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What outcomes should be measured to evaluate the benefits of exercise to maternal mental health? --Manuscript Draft--

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Corresponding Author:	Dawn Brenchley, MSc Southern Health NHS Foundation Trust Southampton, UNITED KINGDOM
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	Southern Health NHS Foundation Trust
Corresponding Author's Secondary Institution:	
First Author:	Dawn Brenchley, MSc
First Author Secondary Information:	
Order of Authors:	Dawn Brenchley, MSc Gilly Mancz, MSc
Order of Authors Secondary Information:	
Abstract:	<p>The physical and mental health of women antenatally and postnatally has been described as “fundamentally important” (National Institute for Health and Clinical Excellence (NICE), 2017:1) to the development of children and the family. Exercise was proposed as a strategy to support maternal mental health, such as postnatal depression (NICE, 2015) with an emphasis on structured and supervised activities however a recent systematic review by Saligheh et al (2017) revealed inconsistencies in the evidence base and could not confirm that exercise reduced symptoms of postnatal depression. An improved understanding of what outcomes could be measured to assess the benefits of initiatives, including exercise based activities, would be valuable to practice ensuring appropriate allocation of resources to support client’s mental health.</p> <p>This study aims to critically analyse the current evidence base to determine what outcomes should be measured to evaluate the benefits of exercise to maternal mental health.</p> <p>The research concluded that using a quantitative methodological approach, predominantly by utilising the Edinburgh Postnatal Depression Score as a primary outcome measure, does not appear to capture the effects of exercise on postnatal depression and anxiety. Further research, using a qualitative approach, is recommended to identify outcomes that should be measured to demonstrate the benefits of exercise to maternal mental health.</p>
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Title of Article: What outcomes should be measured to evaluate the benefits of exercise to maternal mental health?

Authors:

Dawn Brenchley, Health Visitor, Southern Health NHS Foundation Trust
Gilly Mancz, Senior Teaching Fellow, School of Health Sciences, University of Southampton

Address: Dawn Brenchley, Churchcroft Farmhouse, Durley Brook Road, Durley, Southampton, SO32 2AR.

Contact: Dawn.brenchley@nhs.net or Telephone: 07899922269

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Abstract

The physical and mental health of women antenatally and postnatally has been described as “fundamentally important” (National Institute for Health and Clinical Excellence (NICE), 2017:1) to the development of children and the family. Exercise was proposed as a strategy to support maternal mental health, such as postnatal depression (NICE, 2015) with an emphasis on structured and supervised activities however a recent systematic review by Saligheh et al (2017) revealed inconsistencies in the evidence base and could not confirm that exercise reduced symptoms of postnatal depression. An improved understanding of what outcomes could be measured to assess the benefits of initiatives, including exercise based activities, would be valuable to practice ensuring appropriate allocation of resources to support client’s mental health.

This study aims to critically analyse the current evidence base to determine what outcomes should be measured to evaluate the benefits of exercise to maternal mental health.

The research concluded that using a quantitative methodological approach, predominantly by utilizing the Edinburgh Postnatal Depression Score as a primary outcome measure, does not appear to capture the effects of exercise on postnatal depression and anxiety. Further research, using a qualitative approach, is recommended to identify outcomes that should be measured to demonstrate the benefits of exercise to maternal mental health.

Key words

Postnatally, Depression, Anxiety, Postpartum Depression, Exercise, Outcome assessment

Introduction

The incidence of maternal mental health issues has been estimated to range between 10 and 20% (NICE, 2017). The most common mental health problems, during pregnancy and postnatally, are reported to be depression and anxiety (NICE, 2016). The World Health

Organisation (2018) agreed that mental health issues can affect all women however poverty, migration, extreme stress, domestic violence, and low social support can increase the risk.

Health Visiting practice focusses on six high impact areas (Public Health England, 2016) including maternal mental health. Understanding the evidence base is important to enable Health Visitors to recommend strategies to improve mother's mental health. Evidence based practice was quoted by Sackett et al (1996:1) as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients". Maternal mental health is also a major public health issue as, if untreated, mental health issues can have a "devastating impact" on women and the family as a whole (Public Health Agency, 2017:3).

Interest in the impact of exercise on maternal mental health has included establishing walking groups for mothers in the United Kingdom. Some groups were inspired from a national initiative from the Institute of Health Visiting named "Ready Steady Mums" (Institute of Health Visiting, 2018). This type of activity is supported by Evenson et al (2009) who described postnatal exercise as essential to maternal health. An earlier study by Armstrong and Edwards (2004) reported that pram walking has the potential to improve fitness levels and symptoms for women experiencing postnatal depression including positive effects irrespective of socio economic groups, prior exercise habits, medication or other treatments.

Current evidence base

Despite evidence suggesting the benefits of exercise to maternal mental health a recent systematic review by Saligheh et al (2017) revealed inconsistencies in the evidence base and could not confirm that exercise reduced symptoms of postnatal depression. These findings were considered to be due to weaknesses in study design, inclusion criteria, measurement, reporting and assessing confounding factors (Saligheh et al, 2017). In practice, many clients seek support and advice about improving their emotional wellbeing postnatally and often consider exercise as a possible strategy. Consequently, an enhanced

understanding of what outcomes should be measured, in future studies, would be beneficial to further assess the possible link between exercise and improved mental health and would add to the current evidence base. Additionally, an improved understanding of what outcomes should be measured would be valuable to practice in ensuring resources are allocated appropriately, to support client's mental health and to evaluate the benefits of such initiatives.

The importance of measuring outcomes

Interest in measuring outcomes in public health has grown over the past 5 years. In Scotland, Outcomes Frameworks have been developed to help plan, monitor and evaluate health improvement activities (Craig, 2013) and similarly, in England, the publication of the Public Health Outcome Framework (Department of Health, 2016). These comprehensive frameworks appear complex however a simple definition of Health outcomes has been provided by the World Health Organisation (WHO) as a "change in the health of an individual, group of people or population which is attributable to an intervention or series of interventions" (World Health Organisation, 1998:10). Health Visitors are best placed to ensure that practice creates positive outcomes for families and is aligned with outcomes that Local Authorities expect to be met in accordance with contractual requirements.

