

The Role of Exercise in Treating Postpartum Depression: A Review of the Literature

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There is now evidence to support the antidepressant effects of exercise in general and in clinical populations. This article reviews the evidence regarding the potential role of exercise, particularly pram walking, as an adjunctive treatment for postpartum depression. Database searches revealed two small randomised controlled trials conducted in Australia which support exercise as a useful treatment for women with postpartum depression. In addition, uncontrolled studies and observational evidence suggest that postpartum women, some of whom were depressed, report benefit from participation in exercise programmes. There are plausible mechanisms by which exercise could have such an effect. Limited evidence supports a relationship between participation in exercise and reduction in postpartum depression. Given the reluctance by some women to use antidepressant medication postpartum and the limited availability of psychological therapies, exercise as a therapeutic possibility deserves further exploration. Further research using well-designed randomised controlled trial methodologies are warranted. *J Midwifery Womens Health* 2007;52:56–62 © 2007 by the American College of Nurse-Midwives.

keywords: exercise, postpartum depression, pram pushing

Postpartum depression is an important public health issue.¹ In a meta-analysis of 59 studies from various countries, the estimated average prevalence of postpartum depression was 13%.² A more recent meta-analysis of 30 studies based only on structured clinical interview assessments estimated point prevalence to be between 6.5% and 12.9%, including both major and minor depression at various times during the first postpartum year.³ The peak incidence of depression is within the first 4 to 6 weeks after birth, with about half of cases developing in the first 3 months.^{4–5} The duration of postpartum depression can be short,⁵ although evidence suggests that some women continue to experience depression for up to a year or longer.^{4,6} This article reviews the available evidence on the plausibility of exercise as an adjunctive treatment for postpartum depression, with an emphasis on evidence from randomised controlled trials (RCTs).

POSTPARTUM DEPRESSION

Symptoms of postpartum depression may include a reduced quality of life, anxiety attacks, tearfulness, loss of interest in life, insecurity, inappropriate obsessional thoughts, irritability, fatigue, guilt, fear of harming the baby, and a reluctance to breast feed.^{7–9} Some studies have suggested that the incidence of depression after childbirth is no greater than that at other points in a woman's lifecycle,^{4,5} but it can be argued that postpartum depression is likely to be more problematic because its effects are experienced at a

time when exceptional demands are being placed on the women in caring for her baby and family.¹⁰ The legacy of postpartum depression can still be visible years after the mother's illness ends, and numerous studies have found an association between postpartum depression and adverse effects on the child, including insecure attachment, behavioural problems, and cognitive development deficits.^{11–13} Given the potential for prolonged adverse effects, it is important to offer treatments, which currently include antidepressant drugs or psychological therapy. The consideration of adjunctive alternative interventions for the treatment of postpartum depression is also timely, given that the most recent UK Confidential Enquiry into Maternal Deaths (2000–2002) identified suicide as the leading cause of maternal death and that psychiatric disorders contribute to 12% of all maternal deaths.¹⁴

EXERCISE INTERVENTIONS IN DEPRESSED POPULATIONS

There is growing recognition and acceptance of exercise as a useful treatment option for depression among general populations. In a recent systematic review and meta-regression analysis of RCTs, Lawlor and Hopker¹⁵ concluded that exercise may be efficacious in reducing symptoms of depression (standardised mean difference in effect size, -1.1 ; 95% CI: -1.5 – -0.6), although the authors expressed concerns about the quality and small sample size of many studies and the inclusion of individuals without clinical levels of depression. Another meta-analysis¹⁶ excluded studies that did not target clinical levels of depression, were not published in peer-reviewed journals, or did not provide a non-active comparison group. Results from this meta-analysis of 11 treatment studies of individuals with depression yielded a very large combined effect size (Cohen's $d = 1.42$; 95%

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CI: 0.92–1.93), providing convincing statistical evidence to support the use of exercise for the treatment of clinically significant depression.

Furthermore, mean drop out rate for the exercise interventions in this meta-analysis (based on data from 8/11 studies) was approximately 20%, which is similar or better than for antidepressant treatments for depression, which have reported discontinuation rates of between 21% and 31%, depending on the type of drug.¹⁷ This systematic review did not assess the quality of the studies included in the review, and whilst the authors report a large effect size, it is difficult to know what this finding translates to in clinical terms.

