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# **Does Exercise Alleviate the Symptoms of Postpartum Depression?**

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

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Department of Physician Assistant Studies  
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## **ABSTRACT**

**OBJECTIVE:** The objective of this selective EBM review is to determine whether or not exercise alleviates the symptoms of postpartum depression.

**STUDY DESIGN:** This review consists of 2 randomized control trials, published in 2009 and 2010, and one cohort study published in 2009.

**DATA SOURCES:** Sources were studies comparing aerobic exercise to groups who performed no exercise which were found via Pubmed, MEDLINE, Ovid and Cochrane databases.

**OUTCOMES MEASURED:** The three articles measured various outcomes: Psychological well being, depressive symptoms and hospital admission or medication due to postpartum depressive symptoms which were measured through phone interviews and surveys. The Hamilton Rating Scale for Depression, Edinburg Postnatal Depression Scale, Positive Affect Balance Scale and the Danish Psychiatric Central Register were the sources of these measurements.

**RESULTS:** DaCosta et al showed that exercise was successful in lessening mild to moderate postpartum depressed moods. Strom et al found that exercise was an effective treatment of PPD, however only when women were exercising at a higher level of intensity. Norman et al has results showing that a combination of exercise and education improved postpartum mood.

**CONCLUSION:** The conclusion of the three reviewed trials was that aerobic exercise is a safe and effective way for postpartum depressive symptoms to be alleviated. Future studies should focus on a detailed analysis of what intensities of exercise are needed and what amount of exercise (minutes/day or minutes/week) will be most beneficial to the depressed patient.

**KEY WORDS:** “Postpartum/natal depression”, “exercise”

## INTRODUCTION

Pregnancy is often one of the most exciting times in a woman's life, however over 80% of women have to deal with mood changes which frequently occur after giving birth.<sup>1</sup> There is a wide array of postpartum mood disturbances spreading from a more common and mild, yet still significant form; "baby blues," to the very severe and impactful postpartum psychosis.<sup>1</sup> Postpartum depression (PPD) is a type of depression that occurs after a mother has given birth, classically within 3 months of the delivery, however it can occur up to a year after the birth.<sup>1</sup> PPD has been found to affect up to 13-15% of mothers during the first few initial months after their child is born.<sup>2</sup>

Because PPD is an under screened and therefore under diagnosed disease, the exact amount of healthcare costs was unavailable throughout this research. However, it has been shown that PPD adversely affects the relationship of the family, the bonding between the mother and baby as well as the "child's long term conduct and social interactions".<sup>3,4</sup> As stated by Murray et al, "...exposure to maternal depression in the early postpartum months may have an enduring influence on the child's psychological adjustment."<sup>3</sup> These developmental and psychological issues could result in an increased amount of future psychotherapy and psychiatric drug prescriptions, thus, an increase in healthcare costs.

This type of depression is extremely common. For example, according to Postpartum Progress Incorporated, the year 2007 had approximately 6.4 million births in the US.<sup>5</sup> If about 15% of women experience PPD, this results in over 950,000 women who were affected with PPD in that year.<sup>5</sup> Unfortunately, this estimate is probably low compared to the true epidemiological numbers because most women do not seek counseling or care for their PPD symptoms.

Symptoms of PPD usually include sadness, decreased interest, guilt, decreased energy, concentration difficulties, anhedonia, and changes in appetite (similar symptoms to clinical depression). However, one may argue this type of depression is more severe because it can lead to poor care of another person besides the patient: the child. Similar to clinical depression, the exact cause of PPD is unknown. It is widely accepted that many women experience mood changes throughout a pregnancy, which is often attributed to the fluctuations and changes in the hormone levels occurring within a female's body throughout this time period. Many factors contribute to the development and severity of these mood changes such as: changes in a mother's sleep pattern, decreased amount of social engagements, as well as the overall stresses of caring for a baby. A theory gaining more consideration is attributing the cause of PPD to hypothyroidism occurring in the mother after her pregnancy.<sup>6</sup> The usual methods of treating PPD are similar to those of clinical depression. Mild to moderate symptoms typically are treated with cognitive behavioral therapy or group therapy but in some cases an antidepressant such as selective serotonin reuptake inhibitor, SSRI, may be initiated.<sup>6</sup> However, many women are hesitant to take medication for fear of possible transmission into breast milk.

A study published in 2007 showed that exercise was equally successful as antidepressants in the treatment of major clinical depression.<sup>7</sup> Because PPD is a type of clinical depression, there's been an investigation in the efficacy of exercise to help this condition. This would be significant because it would be an inexpensive and safe way to help the mother as opposed to drug therapy, which may be expensive and dangerous to the child due to transmission through breast milk. There are very few successful and non-pharmacological treatments of PPD available to women, which is unfortunate because many women may not seek psychotherapeutic help due to social stigmas and/or financial difficulties. This paper evaluates two randomized

clinical trials (RCTs) and one cohort study investigating the usefulness of exercise in alleviating postpartum depressive symptoms.

