Evidence Portfolio – Pregnancy and Postpartum Work Group, Question 1

What is the relationship between physical activity and weight gain during pregnancy and weight loss during postpartum (up to one year)?

a. What dose of physical activity is associated with the reported quantitative benefit or risk?
b. Is there a dose-response relationship? If yes, what is the shape of the relationship?
c. Does the relationship vary by age, ethnicity, socio-economic status, or weight status?

Sources of Evidence: Existing Systematic Reviews and Meta-Analyses

Conclusion Statements and Grades

PREGNANCY

Strong evidence demonstrates a significant inverse relationship between physical activity and weight gain during pregnancy. **PAGAC Grade: Strong.**

Limited evidence suggests that a dose of physical activity similar to the 2015 American College of Obstetricians and Gynecologists Guidelines and the 2008 *Physical Activity Guidelines for Americans* is associated with minimized weight gain and a lower risk of excess gestational weight gain. **PAGAC Grade: Limited.**

Limited evidence suggests a dose-response relationship between physical activity and gestational weight gain. **PAGAC Grade: Limited**.

Insufficient evidence is available to determine whether the relationship between physical activity and gestational weight gain varies by age, race/ethnicity, socioeconomic status, or weight status. **PAGAC Grade: Not assignable**.

POSTPARTUM

Insufficient evidence is available to determine whether physical activity is associated with weight loss during the postpartum period. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine what dose of physical activity is effective for weight loss during postpartum. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether a dose-response relationship exists between physical activity and weight loss during postpartum. **PAGAC Grade: Not assignable.**

Insufficient evidence is available to determine whether any relationship between physical activity and weight loss during postpartum varies by age, race/ethnicity, socioeconomic status, or weight status. **PAGAC Grade: Grade not assignable**.

Description of the Evidence

To address its research questions, the Pregnancy and Postpartum Work Group conducted one search for systematic reviews, meta-analyses, pooled analyses, and reports on preeclampsia and eclampsia and chose to rely on 7 searches conducted by PAGAC subcommittees that were considered to have the potential to provide pertinent information on pregnancy and postpartum. The 7 searches conducted by subcommittees included:

1. Cardiometabolic Health and Weight Management Q1: What is the relationship between physical activity and prevention of weight gain?
2. Cardiometabolic Health and Weight Management Q2: In people with normal blood pressure or pre-hypertension, what is the relationship between physical activity and blood pressure?
3. Cardiometabolic Health and Weight Management Q3: In adults without diabetes, what is the relationship between physical activity and type 2 diabetes?
4. Brain Health Q2: What is the relationship between physical activity and quality of life?
5. Brain Health Q3: What is the relationship between physical activity and (1) affect, (2) anxiety, and (3) depressed mood and depression?
6. Brain Health Q4: What is the relationship between physical activity and sleep?
7. Aging Q2: What is the relationship between physical activity and physical function?

Additional searches for systematic reviews, meta-analyses, pooled analyses, reports, or original research were not conducted based on the a priori decision to focus on existing reviews.

PREGNANCY

Existing Systematic Reviews and Meta-Analyses

Overview

A total of 11 existing reviews that examined the association between physical activity and weight gain during pregnancy were included: 9 meta-analyses[1-9] and 2 systematic reviews.[10, 11] The reviews were published between 2011 and 2017.

The meta-analyses included a range of 5 to 81 studies and covered the following timeframe: inception to 2015[1, 9]; 1990 to 2013 and 2014[2, 5]; inception to 2012 and 2013[3, 11]; inception to 2014[4]; 1900 to 2010[6]; 1950 to 2011.[8] The meta-analysis by Sui et al[7] did not have date restrictions.

The systematic reviews included 26[10] and 18[11] studies. One systematic review[11] covered a timeframe from inception to 2013, and 1[10] did not report a timeframe.

Exposures

The majority of included reviews examined the effect of exercise interventions that incorporated various modalities, including aerobic and resistance training. One review focused on leisure-time physical activity,[1] 1 examined sedentary behaviors,[10] 1 assessed the effect of supervised exercise,[9] and 1 focused on exercise dose.[11]

Outcomes

All the included reviews assessed maternal gestational weight gain.

POSTPARTUM

Overview

A total of 5 existing reviews that examined the association between physical activity and weight gain during the postpartum period were included: 3 meta-analyses[2, 12, 13] and 2 systematic reviews.[14, 15] The reviews were published in 2013 and 2014.

The meta-analyses included a range of 5 to 12 studies and covered the following timeframe: inception to 2013 and 2014[12, 13] and from 1990 to 2013.[2]

The systematic reviews included 6[14] and 3[15] studies and covered a timeframe from 1990 to 2012 and from inception to 2013, respectively.

Exposures

The included reviews examined the effect of exercise interventions that incorporated various modalities, including aerobic and resistance training.

Outcomes

All the included reviews assessed maternal weight loss during the postpartum period.

Populations Analyzed

The table below lists the populations analyzed in each article.

Table 1. Populations Analyzed by All Sources of Evidence

	Sex	Age	Weight Status	Pregnancy	Chronic Conditions	Other
Amorim Adegboye, 2013	Female	Adults ≥18	Overweight and Obese	Lactating, Postpartum		
Berger, 2014	Female			Postpartum		
da Silva, 2017	Female			Pregnant		
Elliott-Sale, 2014	Female	Adults >18		Pregnant, Postpartum		
Fazzi, 2017	Female	Adults >16		Pregnant		
Han, 2012	Female	Adults		Pregnant		
McDonald, 2016	Female			Pregnant		
Muktabhant, 2015	Female		Normal/Healthy Weight (BMI: 18.5–24.9), Overweight and Obese	Pregnant, Postpartum		
Nascimento, 2014	Female			Postpartum		
Sanabria-Martinez, 2015	Female			Pregnant		
Streuling, 2011	Female			Pregnant		
Sui, 2012	Female		Overweight (BMI: 25–29.9), Obese (BMI: 30 and above), Overweight and Obese	Pregnant		
Thangaratinam, 2012	Female			Pregnant		
van der Pligt, 2013	Female	Mean age 28.3–35.1		Postpartum		
Wiebe, 2015	Female		Overweight and Obese	Pregnant	Hypertension	Gestational diabetes

Supporting Evidence

Existing Systematic Reviews and Meta-Analyses

Table 2. Existing Systematic Reviews and Meta-Analyses Individual Evidence Summary Tables

Postpartum	
Meta-Analysis **Citation:** Amorim AR, Linne YM. Diet or exercise, or both, for weight reduction in women after childbirth. *Cochrane Database Syst Rev*. 2013;(7):Cd005627. doi:10.1002/14651858.CD005627.pub3.	
Purpose: To evaluate the effect of diet, exercise, or both on weight reduction in women carrying excess weight after childbirth. **Timeframe:** Inception–April 2013 **Total # of Studies:** 12 **Exposure Definition:** Exercise interventions included any type of exercise counseling that encouraged women to engage in regular recreational exercises (e.g., walking, jogging, sports) in order to promote weight loss or improve physical fitness, or structured/individualized exercise programs or interventions in which women participated in supervised exercise sessions. Type, intensity, frequency, duration, and timing were varied. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No **Outcomes Addressed:** Change in body weight: percentage of women who returned to prepregnancy weight or lost weight retained after	**Abstract:** BACKGROUND: Weight retention after pregnancy may contribute to obesity. It is known that diet and exercise are recommended components of any weight loss programme in the general population. However, strategies to achieve healthy body weight among postpartum women have not been adequately evaluated. OBJECTIVES: The objectives of this review were to evaluate the effect of diet, exercise or both for weight reduction in women after childbirth, and to assess the impact of these interventions on maternal body composition, cardiorespiratory fitness, breastfeeding performance and other child and maternal outcomes. SEARCH METHODS: We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (31 January 2012) and LILACS (31 January 2012). We scanned secondary references and contacted experts in the field. We updated the search of the Cochrane Pregnancy and Childbirth Group's Trials Register on 30 April 2013 and added the results to the awaiting classification section of the review. SELECTION CRITERIA: All published and unpublished randomised controlled trials (RCTs) and quasi-randomised trials of diet or exercise or both, among women during the postpartum period. DATA COLLECTION AND ANALYSIS: Both review authors independently assessed trial quality and extracted data. Results are presented using risk ratio (RR) for categorical data and mean difference (MD) for continuous data. Data were analysed with a fixed-effect model. A random-effects model was used in the presence of heterogeneity. MAIN RESULTS: Fourteen trials were included, but only 12 trials involving 910 women contributed data to outcome analysis. Women who exercised did not lose significantly more weight than women in the usual care group (two trials; n = 53; MD -0.10 kg; 95% confidence interval (CI) -1.90 to 1.71). Women who took part in a diet (one trial; n = 45; MD -1.70 kg; 95% CI -2.08 to -1.32), or diet plus exercise programme (seven trials; n = 573; MD -1.93 kg; 95% CI -2.96 to -0.89; random-effects, T(2) = 1.09, I(2) = 71%), lost significantly more weight than women in the usual care group. There was no difference in the magnitude of weight loss between diet alone and diet plus exercise group (one trial; n = 43; MD 0.30 kg; 95% CI -0.06 to 0.66). The interventions seemed not to affect breastfeeding performance adversely. AUTHORS' CONCLUSIONS: Evidence from this review suggests that both diet and exercise together and diet alone help women to lose weight after childbirth. Nevertheless, it may be preferable to lose weight through a combination of diet and exercise as this improves maternal

childbirth. Infant weight gain. **Examine Cardiorespiratory Fitness as Outcome:** Yes	cardiorespiratory fitness and preserves fat-free mass, while diet alone reduces fat-free mass. This needs confirmation in large trials of high methodological quality. For women who are breastfeeding, more evidence is required to confirm whether diet or exercise, or both, is not detrimental for either mother or baby.
Populations Analyzed: Females ≥18, Overweight and Obese, Lactating, Postpartum	**Author-Stated Funding Source:** National Institute for Health Research; Brazilian Foundation (CAPES), Brazil.