The UK National Institute for Clinical Excellence (NICE)¹⁸ guidelines for treating depression recommend that patients be advised about the benefits of exercise. The “At Least Five a Week” report of the United Kingdom Chief Medical Officer¹⁹ also concluded that exercise participation can promote mental health and feelings of well-being. It seems plausible that regular exercise may also have a positive effect in the management of depression, specifically in postpartum women.

METHODS

A literature search was conducted for published English language reports of RCTs, uncontrolled studies, and observational reports that assessed physical activity and/or exercise behaviour and postnatal/postpartum depression. Studies involving animals were excluded. The search used a combination of the key words exercise, physical activity, pram pushing, pram walking, postnatal depression, and postpartum depression, and relevant studies were identified by searching Medline, EMBASE, PubMed, SPORT Discus, CINAHL, PsychINFO, and the Cochrane Central Register of Controlled Trials from their inception to the present (May 2006). We also searched the bibliographies of studies identified by electronic searches to identify additional studies. Information about ongoing trials was obtained by searching the clinical trials site from the U.S. National Institute of Health and UK National Research Register.

Our search strategies located two published RCTs and one ongoing RCT. Three reports of uncontrolled and

observational studies were also identified. In addition, a number of observational and/or uncontrolled studies that involved general populations of postpartum women were located.

RESULTS

The Effects of Exercise Upon Postpartum Depression: Randomised Controlled Trials

In a pilot RCT²⁰ in Australia, the effects of a 12-week multi-intervention programme involving group pram walking exercise sessions (3 times per week) plus social support (once per week) was compared with a control group who were asked to maintain their usual exercise regime and social activities. Participants were recruited via recommendations from health professionals or adverts in the community (N = 10 in both groups). Women had to have given birth in the past 12 months and have a score of 12 or more on the Edinburgh Postnatal Depression Scale (EPDS),²¹ which is indicative of probable depression. In both groups, approximately half of the women were receiving medication for their depression and a small number were receiving counselling. Assessments of postpartum depression (using the EPDS), general psychological well-being, anxiety, perceived social support, and aerobic fitness were included in the study. Randomisation was by sealed envelope. It is not clear from the report whether intention to treat analyses were used.

No significant difference in mean EPDS score between groups at baseline was found (pram walking = 17.4; control = 18.4), but the women in the pram walking group exhibited significantly lower EPDS scores than the women in the control group at both the 6-week mid-point (pram walking = 7.2; control = 13.5, $P < .01$) and at the end of the 12-week intervention (pram walking = 4.6; control = 14.8, $P < .01$). The women in the intervention group were also found to have significantly improved aerobic fitness post-intervention compared to the women in the control group ($P < .01$). Adherence to the intervention was acceptable; on average, women attended 24 of the 36 sessions. At baseline, many participants were receiving medication or psychological therapy for their postpartum depression, but were still reporting depressive symptoms.

In the second trial²² by the same research team, the effect of a twice-weekly, group-based “pram walking” intervention was compared with the effects seen in a group who received a social support intervention. To be eligible, women had to have a child between the ages of 6 weeks and 18 months of age and score 12 or above on the EPDS.²¹ Twenty-four women were recruited and randomly allocated using opaque envelopes to each trial group. The researchers recruited 10 participants, five of these by a specialist psychiatrist, with the remainder (n = 14) recruited through hospi-

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tals, newspaper and television advertisements, and community flyers. Of the women who were recruited, between 50% and 55% were receiving counselling, and between 55% and 60% were taking antidepressants; the number using both treatments was not stated. Outcome measures were postpartum depression (using the EPDS), perceived social support, and aerobic fitness. Five participants withdrew within the first 2 weeks, and data is reported for the 19 who completed the trial (pram walking group: $n = 9/12$; social support group $n = 10/12$). Baseline mean EPDS scores were similar (exercise = 17.3; social support = 17.2). For the women in the exercise group, the score decreased significantly by the end of the 12-week intervention period, but not for the women in the social support group (exercise = 6.3; social support = 13.3, $P < .05$). No significant changes in perceived levels of social support were noted for either group. Significant increases in aerobic fitness ($P < .01$) were also reported for the women in the exercise intervention group but not for the women in the social support group. Adherence was 75% and 73% for the exercise intervention and control groups, respectively.