## **OBJECTIVE**

The objective of this selective EBM review is to determine whether or not aerobic exercise can help alleviate the symptoms of postpartum depression.

## **METHODS**

This research was completed by me with the Cochrane database, Pubmed, MEDLINE, and Ovid utilized for searching articles which met the requirements of the review. Only English published and peer reviewed articles were selected for this paper. Key words used to search included “postpartum/natal depression” and “exercise.” The articles chosen were completed from 2009-2010, not previously published in a meta-analysis or systematic review and were relevant to the topic chosen. Inclusion criteria were studies published after 1996, as well as after the meta-analysis published in January 2009. It was pertinent that outcome measures were POEMS (patient oriented evidence that matters). DOE outcome measures and studies with patients already being treated for PPD were excluded from the search criteria.

Three articles were chosen: two randomized control trials and one cohort study. All articles studied the moods of females in the postpartum period with aerobic (ex: walking) exercise as the intervention. The comparison groups were those who did not participate in physical activity. Specifically, Norman et al<sup>2</sup> compared the intervention group with a group who only received educational materials. DaCosta et al<sup>8</sup> and Strom et al<sup>9</sup> both had comparison groups consisting of women who did not participate in physical activity and received normal care. A summary of statistics includes confidence interval (CI), p-value, number needed to treat (NNT),

absolute risk reduction (ARR), and relative risk reduction (RRR). The demographics of included studies can be found in Table 1.

**Table 1- Demographics and Characteristics of included studies**

Study	Type	# pts	Age	Inclusion Criteria	Exclusion Criteria	W/D	Interventions
DaCosta et al., 2009 <sup>8</sup>	RCT	88	Child bearing aged female	Postpartum women experiencing symptoms of PPD who scored > 10 on EPDS	Those not understanding English or French, alcohol or substance abuse, already exercising at least 30 min of exercise 3x/wk, concomitant diseases making exercise dangerous	29	Randomized to a 12-week home based exercise program or a group which received usual postpartum care
Strom et al., 2009 <sup>9</sup>	Cohort Study	70,866	Child bearing aged female	Pregnant women between 1996-2002 who were living in Denmark	Women who were not fluent in Danish	0	Physical activity of either vigorous or moderate compared to a group who did not participate in any physical activity
Norman et al., 2010 <sup>2</sup>	RCT	161	Child bearing aged female	Primi and multiparous English Speaking women	Women who had a diagnosis of a psychiatric disorder medicated and managed by a practitioner or psychiatrist or ever needed hospitalization	26	Randomized to an 8 week program exercising with a physical therapist combined with parenting education or a group which only received education.

## OUTCOMES MEASURED

As previously mentioned, the outcomes of the reviewed studies were required to be Patient Oriented Evidence that Matters, or POEMS. In other words, the outcomes of the treatment had to be important and evident to the patients. The measured outcomes varied by study. Norman et al<sup>2</sup> measured psychological well-being and depressive symptoms using two surveys: Positive Affect Balance Scale (PABS) and the Edinburgh Postnatal Depression Scale (EPDS). Da Costa et al<sup>8</sup> measured the patient's depressive mood using the Hamilton Depression Scale (HAM-D) and also the EPDS. Finally, Strom et al<sup>9</sup> measured hospital admission due to postpartum depression or antidepressant prescriptions via telephone interviews with information from the Danish Psychiatric Central Register and the Register of Medicinal Product Statistics.

## RESULTS

Da Costa et al<sup>8</sup> reported results comparing a group of postpartum women who participated in an exercise program (average 124 min. week) to a group who did not participate in the program (average of 54 min. of exercise a week). The most common type of exercise performed by the women in the intervention group was walking.<sup>8</sup> Adherence was satisfactory, as subjects in the exercise group met with an exercise therapist a median of 4 (4/4) times, and 80.4% met with the therapist at least 3/4 times.<sup>8</sup> This article had only continuous data and no dichotomous data. Additionally, it was unable to be converted to dichotomous data, so the test statistics that were discussed can be found in Table 2.