Method

Cluett and Bluff (2006: 6) shared that research is not only about discovering facts but is also about exploring the relationship between facts. Using a critical approach, this research assessed the best available evidence, using defined search criteria and synthesised findings from each paper to determine the impact to practice (Aveyard et al 2015).

Databases were systematically searched including EBSCOhost, CINAHL Plus, Cochrane, Medline, PubMed, Psych INFO, EMBASE, and NICE Evidence Search. Using a literature review methodology is a fundamental part of research to inform practice (Coughlan et al, 2013). The above databases were used because of their relevance to this field of practice and their credibility as databases (Tee, 2012).

The search terms used for the literature search, using Boolean operators (Saimbert, 2012), included Maternal Mental Health, Postnatal, Depression, Anxiety, Perinatal, Postpartum, Mothers Mental Health, Exercise, Outcomes, Effects of, Mood.

The search strategy was expanded to capture relevant articles by using the 'OR' and 'AND' operators as detailed in Table 1 below:

Ten papers were included in the final literature review following the use of inclusion and exclusion criteria described in Figure 1. The PRISMA (Mother et al, 2009) diagram details the results of the literature search and reasons for inclusion and exclusion of papers for the literature review.

Each paper was critically analysed using an adapted range of appropriate tools by the Critical Appraisal Skills Programme (CASP) (2018). Eight tools are available from CASP to cover different research designs including Randomised Controlled Trials, Systematic Reviews, Cohort Studies, Case Control Studies, Economic Evaluations, Diagnostic Studies, Qualitative Studies and Clinical Prediction Rule.

Results

The overall quality of the available literature was good with well structured papers featuring clear study aims. Ten studies were selected for review comprising of two systematic reviews with meta-analysis, four randomised controlled trials, three studies that included mixed methods and one cross sectional online survey that used a quantitative approach. The selected studies were conducted in the United Kingdom, Australia, New Zealand and Canada and included participants that were representative of the majority of the population that would be seen in health visiting practice in the U.K. Unfortunately, demographic data was not shared in many of the papers which meant that further understanding of the generalisability of the data to local populations was limited (Aveyard et al, 2015).

Discussion

Study Design and Analysis

The majority of the studies used a positivist approach (Parahoo, 2014), through the use of quantitative data, to examine the effect of exercise on symptoms of, predominantly, postnatal depression. A quantitative approach to studies can be valuable to answer research questions (Parahoo, 2014) and it is plausible why a quantitative design was used in the majority of studies reviewed.

The study of the relationship between postnatal depression and exercise using validated tools such as the Edinburgh Postnatal Depression Scale (EPDS) questionnaire (Cox et al, 1987) as a basis for data collection was featured in eight of the papers Cramp and Bray, 2010, Daley et al, 2009, Daley et al, 2015, Drista et al, 2009, Lovell et al, 2015, Norman et al, 2010, McCurdy et al, 2017 and Shelton and Lee, 2018. This provided the opportunity to objectively examine the relationship between two parameters; exercise and depression. On the other hand, gathering quantitative data can also limit the understanding of human experiences (Parahoo, 2014), particularly when considering maternal mental health.

The Edinburgh Postnatal Depression Scale (EPDS) questionnaire (Cox et al, 1987) was used in many studies, primarily used to screen mothers for symptoms of depression prior to trial entry or during the trials. Two studies, Daley et al, 2009 and Drista et al, 2009, considered a score above 10 on the EPDS scale to be an indicator of a risk of depression whereas Daley et al, 2015 and Forsyth et al, 2017 used a score of above 12 on the EPDS questionnaire as an entry level to the study. In practice, the EPDS scale has, historically, been used to screen women postnatally for the risk of depression (Cox et al, 1987) with scores above 12 to 13 used as an indicator of a risk of depression. Unfortunately, there was no discussion in the papers to describe why a EPDS score above 10 was used as an entry level in the papers by Daley et al, 2009 or Drista et al, 2009. In contrast, Norman et al (2010) used the Positive Affect Balance Scale (PABS) questionnaire as a primary outcome measure, in addition to the EPDS questionnaire. Two papers (Daley et al, 2009 and McCurdy et al, 2017) added the

Hamilton rating for depression (Hamilton, 1960) to the EPDS questionnaire although, there was no discussion about the rationale of the choice of each tool in these papers.

There appeared to be little consensus in the literature review about the optimum frequency of exercise intervention that could be used as an outcome measure. Norman et al (2010) compared the introduction of an 8 week exercise programme to mothers with their babies to a group that received educational programmes. In this randomised controlled trial Norman et al (2010) revealed a significant difference in PABS score in the first eight weeks of the exercise intervention group and a reduced EPDS score over time for the first 8 weeks of the intervention. Similar to the EPDS, the PABS questionnaire comprises of ten questions that screens for the ability of an individual to cope with the stresses of everyday living and their satisfaction and engagement in activities connected with their social life. Norman et al (2010) also concluded, however, that there was no further change in EPDS or PABS score between 8 -12 weeks. There was no explanation for this observation in the paper although findings could be attributable to the end of the exercise intervention at 8 weeks. In contrast, Cramp and Bray (2010) looked at a single episode of exercise for women exercising with or without their baby, in contrast to a much larger randomised controlled trial conducted by Daley et al (2015) that featured a facilitated, weekly, exercise intervention over six months.

