

The effects of music and exercise on antenatal depression by online mode: an experimental study

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Abstract:

Background: Antenatal Depression is one of the most common mood disorders which is associated with low birth weight, preterm birth and abnormal Apgar score, cognitive, emotional and behavior development disorders. Prevalence of antenatal depression is about 34% of pregnant women's in worldwide and 3.8-65% of pregnant women's in India. The objective of the study is to analyse the effects of music and exercise on antenatal depression using online mode. **Methodology:** Women are coming to obstetrics check-up at primary health care centre OPD will be screened for the inclusion and exclusion criteria. Twenty women's in antenatal depression were recruited. The Edinburgh postnatal depression scale (EPDS) and Perinatal anxiety screening scale (PASS) questionnaire responses were obtained and were used to measure the antenatal depression levels. **Results:** Data was analyzed and was found that there was a significant difference in Depression between groups. The relative data of music and exercises analysis of antenatal depression revealed that there is an association between decreased antenatal depression and anxiety. **Conclusion:** Increased antenatal exercises and music is associated with decreased risk of antenatal depression.

Keywords: Pregnancy, Exercises, Music, Antenatal Depression and Anxiety, Women's Health.

INTRODUCTION

Pregnancy can be a time of joy, but it also has increased vulnerability for the development of stress, anxiety and depression. Antenatal depression is one of the most common mood disorders which is associated with low birth weight, preterm birth and Apgar score., cognitive, emotional and behaviour development disorders . Antenatal depression affects 3.8-65% of pregnant women's in India. Exercise, medications, psychotherapy, and alternative therapies are all used in the treatment of prenatal depression.

Since the unborn child indirectly benefits from the mother's care, many doctors and patients favour non-pharmacological options over prescription drugs when pregnant . Several investigations have questioned the safety of using psychotropic drugs during pregnancy, even though severe depression medicine is safe to take during this time. Although psychotherapy is a useful treatment option, it is not used enough for a number of reasons. Thus, there is a need for an accessible and safe alternative treatment for prenatal depression . Research on the effects of exercise on depression in the general population is ongoing, as evidenced by an increasing number of clinical trials that show exercise reduces depressive symptoms. Regular exercise protects the cardiovascular system, helps people maintain a healthy weight, lowers their risk of cancer, and can help manage chronic illnesses like diabetes and hypertension .

These and other health benefits are constantly shown by research findings. In fact, one of the first lifestyle adjustment tactics that are typically suggested for lowering morbidity and mortality is frequent exercise. Given the growing recognition of depression as a chronic illness, it makes sense to assume that lifestyle

modification techniques may potentially be beneficial in the disease treatment of depression .

In terms of prenatal treatment, music therapy reduces mother discomfort, anxiety, and depression as well as associated risk factors. Depression, anxiety, or stress experienced by pregnant women can lead to negative outcomes for their unborn children. These may include emotional problems, symptoms resembling attention deficit disorders, or delayed cognitive development in the child. Therefore, it's crucial to support maternal mental health during pregnancy to promote the best possible outcomes for both mother and child.

It really is that simple! . Stress and anxiety during pregnancy cause the adrenal glands to secrete more glucocorticoids, such cortisol, in reaction to the environment. These hormones are transferred to the foetus by passing through the placental barrier; this process has been identified as a critical factor that can hasten the emergence of unfavourable outcomes during pregnancy . Pregnant women who listen to music have been reported to have lower arterial blood pressure and heart rates as well as higher foetal heart rate and movements.

The harmful consequences of prenatal anxiety on the mother and unborn child could be stopped by the measures designed to lessen the steadily rising worry throughout the third trimester of pregnancy .

The effects of singing on psychological and physiological characteristics have also been studied recently, as singing is a unique type of active music creating. Strong mother-infant bonding has also been demonstrated to have a good impact on the mental health and depressive symptoms of the mother. Apart

from these subjectively measured effects, research has demonstrated that taking singing and music lessons can raise oxytocin levels, a hormone commonly linked to social behaviour. Garcia-Gonzalez, et al, (2018) reported that the pregnant women's psychological well-being must be fostered since the foetus is impacted on an affective, emotional, and organic level by the mother's emotional perceptions. It might be argued that the NST process is anxiogenic, and that pregnant women benefit from this procedure by experiencing less anxiety while they listen to music. In order to help full-term pregnant women, relax and reduce anxiety during a non-stress test (NST), prenatal music stimulation with RIM may be used over the course of fourteen 40-minute music sessions. This could improve the delivery process by delaying the onset of labour in women who are nulliparous. The benefits of prenatal music stimulation on the improvement of birthing process indicators (such as the length of the first stage of labour, the onset of labour early, the type of delivery, and the quality of the perineum) require more research. The primary aim of the study was to find the effects of music and exercise on antenatal depression using online mode. Further, the objective of this study were to analyze the effects of music and exercise on antenatal depression using online mode, and too determine the effects of music and exercise on antenatal depression using online mode.