While both trials reported substantial reductions in EPDS scores in participants randomised to receive an intervention involving exercise, the small sample sizes and short-term follow-up limit their validity. The long-term merits of the interventions were not assessed. In addition, because both studies were conducted in the Gold Coast, Australia, where the prevailing warm weather conditions are likely to have positively influenced mothers' decisions to exercise by pushing their child in a pram, the generalisability of findings needs to be confirmed. Although initial trial evidence is promising, it is not entirely clear at present whether exercise in the form of pram walking, or indeed any other form of exercise, is effective in women with postpartum depression.

Uncontrolled and Observational Studies Focussing on Postpartum Depression

The efficacy of group-based weekly exercise classes for sedentary women (aged 19–37 years) experiencing postpartum depression referred by health visitors, general practitioners, and a specialist consultant psychiatrist was assessed in Scotland through maternal report.²³ Evaluation questionnaires were sent to 10 of 20 women who participated in the classes. Most women reported improvements in well-being from the exercise classes, and half said that they also exercised at home. The opportunity for discussion with other mothers, however, was rated higher than both exercise and relaxation as an activity that improved feelings of well-being. The author reports that the final EPDS scores for participants showed a marked reduction (no data presented). An evaluation survey²⁴ of a pilot scheme aimed to facilitate

exercise opportunities in women at high risk for depression (assessment risk not given) and to mothers ($N = 60$) living in a socioeconomically deprived area in the north of England found participants reported more energy ($n = 19$), motivation ($n = 21$), increased self-confidence ($n = 14$), feeling more relaxed ($n = 17$), being more physically active ($n = 20$), and feeling fitter afterwards ($n = 23$). A larger study^{25,26} involving a focus group of 50 women, two-thirds of whom were depressed, found that about half of participants felt that depressed mothers would be unlikely to want to get involved in community walking programmes because of concerns about being labelled.

Uncontrolled and Observational Studies

Several additional surveys of mothers' views about the feasibility and perceived effectiveness of exercise programmes after giving birth have been published recently. An Australian "Stroll Your Way To Well-Being" programme for postpartum women²⁵ conducted a random telephone survey of the perceived benefits and barriers associated with pram walking ($N = 450$). About 90% of respondents felt that pram walking could increase physical fitness and improve mental health, and most women (70%) were still walking 16 months after the programme had started.²⁶ In another survey²⁷ of a group of postpartum women in Australia, opinions about benefit to mental and physical health were surveyed during participation in a pram walking programme. Opinions about benefit were positive but were based on only a 34% response rate. A secondary analysis of longitudinal data²⁸ collected prenatally and 6 weeks postpartum from a study of obstetric outcomes in the South of England, found that vigorously active women at the 6-week assessment ($N = 1,003$) demonstrated better scores on all measures of postnatal adaptation (e.g., confidence in tasks of mothering, satisfaction with life circumstances, and satisfaction with motherhood) and were more likely to participate in activities such as socialising, hobbies, and entertainment. Nine women completed a questionnaire evaluation after taking part in a programme called "Shape Up After Your Baby."²⁹ The main reasons for joining the class were to get fit ($n = 8$) and to meet other mothers ($n = 5$). When asked what they had enjoyed most about the classes, most women stated meeting other mothers with babies ($n = 6$), ideas for exercise ($n = 6$), and opportunities for discussion ($n = 6$). It is not clear from this report if any mothers had been diagnosed with postpartum depression. A recent study³⁰ evaluated the effects of a pram walking intervention upon physical activity, mental health, and social outcomes in volunteers from Australia. Those mothers living in an intervention area were invited to participate in a pram walking group ($N = 60$), and the control group ($N = 48$) was invited to participate in a pram walking group starting 6 months later. Participants completed an assessment of outcomes by questionnaire

at baseline and 6 months after completing the programme. There was no significant increase in the proportion of mothers considered to be performing adequate physical activity in the intervention or control groups from baseline to follow-up. However, intervention group mothers increased their sessions of vigorous exercise and control group mothers increased the amount of minutes spent walking. The majority of mothers had joined a pram-walking group to participate in exercise, get out of the house, and meet other postpartum women.