<table>
<tr><th colspan="2">Postpartum</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Berger AA, Peragallo-Urrutia R, Nicholson WK. Systematic review of the effect of individual and combined nutrition and exercise interventions on weight, adiposity and metabolic outcomes after delivery: evidence for developing behavioral guidelines for post-partum weight control. BMC Pregnancy Childbirth. 2014;14:319. doi:10.1186/1471-2393-14-319.</td></tr>
<tr><td>Purpose: To assess the benefits and harms of post-partum behavioral weight management interventions that included nutrition, exercise, or combined nutrition and exercise components.</td><td rowspan="5">Abstract: BACKGROUND: Post-partum weight retention contributes to the risk of chronic obesity and metabolic alterations. We conducted a systematic review of randomized controlled trials (RCTs) on the effect of post-partum nutrition and exercise interventions on weight loss and metabolic outcomes. DATA SOURCES: Four electronic databases were searched from inception to January, 2012. Two investigators reviewed titles and abstracts, performed data abstraction on full articles and assessed study quality. METHODS: We included RCTs comparing nutrition, exercise or combined nutrition and exercise interventions with a control condition. Thirteen studies met our inclusion criteria (N = 1,310 participants). Data were abstracted on study characteristics, intervention components, enrollment period, and length of follow-up. Outcomes of interest included weight, adiposity, cardio-metabolic measures (glucose, lipids) and obesity-related inflammatory markers. RESULTS: Nine trials compared combined interventions to standard post-partum care; three trials assessed the effect of exercise interventions, one trial evaluated a nutrition-only intervention. Four good quality RCTs on combined interventions had inconsistent findings, with the larger RCT (N = 450) reporting no difference in weight between groups. Four fair-to good quality RCTs reported greater weight loss in the combined intervention group vs. standard care, ranging from 0.17 kg to 4.9 kg. Results from exercise only interventions were inconclusive. Evidence for nutrition only interventions was insufficient. There was insufficient evidence for the effect of post-partum interventions on metabolic risk factors and inflammatory biomarkers. CONCLUSIONS: Combined nutrition and exercise interventions can achieve weight loss, but evidence is limited due to a small number of trials and limitations in study design.</td></tr>
<tr><td>Timeframe: Inception–May 2013</td></tr>
<tr><td>Total # of Studies: 13 (3 only addressing PA exposure)</td></tr>
<tr><td>Exposure Definition: Interventions included a structured aerobic and strength training sessions or a pedometer based walking program. Programs lasted 3 months long.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Weight: percentage of weight loss, proportion of women returning to pre-pregnancy weight gain.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Postpartum</td><td>Author-Stated Funding Source: Not reported.</td></tr>
</table>

<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: da Silva SG, Ricardo LI, Evenson KR, Hallal PC. Leisure-time physical activity in pregnancy and maternal-child health: a systematic review and meta-analysis of randomized controlled trials and cohort studies. Sports Med. 2017;47(2):295–317. doi:10.1007/s40279-016-0565-2.</td></tr>
<tr><td>Purpose: To compare associations between leisure time physical activity (LTPA) in pregnancy and maternal and child health outcomes.</td><td rowspan="4">Abstract: BACKGROUND: Evidence suggests that leisure-time physical activity (LTPA) during pregnancy is associated with a reduced risk of preeclampsia, gestational diabetes mellitus (GDM), and preterm birth. However, these results are inconsistent when comparing cohort studies and randomized controlled trials (RCTs). OBJECTIVE: The purpose of our study was to compare the associations between LTPA in pregnancy and maternal (GDM, preeclampsia, and weight gain during pregnancy) and child health outcomes (preterm birth, birthweight, and fetal growth) between RCTs and cohort studies. METHODS: We performed a systematic search in PubMed, Web of Science, and EBSCO up to 31 August 2015. Inclusion criteria for experimental studies required randomized trials with a control group and exposure to a physical activity structured program. The inclusion criteria for cohort studies required information on LTPA during pregnancy as an exposure and at least one maternal-child health outcome. We assessed the methodological quality of all studies and performed a meta-analysis to produce summary estimates of the effects using random models. RESULTS: We included 30 RCTs and 51 cohort studies. The meta-analysis of RCTs indicated that participation in LTPA was associated with lower weight gain during pregnancy, lower likelihood of GDM, and lower likelihood of delivering a large-for-gestational-age infant. Cohort studies indicated that participation in LTPA was associated with lower weight gain during pregnancy, lower likelihood of GDM, and lower risk of preterm delivery. CONCLUSIONS: Our findings support the promotion of LTPA in pregnancy as a strategy to improve maternal and child health.</td></tr>
<tr><td>Timeframe: Inecption–August 2015</td></tr>
<tr><td>Total # of Studies: 81</td></tr>
<tr><td>Exposure Definition: LTPA: Randomized control trials assessed structured exercise programs including moderate-intensity physical activities, most including aerobic exercises and strength training. The duration of the sessions varied between 20 and 70 minutes. Cohort studies assessed PA by self report and accelerometer wear.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Excessive gestational weight gain. Gestational diabetes. Pre-eclampsia. Birth weight. Fetal growth. Gestational age.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Pregnant</td><td>Author-Stated Funding Source: Not reported.</td></tr>
</table>

<table>
<tr><th colspan="2">Pregnancy, Postpartum</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Elliott-Sale KJ, Barnett CT, Sale C. Systematic review of randomised controlled trials on exercise interventions for weight management during pregnancy and up to one year postpartum among normal weight, overweight and obese women. Pregnancy Hypertens. 2014;4(3):234. doi:10.1016/j.preghy.2014.03.015.</td></tr>
<tr><td>Purpose: To compare the effects of an exercise intervention with routine care or another intervention on gestational weight gain and postpartum weight retention in normal weight, overweight, and obese women.</td><td rowspan="4">Abstract: OBJECTIVE: To review the effectiveness of exercise interventions in managing weight among pregnant and postpartum women. METHODS: Ten databases were searched for randomised controlled studies, published between January 1990 and September 2013 that compared an exercise-based weight management intervention with routine care or another type of intervention. There were no restrictions to the type, frequency, duration, intensity or mode of exercise intervention. Interventions not specifically designed to target or affect weight were excluded. Study quality was assessed using the Cochrane Collaboration's tool for assessing risk of bias in randomised trials and the Consolidated Standards of Reporting Trials statement. RESULTS: The combined searches yielded 354 articles. Reasons for study exclusion included but were not limited to; non-randomisation, retrospective study design, duplicates, qualitative/baseline studies, not specifically designed to influence weight, combined intervention and study protocols. Five papers were included in this review (three trials with pregnant women and two trials with postpartum women). Two of the three pregnancy-related studies found that exercise interventions significantly reduced gestational weight gain. In addition, postpartum women in the intervention groups lost significantly more body weight than those in the control groups. CONCLUSIONS: There is a paucity of information on the efficacy of exercise-only interventions for the prevention of excessive gestational weight gain and retention. However, there is some limited evidence to suggest that exercise can be used for these groups to alleviate some of the issues associated with maternal obesity.</td></tr>
<tr><td>Timeframe: 1990–2013</td></tr>
<tr><td>Total # of Studies: 5</td></tr>
<tr><td>Exposure Definition: Interventions were predominately aerobic exercise based, with some resistance exercises. Intervention duration ranged from 45 to 60 minutes, frequency 3–5 times per week, and moderate intensity (<70% heart rate maximum; <140 beats per minute; 12–14 on the 6–20 Borg Scale).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Change in body weight or body mass index.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Age >18, Pregnant, Postpartum</td><td>Author-Stated Funding Source: NHS Nottingham City—National Institute for Health Research, Research Capability Funding.</td></tr>
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<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Systematic Review
Citation: Fazzi C, Saunders DH, Linton K, Norman JE, Reynolds RM. Sedentary behaviours during pregnancy: a systematic review. Int J Behav Nutr Phys Act. 2017;14(1):32. doi:10.1186/s12966-017-0485-z.</td></tr>
<tr><td>Purpose: To determine the time spent in sedentary behaviors and the prevalence of sedentary behaviors among pregnant women, and whether sedentary behaviors are associated with pregnancy outcomes in mothers and offspring.</td><td rowspan="4">Abstract: BACKGROUND: In the general population, at least 50% of time awake is spent in sedentary behaviours. Sedentary behaviours are activities that expend less energy than 1.5 metabolic equivalents, such as sitting. The amount of time spent in sedentary behaviours is a risk factor for diseases such as type 2 diabetes, cardiovascular disease, and death from all causes. Even individuals meeting physical activity guidelines are at a higher risk of premature death and adverse metabolic outcomes if they sit for extended intervals. The associations between sedentary behaviour with type 2 diabetes and with impaired glucose tolerance are stronger for women than for men. It is not known whether sedentary behaviour in pregnancy influences pregnancy outcomes, but if those negative outcomes observed in general adult population also occur in pregnancy, this could have implications for adverse outcomes for mothers and offspring. We aimed to determine the proportion of time spent in sedentary behaviours among pregnant women, and the association of sedentary behaviour with pregnancy outcomes in mothers and offspring. METHODS: Two researchers independently performed the literature search using 5 different electronic bibliographic databases. Studies were included if sedentary behaviours were assessed during pregnancy. Two reviewers independently assessed the articles for quality and bias, and extracted the relevant information. RESULTS: We identified 26 studies meeting the inclusion criteria. Pregnant women spent more than 50% of their time in sedentary behaviours. Increased time in sedentary behaviour was significantly associated with higher levels of C Reactive Protein and LDL Cholesterol, and a larger newborn abdominal circumference. Sedentary behaviours were significantly higher among women who delivered macrosomic infants. Discrepancies were found in associations of sedentary behaviour with gestational weight gain, hypertensive disorders, and birth weight. No consistent associations were found between sedentary behaviour and other variables such as gestational diabetes. There was considerable variability in study design and methods of assessing sedentary behaviour. CONCLUSIONS: Our review highlights the significant time spent in sedentary behaviour during pregnancy, and that sedentary behaviour may impact on pregnancy outcomes for both mother and child. The considerable heterogeneity in the literature suggests future studies should use robust methodology for quantifying sedentary behaviour.</td></tr>
<tr><td>Timeframe: Not reported</td></tr>
<tr><td>Total # of Studies: 26</td></tr>
<tr><td>Exposure Definition: Sedentary behaviors assessed in a variety of ways, including objective measurement (e.g., accelerometer, pedometer), questionnaire, or self-reported diaries. Non-objective measures were mostly focused on behaviors such as TV viewing and sitting time.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Maternal outcomes: gestational weight gain, hypertensive disorders, depression, metabolic outcomes, blood lipid levels. Infant outcomes: birth weight, macrosomia, abdominal circumference, gestational length, risk of preterm delivery.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Females >16, Pregnant</td><td>Author-Stated Funding Source: National Commission for Scientific and Technological Research, Tommy’s and the British Heart Foundation, the MRC Centre Grant.</td></tr>
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Pregnancy	
Meta-Analysis **Citation:** Han S, Middleton P, Crowther CA. Exercise for pregnant women for preventing gestational diabetes mellitus. *Cochrane Database Syst Rev*. 2012;(7):Cd009021. doi:10.1002/14651858.CD009021.pub2.	
Purpose: To assess the effects of physical exercise for pregnant women for preventing glucose intolerance or gestational diabetes.	**Abstract:** BACKGROUND: Gestational diabetes mellitus (GDM) affects a significant number of women each year. GDM is associated with a wide range of adverse outcomes for women and their babies. Recent observational studies have found physical activity during normal pregnancy decreases insulin resistance and therefore might help to decrease the risk of developing GDM. OBJECTIVES: To assess the effects of physical exercise for pregnant women for preventing glucose intolerance or GDM. SEARCH METHODS: We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (2 April 2012), ClinicalTrials.gov (2 April 2012) and the WOMBAT Perinatal Trials Registry (2 April 2012). SELECTION CRITERIA: Randomised and cluster-randomised trials assessing the effects of exercise for preventing pregnancy glucose intolerance or GDM. DATA COLLECTION AND ANALYSIS: Two review authors independently assessed study eligibility, extracted data and assessed the risk of bias of included studies. MAIN RESULTS: We included five trials with a total of 1115 women and their babies (922 women and their babies contributed outcome data). Four of the five included trials had small sample sizes with one large trial that recruited 855 women and babies. All five included trials had a moderate risk of bias. When comparing women receiving additional exercise interventions with those having routine antenatal care, there was no significant difference in GDM incidence (three trials, 826 women, risk ratio (RR) 1.10, 95% confidence interval (CI) 0.66 to 1.84), caesarean section (two trials, 934 women, RR 1.33, 95% CI 0.97 to 1.84) or operative vaginal birth (two trials, 934 women, RR 0.83, 95% CI 0.58 to 1.17). No trial reported the infant primary outcomes prespecified in the review.None of the five included trials found significant differences in insulin sensitivity. Evidence from one single large trial suggested no significant difference in the incidence of developing pregnancy hyperglycaemia not meeting GDM diagnostic criteria, pre-eclampsia or admission to neonatal ward between the two study groups. Babies born to women receiving exercise interventions had a non-significant trend to a lower ponderal index (mean difference (MD) -0.08 gram x 100 m(3), 95% CI -0.18 to 0.02, one trial, 84 infants). No significant differences were seen between the two study groups for the outcomes of birthweight (two trials, 167 infants, MD -102.87 grams, 95% CI -235.34 to 29.60), macrosomia (two trials, 934 infants, RR 0.91, 95% CI 0.68 to 1.22), or small-for-gestational age (one trial, 84 infants, RR 1.05, 95% CI 0.25 to 4.40) or gestational age at birth (two trials, 167 infants, MD -0.04 weeks, 95% CI -0.37 to 0.29) or Apgar score less than seven at five minutes (two trials, 919 infants, RR 1.00, 95% CI 0.27 to 3.65). None of the trials reported long-term outcomes for women and their babies. No information was available on health services costs. AUTHORS' CONCLUSIONS: There is limited randomised controlled trial evidence available on the effect of exercise during pregnancy for preventing pregnancy glucose intolerance or GDM. Results from three randomised trials with moderate risk
Timeframe: Inception–April 2012	
Total # of Studies: 5	
Exposure Definition: Interventions included any types of exercise and lifestyle management (i.e., exercise advice, providing exercise sessions) for pregnant women for preventing gestational diabetes mellitus before screening tests. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No	
Outcomes Addressed: Incidence of gestational diabetes mellitus. Mode of birth (normal vaginal birth, operative vaginal birth, caesarean section). Perineal trauma. Pre-eclampsia. Weight gain during pregnancy. Fetal birthweight. Perinatal mortality.	