MATERIAL AND METHODS

This study aimed to analyze the effects of music and exercise on antenatal depression using online mode.

Study design: Experimental study

Study setting: Data collected from Primary health center (PHC) and conducted through online

Sample size: 20 prenatal women (27weeks to 38weeks)

Study type: Pre and post type

Study duration: The study duration is 6 weeks

2.1. Inclusion criteria

- Antenatal who are in III Trimester.

RESULTS AND OBSERVATIONS:

- Antenatal depression women's were recruited.
- Women's who are conceive normally without any medication.
- A woman's who are having knowledge of using smart phone and online meetings.
- 2.2. Exclusion criteria
- First and second trimester women's
- Depression caused by alcohol abuse or non-alcoholic psychoactive substance
- Depressive episodes caused by somatic disease.
- 2.3. PICOS criteria

P (Participants) = Pregnant women, (III Trimester) including women with suspected or confirmed depression

I (Intervention) = music and exercise

C (Comparison) = usual care and active control

O (Outcome) = antenatal depression and antenatal anxiety

Women's coming to obstetrics check-up at primary health care centre OPD will be screened for the inclusion and exclusion criteria. Twenty women's (group A-10 & group B-10) in antenatal depression were recruited. The Edinburgh postnatal depression scale (EPDS) and Perinatal anxiety screening scale(PASS). Group A considered as control group and didn't received any treatment. Group B considered as experimental group. In the experimental group the subjects were undergone music and exercise for 3 days per week till the labor (6 weeks) by using online mode. MUSIC- Antenatal music (20 minutes per day) Ultimate stress relief – soothing music for relaxation, meditation and anxiety reduction.

EXERCISE:

1. 10 mins of warm-up, stretching & relaxation,
2. 20 mins of strengthening exercise
3. 20 mins of walking.



Outcome Measures

Outcome

- To reduce depression and anxiety

Measures

- Edinburgh postnatal depression scale (EPDS)
- Perinatal anxiety screening scale(PASS)

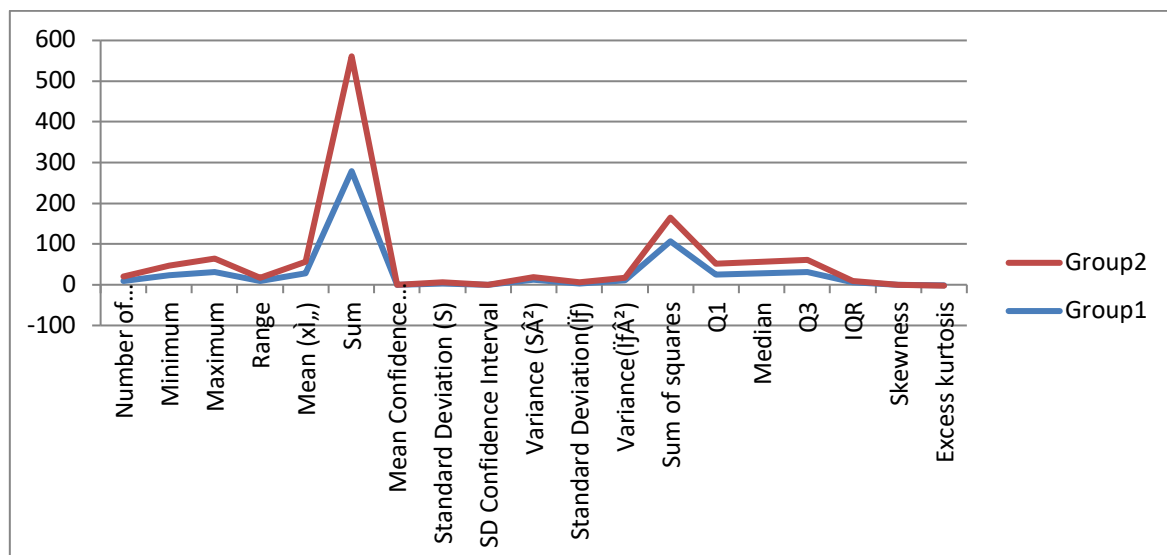
Statistical Analysis

Descriptive statistics: Age

Table 1: demographical data

Groups	Group1	Group2
Number of observations	10	10
Minimum	23	24
Maximum	32	32
Range	9	8
Mean ($\bar{x}$,)	27.9	28.2
Sum	279	282
Mean Confidence Interval	95% CI [25.43, 30.37]	95% CI [26.39, 30.01]
Standard Deviation (S)	3.45	2.53
SD Confidence Interval	95% CI [2.37, 6.29]	95% CI [1.74, 4.62]
Variance ($\hat{S}^2$)	11.88	6.4
Standard Deviation($\hat{f}$)	3.27	2.4
Variance($\hat{f}^2$)	10.69	5.76
Sum of squares	106.9	57.6
Q1	25	26
Median	28	28
Q3	31	30
IQR	6	4
Skewness	-0.28	-0.074
Excess kurtosis	-1.39	-0.87