Qualitative data

Only three studies (Shelton and Lee ,2018, Forsyth et al, 2017 and McInnes et al,2017) included a qualitative element, using a mixed methods approach. These papers gathered some interesting insights into the experience of women included in the studies. Using a phenomenological approach, exploring the lived experiences of participants (Parahoo 2014), McInnes et al (2017) used surveys, focus groups and individual interviews to evaluate improved physical, social and mental wellbeing of mothers. Conversely Shelton and Lee (2018) used structured interviews with mothers at completion of the study and Forsyth et al (2017) added focus groups into a study that was originally set up as a randomised controlled trial. Focus groups were added to this study to provide an analysis of themes that included the improvement of mental health, confidence and resilience in women who participated in the exercise group of the study. Insights were gathered from these focus groups that

revealed barriers to exercise, postnatally, such as time, maternal responsibilities, breastfeeding and physical status. Alderson (2001) described the advantages that qualitative interviews provide to encourage extended replies using open questions and elicit valuable examples of views and experience, including verbatim comments.

Using mixed methods methodology can have advantages to answer a research question in depth as quantitative and qualitative approaches can be incorporated and used to confirm and clarify potential links in data (Halcomb, 2018). Caution was however advised by Halcomb (2019) to avoid a “combined approach” where qualitative and quantitative methods are each used but are not fully integrated into the research.

A criticism of qualitative methodology has been that researchers conducting qualitative interviews can lose objectivity as they become involved in the research (Parahoo, 2014). McInnes et al (2017) used audio recorded and transcribed interviews and focus groups that may have increased objectivity including analysis of the survey data using descriptive statistics.

Measuring outcomes by EPDS score and use of other validated scales

The majority of the papers analysed used primary outcomes that measured the difference in mean EPDS score between the baseline and following an exercise intervention. Three studies featured in the meta-analysis provided by Daley et al (2009) reported a significant reduction of EPDS score as an outcome however, it was interesting to note that when social support was excluded as a co-intervention, the effect was considerably reduced.

The largest study included in the systematic review by Daley et al (2009) did not demonstrate a significant difference in EPDS score between study groups at follow up. In contrast, Daley et al (2015) reported that EPDS scores were reduced in women who participated in home based exercise interventions for 6 months. Additionally, women diagnosed with postnatal depression and randomised to the facilitated exercise arm of the Daley et al (2015) study were twice as likely to report lower EPDS scores at 6 months follow up compared to women who did not exercise. However, the study had a low response rate

of 10.7% therefore caution is advised when considering the generalisability of the data although the convenience sampling method (Parahoo, 2014) was appropriate to health visiting practice and could be easily reproduced.

Drista et al (2009) included EPDS as a screening tool at baseline and on completion of the study, in addition to assessing the impact of exercise on levels of fatigue, as a primary outcome. The study also utilised the Multidimensional fatigue inventory (MFI-20), the Pittsburgh Sleep Quality Index (PSQI), the Perceived Stress Scale (PSS) and the MOS social support survey (McDowell, 2006). This study concluded that 120 minutes of exercise per week was effective at reducing physical fatigue and reduced EPDS scores. However, numbers in the study were also small and the authors acknowledged that participants in the study were highly educated and motivated as volunteers, therefore results should be treated with caution.

A meta-analysis conducted by McCurdy et al (2017), which featured studies that used EPDS and Hamilton Depression rating scales, concluded that exercise in postpartum women has a small, beneficial, effect on depressive symptoms compared with standard care. Supervised exercise appeared to have a pronounced effect on depressive symptoms in contrast to unsupervised exercise. This may provide some evidence of the effects of group support when exercising. The type of exercise that may provide benefits to women was explored by Drista et al (2009) in another randomised controlled trial using EPDS data and Multidimensional Fatigue Inventory (MFI-20) as instruments to determine outcomes. Drista et al (2009) suggested that women with severe depression responded best to interventions that required little focused attention such as walking. These findings may be helpful when advising women about forms of exercise and potential benefits to their mental health.

A limitation of many of the studies, including papers reviewed in the two systematic reviews by Daley et al (2009) and McCurdy et al (2017) were small sample numbers, low response rates of returning questionnaires or adherence to the exercise interventions featured in the studies. These provided challenges with statistical analysis to prove a beneficial effect of exercise using quantitative data.

The EPDS questionnaire has been replaced, locally, by the use of PHQ-9 scale (Kroenke and Spitzer, 2002) to screen for depression and the GAD 7 questionnaire (Spritzer, 2006) that asks questions to screen for anxiety. This combination of questionnaires is used by General Practitioners, Midwives and Psychologists who provide talking therapies (NHS, 2018). None of the studies used the PHQ-9 questionnaire or the GAD 7 questionnaire therefore it would be valuable if future studies included these tools to represent current practice.

Postnatal depression, anxiety and maternal well being

Most papers focused on depression even though postnatal anxiety is reported to affect up to 33 % of the population of pregnant and postpartum women (Leach et al, 2017). Only Cramp and Bray (2010) measured anxiety in a randomised controlled trial using the State Scale of the State Trait Anxiety Inventory (McDowell, 2006) and reported a significant reduction in anxiety states. However, Cramp and Bray (2010) did not state whether the questionnaires were completed immediately after exercise or later which could have affected the assessment of feeling states reported in the study. Furthermore, the study sample was small and therefore the results should be interpreted cautiously. In contrast, Lovell et al (2015) included a short form version of the Depression Anxiety Stress Scale (DASS-21) (Parkitny and McAuley, 2010) to assess psychological distress in a cross sectional online survey of 3501 mothers. This study concluded that women who exercised, even once a week, reported lower psychological distress and depression compared to mothers who did not exercise regularly.

Other outcome measures

Daley et al (2009) discussed the importance of adherence when assessing the effectiveness of any health promotion intervention. Daley et al (2009) identified a high level of attendance at different types of exercise intervention and Cramp and Bray (2010) found no difference in outcomes whether women had babies with them or not at the exercise intervention. These results are promising when considering adherence to exercise programmes however Shelton and Lee (2018) revealed interesting insights, in qualitative

data, about the barriers to exercise that women face postnatally. This included the impact of time, maternal responsibilities and physical status.

Implications for future research

There is a need to understand, in more detail, behaviours around adherence and barriers to exercise postnatally and these should be included in further research and considered before creating programmes that include exercise interventions with the intention of enhancing maternal mental health.