Examine Cardiorespiratory Fitness as Outcome: No	of bias suggested no significant difference in GDM incidence between women receiving an additional exercise intervention and routine care.Based on the limited data currently available, conclusive evidence is not available to guide practice. Larger, well-designed randomised trials, with standardised behavioural interventions are needed to assess the effects of exercise on preventing GDM and other adverse pregnancy outcomes including large-for-gestational age and perinatal mortality. Longer-term health outcomes for both women and their babies and health service costs should be included. Several such trials are in progress. We identified another seven trials which are ongoing and we will consider these for inclusion in the next update of this review.
Populations Analyzed: Female, Adults, Pregnant	**Author-Stated Funding Source:** Australian Research Centre for Health of Women and Babies, Robinson Institute, The University of Adelaide, Australian Department of Health and Ageing, National Health and Medical Research Council.

<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Systematic Review
Citation: McDonald SM, Liu J, Wilcox S, Lau EY, Archer E. Does dose matter in reducing gestational weight gain in exercise interventions? A systematic review of literature. J Sci Med Sport. 2016;19(4):323–335. doi:10.1016/j.jsams.2015.03.004.</td></tr>
<tr><td>Purpose: To examine the exercise dose prescribed in interventions during pregnancy and its influence on gestational weight gain.</td><td rowspan="5">Abstract: OBJECTIVES: The purpose of this review was to examine the relationship between exercise dose and reductions in weight gain during pregnancy in exercise interventions. DESIGN: Systematic literature review. METHODS: Four electronic research databases (PubMed, Web of Science, CINAHL, and Academic Search Premiere) were used to identify exercise interventions conducted with pregnant women. Eligible articles must have satisfied the following criteria: inclusion of a control condition, exercise as a major intervention component, weight gain measured and reported for each experimental condition, description of exercise dose (frequency, intensity and duration), and utilized an adequate number of control conditions to assess independent effects of exercise on weight gain. RESULTS: The literature search identified 4837 articles. Of these, 174 abstracts were screened and 21 intervention studies (18 exercise-only, 3 exercise/diet) were eligible for review. Only 38% of the interventions achieved statistically significant reductions in gestational weight gain. Successful interventions possessed higher adherence and lower attrition rates and were predominantly conducted among normal weight populations. No clear patterns or consistencies of exercise dose and reductions in weight gain were evident. CONCLUSIONS: An exercise dose associated with reductions in weight gain was unquantifiable among these interventions. Adherence and retention rates were strong contributors to the success of exercise interventions on gestational weight gain. It is strongly suggested that future researchers investigate methods to increase adherence and compliance, especially among overweight and obese women, and utilize objective measurement tools to accurately evaluate exercise dose performed by the participants and the impact on body composition and weight gain.</td></tr>
<tr><td>Timeframe: Inception–February 2013</td></tr>
<tr><td>Total # of Studies: 21 (18 only addressing PA exposure)</td></tr>
<tr><td>Exposure Definition: Supervised exercise programs or unsupervised programs including exercise of varying intensities. Duration of interventions ranged from 8 to 30 weeks. Frequency of the exercise programs ranged from 1 to 6 days per week, and sessions ranged from 15 to 90 minutes.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Gestational weight gain: total weight gain and weekly rate of weight gain.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Pregnant</td><td>Author-Stated Funding Source: Not reported.</td></tr>
</table>

Pregnancy	
Meta-Analysis **Citation:** Muktabhant B, Lawrie TA, Lumbiganon P, Laopaiboon M. Diet or exercise, or both, for preventing excessive weight gain in pregnancy. *Cochrane Database Syst Rev*. 2015;(6):Cd007145. doi:10.1002/14651858.CD007145.pub3.	
Purpose: To evaluate the effectiveness and safety of diet or exercise, or both, interventions for preventing excessive weight gain during pregnancy. **Timeframe:** Inception–November 2014 **Total # of Studies:** 65 (49 only in MA) **Exposure Definition:** Exercise (supervised or unsupervised) interventions only, or with diet, included any activity requiring physical effort, carried out to sustain or improve health and fitness. Interventions varied widely in intensity and modality to include supervised exercise, individualized exercise programs, dance classes, and provision of pedometers or treadmills. **Measures Steps:** No **Measures Bouts:** No **Examines HIIT:** No **Outcomes Addressed:** Mother outcomes: weight	**Abstract:** BACKGROUND: This is an update of a Cochrane review first published in 2012, Issue 4. Excessive weight gain during pregnancy is associated with poor maternal and neonatal outcomes including gestational diabetes, hypertension, caesarean section, macrosomia, and stillbirth. Diet or exercise interventions, or both, may reduce excessive gestational weight gain (GWG) and associated poor outcomes; however, evidence from the original review was inconclusive. OBJECTIVES: To evaluate the effectiveness of diet or exercise, or both, interventions for preventing excessive weight gain during pregnancy and associated pregnancy complications. SEARCH METHODS: We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (5 November 2014), contacted investigators of the previously identified ongoing studies and scanned reference lists of retrieved studies. SELECTION CRITERIA: Randomised controlled trials (RCTs) of diet or exercise, or both, interventions for preventing excessive weight gain in pregnancy. DATA COLLECTION AND ANALYSIS: Two review authors independently assessed trials for inclusion and risk of bias, extracted data and checked them for accuracy. We organised RCTs according to the type of interventions and pooled data using the random-effects model in the Review Manager software. We also performed subgroup analyses according to the initial risk of adverse effects related to poor weight control. We performed sensitivity analysis to assess the robustness of the findings. MAIN RESULTS: We included 65 RCTs, out of which 49 RCTs involving 11,444 women contributed data to quantitative meta-analysis. Twenty studies were at moderate-to-high risk of bias. Study interventions involved mainly diet only, exercise only, and combined diet and exercise interventions, usually compared with standard care. Study methods varied widely; therefore, we estimated the average effect across studies and performed sensitivity analysis, where appropriate, by excluding outliers and studies at high risk of bias.Diet or exercise, or both, interventions reduced the risk of excessive GWG on average by 20% overall (average risk ratio (RR) 0.80, 95% confidence interval (CI) 0.73 to 0.87; participants = 7096; studies = 24; I(2) = 52%). This estimate was robust to sensitivity analysis, which reduced heterogeneity, therefore we graded this evidence as high-quality. Interventions involving low glycaemic load diets, supervised or unsupervised exercise only, or diet and exercise combined all led to similar reductions in the number of women gaining excessive weight in pregnancy.Women receiving diet or exercise, or both interventions were more likely to experience low GWG than those in control groups (average RR 1.14, 95% CI 1.02 to 1.27; participants = 4422; studies = 11; I(2) = 3%; moderate-quality evidence). We found no difference between intervention and control groups with regard to pre-eclampsia (RR 0.95, 95% CI 0.77 to 1.16; participants = 5330; studies = 15; I(2) = 0%; high-quality evidence); however, maternal hypertension (not a pre-specified outcome) was reduced in the intervention group compared with the control group overall (average RR 0.70, 95% CI 0.51