There was a significant interaction between the intervention group and baseline EPDS score; women who were more depressed (those with a higher EPDS), had a lower post-exercising score compared to those in the control group.<sup>8</sup> As shown as italics in Table 2, the



EPDS score was 4 points lower in the intervention group compared to the control group (4.06 pts, 95% CI:1.51-6.61,  $p < 0.001$ ).<sup>8</sup>

Post treatment measurements showed that the HAM-D score was significantly lower in the intervention group compared to the control group (1.83 points, 95% CI: .24-4.31,  $p=.02$ ), however the benefit that these women felt after participating in the program decreased as time increased. The far right side of the table shows results limited to only the 35 “compliers.” These are the women who consistently engaged in the ‘one hour a week’ requirement every week. When comparing the complier column to the previous column, the EPDS results remain significant, but there were no HAM-D significant interactions.<sup>8</sup>

**Table 2: Mean interventional baseline changes in EPDS and HAM-D scores<sup>8\*</sup>**

	<b>Group</b>	<b>Time Period</b>	<b>Intention to Treat analysis Intervention effect slope (95% CI)</b>	<b>Efficacy analysis Intervention effect slope (95%CI)</b>
<b>EPDS</b>	All subjects	Pooled(3 & 6 mo)	P=0.0002 interaction	P=0.0001 interaction
	Baseline $\leq 13$	Pooled(3 & 6 mo)	+2.77 (+0.5, +5.05)	+2.47 (+0.12, +4.82)
	<i>Baseline &gt;13</i>	<i>Pooled(3 &amp; 6 mo)</i>	<i>-4.06 (-6.61, -1.51)</i>	<i>-4.54 (-7.01, -2.08)</i>
<b>HAM- D</b>	All subjects	Pooled(3 & 6 mo)	P=0.0977 interaction	-1.29 (-2.56, -0.01)
	All subjects	3 months	-1.83 (-3.41, -0.24)	-
	All subjects	6 months	-.26 (-1.78, +1.26)	-

\*This information comes directly from DaCosta et al<sup>8</sup>

Strom et al<sup>9</sup> was a cohort study was performed with over 70,000 participants. Using national registers, data was collected by telephone interviews during the weeks of pregnancy as well as postpartum weeks. The authors not only compared exercise to no exercise, but also researched the differences in moods among intensities of exercise. The levels measured were

‘vigorously’ intense and ‘moderately’ intense, classified based on METs (metabolic equivalents) which categorize exercise intensity on the “rate of energy expenditure”.<sup>9</sup>

The authors found that 37% of the subjects were taking part in physical activity, which consisted of swimming, cycling and walking.<sup>9</sup> The authors found that there was no statistically significant interaction between physical activity related to hospital admissions for PPD. However, the other variable which was studied in this cohort study was the amount of PPD prescriptions written by physicians. Those women who were physically active had an OR of .79 (95% CI, 0.70-0.89) compared to those who were inactive.<sup>9</sup> The most interesting result of this study was that women who were engaging in vigorous (versus moderate) exercise during pregnancy had a lower risk of PPD prescriptions (adjusted OR, .81; CI 95%, .66-.99), even after adjusting for all variables, as seen in italics in Table 3.<sup>9</sup> No p values were reported throughout this study.

**Table 3: ORs of PPD Prescriptions by intensities of physical activity<sup>9\*</sup>**

	Crude		Adjusted	
	OR	95% CI	OR	95% CI
Not physically active	Reference		Reference	
Physically active-Moderate	0.85	0.74-0.97	0.94	0.82-1.08
Physically Active-Vigorous	0.67	0.56-0.81	<i>0.81</i>	<i>0.66-0.99</i>

\*This information comes directly from Strom et al<sup>9</sup>

Norman et al<sup>2</sup> randomized 161 women to two groups; one group received only health education materials, and the other group received the same materials but also participated in an exercise program. The Positive Affect Balance scale was used to measure psychological well-being and was the key outcome measure. The EPDS was also used to measure depressive symptoms. Baseline, 8 weeks post baseline and 12 weeks post baseline were the time intervals at which surveys were measured.<sup>2</sup>

Women in the M&B (Mother and baby) group, who participated in the exercise program, had a statistically significant reduced risk for PPD according to results of the EPDS.<sup>2</sup> As stated by the authors, “after the 8 week program, the proportion of women in the M&B (intervention) group with an increased risk for depression was reduced by 50%”.<sup>2</sup> Table 4 shows that there was a greater improvement in the women’s well being for the group of women who participated in the interventional exercise program. As seen in table 5, the number needed to treat was -20, which indicated that for every 20 people in the intervention group, there was one fewer incidence of depressive symptoms than in the control group.

This study investigated the reasons women did not finish completing the intervention. There were 26 women who dropped out of the study (18 in the intervention group, and 8 in the comparison group). The most common reason in the intervention group was due to being ‘too busy with other children,’ and the most common reason in the comparison group was due to the fact they were unable to be contacted. Other reasons include the “baby being unwell” and “moving away” from the study location.<sup>2</sup>

**Table 4: PABS and EPDS scores at baseline and 8 weeks \***

	<b>Education and Exercise</b>	<b>Only Education</b>
<b>PABS</b>		
Baseline	10.72 (± 2.19) 95%CI 10.10-11.24	10.67 (± 2.17) 95%CI 10.16-11.21
8 weeks p=.007	11.82 (± 2.08) 95%CI 11.24-12.37	10.47 (± 2.26) 95%CI 9.96-11.01
<b>EPDS</b>		
Baseline	8.00 (± 6.16) 95%CI 6.54-9.57	6.75 (± 5.44) 95%CI 5.32-8.08
8 weeks p<.0001	5.47 (± 5.11) 95%CI 4.19-6.92	6.75 (± 5.51) 95%CI 5.42-7.95