Using quantitative data to evaluate the benefits of exercise to postnatal depression can be limited as quantitative research may exclude rich detail about the experiences (Parahoo 2014) and associated benefits of exercise postnatally to maternal mental health. These benefits may not be adequately reflected using existing validated tools such as the EPDS. Furthermore, the EPDS questionnaire has been replaced, in some parts of England, by the use of the PHQ-9 scale to screen for depression and the GAD 7 questionnaire. Therefore, as none of the studies used the PHQ-9 questionnaire or the GAD 7 questionnaire, the current evidence base may not reflect current practice. Further studies integrating the use of PHQ-9 and GAD 7 questionnaires with qualitative methods, such as focus groups and one to one interviews, is recommended using mixed methods methodology.

Implications for Practice

This literature review supports the evidence base by providing an analysis of what outcomes should be measured to determine the benefits of exercise to maternal mental health.

Measuring changes in EPDS scores may not provide an accurate analysis of the benefits of exercise to maternal mental health and excludes detailed screening for postnatal anxiety.

This research is relevant to the practice of Health Visitors and the recommendations could be considered when establishing local public health initiatives which feature exercise, such as “Ready Steady Mums” (Institute of Health Visiting, 2018) for mothers in the postnatal period. Using the recommendations in this research to establish metrics to measure

outcomes at the start of projects may enhance the opportunity to optimally evaluate the experience and benefits of exercise to the wellbeing of women participating in such programmes. Consideration of mother's motivation, perceived barriers to exercise and the impact of social support should also be considered as measurable outcomes to evaluate the effectiveness of local public health initiatives that include exercise.

Limitations of this research

This research is limited to the ten papers that were identified in the literature search. Widening the search terms used in the literature search and expanding the selection criteria to include dissertations available online, in full text, may have increased the number of studies that could have been included in the literature review. It would have been beneficial if the surveys and tools used in the studies by Shelton and Lee (2018), Forsyth et al (2017) and McInnes et al (2017) had been detailed in the papers or links provided to the full questionnaires as a critique of these tools could have been included in the analysis.

Conclusion

This research concluded that using a quantitative methodological approach, predominantly by utilising the Edinburgh Postnatal Depression Score as a primary outcome measure, does not consistently determine beneficial effects of exercise to postnatal depression and anxiety. Using the EPDS questionnaire does not reflect current practice and the benefits of exercise to maternal mental wellbeing may not be captured by measuring a point change in validated tools such as the EPDS. However, some limited qualitative data does reveal striking benefits of exercise to maternal mental health. Future research, using a qualitative approach, is recommended to provide a deeper, richer, insight into the experiences of women and to explore further outcomes that should be measured to evaluate the benefits of exercise to maternal mental health.

Key points

- Using the Edinburgh Postnatal Depression Scale, as a primary outcome measure, may not be a reliable method to demonstrate significant beneficial effects of exercise to postnatal depression and anxiety however qualitative data suggests benefits to maternal mental health.
- None of the studies used the PHQ-9 questionnaire or the GAD 7 questionnaire therefore it would be valuable if future studies included these tools to represent current practice.
- Health Visitors are uniquely placed to ensure that practice creates positive outcomes for families and initiatives are aligned with outcomes that Local Authorities expect to be met in accordance with contractual requirements.
- Using the recommendations in this research to establish metrics to measure outcomes at the start of projects may enhance the opportunity to evaluate the experience of and the benefits to their wellbeing of women participating in such programmes.

Further reading and useful information

The Kings Fund have produced guidance. How to measure for improving outcomes: a guide for commissioners. <https://www.kingsfund.org.uk/audio-video/how-measure-improving-outcomes-guide-commissioners>

Institute of Health Visiting website provides information about postnatal mental health <https://ihv.org.uk>

National Institute of Health and Clinical Excellence (NICE) Guidance (2014) about Antenatal and postnatal mental health: clinical management and service guidance available at <https://www.nice.org.uk/guidance/cg192>

Conflict of interest statement

I declare that there is no conflict of interest, including any possible interest, financial or otherwise, that may embarrass the author or the journal if revealed at a later date.

Ethical Approval

Because the research project was a literature review, the research did not need to be reviewed by a Research Ethics Committee before the research took place (Parahoo, 2014). Ethical consideration was assessed in each selected paper and included in the analysis of each paper to ensure that participants consented to participate in each study and if they were protected from harm (Parahoo, 2014). Ethical consideration is particularly significant when researching sensitive topics such as outcomes in maternal mental health (Parahoo, 2014).

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Stage 1	Stage 2
Using 'OR' Operator	Using 'AND' Operator
'Maternal Mental Health' OR 'Postnatal' OR 'Depression' OR 'Anxiety' OR 'Perinatal' OR 'Postpartum' OR 'Mothers Mental Health' OR 'Mood'.	'Maternal Mental Health' OR 'Postnatal' OR 'Depression' OR 'Anxiety' OR 'Perinatal' OR 'Postpartum' OR 'Mothers Mental Health' OR 'Mood'.
Using 'OR' Operator	Using 'AND' Operator
'Outcomes' was searched with OR operator with 'Effects of'	Outcomes' was searched with OR operator with 'Effects of'
	Using 'AND' Operator
	Exercise

Table 1 : Expanded Search Strategy

Inclusion Criteria	Exclusion Criteria
Primary research	Secondary research
Quantitative & Qualitative Studies	Theses
Studies that included measurement of outcomes	Studies that did not include measurement of outcomes
Studies that focused on the impact of exercise on maternal mental health	Studies that did not focus on exercise in maternal health
Studies published from year 2009 to 2019	Studies published before year 2009
Studies published in English language	Studies not published in English language
Abstracts available and full text	No Abstract or full text available
Peer reviewed Journals	Journals that were not peer reviewed