Graph 1: Comparison of Group A & Group B



Interpretation of Two-Sample T-Test Results EPDS

Hypothesis testing

In a study comparing the average scores of EPDS (Edinburgh Postnatal Depression Scale) between two groups, A and B, a two-sample t-test (Welch's t-test) was conducted to determine if there is a statistically significant difference between their means. The null hypothesis (H_0) stated that there is no difference between the population means of EPDS A and EPDS B. However, since the p-value obtained from the test is less than the significance level ($\alpha = 0.05$), we reject the

null hypothesis. This suggests that the average EPDS scores for populations A and B are significantly different, indicating a meaningful difference between the two groups.

P-Value and Type I Error

The calculated p-value for the test is 0.002258. This p-value indicates the probability of observing a test statistic as extreme as, or more extreme than, the one obtained, assuming that the null hypothesis is true. In this context, a p-value of 0.002258 means there is only a 0.23% chance of committing a Type I error, which is the error of rejecting a true null hypothesis. The small p-value strongly supports the alternative hypothesis (H1), affirming that there is a significant difference between the mean scores of EPDS A and EPDS B.

Test statistics

The test statistic (T) is 3.8552, which falls outside the 95% confidence interval for the acceptance region, defined as [-2.177, 2.177]. This further corroborates the conclusion that the difference in mean scores is statistically significant. Additionally, the difference between the sample means ($x_1 - x_2$) is 5.3, and it also lies outside the 95% confidence interval for the mean difference, which is [-2.9928, 2.9928]. The standard deviation of the difference (S') is 1.375, which was used to compute the test statistic.

Effect Size

The observed effect size (Cohen's d) is 1.72, indicating a large effect. This large effect size signifies that the magnitude of the difference between the average scores of EPDS A and EPDS B is not only statistically significant but also practically meaningful. An effect size of this magnitude typically denotes a substantial difference, implying that the findings are likely to be of considerable practical importance.

Which is Greater?

Given that the mean difference ($x_1 - x_2$) is 5.3, it indicates that the average score of EPDS A is greater than the average score of EPDS B.

Summary Table

Statistic	Value
p-value	0.002258
Test statistic (T)	3.8552
95% CI for T	[-2.177, 2.177]
Mean difference ($x_1 - x_2$)	5.3
95% CI for Mean Difference	[-2.9928, 2.9928]
Standard Deviation of Difference (S')	1.375
Effect size (Cohen's d)	1.72

Interpretation of Two-Sample T-Test Results PASS

Hypothesis Testing

In a study comparing the average scores of PASS (Perceived Anxiety and Stress Scale) between two groups, A and B, a two-sample t-test (Welch's t-test) was conducted to determine if there is a statistically significant difference between their means. The null hypothesis (H0) stated that there is no difference between the population means of PASS A and PASS B. However, since the p-value obtained from the test is less than the significance level ($\alpha = 0.05$), we reject the null hypothesis. This suggests that the average PASS scores for populations A and B are significantly different, indicating a meaningful difference between the two groups.

P-Value and Type I Error

The calculated p-value for the test is 0.0003317. This p-value indicates the probability of observing a test statistic as extreme as, or more extreme than, the one obtained, assuming that the null hypothesis is true. In this context, a p-value of 0.0003317 means there is only a 0.033% chance of committing a Type I error, which is the error of rejecting a true null hypothesis. The extremely small p-value strongly supports the alternative hypothesis (H1), affirming that there is a significant difference between the mean scores of PASS A and PASS B.

Test Statistics

The test statistic (T) is 5.3921, which falls outside the 95% confidence interval for the acceptance region, defined as [-2.2357, 2.2357]. This further corroborates the conclusion that the difference in mean scores is statistically significant. Additionally, the difference between the sample means ($x_1 - x_2$) is 15.5, and it also lies outside the 95% confidence interval for the mean difference, which is [-6.4266, 6.4266]. The standard deviation of the difference (S') is 2.875, which was used to compute the test statistic.