gain (excessive or low), preterm birth, pre-eclampsia or eclampsia, preterm pre-labor rupture of membranes, difficulty of labor (e.g., induction of labor and cesarean delivery) and maternal weight retention postpartum. Infant outcomes: birth weight and complication related to macrosomia including hypoglycaemia, hyperbilirubinaemia, infant birth trauma (palsy, fracture, shoulder dystocia), and respiratory distress syndrome. **Examine Cardiorespiratory Fitness as Outcome:** No	to 0.96; participants = 5162; studies = 11; I(2) = 43%; low-quality evidence).There was no clear difference between groups with regard to caesarean delivery overall (RR 0.95, 95% CI 0.88 to 1.03; participants = 7534; studies = 28; I(2) = 9%; high-quality evidence); although the effect estimate suggested a small difference (5%) in favour of the interventions. In addition, for combined diet and exercise counselling interventions there was a 13% (-1% to 25%) reduction in this outcome (borderline statistical significance).We found no difference between groups with regard to preterm birth overall (average RR 0.91, 95% CI 0.68 to 1.22; participants = 5923; studies = 16; I(2) = 16%; moderate-quality evidence); however limited evidence suggested that these effect estimates may differ according to the types of interventions, with a trend towards an increased risk for exercise-only interventions.We found no clear difference between intervention and control groups with regard to infant macrosomia (average RR 0.93, 95% CI 0.86 to 1.02; participants = 8598; studies = 27; I(2) = 0%; high-quality evidence), although the effect estimate suggested a small difference (7% reduction) in favour of the intervention group. The largest effect size occurred in the supervised exercise-only intervention group (RR 0.81, 95% CI 0.64 to 1.02; participants = 2445; studies = 7; I(2) = 0%), which approached statistical significance (P = 0.07). Furthermore, in subgroup analysis by risk, high-risk women (overweight or obese women, or women with or at risk of gestational diabetes) receiving combined diet and exercise counselling interventions experienced a 15% reduced risk of infant macrosomia (average RR 0.85, 95% CI 0.73 to 1.00; participants = 3252; studies = nine; I(2) = 0; P = 0.05; moderate-quality evidence)There were no differences in the risk of poor neonatal outcomes including shoulder dystocia, neonatal hypoglycaemia, hyperbilirubinaemia, or birth trauma (all moderate-quality evidence) between intervention and control groups; however, infants of high-risk women had a reduced risk of respiratory distress syndrome if their mothers were in the intervention group (RR 0.47, 95% CI 0.26 to 0.85; participants = 2256; studies = two; I(2) = 0%; moderate-quality evidence). AUTHORS' CONCLUSIONS: High-quality evidence indicates that diet or exercise, or both, during pregnancy can reduce the risk of excessive GWG. Other benefits may include a lower risk of caesarean delivery, macrosomia, and neonatal respiratory morbidity, particularly for high-risk women receiving combined diet and exercise interventions. Maternal hypertension may also be reduced. Exercise appears to be an important part of controlling weight gain in pregnancy and more research is needed to establish safe guidelines. Most included studies were carried out in developed countries and it is not clear whether these results are widely applicable to lower income settings.
Populations Analyzed: Female, Normal/Healthy Weight (BMI: 18.5–24.9), Overweight and Obese, Pregnant, Postpartum	**Author-Stated Funding Source:** National Institute for Health Research, Khon Kaen University, University of Liverpool, Thai Cochrane Network, Thailand Research Fund/Distinquished Professor Award, UNDP/UNFPA/UNICEF/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Department of Reproductive Health and Research (RHR), WHO.