Table 2. Inclusion and Exclusion criteria for literature review



PRISMA '2009' Flow Diagram

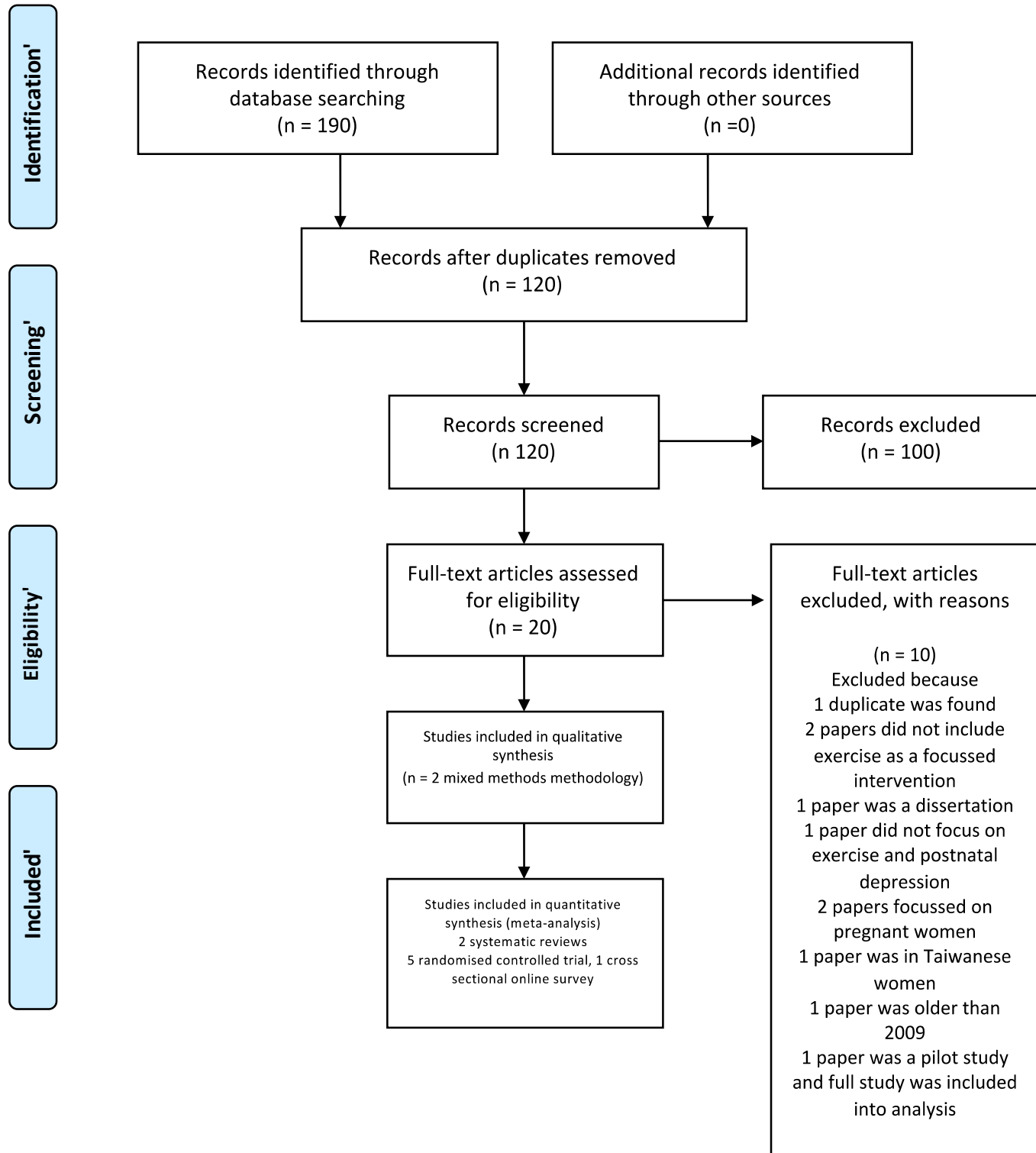


Table of Selected Papers using adapted CASP Tool (CASP 2018)

Study	1. Did the review ask a clearly-focused issue?	2. What was the study design? What outcomes were measured?	3. Type of exercise intervention Sample number	4. Were the groups similar at the start of the trial	5. How are the results presented and What is the main result?	6. How precise are these results?	7. Can the results be applied to the local population?	8. Were all important outcomes considered?	9. Limitations of the study
Cramp A and Bray S (2010) <i>Maternal Child Health Journal</i> 14:343-349	Yes To examine feeling states during exercise with or without baby present	Randomised controlled trial 2x2 crossover study Participants randomised to one of two possible groups 1. With baby present, followed by without baby present. 2. Without baby present followed by with baby present Used Exercise Induced Feeling Inventory Subscales and State Scale of the State Trait Anxiety Inventory	One episode of exercise for each group. Both had exercise as an intervention – with and without baby and then cross over N=26 women met inclusion criteria. 3 participants failed to complete both conditions of study. 23 women included in analysis.	Can't tell Demographic questionnaire given to each participant. Participants completed questionnaire to indicate normal levels of activity. Results do not state how groups differed with regard to age, social class and how frequently they usually exercised. <u>Ethical consideration</u> Paper noted that participants obtained consent from their physician to engage in physical activity. Study was approved by local research ethics committee. Consent was obtained face to face with participants using an informed consent letter.	The tables used to illustrate the results did not confirm that data from 23 women was included. No statistical difference seen between the two order streams. Women reported feeling happier, more energetic, refreshed and calm. Participants reported decreased feelings of anxiety after exercising. Same results regardless of whether baby was with or without Mum.	Carry over effects were considered because of the crossover design of the study. Planned contrasts were used to examine any carry over effect. 5 mixed model ANCOVAs were conducted – for each EFI subscale and STAI	Yes Women were recruited The results showed no difference in feeling states whether women exercised with or without babies therefore this may encourage women with their babies, and therefore reduce barriers to exercise to achieve improvement in well being	It would have been helpful to know if participants had a history of anxiety or depression prior to pregnancy	Only looked at 2 separate episodes of exercise therefore the results should be viewed with caution. Results didn't state if the questionnaires were completed immediately after exercise or sometime after as this may have affected accurate assessment of feeling states. Study sample was small and therefore should be interpreted cautiously when generalising to other populations until replicated with a large number of participants. Range of participants was 8 – 43 weeks postpartum therefore may have been influenced between hormone levels in early postnatal period. Study did not analyse results from women who were early in postnatal period to assess whether there was a difference in results for this group. No pre pregnancy physical activity was considered or pre-existing anxiety or depression identified or included in the analysis.