PROPOSED MECHANISMS

There are various hypothesised mechanisms by which exercise is thought to influence mental health outcomes and several biologic, psychosocial, and psychological theories have been suggested. Proposed mechanisms for how exercise improves mood are speculative at present, because no study has directly investigated the causal pathway in depressed patients successfully treated with exercise.³¹ Each mechanism will be discussed briefly here, and readers are directed to other publications^{16,32,33} for more detailed discussions.

One possible mechanism is biochemical change, such as increased levels of endorphins.³⁴ The endorphin hypothesis proposes that the effects of acute exercise on psychological well-being, in particular, “euphoria,” is caused by the release and subsequent binding of endogenous opioids (β -endorphins) to receptor sites in the brain, leading to improved mental health outcomes. Despite very limited support, the endorphin hypothesis remains one of the most popular explanations of the psychological benefits of exercise.^{32,33}

Psychological hypotheses, such as increased sense of mastery and self-esteem, have been proposed,³⁴⁻³⁵ and there is a well-established link between depression and negative self-evaluations.³⁶ The positive relationship between exercise and depression could be explained in terms of the physical signs associated with exercise (e.g., weight loss and muscle tone), and these physical signs could be viewed as positive cues towards a sense of achievement in one’s physical self. In the context of postpartum women, this is an important consideration, given that new mothers may have negative feelings about themselves and their bodies after giving birth, and may be keen to exercise to achieve weight loss.²⁵ Other researchers³⁷ have suggested that exercise can serve as distraction or “time-out” from daily hassles and stressful stimuli, and is responsible for the improvements in mental health associated with exercise. In this respect, women with postpartum depression may find exercise a useful strategy to help them focus on events other than their particular life circumstances.

THE POTENTIAL VALUE OF EXERCISE IN THE MANAGEMENT OF POSTPARTUM DEPRESSION

Antidepressants have been reported to be effective in treating postpartum depression in one small trial,^{38,39} and there is good evidence of their benefit within the general population of persons who are depressed,⁴⁰ although some reluctance to take such medication among postpartum women has been reported.^{39,41} Numerous small trials of different psychological therapies and counselling based interventions have consistently shown these to be effective treatments for postpartum depression,^{38,42} but their availability is often limited.

In contrast, exercise has minimal associated side effects and is less reliant upon external factors, such as the availability of a therapist. There are additional potential benefits, because exercise interventions can improve a mother’s physical and psychological health simultaneously, making it potentially a cost-effective self-care adjunctive treatment.⁴³ Engaging in exercise does not carry a stigma and can be done outside the standard medical setting. The costs associated with exercise are usually low.

Maternal body weight and postpartum weight have been found to be important predictors of psychological well-being following birth.^{44,45} After giving birth, many mothers have excess weight and decreased fitness levels.^{28,46} Exercise is a proven method for weight loss and for cardiovascular health gains.¹⁹ Studies of pregnant and postpartum women have indicated high risk for inactivity and reductions in previously established levels of activity⁴⁷⁻⁴⁹; thus, the promotion of exercise after birth may help to improve physical activity levels of women throughout the life course.

While evidence suggests that exercise can have many health benefits,²⁸ initiation of an active lifestyle may not be an easy task for women in the postpartum period, and is likely to be even more difficult for those who are depressed. Women with postpartum depression who are asked to do too many things to manage their symptoms/disease may find it difficult to implement any of the changes, leading to further developments of feelings of inadequacy. Other possible barriers for postpartum women include having to care for the newborn and possibly other children, which compromises their time, and increases the costs associated with exercise.²⁵ Once a mother makes a decision to exercise, her ability to do so might be complicated further by pragmatics, such as breastfeeding, and some women are concerned about the potential negative effects of exercise on their breastfeeding outcomes.⁵⁰ Exercise as an intervention may not be suitable for some women, such as those recovering from a recent physically difficult birth or those experiencing more severe forms of postpartum depression or postpartum psychosis. Individuals experiencing mental ill-health

can often be lacking in motivation and are socially isolated so it may be difficult for these women to seek out opportunities to exercise in their communities.

