effect of other relaxation methods with physical activity and the interactive effects of combination training types should be studied.

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Conflicts of interest

Nothing to declare.

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