<table>
<tr><th colspan="2">Postpartum</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Nascimento SL, Pudwell J, Surita FG, Adamo KB, Smith GN. The effect of physical exercise strategies on weight loss in postpartum women: a systematic review and meta-analysis. Int J Obes (Lond). 2014;38(5):626–635. doi:10.1038/ijo.2013.183.</td></tr>
<tr><td>Purpose: To evaluate the effectiveness of lifestyle modification control trials that utilize exercise interventions, with or without complementary dietary intervention, on weight loss among postpartum women; and to investigate different intervention strategies, including length of intervention, use of dietary intervention, study goals used, and supervision of exercise intervention.</td><td rowspan="5">Abstract: For women of reproductive age, excessive gestational weight gain and/or postpartum weight retention can increase the risk of obesity. This systematic review evaluates the effectiveness of lifestyle modification control trials that utilize exercise interventions, with or without dietary intervention, on weight loss among postpartum women. A search of randomized clinical trials (RCT) was performed using the follow databases and the bibliography of candidate studies: MEDLINE, Web of Science, EMBASE, CENTRAL/Cochrane and Physiotherapy Evidence Database. English language RCT papers published up to 31 October 2012, which present changes on maternal body weight from baseline to the end of exercise intervention were included. The primary meta-analysis examined the effects of exercise interventions, with or without complementary dietary intervention, on weight loss during the postpartum period compared with usual standard of care. Five subgroup analyses were performed to examine differences in study interventions and exercise modalities: duration of intervention, quality of study methodology, supervision of exercise intervention, exercise intervention goals used and the type of dietary intervention. In total 11 studies met eligibility criteria with 769 participants, 409 under intervention and 360 in the control group. The primary meta-analysis included all 11 studies and found a mean difference (MD) on weight loss of -2.57 kg (95% CI -3.66 to -1.47). The subgroup analysis demonstrated that the most effective interventions in reducing weight in postpartum women were exercise programs with objectively defined goals, such as the use of heart rate monitors or pedometer (MD of -4.09 kg-95% CI -4.94 to -3.25, I(2)=0%) and exercise combined with intensive dietary intervention (MD of -4.34 kg-95% CI -5.15 to -3.52, I(2)=0%). Thus, there is benefit from overall lifestyle interventions on weight loss in postpartum women and exercise plus intensive diet and objective targets are the most effective intervention strategies.</td></tr>
<tr><td>Timeframe: Inception–October 2012</td></tr>
<tr><td>Total # of Studies: 11</td></tr>
<tr><td>Exposure Definition: Exercise interventions with or without dietary intervention. The majority of interventions began between 4 and 14 weeks postpartum. Exercise intervention strategies varied to include one supervised exercise session per week or unsupervised sessions for 12 weeks. Intervention strategies used included heart rate monitors, pedometers, personalized exercise counseling, correspondence programs, text messages, and telephone calls. Walking was the most common modality of exercise recommended, followed by general aerobic exercise.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Weight loss during postpartum period (kg). Five subgroup analyses were performed to examine differences in study interventions and exercise modalities: duration of intervention, quality of study methodology, supervision of exercise intervention, exercise intervention goals used, and the type of dietary intervention.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Postpartum</td><td>Author-Stated Funding Source: Not reported.</td></tr>
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<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Sanabria-Martinez G, Garcia-Hermoso A, Poyatos-Leon R, Alvarez-Bueno C, Sanchez-Lopez M, Martinez-Vizcaino V. Effectiveness of physical activity interventions on preventing gestational diabetes mellitus and excessive maternal weight gain: a meta-analysis. BJOG. 2015;122(9):1167–1174. doi:10.1111/1471-0528.13429.</td></tr>
<tr><td>Purpose: To conduct a meta-analysis of randomised controlled clinical trials (RCTs) focused on assessing the effectiveness of physical exercise programs during pregnancy to prevent gestational diabetes mellitus and excessive maternal weight gain.</td><td rowspan="5">Abstract: BACKGROUND: It is commonly accepted that pregnancy-related physiological changes (circulatory, respiratory, and locomotor) negatively influence the daily physical activity of pregnant women. OBJECTIVES: The aim of this study is to conduct a meta-analysis of randomised controlled trials (RCTs) for assessing the effectiveness of physical exercise interventions during pregnancy to prevent gestational diabetes mellitus and excessive maternal weight gain. SEARCH STRATEGY: Keywords were used to conduct a computerised search in six databases: Cochrane Library Plus, Science Direct, EMBASE, PubMed, Web of Science, and ClinicalTrials.gov. SELECTION CRITERIA: Healthy pregnant women who were sedentary or had low levels of physical activity were selected for RCTs that included an exercise programme. DATA COLLECTION AND ANALYSIS: Two independent reviewers extracted data and assessed the quality of the included studies. Of 4225 articles retrieved, 13 RCTs (2873 pregnant women) met the inclusion criteria. Pooled relative risk (RR) or weighted mean differences (WMDs) (depending on the outcome measure) were calculated using a random-effects model. MAIN RESULTS: Overall, physical exercise programmes during pregnancy decreased the risk of gestational diabetes mellitus (RR = 0.69; P = 0.009), particularly when the exercise programme was performed throughout pregnancy (RR = 0.64; P = 0.038). Furthermore, decreases were also observed in maternal weight (WMD = -1.14 kg; 95% CI -1.50 to -0.78; P < 0.001). No serious adverse effects were reported. CONCLUSION: Structured moderate physical exercise programmes during pregnancy decrease the risk of gestational diabetes mellitus and diminish maternal weight gain, and seem to be safe for the mother and the neonate; however, further studies are needed to establish recommendations.</td></tr>
<tr><td>Timeframe: 1990–May 2014</td></tr>
<tr><td>Total # of Studies: 13</td></tr>
<tr><td>Exposure Definition: Exercise programs included aerobic exercises, resistance, toning, flexibility, and strength exercises, weight training. The frequency of sessions ranged from 2 to 5 per week, and the sessions lasted between 15 and 60 minutes. Intensity ranged from very light to moderate.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Relative risk for gestational diabetes mellitus. Weighted mean difference for maternal weight.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Pregnant</td><td>Author-Stated Funding Source: No funding source used.</td></tr>
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<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Streuling I, Beyerlein A, Rosenfeld E, Hofmann H, Schulz T, von Kries R. Physical activity and gestational weight gain: a meta-analysis of intervention trials. BJOG. 2011;118(3):278–284. doi:10.1111/j.1471-0528.2010.02801.x.</td></tr>
<tr><td>Purpose: To compile all available evidence from interventional studies regarding the association between regular exercise during pregnancy and gestational weight gain in healthy pregnant women.</td><td rowspan="4">Abstract: BACKGROUND: high gestational weight gain (GWG) has been found to be associated with a number of adverse perinatal and long-term outcomes. OBJECTIVES: we aimed to perform a systematic review and meta-analysis to find out whether physical activity in pregnancy might help avoid high GWG. SEARCH STRATEGY: a literature search in relevant databases and an additional search by hand through bibliographies of various publications were performed. SELECTION CRITERIA: we included randomised controlled trials on healthy women, with increased physical activity as the only intervention. GWG had to be documented for the intervention and control group separately. DATA COLLECTION AND ANALYSIS: two reviewers independently extracted data and performed quality assessment. Data from the included trials were combined using a random-effects model. The effect size was expressed as mean difference (MD). MAIN RESULTS: of 1380 studies identified, 12 trials met the inclusion criteria. In seven trials, GWG was lower in the exercise group compared with the control group, whereas five trials showed a lower GWG in the control groups. The meta-analysis resulted in an MD of GWG of -0.61 (95% CI: -1.17, -0.06), suggesting less GWG in the intervention groups compared with the control groups. We found no indication for publication bias or dose effects. AUTHOR'S CONCLUSIONS: in summary, our analyses suggest that physical activity during pregnancy might be successful in restricting GWG.</td></tr>
<tr><td>Timeframe: 1900–October 2010</td></tr>
<tr><td>Total # of Studies: 12</td></tr>
<tr><td>Exposure Definition: Intervention composed solely of PA, varied by intensity, duration, and mode of activity. Each intervention was described using metabolic equivalents (METs)/intervention. Exercise was performed about 3 times a week for 20 minutes to 1 hour. Activities included aerobics, running, cycling, water aerobics, and muscle strengthening (approximately 8,630–17,920 METs per intervention).
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Gestational weight gain: difference between pre-pregnancy weight and body weight at delivery, or weight data from early gestation and late gestation, or weight change during 10-week intervention.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Pregnant</td><td>Author-Stated Funding Source: German Federal Ministry of Education and Research (BMFB), the Deutsche Forschungsgemeinschaft (DFG).</td></tr>
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<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Sui Z, Grivell RM, Dodd JM. Antenatal exercise to improve outcomes in overweight or obese women: a systematic review. Acta Obstet Gynecol Scand. 2012;91(5):538–545. doi:10.1111/j.1600-0412.2012.01357.x.</td></tr>
<tr><td>Purpose: To evaluate the currently available literature relating to antenatal exercise interventions specifically targeting pregnant women.</td><td rowspan="5">Abstract: BACKGROUND: Women who are overweight or obese during pregnancy are at increased risk of a number of adverse pregnancy outcomes. OBJECTIVE: To review the literature systematically to assess the benefits and harms of an exercise intervention for pregnant women who are overweight or obese. SEARCH STRATEGY: A literature search of PUBMED, SCOPUS, the Cochrane Controlled Trials Register (CENTRAL) and the Australian and International Clinical Trials Registers was performed, as well as an additional hand search through bibliographies of various publications. There were no date or language restrictions. SELECTION CRITERIA: Studies included were randomized controlled trials comparing supervised antenatal exercise intervention with routine standard antenatal care in women who were overweight or obese during pregnancy. The primary outcome was maternal gestational weight gain. The quality of each study was assessed utilizing standard Cochrane systematic review methodology. Data collection and analysis. Six randomized controlled trials and one quasi-randomized trial were identified and included, involving a total of 276 women who were overweight or obese during pregnancy. RESULTS: Provision of a supervised antenatal exercise intervention was associated with lower gestational weight gain (five trials, 216 participants, mean difference of -0.36 kg, 95% confidence interval -0.64 to -0.09 kg) when compared with standard antenatal care. CONCLUSIONS: A monitored physical activity intervention appears to be successful in limiting gestational weight gain; however, the effect on maternal and infant health is less certain.</td></tr>
<tr><td>Timeframe: No date restriction</td></tr>
<tr><td>Total # of Studies: 7</td></tr>
<tr><td>Exposure Definition: Antenatal exercise intervention included resistance training, aerobic exercise, stationary cycling, aerobic classes, walking, stretching, and strengthening physiotherapy, and an individualized energy expenditure plan.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Primary outcome: maternal gestational weight gain (kg). Secondary outcomes: hypertension; pre-eclampsia or eclampsia; gestational diabetes; infection; need for induction of labor; cesarean section and postpartum hemorrhage requiring blood transfusion for the women; risk of large-for-gestational-age infant; preterm birth before 37 weeks of gestation; and perinatal death (stillbirth and neonatal death).
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Overweight (BMI: 25–29.9), Obese (BMI: 30 and above), Overweight and Obese, Pregnant</td><td>Author-Stated Funding Source: Not reported.</td></tr>
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<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Thangaratinam S, Rogozinska E, Jolly K, et al. Effects of interventions in pregnancy on maternal weight and obstetric outcomes: meta-analysis of randomised evidence. BMJ. 2012;(344):e2088. doi:10.1136/bmj.e2088.</td></tr>
<tr><td>Purpose: To evaluate the effects of dietary and lifestyle interventions in pregnancy on maternal and fetal weight and to quantify the effects of these interventions.</td><td rowspan="5">Abstract: OBJECTIVE: To evaluate the effects of dietary and lifestyle interventions in pregnancy on maternal and fetal weight and to quantify the effects of these interventions on obstetric outcomes. DESIGN: Systematic review and meta-analysis. DATA SOURCES: Major databases from inception to January 2012 without language restrictions. STUDY SELECTION: Randomised controlled trials that evaluated any dietary or lifestyle interventions with potential to influence maternal weight during pregnancy and outcomes of pregnancy. DATA SYNTHESIS: Results summarised as relative risks for dichotomous data and mean differences for continuous data. RESULTS: We identified 44 relevant randomised controlled trials (7278 women) evaluating three categories of interventions: diet, physical activity, and a mixed approach. Overall, there was 1.42 kg reduction (95% confidence interval 0.95 to 1.89 kg) in gestational weight gain with any intervention compared with control. With all interventions combined, there were no significant differences in birth weight (mean difference -50 g, -100 to 0 g) and the incidence of large for gestational age (relative risk 0.85, 0.66 to 1.09) or small for gestational age (1.00, 0.78 to 1.28) babies between the groups, though by itself physical activity was associated with reduced birth weight (mean difference -60 g, -120 to -10 g). Interventions were associated with a reduced the risk of pre-eclampsia (0.74, 0.60 to 0.92) and shoulder dystocia (0.39, 0.22 to 0.70), with no significant effect on other critically important outcomes. Dietary intervention resulted in the largest reduction in maternal gestational weight gain (3.84 kg, 2.45 to 5.22 kg), with improved pregnancy outcomes compared with other interventions. The overall evidence rating was low to very low for important outcomes such as pre-eclampsia, gestational diabetes, gestational hypertension, and preterm delivery. CONCLUSIONS: Dietary and lifestyle interventions in pregnancy can reduce maternal gestational weight gain and improve outcomes for both mother and baby. Among the interventions, those based on diet are the most effective and are associated with reductions in maternal gestational weight gain and improved obstetric outcomes.</td></tr>
<tr><td>Timeframe: Inception–January 2012</td></tr>
<tr><td>Total # of Studies: 44 (18 only addressing PA exposure)</td></tr>
<tr><td>Exposure Definition: Exercise included light-intensity resistance training, weight-bearing exercises, and walking for 30 minutes. It was not reported how exercise was assessed.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Gestational weight gain (kg), pre-eclampsia, birth weight (g), size for gestational age (large and small), and pre-term delivery.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Pregnant</td><td>Author-Stated Funding Source: National Institute for Health Research Health Technology Assessment.</td></tr>
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<table>
<tr><th colspan="2">Postpartum</th></tr>
<tr><td colspan="2">Systematic Review
Citation: van der Pligt P, Willcox J, Hesketh KD, et al. Systematic review of lifestyle interventions to limit postpartum weight retention: implications for future opportunities to prevent maternal overweight and obesity following childbirth. Obes Rev. 2013;14(10):792–805. doi:10.1111/obr.12053.</td></tr>
<tr><td>Purpose: To identify and assess the effectiveness of intervention studies aimed at limiting postpartum weight retention (PPWR) and promoting healthy maternal weight status following childbirth.</td><td rowspan="5">Abstract: Postpartum weight retention can predict future weight gain and long-term obesity. Moreover, failure to lose weight gained during pregnancy can lead to increased body mass index for subsequent pregnancies, increasing the risk of adverse maternal and foetal pregnancy outcomes. This systematic review evaluates the effectiveness of lifestyle interventions aimed at reducing postpartum weight retention. Seven electronic databases were searched for intervention studies and trials enrolling women with singleton pregnancies and published in English from January 1990 to October 2012. Studies were included when postpartum weight was a main outcome and when diet and/or exercise and/or weight monitoring were intervention components. No limitations were placed on age, body mass index or parity. Eleven studies were identified as eligible for inclusion in this review, of which 10 were randomized controlled trials. Seven studies were successful in decreasing postpartum weight retention, six of which included both dietary and physical activity components, incorporated via a range of methods and delivered by a variety of health practitioners. Few studies utilized modern technologies as alternatives to traditional face-to-face support and cost-effectiveness was not assessed in any of the studies. These results suggest that postpartum weight loss is achievable, which may form an important component of obesity prevention in mothers; however, the optimal setting, delivery, intervention length and recruitment approach remains unclear.</td></tr>
<tr><td>Timeframe: 1990–October 2012</td></tr>
<tr><td>Total # of Studies: 11 (6 only addressing PA and dietary interventions)</td></tr>
<tr><td>Exposure Definition: Supervised and individually tailored exercise sessions conducted in both clinics and at home or PA assessed by questionnaire. Frequency ranged from 20 to 60 minutes for typically 12 weeks.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: PPWR. Waist circumference.
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Mean age 28.3–35.1, Postpartum</td><td>Author-Stated Funding Source: National Health and Medical Research Council Postgraduate Scholarship, Sidney Myer Health Postgraduate Scholarship, National Heart Foundation of Australia Career Development Award.</td></tr>
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<table>
<tr><th colspan="2">Pregnancy</th></tr>
<tr><td colspan="2">Meta-Analysis
Citation: Wiebe HW, Boule NG, Chari R, Davenport MH. The effect of supervised prenatal exercise on fetal growth: a meta-analysis. Obstet Gynecol. 2015;125(5):1185–1194. doi:10.1097/AOG.0000000000000801.</td></tr>
<tr><td>Purpose: To estimate the influence of structured prenatal exercise on newborn birth weight, macrosomia, and growth restriction.</td><td rowspan="5">Abstract: OBJECTIVE: To estimate the influence of structured prenatal exercise on newborn birth weight, macrosomia, and growth restriction. DATA SOURCES: A structured search of MEDLINE, EMBASE, CINAHL, Sport Discus, Ovid's All EBM Reviews, and ClinicalTrials.gov databases up to January 13, 2015. The search combined keywords and MeSH-like terms including, but not limited, to "physical activity," "exercise," "pregnancy," "gestation," "neonatal," and "randomized controlled trial." METHODS OF STUDY SELECTION: Articles reporting randomized controlled trials comparing standard care with standard care plus supervised prenatal exercise for which birth size was available were included. Supervision was defined as at least one exercise session performed with study personnel every 2 weeks throughout the program. Interventions consisting solely of pelvic floor exercises, stretching, or relaxation were excluded. Our search yielded 1,036 publications of which 79 were assessed for eligibility. Twenty-eight studies reporting on 5,322 pregnancies were subsequently included in the analysis. TABULATION, INTEGRATION, AND RESULTS: Our meta-analysis demonstrated that prenatal exercise reduced the odds of having a large newborn (birth weight greater than 4,000 g or greater than the 90th percentile for gestational age and sex) by 31% (odds ratio [OR] 0.69, 95% confidence interval [CI] 0.55-0.86; I 25%) without altering the risk of having a small newborn (birth weight less than 2,500 g or less than the 10th percentile for gestational age and sex) (OR 1.02, 95% CI 0.72-1.46; I 0%) or gestational age at delivery (weighted mean difference -0.00 weeks, 95% CI -0.09 to 0.09; I 0%). Newborns of mothers assigned to exercise were lighter than those of nonexercising controls (weighted mean difference -31 g, 95% CI -57 to -4; I 0%). Maternal gestational weight gain (weighted mean difference -1.1 kg, 95% CI -1.5 to -0.6; I 53%) and odds of cesarean delivery (OR 0.80, 95% CI 0.69-0.94; I 0%) were also reduced. CONCLUSION: These data demonstrate that structured prenatal exercise reduces the risk of having a large newborn without a change in the risk of having a small newborn.</td></tr>
<tr><td>Timeframe: Inception–January 2015</td></tr>
<tr><td>Total # of Studies: 28</td></tr>
<tr><td>Exposure Definition: Standard care, plus a supervised exercise (aerobic, resistance, or both) intervention. Supervision defined as at least one exercise session performed with study personnel every 2 weeks throughout the program. Frequency ranged from 1 to 5 times per week. The time of each session ranged from 15 to 70 minutes. The duration ranged from 6 to 33 weeks ending in the mid- to late third trimester. Mode of exercise included walking, stationary cycling, aerobic dance, water gymnastics, and resistance training.
Measures Steps: No
Measures Bouts: No
Examines HIIT: No</td></tr>
<tr><td>Outcomes Addressed: Neonatal size at birth (large-at-birth, small-at-birth newborns). Gestational age (weeks).
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td>Populations Analyzed: Female, Overweight and Obese, Pregnant, Hypertension, Gestational diabetes</td><td>Author-Stated Funding Source: University of Alberta Human Performance Scholarship Fund.</td></tr>
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Table 3. Existing Systematic Reviews and Meta-Analyses Quality Assessment Chart