\*This information comes directly from Normal et al<sup>2</sup>

**Table 5: Calculations for Prevention**

		<b>Relative Risk Reduction</b>	<b>Absolute Risk Reduction</b>	<b>Number Needed to Treat</b>
<b>CER</b>	<b>EER</b>	(EER-CER)/CER	EER-CER	1/ARR

0.16	0.11	$(0.11 - 0.16) / (0.016) = -0.313$	$.11 - .16 = -.05$	$1 / -.05 = -20$
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There were no adverse effects reported throughout the three studied articles. It should be noted that someone beginning an exercise program should consult with his or her doctor prior to the activity. These women were monitored by specialists and taught how to begin their exercise program, which was beneficial to the researchers due to a lack of injuries and/or harm.

## DISCUSSION

As the recognition of postpartum depression is increasing, a need for a safe and cost effective nonpharmacologic treatment is pertinent. In the study performed by DaCosta et al<sup>8</sup> it is evident that exercise was successful in alleviated the symptoms of PPD. In fact, people who were moderately depressed had a better response to exercise. This may be because those women who were only slightly experiencing mood disturbances, were not affected enough to feel motivated to participate in an activity to improve their mood. The adherence rate was high in this study which gives support to the accessibility and convenience of exercise as a treatment program.<sup>8</sup>

The study by Strom et al<sup>9</sup> also supported the theory that exercise is a feasible way of decreasing the severity of the symptoms of PPD. However, the only statistically significant effect was when women were vigorously exercising. The authors of this study stated that this conclusion “may point in the direction of a biologic response mechanism.”<sup>9</sup> In this study, the authors stated that a weakness was that the data may have been swayed due to prescriptions written that were for anti-depressant medications, but for the purpose of ‘off-label’ use.<sup>9</sup> In other words, some women may be on antidepressants for irritable bowel syndrome, or for treatment of neuropathic pain, rather than PPD.

Normal et al also found that an exercise and education program was an effective combination in alleviating PPD symptoms.<sup>2</sup> An interesting analysis was that the authors did not find a statistical difference in the amount of time of exercise that was needed in order for effects to be felt by the women. Although the type of educational materials given to the women was not discussed in great detail, this study supports health education in combination with exercise. The educational materials may have been an extra motivational factor to the women to exercise because it taught them how and why they should improve their health.

Besides those already mentioned, a few other weaknesses were evident throughout these trials. First, women who volunteered to partake in the experiments are more likely to be a motivated and interested group, thus not representing a normal sample of women in the postpartum period. Additionally, as stated in the study by DaCosta et al<sup>8</sup> the women in the intervention groups often met with physiologists and/or trainers, and may have experienced an “attention placebo” effect. In other words, these women may have had decreased symptoms of PPD due to a social fulfillment gained from meeting frequently with researchers, physiologists and other women partaking in the experiments.<sup>8</sup> This is not something most women in the postpartum period usually have access too, in fact, this period can otherwise be classified as a relatively socially isolating time period. Finally, due to the type of intervention, blinding is not realistic. Unfortunately, this is still a weakness in the experimental set up.

In 2003, The Melanie Blocker Stokes Mothers Act<sup>10</sup> was introduced to congress which increases awareness and education of PPD as well as increasing services available to women who develop mood disorders in the postpartum period. This act proposed a portion of money to be granted to research in the area of diagnostic screening and treatments of PPD.<sup>10</sup> This shows the severity and increasing attentiveness to PPD and the necessity of developing new treatments.

## CONCLUSIONS

The reviewed studies establish that aerobic exercise is an alternative way to alleviate the symptoms of postpartum depression. This is beneficial and imperative because many women are reluctant to seek treatment due to social reasons, financial problems and even for fear of serious drug side effects of transmission into breast milk. DaCosta et al<sup>8</sup> concluded that exercise was effective in treating specifically mild to moderate postpartum depressed moods. Strom et al<sup>9</sup> found that exercise was an effective treatment, however only at a certain level of intensity. Finally, Norman et al<sup>2</sup> concluded that an education and exercise combination program allowed for an improvement in postpartum mood.

There are numerous ways research could be furthered in this field. The evident next step, which was prefaced in the study by Strom et al<sup>9</sup>, is to determine how much and at what intensity exercise is truly needed for a psychological effect. Many people have different opinions of what constitutes 'exercise.' Studies should be initiated which could give women a more precise guideline of the time and intensity of exercise required to ease PPD symptoms.

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