Many types of exercise could be beneficial for postpartum women, but pram walking may be the most viable and adherence to pram walking interventions in the previous small trials^{20,22} was relatively high (66%–75%), although this was in optimal climate conditions. New mothers generally have endorsed the community pram walking group concept as good idea.²⁵ Other research⁴⁸ has found that new mothers cite lack of support from a spouse/partner and parenting issues as particular barriers to physical activity, with facilitators being social support for exercise and availability of childcare. With these comments in mind, pram walking is an activity that can be integrated into women's lives relatively easily, can be fitted in around the demands of the baby, and includes the baby so no additional childcare is required. More information on appropriate alternatives is needed.

If exercise is found to be an effective treatment for women with postpartum depression, the challenge for health professionals may then be to motivate mothers who are depressed to engage in a physically active lifestyle. Leaders of postpartum depression support groups could introduce pram walks and/or exercise classes into their sessions; this may also prove to a useful source of motivation for mothers in terms of peer support. Such schemes have been evaluated^{24,29} as being successful in getting depressed mothers and mothers with young children active in their communities. It might be that health organisations could consider developing information packs for local providers to promote pram-walking groups. As an example of this, as part of the Australian "Stroll Your Way to Well-Being" programme,^{25–27} kits were developed and distributed to facilitate the set-up of postpartum community walking groups. The effectiveness of this was assessed showing that about one quarter of information kit recipients established a pram walking group.

IMPLICATIONS AND CONCLUSION

There is mounting evidence that exercise participation is likely to benefit persons with general depressive symptomatology and two small randomized trials have suggested that exercise may provide benefits for women with postpartum depression. Observational evidence has suggested that community-based exercise programmes are acceptable to postpartum women and they consistently report benefits from participation. Given the high prevalence and considerable consequences of postpartum depression to the mother, the baby, and the family, exercise may have a treatment role to play as a therapeutic option, particularly given

the reported reluctance of some postpartum women to take drug interventions and the limited availability of psychological therapies. While initial trial evidence is encouraging, these were small, and larger, high-quality RCTs are required to further assess the feasibility and effectiveness of exercise as an adjunctive treatment in women with postpartum depression.

REFERENCES

1. Lumley J, Austin M. What interventions may reduce postnatal depression. *Curr Opin Obstet Gynecol* 2001;13:605–11.
2. O'Hara M, Swain A. Rates and risk of postnatal depression—A meta analysis. *Int Rev Psychol* 1996;8:37–54.
3. Gaynes BN, Gavin N, Melzer-Brody S, Lohr KN, Swinson T, Gartlehner G, et al. Perinatal depression: Prevalence, screening accuracy and screening outcomes. Summary, Evidence Report/Technology Assessment no.119. Prepared by RTI-University of North Carolina Evidence based Practice Center under contract No. 290-02-0016. AHRQ Publication No.05-E006-1. Rockville (MD): Agency for Healthcare Research and Quality, 2005.
4. Cox J, Murray D, Chapman G. A controlled study of the onset, duration and prevalence of postnatal depression. *Br J Psychiatry* 1993;163:27–31.
5. Cooper P, Campbell E, Day A, Kennerley H, Bond A. Non-psychotic psychiatric disorder after childbirth. A prospective study of prevalence, incidence, course and nature. *Br J Psychiatry* 1988;152:799–806.
6. Horowitz JA, Goodman J. A longitudinal study of maternal postpartum depression symptoms. *Res Theory Nurs Pract* 2004;18:149–63.
7. Beck CT. The lived experience of postpartum depression: A phenomenological study. *Nurs Res* 1992;42:166–70.
8. Da Costa D, Drista M, Rippen N, Lowensteyn I, Khalife S. Health-related quality of life in postpartum depressed women. *Arch Womens Ment Health* 2006;9:95–102.
9. Hatton DC, Harrison-Hohner J, Coste S, Dorato V, Curet LB, McCarron DA. Symptoms of postpartum depression and breastfeeding. *J Hum Lact* 2005;21:444–9.
10. Holden JM. Can non-psychotic depression be prevented? In: Cox JL, Holden M, editors. *Perinatal psychiatry: Use and misuse of the Edinburgh Postnatal Depression Scale*. London: Gaskell, 1994.
11. Sharp D, Hay D, Pawlby S. The impact of postnatal depression on boy's intellectual development. *J Child Psychol Psychiatry* 1995;36:1315–37.
12. Hay D, Pawlby S, Sharp D, Asten P, Mills A, Kumar R. Intellectual problems shown by 11-year-old children whose mothers had postnatal depression. *J Child Psychol Psychiatry* 2001;42:871–89.
13. Beck CT. Maternal depression and child behaviour problems: A meta-analysis. *J Adv Nurs* 1999;29:623–9.
14. Confidential Enquiry into Maternal and Child Health (CEMACH) Web site. Why mothers die 2000–2002: Report on