<p>Daley A et al, (2009) <i>Family Practice</i> 26 (2):154-162</p>	<p>To evaluate the effectiveness of exercise in the management of postnatal depression</p>	<p>Systematic Review and Meta-analysis Selection criteria was randomised controlled trials or quasi-randomised controlled trials Five trials were included in the review from 27 reports that were potentially suitable for inclusion.</p> <p>5 trials included EPDS prior to trial entry 1 paper added health care professional judgement Hamilton rating for depression used in one trial EPDS was used to assess PND following 12 weeks but not always as a primary outcome. Hamilton rating for depression was used in one trial</p>	<p>Studies that compared any type of exercise intervention with other treatments or no treatment in women with post-natal depression. 221 participants across five trials with 114 interventions and 107 comparators Trials were from Australia, Canada England and Taiwan. Two of the studies included pram walking groups Four trials compared exercise to no exercise</p>	<p>In four trials participants were also receiving concurrent antidepressant medication and/or psychological therapies. One trial excluded participants if they were using antidepressants or had had psychotherapy in previous year. One study did not provide this information. <u>Ethical consideration</u> This was a systematic review. No discussion of ethics in reviewed papers featured in paper.</p>	<p>Three trials showed a significant difference in EPDS score between trial groups at final follow up and two did not. No evidence to support the effectiveness of exercise as a replacement for standard treatment. Social support element of exercise may have a positive effect</p> <p>Attendance at exercise classes and adherence to exercise intervention was good.</p>	<p>Meta-analysis was used and confidence intervals were explored and explained in study. 95% confidence intervals were described (when using a random effects model) meaning that 95% population had reduced symptoms of PND compared to no exercise. When a study (combining social support was taken out of the meta-analysis significant heterogeneity between studies was not found however there was significant heterogeneity between studies when this was included.</p>	<p>Because similar population of postnatal women from countries featured in chosen studies such as Australia, UK and Canada however demographic information was not detailed in systematic review. Walking groups were included as exercise intervention in 2 studies-comparable to Health Visitor led walking groups in local area</p>	<p>Would have liked to have seen studies looking at other outcomes to evaluate effectiveness of exercise on Postnatal depression. As anxiety is also prevalent postnatally it would have been useful to have included studies that looked at impact on reducing anxiety however the paper did state that the systematic review was focused on effectiveness of exercise in the management of Postnatal depression. Demographic information would have been useful to understand relevance to local practice</p>	<p>Rates of attendance and adherence were high however it might be because volunteer samples consisted of motivated women Trial numbers were small (5 studies were chosen with total participants of 221 Follow up was short and limited to between 3-4 months after baseline in 3 trials and 6 months in one trial therefore longer term effects of exercise could not be considered. EPDS scores of 10 and above were used to classify women at risk of postnatal depression however in practice it is more usual for a EPDS score of 12-13 to be used to assess that women are at risk of postnatal depression</p>
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<p>Daley A et al, (2015) <i>Psychological Medicine</i> 45:2413-2425</p>	<p>To evaluate the effectiveness of a facilitated exercise intervention a treatment for postnatal depression</p>	<p>Randomised controlled trial used EPDS prior to study and ICD -10 criteria to confirm postnatal depression. EPDS score measured at 6 months follow up Did include women with anxiety and depression. Used EPDS above 13 as entry to study</p>	<p>Facilitated exercise intervention during months 1 and 2 and subsequent progression to 30 minutes of moderate intensity exercise 3-5 days a week</p>	<p>Diagnoses of depression and those with mixed anxiety and depressive disorder were balanced across groups Unsure if demographically balanced across two groups. Paper states that majority of participants lived in the two highest deprivation quartiles (79%) and 37% were of non-white ethnicity. <u>Ethical consideration</u> Authors noted that eligible women were asked to provide written informed consent. Study was approved by local research ethics committee.</p>	<p>EPDS scores were reduced in exercise intervention group. Women were twice as likely to report a meaningful change in EPDS score at 6 months follow up in the exercise group.</p>	<p>Used statistical analysis using SAS version 9.2 and Stata version 12 Confidence interval reported of 95% and statistically significant $p = 0.05$</p>	<p>Women with a diagnosis of mixed anxiety and depression were included in the study which is more representative of clients in practice. Population in the UK. Screened using Child Health System that is used in practice. Level of deprivation in study participants may be higher than in local practice. Ethnicity is different in some local population</p>	<p>Would have liked to have seen any qualitative data which may have been available from exercise diary logs.</p>	<p>Small sample size as 10.7% response rate did not meet recruitment target of 166 participants.</p>
<p>Drista M et al (2009) <i>Journal of Psychosomatic Research</i> 67: 159-163</p>	<p>Explored effects of home based exercise on reductions in physical and mental fatigue scores in postpartum (4-38 weeks) depressed women and explored mediators of the intervention</p>	<p>Randomised Controlled Trial 88 women with a score of above 10 on Edinburgh Postnatal Depression score (EPDS) EPDS used and Multidimensional fatigue inventory (MFI-20) EPDS score above 10 used as entry</p>	<p>Participants randomly assigned to a 12 week individualized home based exercise intervention (n=46) or a no treatment control group (n=42) The paper does not explain how women were</p>	<p>All women were entered with an EPDS of above 10 but only with one completion of an EPDS which may not have accounted for a transient score All women underwent a physician supervised cardiovascular fitness test prior to randomisation into treatment and</p>	<p>EPDS scores reduced in exercise group Social support was not a significant moderator in the exercise group. Intervention was effective at alleviating physical and mental fatigue in women who entered the study after 9</p>	<p>The authors investigated whether the effects of the intervention depended on clinical variable at study entry e.g. parity. Hypotheses were tested by computing a series of linear regressions.</p>	<p>All women entered into the study were described as highly educated and motivated therefore this may not be generalizable to the local population. Demographic data was not included in</p>	<p>Yes</p>	<p>Women in the control group still reported an average of 54.6 minutes per week of aerobic exercise compared to 124 .09 minutes weekly in the treatment group meaning that the impact of exercise may have been clearer if the control group had not exercised. Small numbers in the study. Home based exercise may be difficult to complete due to space in some households</p>