	Amorim Adegboye, 2013	Berger, 2014	da Silva, 2017	Elliott-Sale, 2014	Fazzi, 2017	Han, 2012
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	Yes	No	No	No	No	Yes
Comprehensive literature search performed.	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	Yes	Yes	Yes	No	Yes	Yes
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	Yes	Yes	Yes	Yes	No	Yes
List of studies (included and excluded) provided.	Yes	No	No	Yes	No	Yes
Characteristics of included studies provided.	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	No	N/A	No	No	N/A	No
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	Yes	No	No	No	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	N/A	Yes	Yes	N/A	Yes
Effect size index chosen justified, statistically.	Yes	N/A	Yes	Yes	N/A	Yes
Individual-level meta-analysis used.	No	N/A	No	No	N/A	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	No	No	No	No	No
Conflict of interest disclosed.	Yes	No	Yes	Yes	Yes	Yes

	McDonald, 2016	Muktabhant, 2015	Nascimento, 2014	Sanabria-Martinez, 2015	Streuling, 2011	Sui, 2012
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes	Yes	Yes	Yes
Population variables defined and considered in methods.	No	Yes	No	No	No	Yes
Comprehensive literature search performed.	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate study selection and data extraction performed.	No	Yes	Yes	Yes	No	No
Search strategy clearly described.	Yes	Yes	Yes	Yes	Yes	Yes
Relevant grey literature included in review.	No	No	No	Yes	No	Yes
List of studies (included and excluded) provided.	No	Yes	Yes	No	Yes	Yes
Characteristics of included studies provided.	Yes	Yes	Yes	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	N/A	No	No	Yes	Yes	No
Scientific quality (risk of bias) of included studies assessed and documented.	No	Yes	Yes	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	N/A	Yes	Yes	Yes	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	N/A	Yes	Yes	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	N/A	Yes	Yes	Yes	Yes	Yes
Effect size index chosen justified, statistically.	N/A	Yes	Yes	Yes	Yes	Yes
Individual-level meta-analysis used.	N/A	No	No	No	No	No
Practical recommendations clearly addressed.	Yes	Yes	Yes	Yes	No	Yes
Likelihood of publication bias assessed.	No	Yes	Yes	Yes	Yes	No
Conflict of interest disclosed.	No	Yes	No	Yes	Yes	Yes

	Thangaratinam, 2012	van der Pligt, 2013	Wiebe, 2015
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes	Yes	Yes
Population variables defined and considered in methods.	No	Yes	Yes
Comprehensive literature search performed.	Yes	Yes	Partially Yes
Duplicate study selection and data extraction performed.	Yes	Yes	Yes
Search strategy clearly described.	Yes	Yes	Yes
Relevant grey literature included in review.	Yes	No	Yes
List of studies (included and excluded) provided.	No	No	No
Characteristics of included studies provided.	Yes	Yes	Yes
FITT defined and examined in relation to outcome effect sizes.	No	N/A	Yes
Scientific quality (risk of bias) of included studies assessed and documented.	Yes	Yes	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes	Yes	Yes
Scientific quality used appropriately in formulating conclusions.	Yes	Yes	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes	N/A	Yes
Effect size index chosen justified, statistically.	Yes	N/A	Yes
Individual-level meta-analysis used.	No	N/A	No
Practical recommendations clearly addressed.	Yes	Yes	Yes
Likelihood of publication bias assessed.	Yes	No	No
Conflict of interest disclosed.	Yes	Yes	Yes

Appendices

Appendix A: Analytical Framework

Topic Area

Pregnancy and Postpartum

Systematic Review Questions

What is the relationship between physical activity and weight gain during pregnancy and weight loss during postpartum (up to one year)?

a. What dose of physical activity is associated with the reported quantitative benefit or risk?
b. Is there a dose-response relationship? If yes, what is the shape of the relationship?
c. Does the relationship vary by age, race/ethnicity, socio-economic status, or weight status?

Population

Pregnant adolescents and women and postpartum mothers

Key Definitions

- Postpartum period: Date of birth through one year after birth

Exposure

All types and intensities of physical activity, including lifestyle activities, leisure activities, and sedentary behavior

Endpoint Health Outcomes

- Gestational weight gain
- Postpartum weight loss

Comparison

Pregnant adolescents and women and postpartum mothers who participate in varying levels of physical activity, including no reported physical activity

Appendix B: Final Search Strategy

Search Strategy: PubMed (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: PubMed; Date of Search: 8/22/17; 27 results (18 results already in database, 9 unique results)

Set	Search Strategy
Limit: Date	("2006/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Language	AND (English[lang])
Limit: Exclude animal only	NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh]))
Limit: Publication Type Include (Systematic Reviews/Meta-Analyses)	AND (systematic[sb] OR meta-analysis[pt] OR "systematic review"[tiab] OR "systematic literature review"[tiab] OR metaanalysis[tiab] OR "meta analysis"[tiab] OR metanalyses[tiab] OR "meta analyses"[tiab] OR "pooled analysis"[tiab] OR "pooled analyses"[tiab] OR "pooled data"[tiab])
Limit: Publication Type Exclude (Systematic Reviews/Meta-Analyses)	NOT ("comment"[Publication Type] OR "editorial"[Publication Type])
Physical Activity	AND (("Aerobic endurance"[tiab] OR "Bicycl*"[tiab] OR "Endurance training"[tiab] OR "Exercise"[mh] OR "Exercise"[tiab] OR "Exercises"[tiab] OR "Free living activities"[tiab] OR "Free living activity"[tiab] OR "Functional training"[tiab] OR "Leisure-time physical activity"[tiab] OR "Lifestyle activities"[tiab] OR "Lifestyle activity"[tiab] OR "Muscle stretching exercises"[mh] OR "Physical activity"[tiab] OR "Qi gong"[tiab] OR "Recreational activities"[tiab] OR "Recreational activity"[tiab] OR "Resistance training"[tiab] OR "Running"[tiab] OR "Sedentary lifestyle"[mh] OR "Speed training"[tiab] OR "Strength training"[tiab] OR "Tai chi"[tiab] OR "Tai ji"[mh] OR "Tai ji"[tiab] OR "Training duration"[tiab] OR "Training frequency"[tiab] OR "Training intensity"[tiab] OR "Treadmill"[tiab] OR "Walking"[tiab] OR "Weight lifting"[tiab] OR "Weight training"[tiab] OR "Yoga"[mh] OR "Yoga"[tiab]) OR (("Aerobic activities"[tiab] OR "Aerobic activity"[tiab] OR "Cardiovascular activities"[tiab] OR "Cardiovascular activity"[tiab] OR "Endurance activities"[tiab] OR "Endurance activity"[tiab] OR "Physical activities"[tiab] OR "Physical conditioning"[tiab] OR "Sedentary"[tiab]) NOT medline[sb]))
Outcome	AND ("eclampsia"[tiab] OR "pre-eclampsia"[tiab] OR "pre-eclampsia"[mh] OR "preeclampsia"[tiab])