confidential enquiries into maternal deaths in the United Kingdom. London: Royal College of Obstetricians and Gynaecologists. Available from: http://www.cemach.org.uk/publications/WMD2000_2002/content.htm [Accessed September 7, 2006].

15. Lawlor DA, Hopker SW. The effectiveness of exercise as an intervention in the management of depression: Systematic review and meta-regression analysis of randomized controlled trials. *BMJ* 2001;322:1–8.

16. Stathopoulou G, Powers MB, Berry AC, Smits AJ, Otto MW. Exercise interventions for mental health: A quantitative and qualitative review. *Clin Psychol Sci Pract* 2006;13:179–93.

17. MacGillivray S, Arnoll B, Hatchet S, Ogston S, Reid I, Sullivan F, et al. Efficacy and tolerability of selective serotonin reuptake inhibitors compared with tricyclic antidepressants in depression treated in primary care: Systematic review and meta-analysis. *BMJ* 2003;326:1014.

18. National Institute for Clinical Excellence. CG23 depression: Management of depression in primary and secondary care—NICE Guidance. London: National Health Service, 2004.

19. Department of Health Web site. At least five a week: Evidence on the impact of physical activity and its relationship to health. Available from: http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PolicyAndGuidance/PolicyAndGuidanceArticle/fs/en?CONTENT_ID=4080994&chk=IFtIOF [Accessed September 7, 2006].

20. Armstrong K, Edwards H. The effects of exercise and social support on mothers reporting depressive symptoms: A pilot randomized controlled trial. *Int J Ment Health Nurs* 2003;12:130–8.

21. Cox J, Holden J, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987;150:782–6.

22. Armstrong K, Edwards H. The effectiveness of a pram-walking exercise programme in reducing depressive symptomatology for postnatal women. *Int J Nurs Pract* 2004;10:177–94.

23. May A. Using exercise to tackle postnatal depression. *Health Visitor* 1995;68:146–7.

24. Wilkinson J, Philips S, Jackson J, Walker K. “Mad for Fitness”: An exercise group of combat a high incidence of postnatal depression. *J Family Health Care* 2003;13:44–8.

25. Currie JL, Develin ED. Stroll your way to well-being: A survey of the perceived benefits, barriers, community support and stigma associated with pram walking groups designed for new mothers, Sydney. *Health Care Women Int* 2002;23:882–93.

26. Currie J, Boxer E, Develin ED. Pramwalking as postnatal exercise and support: An evaluation of the Stroll Your Way to Well-Being program and supporting resources in terms of individual participation rates and community group information. *Aust J Midwifery* 2000;14:21–5.

27. Currie JL, Develin ED. The strollers pramwalking program: community intervention aimed at increasing the physical activity level of mothers with young children. *Health Prom J Aust* 2000;10:57–9.

28. Sampselle CM, Seng J, Yeo S, Killion C, Oakley D. Physical activity and postpartum well-being. *J Obstet Gynecol Neonatal Nurs* 1999;28:41–9.