	on changes in physical fatigue	requirement into study Perceived stress scale used Pittsburgh Sleep quality index	randomised except that they were assigned to an exercise group or a control group.	control groups however there does not appear to have been a balance achieved in each group to allow for preexisting cardiovascular fitness which may have influenced the results. <u>Ethical consideration</u> Authors noted only that eligible women provided consent to participate but did not detail how this was obtained and the authors did not detail if Study was approved by local research ethics committee but did acknowledge a grant obtained from a research group which does have a policy on ethics for research participants. http://www.frqs.gouv.qc.ca/en/ethique/ethique-de-la-recherche	weeks post delivery	Simple slope analyses showed parity was a significant moderator in the control group but not in the exercise group. Statistical analysis was applied to the reduction in physical fatigue as that was shown to be reduced in the exercise group. This was tested using Sobel tests Confidence limits were not described.	the study therefore unable to consider if this study could be reproduced in the local population		
Forsyth J et al (2017) <i>Health Care for Women International</i> 38 (6): 635 – 639	Clear objective to conduct a pilot randomized controlled trial to examine the effectiveness of a mixture	Mixed Methods Women scoring above 12 EPDS entered into study Structured clinical interview using DSM-1V and SCID –PN Diagnosis.	Pram walking, facility based group exercise and self initiated home based exercise N=22 (from initial 24) 11 in each group	All women were entered with an EPDS of above 12 Demographic data was obtained from all participants and matched evenly for age, height, body mass, age of child in months, marital	Qualitative data revealed positive views Boosting mental health, confidence and resilience. Valued opportunity to socialise	A series of analyses of covariance (ANCOVAS) were used to determine if the intervention significantly improved	Yes Demographic data was provided Women lived in UK in area with adverse weather conditions and high	Yes, however more detailed information, including qualitative data, from focus groups would have been beneficial to understand	Pilot study. Low numbers of 11 participants in each group. Reasons given for the lack of statistical effect may be due to low exercise adherence. 24% of group exercise and 14% of pram walking sessions were attended and mean amount of exercise undertaken was 61 minutes per week. The authors discussed perceived barriers to

	<p>of pram walking, facility based group exercise and self initiated home based exercise, specifically targeted at women living in an inner city, where adverse weather conditions and high levels of social deprivation prevail.</p>	<p>Although described as a randomized controlled study, the authors added in focus group at completion of the study to gather qualitative data and thematic framework analysis was conducted to identify emergent themes.</p>		<p>status, education, prior employment and smoking. <u>Ethical consideration</u> Study was approved by local research ethics committee and paper acknowledged informed consent gained from each participant.</p>	<p>Getting out of the house was a benefit No significant difference in EPDS or SCID-PN diagnosis Authors suggested looking at adherence</p>	<p>EPDS scores. A Chi2 test was used to indicate if SCID-PN diagnosis significantly changed at 3 and 6 months. Thematic analysis Conducted by 2 independent researchers.</p>	<p>levels of social deprivation. Can be compared to local population.</p>	<p>other outcomes that could be measured in future studies.</p>	<p>exercise as a possible explanation for low adherence and suggest further studies to include a behaviour change approach to address perceive barriers to exercise Further studies including consideration of encouraging exercise adherence was suggested by authors.</p>
<p>Lovell G et al (2015) <i>Nursing and Health Sciences</i> 17: 42-48</p>	<p>To quantify psychological distress, depression, anxiety and stress in mothers in Australia and New Zealand Secondary aim to examine role of exercise in psychological wellbeing.</p>	<p>Descriptive online survey Depression Anxiety Stress Scale (DASS-21) Quantitative data</p>	<p>Modality of exercise was not captured. N=3601 mothers with a child of 5 years and younger</p>	<p>All participants completed the same survey. Recruitment of participants achieved via advertisements in national and local newspapers, radio and websites. <u>Ethical consideration</u> Study was approved by local research ethics committee. Informed consent was obtained online prior to commencement of the study and acknowledged confidentiality and anonymity.</p>	<p>Women who exercised, even one a week, reported lower psychological distress, depression and depression scores compared to those who did not exercise Women who exercised 3-4 times a week had the greatest effect on depression scores. Large sample of 3601 mothers</p>	<p>Statistical analyses applied to results using SPSS version 19.0. Results was statistically significant for secondary research aim $p < 0.001$ for psychological distress, anxiety, depression and stress.</p>	<p>Applicable to local population as women with child under 5 years of age (client profile of Health Visitors) Some demographic data available in paper that can be generalisable to local population. Discussed exercise prescription – recent local use of social prescribing for well being has been commenced</p>	<p>Can't Tell Suggested future qualitative research that considered any differences in benefits/effects whether women exercised alone or in groups</p>	<p>Does not infer causality as a survey Survey of women –did not measure baseline depression and again following intervention. Measured number of women with depression and compared with if they exercised. Anxiety was least sensitive to exercise incidence. It would have been helpful to have reviewed the survey if it had been published with the paper</p>