Search Strategy: CINAHL (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: CINAHL; Date of Search: 8/20/2017; 10 results (0 unique results)
Terms searched in title or abstract

Set	Search Strategy
Physical Activity	("Aerobic endurance" OR "Bicycl*" OR "Endurance training" OR "Exercise" OR "Exercises" OR "Free living activities" OR "Free living activity" OR "Functional training" OR "Leisure-time physical activity" OR "Lifestyle activities" OR "Lifestyle activity" OR "Muscle stretching exercises" OR "Physical activity" OR "Qi gong" OR "Recreational activities" OR "Recreational activity" OR "Resistance training" OR "Running" OR "Sedentary lifestyle" OR "Speed training" OR "Strength training" OR "Tai chi" OR "Tai ji" OR "Tai ji" OR "Training duration" OR "Training frequency" OR "Training intensity" OR "Treadmill" OR "Walking" OR "Weight lifting" OR "Weight training" OR "Yoga" OR "Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Physical activities" OR "Physical conditioning" OR "Sedentary")
Outcomes	("eclampsia" OR "pre-eclampsia" OR "preeclampsia")
Systematic Reviews and Meta-Analyses	("systematic review" OR "systematic literature review" OR metaanalysis OR "meta analysis" OR metanalyses OR "meta analyses" OR "pooled analysis" OR "pooled analyses" OR "pooled data")
Limits	2006–April 2017 English language Peer reviewed Exclude Medline records Human

Search Strategy: Cochrane (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: Cochrane; Date of Search: 8/20/17; 10 results (0 unique results)
Terms searched in title, abstract, or keywords

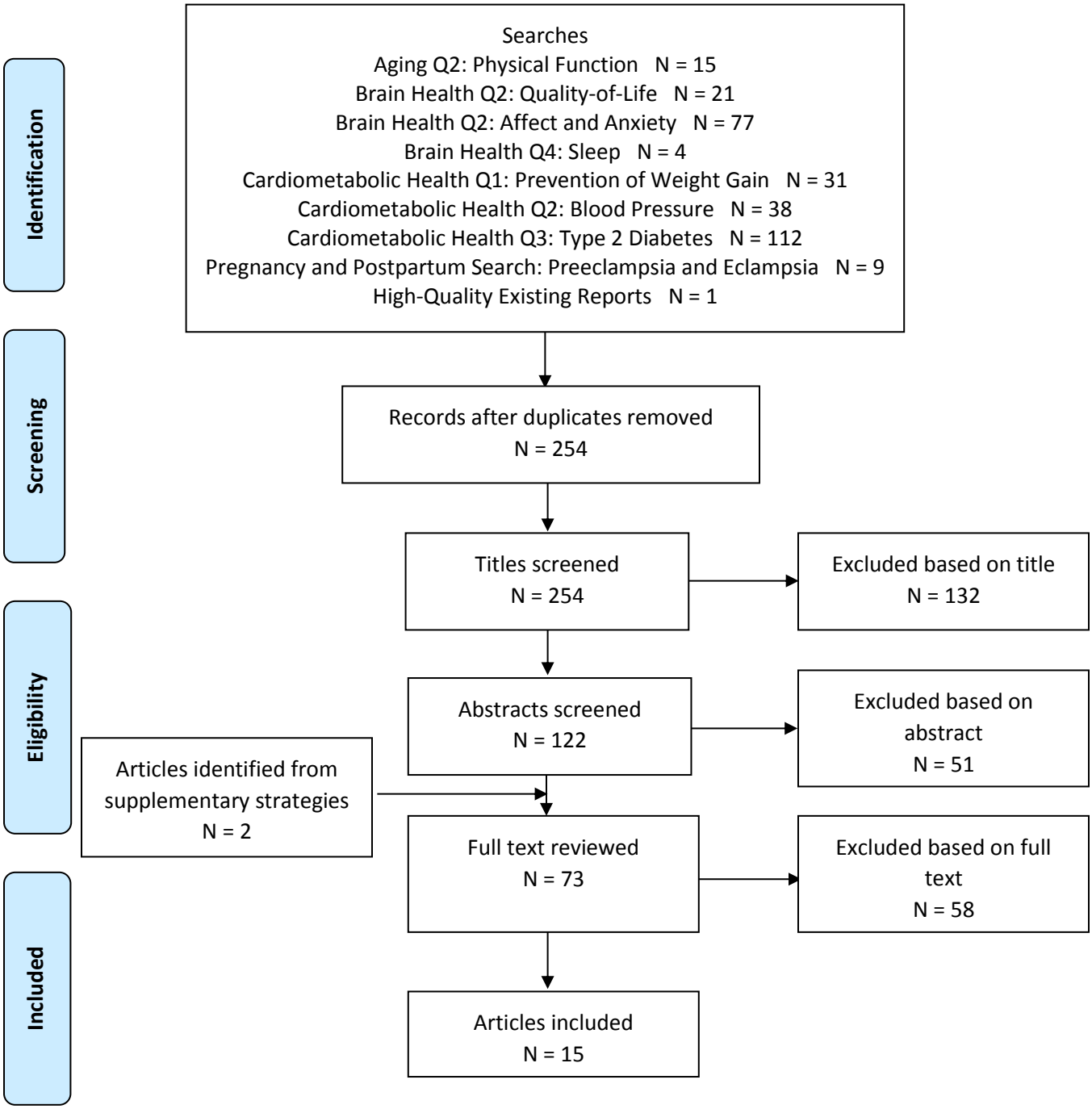
Set	Search Terms
Physical Activity	("Aerobic endurance" OR "Bicycl*" OR "Endurance training" OR "Exercise" OR "Exercises" OR "Free living activities" OR "Free living activity" OR "Functional training" OR "Leisure-time physical activity" OR "Lifestyle activities" OR "Lifestyle activity" OR "Muscle stretching exercises" OR "Physical activity" OR "Qi gong" OR "Recreational activities" OR "Recreational activity" OR "Resistance training" OR "Running" OR "Sedentary lifestyle" OR "Speed training" OR "Strength training" OR "Tai chi" OR "Tai ji" OR "Tai ji" OR "Training duration" OR "Training frequency" OR "Training intensity" OR "Treadmill" OR "Walking" OR "Weight lifting" OR "Weight training" OR "Yoga" OR "Aerobic activities" OR "Aerobic activity" OR "Cardiovascular activities" OR "Cardiovascular activity" OR "Endurance activities" OR "Endurance activity" OR "Physical activities" OR "Physical conditioning" OR "Sedentary")
Outcomes	("eclampsia" OR "pre-eclampsia" OR "preeclampsia")
Limits	2006-present Cochrane Reviews and Other Reviews Word variations will not be searched

Supplementary Strategies

At full text review members of the Physical Activity Guidelines Pregnancy and Postpartum Work Group identified two relevant articles for consideration[13, 14] that were not captured by the search strategies.

Appendix C: Literature Tree

Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports Literature Tree



Appendix D: Inclusion/Exclusion Criteria

Pregnancy Work Group
What is the relationship between physical activity and weight gain during pregnancy and weight loss during postpartum (up to one year)?

a. What dose of physical activity is associated with the reported quantitative benefit or risk?
b. Is there a dose-response relationship? If yes, what is the shape of the relationship?
c. Does the relationship vary by age, race/ethnicity, socio-economic status, or weight status?

Category	Inclusion/Exclusion Criteria	Notes/Rationale
Publication Language	**Include:** • Studies published with full text in English	
Publication Status	**Include:** • Studies published in peer-reviewed journals • Reports determined to have appropriate suitability and quality by PAGAC **Exclude:** • Grey literature, including unpublished data, manuscripts, abstracts, conference proceedings	
Research Type	**Include:** • Original research • Meta-analyses • Systematic reviews • Pooled analyses • Reports determined to have appropriate suitability and quality by PAGAC	
Study Subjects	**Include:** • Human subjects	
	• Pregnant adolescents and women • Postpartum adolescents and women	
Age of Study Subjects	**Include:** • Pregnant or postpartum adolescents and women: All ages	
Health Status of Study Subjects	**Exclude:** • Studies that specifically include people because of their disease state (e.g., cancer, chronic disease, diabetes, cardiovascular disease) • Participants hospitalized for reasons other than birth/delivery only (acute care, admitted into the hospital, rehabilitation facilities) • Nonambulatory adults only	
Comparison	**Include:**	

	• Pregnant women and postpartum mothers who participate in varying levels of physical activity, including no reported physical activity	
Date of Publication	**Include:** • Original research published 2006 to present • Systematic reviews and meta-analyses published from 2006 to present	
Study Design	**Include:** • Randomized controlled trials • Non-randomized controlled trials • Prospective cohort studies • Retrospective cohort studies • Case-control studies • Systematic reviews • Meta-analyses • Pooled reports • PAGAC-approved reports **Exclude:** • Cross-sectional studies • Before-and-after studies • Narrative reviews • Commentaries • Editorials	
Exposure/ Intervention	**Include studies in which the exposure or intervention is:** • All types and intensities of physical activity, including lifestyle activities, leisure activities, and sedentary behavior **Exclude:** • Studies missing physical activity (mental games such as Sudoku instead of physical activities) • Studies of a single, acute session of exercise • Studies of a disease-specific therapeutic exercise delivered by a medical professional (e.g., physical therapist) • Studies with measures of physical fitness as the exposure • Studies of multimodal interventions that do not present data on physical activity alone • Studies that only use physical activity as a confounding variable	
Outcome	**Include studies in which the outcome is:** • Gestational weight gain • Postpartum weight loss	

	• Gestational diabetes mellitus • Eclampsia • Preeclampsia • Quality of life • Affect • Anxiety • Depression • Sleep	