Effect Size

The observed effect size (Cohen's *d*) is 2.41, indicating a large effect. This large effect size signifies that the magnitude of the difference between the average scores of PASS A and PASS B is not only statistically significant but also practically meaningful. An effect size of this magnitude typically denotes a substantial difference, implying that the findings are likely to be of considerable practical importance.

Which is Greater?

Given that the mean difference ($x_1 - x_2$) is 15.5, it indicates that the average score of PASS A is greater than the average score of PASS B.

Summary Table

Statistic	Value
p-value	0.0003317
Test statistic (T)	5.3921
95% CI for T	[-2.2357, 2.2357]
Mean difference ($x_1 - x_2$)	15.5
95% CI for Mean Difference	[-6.4266, 6.4266]
Standard Deviation of Difference (S')	2.875
Effect size (Cohen's <i>d</i>)	2.41

The average scores of EPDS A and EPDS B differ significantly, according to the results of the two-sample t-test. The low p-value (0.002258) and the test statistic (3.8552) being outside the 95% acceptance region strongly suggest rejecting the null hypothesis. Furthermore, the large effect size (1.72) highlights the practical significance of the difference between the two groups. Therefore, the findings suggest that interventions or conditions leading to different EPDS scores in groups A and B are likely to have a meaningful impact on postnatal depression outcomes. Specifically, the average EPDS score for group A is significantly higher than that for group B. The average scores of PASS A and PASS B differ significantly, according to the results of the two-sample t-test. The extremely low p-value (0.0003317) and the test statistic (5.3921) being outside the 95% acceptance region strongly suggest rejecting the null hypothesis. Furthermore, the large effect size (2.41) highlights the practical significance of the difference between the two groups. Therefore, the findings suggest that interventions or conditions leading to different PASS scores in groups A and B are likely to have a meaningful impact on anxiety and stress outcomes. Specifically, the average PASS score for group A is significantly higher than that for group B.

DISCUSSION

This experimental study aimed to correlate the music, exercises and antenatal depression, anxiety among Indian population. Previous studies have analysed the association of antenatal depression and anxiety with EPDS and PASS, the result obtained in them are highly variable. A study by Meena Konsam et al., (2023) on perinatal anxiety in pregnant women using STAI and music found that when perinatal anxiety is associated with music when orientation (ES 1.13, 95% CI: 0.82–1.44, $P < 0.0001$) and habituation (ES 1.05, 95% CI: 0.53–1.57, $P = 0.0001$) [10]. A study by Chineze

Nwebube et al., (2017) on diagnosis of antenatal depression using EPDS measures and music found that antenatal depression, anxiety is associated with music when EPDS ($p = .002$) (effect size 0.92) [18]. Similarly, in the study by Amina Riaz et al., (2022) on aerobic exercise in pregnant women's with antenatal depression CES-D measures 0.05 p-value found that antenatal depression, anxiety is associated with exercises [20]. However, in a study by Jayashree Kannappan et al., (2021) on diagnosis of depression on antenatal women found that HAM-d measures ($r = -0.118$, $P < 0.001$) [27].

The present study has proven that there was a decrease in antenatal depression and anxiety in antenatal depression women's that there was a significant difference between the groups EPDS p-value (0.002258) PASS p-value (0.003317) is associated with music and exercises and decreases the risk of antenatal depression and anxiety. However, in a study by Siti Roshaidai Arifin et al., (2022) in antenatal women's with antenatal depression and anxiety found that antenatal depression, anxiety is associated with exercises when EPDS ($p = 0.05$) [30]. Similar result where found with antenatal depression in pregnant women's PASS ($p = 0.005$) associated with exercise, music by Minseon Koh et al., (2019) [28]. Similarly, in a study by Slavica Arsova et al., (2017) on diagnosis of antenatal depression of maternal antenatal depression where found when HAMA, HAMD ($p = 0.05$) [33]. However, in a study by Farhin Zaidi et al., (2018) in women's with prevalence of postpartum depression and its association with antenatal depression where found that EPDS ($p\text{-value} = 0.025$) [34]. A study by Jennifer Guida et al., (2012) on diagnosis of postpartum depression associated with antenatal physical activity where found with depression when PPD [OR 1.34; 95% CI: (1.04, 1.74); $p = 0.03$] it was concluded that the relative data of music and exercises analysis of antenatal depression revealed that there is an

association between decreased antenatal depression and anxiety [35]. In this study there is a decrease in antenatal depression and anxiety in antenatal depression women that is associated with music and exercises and decreases the risk of antenatal depression and anxiety.

CONCLUSION

Increased antenatal exercises and music is associated with decreased risk of antenatal depression.

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