29. Sefi S. Running a postnatal exercise group. *Health Visitor* 1987;60:197.

30. Watson N, Milat AJ, Thomas M, Currie J. The feasibility and effectiveness of pram walking groups for postpartum women in western Sydney. *Health Prom J Aust* 2005;16:93–9.

31. Brosse AL, Sheets ES, Lett HS, Blumenthal JA. Exercise and the treatment of clinical depression in adults: Recent findings and future directions. *Sports Med* 2002;32:741–52.

32. Leith LM. Foundations of exercise and mental health. Morgantown (WV): Fitness Information Technology, Inc., 1994.

33. Ernst C, Olson AK, Pinel JPI, Lam RW, Christie BR. Antidepressant effects of exercise: Evidence for an adult-neurogenesis hypothesis? *Rev Psychiatr Neurosci* 2006;31:84–92.

34. Steinberg H, Sykes EA. Introduction to symposium on endorphins and behavioural processes: A review of literature on endorphins and exercise. *Pharmacol Biochem Behav* 1985;23:857–62.

35. Fox KR, Boutcher SH, Faulkner GE, Biddle SJH. The effects of exercise on self-perceptions and self-esteem. In: Biddle SJH, Fox KR, Boutcher SH, editors. *Physical activity and psychological well-being*. London: Routledge, 2000;88–117.

36. Roberts JE, Gotlib IH. Temporal variability in global self-esteem and specific self-evaluation as prospective predictors of emotional distress: Specificity in predictors and outcome. *J Abnorm Psychol* 1997;106:521–9.

37. Bahrke MS, Morgan WP. Anxiety reduction following exercise and meditation. *Cog Therapy Res* 1978;2:323–33.

38. Lumley J, Austin MP, Mitchell C. Intervening to reduce depression after birth: a systematic review of the randomized trials. *Int J Technol Assess Health Care* 2004;20:128–44.

39. Appleby L, Warner R, Whitton A, Faragher B. A controlled study of fluoxetine and cognitive behavioural counselling in the treatment of postnatal depression. *BMJ* 1997;314:932.

40. Moncrieff J, Wessely S, Hardy R. Active placebos versus antidepressants for depression. *The Cochrane Database of Systematic Reviews* 2004, Issue 1. Art. No.: CD003012.pub2. DOI: 10.1002/14651858.CD003012.pub2.

41. Whitton A, Warner R, Appleby L. The pathway to care in post-natal depression: women’s attitudes to post-natal depression and its treatment. *Br J Gen Pract* 1996;46:427–8.

42. Holden J, Sagovsky R, Cox J. Counselling in a general practice setting: controlled study of health visitor intervention in treatment of postnatal depression. *BMJ* 1989;298:223–6.

43. Daley AJ. Exercise therapy and mental health in clinical populations: Is exercise therapy a worthwhile intervention? *Adv Psychiatric Treat* 2002;8:262–70.

44. LaCoursiere YD, Baksh L, Bloebaum L, Varner MW. Maternal body mass index and self-reported postpartum depressive symptoms. *Matern Child Health J* 2006;10:385–90.

45. Jenkin W, Tiggermann M. Psychological effects of weight retained after pregnancy. *Women Health* 1997;25:89–98.

46. South-Paul JE, Rajagopal KR, Tenholder MF. Exercise responses prior to pregnancy and in the postnatal state. *Med Sci Sport Exer* 1992;24:410–4.

47. Zhang J, Savitz D. Exercise during pregnancy among US women. *Ann Epidemiol* 1996;6:53–9.

48. Albright C, Maddock JE. Physical activity before pregnancy and following childbirth in a multiethnic sample of healthy women in Hawaii. *Women Health* 2006;42:95–110.

49. Symons Downs D, Hausenblas HA. Women's exercise be-

liefs and behaviors during their pregnancy and postpartum. *J Midwifery Womens Health* 2004;49:138–44.

50. Rich M, Currie J, McMahon C. Physical exercise and the lactating women: a qualitative pilot study of mothers' perceptions and experiences. *Breastfeeding Rev* 2004;12:11–7.

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