Norman E et al (2010) <i>Physical Therapy</i> 90 (3): 348-355	To evaluate the effect of a physical therapy exercise and health care education programme on the psychological wellbeing of new mothers.	Randomised Controlled Trial EPDS – All women recruited regardless of EPDS score (22% had score above 13 at entry) Positive Affect Balance Scale	One hour of group exercise a week for 8 weeks vs written educational material over 8 weeks N=62 experimental group N= 73 educational material only group	All women on discharge from hospital postnatally were invited to participate in study. Women randomised using computer generated random numbers list to two groups. <u>Ethical consideration</u> Study was approved by local research ethics committee and paper acknowledged informed consent gained from each participant.	EPDS scores reduced regardless of the amount of physical exercise compared to education only intervention PABS score difference in exercise groups up to 8 weeks post intervention	Data analysed using SPSS software version 11.5 Results reported to be significant however only noted in table of results for EPDS at 8 weeks p=< .0001	Yes, some demographic information available to allow comparison to local population.	Yes	Authors suggested that the results of the study were of short term outcomes and further work is needed to explore whether intervention effects are maintained as sustained psychological and behavioral benefits at 6 months.
McCurdy A et al (2017) <i>Obstetrics & Gynecology</i> 129 (6): 1087-1097	To examine the influence of exercise on depressive symptoms and the prevalence of depression in the postpartum period.	Systematic review and Meta-analysis Randomised controlled trials and quassi randomised controlled trials used in the inclusion criteria 16 papers in final analysis Used EPDS and Hamilton Depression rating scale in studies that were analysed.	Supervised and unsupervised exercise, of at least 4 weeks duration, in papers reviewed. Studies compared exercise groups with a control group (standard care, waiting list or no therapeutic intervention including monthly newsletter or phone call). N= 1327 participants across 16 trials.	N/a but Studies were independently assessed by two reviewers with an additional arbitrator. Reviewers not blinded to authors of studies. Methodologic quality of articles assessed using a critical appraisal tool Jadad scale). <u>Ethical consideration</u> This was a systematic review. No discussion of ethics in reviewed papers featured in paper.	Exercise in postpartum women has a small beneficial effect on depressive symptoms compared with standard care Supervised exercise has a more pronounced effect on depressive symptoms than unsupervised exercise Supervised exercise has higher adherence	X ² tests used to estimate heterogeneity between trials. 3 sensitivity analyses were performed and discussed in paper. 95% confidence interval reported on results data	No demographic information available therefore difficult to generalise to local population however women postnatally were included in studies therefore could be relevant to local population.	Yes	Authors advised that Researchers need to be clear about how to define depression and included discussion on updated ICD 10 th revision and DSM-5 to diagnose postnatal depression. Trials included in the meta-analysis are small and had some methodologic limitations. Authors were unable to identify the optimal intensity or type of exercise for improving depressive symptoms. The results of these studies should not be generalized to women experiencing severe depressive symptoms because the studies in the review examined women with mild to moderate depression

McInnes R et al, (2017) <i>Journal of Health Visiting</i> 5 (5): 236-243	To assess predefined aims of buggy walks. Explore perceptions of mental, physical and social well being in relation to participation in programme.	Mixed Methods Approach Survey of mothers and service providers Survey tool developed to scope range of views	Women who attended buggy walks (n=32) Women who did not attend buggy walks (n=27) completed survey. 3 focus groups also held with participants who attended buggy walking groups and consented to focus group attendance. 19 service providers included in study	Women were invited to participate if they had given birth in previous 2 years. Service providers were included if they had regular contact with new mothers. <u>Ethical consideration</u> Study was approved by local research ethics committee and acknowledgement of confidentiality and anonymity stated in paper. Informed consent was obtained from women using a written signed form.	Qualitative data revealed positive outcomes for women Recommended health cost analysis in future research to evaluate cost savings in addition to perceived value of involving Health Visitors in this context	Qualitative data entered into NVivo and thematic analysis undertaken using data	Convenience sample could be replicated in local practice using same method. Generalisable to local population	Difficult to evaluate as survey questions not included in the paper.	This study did not objectively assess outcomes as effects of the walks on health indicators but did explore perceptions of benefit. It was a small study based in one area of Scotland and therefore may have limited generalisability. The recruitment method of the study may have meant that participants who were interviewed were more favorably disposed towards buggy walks. It would have been helpful to have published the survey tool that was devised for the study. Unclear if survey tool was the same for service providers and Mothers.
Shelton S and Lee S (2018) <i>Nursing for Women's Health</i> 22 (2): 149-157	Aim of study not provided in abstract or separately in paper. Purpose is explained in literature review section to: Explore exercise patterns of women after childbirth with specific aim of understanding the factors that may influence incorporation	Descriptive study Mixed Methods EPDS used. 62 women completed study questionnaire. Structured interview at end of study to capture qualitative data (n=18) Part of larger study (Shelton, 2015 – dissertation and full study unavailable.	Frequency of exercise recorded and compared to before and during pregnancy. Type of exercise not reported in paper.	Participants recruited from private obstetric offices in one area of America. Paper does not state number of offices that recruitment took place from. Criteria for recruitment is detailed in paper. <u>Ethical consideration</u> Study was approved by local research ethics committee. Informed consent obtained from participants in a	Structured interviews revealed information about barriers to exercise Providing women with an objective recommendation for exercise such as stroller walking 3 days a week gives them a foundation for health promotion and wellness	Objective data analysed using SPSS version Databases cross referenced for entry error	Low sample number requires caution however average age is comparable to local population (aged 29 years) and 4-9 weeks postpartum. However other demographic data, described in limitations, may mean not generalisable	It would have been helpful to have been able to review this data in contrast and perspective to larger study that was not available in published full text.	Because of the limitations of the sample, in one area of America, the generalisability of the study findings must be considered. 90.3% women were white/non Hispanic and 48.4% of women had annual income greater than 80,000\$ (equivalent £60,000 annually compared to average UK household income of £ 45,773 (ONS 2018) The sample comprised of mainly married, white, women with an income reflective of upper middle class in America. Because some of the barriers included time, women who participated in the study may have the means to access additional support leading to fewer barriers to access exercise. Women self-identified as being healthy women

	of exercise into woman's daily routing in the first months postpartum.			face to face meeting.			to local populations.		who may have been more motivated to exercise Low sample number n=18. Most women had a plan to exercise post pregnancy
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