Appendix E: Rationale for Exclusion at Abstract or Full-Text Triage for Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Allen R, Rogozinska E, Sivarajasingam P, Khan KS, Thangaratinam S. Effect of diet- and lifestyle-based metabolic risk-modifying interventions on preeclampsia: a meta-analysis. *Acta Obstet Gynecol Scand.* 2014;93(10):973-985. doi:10.1111/aogs.12467.				X		
Amorim AR, Linne YM, Lourenco PM. Diet or exercise, or both, for weight reduction in women after childbirth. *Cochrane Database Syst Rev*. 2007;(3):Cd005627. doi:10.1002/14651858.CD005627.pub2.						X
Aune, D, Saugstad, OD, Henriksen, T, et al. Physical activity and the risk of preeclampsia: a systematic review and meta-analysis. Epidemiology. 2014. 25(3):331-43.	X					
Aune D, Sen A, Henriksen T, Saugstad OD, Tonstad S. Physical activity and the risk of gestational diabetes mellitus: a systematic review and dose-response meta-analysis of epidemiological studies. *Eur J Epidemiol*. 2016;31(10):967–997. doi:10.1007/s10654-016-0176-0.	X					
Bain E, Crane M, Tieu J, et al. Diet and exercise interventions for preventing gestational diabetes mellitus. *Cochrane Database Syst Rev.* 2015;(4):Cd010443. doi:10.1002/14651858.CD010443.pub2.				X		
Beddoe AE, Lee KA. Mind-body interventions during pregnancy. *J Obstet Gynecol Neonatal Nurs*. 2008;37(2):165-175. doi:10.1111/j.1552-6909.2008.00218.x.				X		
Bgeginski R, Ribeiro PA, Mottola MF, Ramos JG. Effects of weekly supervised exercise or physical activity counseling on fasting blood glucose in women diagnosed with gestational diabetes mellitus: a systematic review and meta-analysis of randomized trials. *J Diabetes*. Dec 2016. doi:10.1111/1753-0407.12519.		X				
Bo K, Artal R, Barakat R, et al. Exercise and pregnancy in recreational and elite athletes: 2016 evidence summary from the IOC expert group meeting, Lausanne. Part 1-exercise in women planning pregnancy and those who are pregnant.			X			

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Br J Sports Med. 2016;50(10):571-589. doi:10.1136/bjsports-2016-096218.						
Bonzini M, Coggon D, Palmer KT. Risk of prematurity, low birthweight and pre-eclampsia in relation to working hours and physical activities: a systematic review. *Occup Environ Med*. 2007;64(4):228–243. doi:10.1136/oem.2006.026872.	X					
Brown J, Alwan NA, West J, et al. Lifestyle interventions for the treatment of women with gestational diabetes. *Cochrane Database Syst Rev*. 2017;5:Cd011970. doi:10.1002/14651858.CD011970.pub2.				X		
Busanich BM, Verscheure SD. Does McKenzie therapy improve outcomes for back pain? *J Athl Train*. 2006;41(1):117-119.		X				
Cameron AJ, Spence AC, Laws R, Hesketh KD, Lioret S, Campbell KJ. A review of the relationship between socioeconomic position and the early-life predictors of obesity. *Curr Obes Rep*. 2015;4(3):350-362. doi:10.1007/s13679-015-0168-5.	X					
Carolan-OIah MC. Educational and intervention programmes for gestational diabetes mellitus (GDM) management: an integrative review. *Collegian*. 2016;23(1):103-114.				X		
Choi J, Fukuoka Y, Lee JH. The effects of physical activity and physical activity plus diet interventions on body weight in overweight or obese women who are pregnant or in postpartum: a systematic review and meta-analysis of randomized controlled trials. *Prev Med*. 2013;56(6):351-364. doi:10.1016/j.ypmed.2013.02.021.				X		
Cooney GM, Dwan K, Greig CA, et al. Exercise for depression. *Cochrane Database Syst Rev.* 2013;(9):Cd004366. doi:10.1002/14651858.CD004366.pub6.		X				
Cooper D, Yang L. *Pregnancy, Exercise*. Treasure Island, FL: StatPearls Publishing; 2017.			X			
Craig M, Howard L. Postnatal depression. *BMJ Clin Evid*. Jan 2009:pii:1407.		X				
Curtis K, Weinrib A, Katz J. Systematic review of yoga for pregnant women: current status and future directions. *Evid Based Complement Alternat Med*. 2012;2012:715942. doi:10.1155/2012/715942.	X					

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Daley A. Exercise and depression: a review of reviews. *J Clin Psychol Med Settings.* 2008;15(2):140–147. doi:10.1007/s10880-008-9105-z.			X			
Daley AJ, Foster L, Long G, et al. The effectiveness of exercise for the prevention and treatment of antenatal depression: systematic review with meta-analysis. *BJOG*. 2015;122(1):57-62. doi:10.1111/1471-0528.12909.					X	
Daley A, Jolly K, MacArthur C. The effectiveness of exercise in the management of post-natal depression: systematic review and meta-analysis. *Fam Pract.* 2009;26(2):154–162. doi:10.1093/fampra/cmn101.		X				
Daley AJ, Jolly K, Sharp DJ, et al. The effectiveness of exercise as a treatment for postnatal depression: study protocol. *BMC Pregnancy Childbirth*. 2012;12:45. doi:10.1186/1471-2393-12-45.			X			
Davies GA, Maxwell C, McLeod L, et al. Obesity in pregnancy. *J Obstet Gynaecol Can*. 2010;32(2):165-173. doi:10.1016/S1701-2163(16)34432-2.				X		
Delissaint D, McKyer EL. A systematic review of factors utilized in preconception health behavior research. *Health Educ Behav*. 2011;38(6):603-616. doi:10.1177/1090198110389709.				X		
Dietz P, Watson ED, Sattler MC, Ruf W, Titze S, van Poppel M. The influence of physical activity during pregnancy on maternal, fetal or infant heart rate variability: a systematic review. *BMC Pregnancy Childbirth*. 2016;16(1):326. doi:10.1186/s12884-016-1121-7.	X					
Di Mascio D, Magro-Malosso ER, Saccone G, Marhefka GD, Berghella V. Exercise during pregnancy in normal-weight women and risk of preterm birth: a systematic review and meta-analysis of randomized controlled trials. *Am J Obstet Gynecol*. 2016;215(5):561–571. doi:10.1016/j.ajog.2016.06.014.	X					
DiNallo JM, Downs DS. The role of exercise in preventing and treating gestational diabetes: a comprehensive review and recommendations for future research. *J Appl Biobehav Res*. 2008;12(3-4):141–177. doi:10.1111/j.1751-9861.2008.00019.x.	X					
Dodd JM, Grivell RM, Crowther CA, Robinson JS. Antenatal interventions for				X		

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
overweight or obese pregnant women: a systematic review of randomised trials. *BJOG*. 2010;117(11):1316-1326. doi:10.1111/j.1471-0528.2010.02540.x.						
Dode MA, dos Santos IS. Non classical risk factors for gestational diabetes mellitus: a systematic review of the literature. *Cad Saude Publica*. 2009;25(suppl 3):S341–S359.	X					
Facchinetti F, Dante G, Petrella E, Neri I. Dietary interventions, lifestyle changes, and dietary supplements in preventing gestational diabetes mellitus: a literature review. *Obstet Gynecol Surv*. 2014;69(11):669–680. doi:10.1097/OGX.0000000000000121.	X					
Fasanmade OA, Dagogo-Jack S. Diabetes care in Nigeria. *Ann Glob Health.* 2015;81(6):821–829. doi:10.1016/j.aogh.2015.12.012.	X					
Ferraro ZM, Gaudet L, Adamo KB. The potential impact of physical activity during pregnancy on maternal and neonatal outcomes. *Obstet Gynecol Surv.* 2012;67(2):99-110. doi:10.1097/OGX.0b013e318242030e.			X			
Field T. Prenatal depression risk factors, developmental effects and interventions: a review. *J Pregnancy Child Health.* 2017;4(1). doi:10.4172/2376-127X.1000301.			X			
Firth A, Haith-Cooper M, Egan D. Do psychosocial interventions have an impact on maternal perception of perinatal depression? *Br J Midwifery*. 2016;24(12):855–866. doi:10.12968/bjom.2016.24.12.855.	X					
Foster NE, Bishop A, Bartlam B, et al. Evaluating Acupuncture and Standard carE for pregnant women with back pain (EASE Back): a feasibility study and pilot randomised trial. *Health Technol Assess*. 2016;20(33):1-236. doi:10.3310/hta20330.			X			
Gardner B, Wardle J, Poston L, Croker H. Changing diet and physical activity to reduce gestational weight gain: a meta-analysis. *Obes Rev.* 2011;12(7):e602-e620. doi:10.1111/j.1467-789X.2011.00884.x.				X		
Gavard JA, Artal R. Effect of exercise on pregnancy outcome. *Clin Obstet Gynecol.* 2008;51(2):467-480. doi:10.1097/GRF.0b013e31816feb1d.						X

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Gilinsky AS, Kirk AF, Hughes AR, Lindsay RS. Lifestyle interventions for type 2 diabetes prevention in women with prior gestational diabetes: A systematic review and meta-analysis of behavioural, anthropometric and metabolic outcomes. *Prev Med Rep*. 2015;2:448-461. doi:10.1016/j.pmedr.2015.05.009.		X				
Gindlesberger D, Schrager S, Johnson S, Neher JO. Clinical inquiries. What's the best treatment for gestational diabetes? *J Fam Pract*. 2007;56(9):757-758.		X				
Gong H, Ni C, Shen X, Wu T, Jiang C. Yoga for prenatal depression: a systematic review and meta-analysis. *BMC Psychiatry*. 2015;15:14. doi:10.1186/s12888-015-0393-1.		X				
Harrison AL, Shields N, Taylor NF, Frawley HC. Exercise improves glycaemic control in women diagnosed with gestational diabetes mellitus: a systematic review. *J Physiother*. 2016;62(4):188-196. doi:10.1016/j.jphys.2016.08.003.		X				
Hollenbach D, Broker R, Herlehy S, Stuber K. Non-pharmacological interventions for sleep quality and insomnia during pregnancy: a systematic review. *J Can Chiropr Assoc*. 2013;57(3):260-270.					X	
Jacqueminet S, Jannot-Lamotte MF. Therapeutic management of gestational diabetes. *Diabetes Metab*. 2010;36(6 Pt 2):658-671. doi:10.1016/j.diabet.2010.11.016.		X				
Johnson M, Campbell F, Messina J, Preston L, Buckley Woods H, Goyder E. Weight management during pregnancy: a systematic review of qualitative evidence. *Midwifery.* 2013;29(12):1287-1296. doi:10.1016/j.midw.2012.11.016.			X			
Jones L, Othman M, Dowswell T, et al. Pain management for women in labour: an overview of systematic reviews. *Cochrane Database Syst Rev.* 2012;(3):CD009234. doi:10.1002/14651858.CD009234.pub2.	X					
Kasawara KT, do Nascimento SL, Costa ML, Surita FG, e Silva JL. Exercise and physical activity in the prevention of pre-eclampsia: systematic review. *Acta Obstet Gynecol Scand*. 2012;91(10):1147–1157. doi:10.1111/j.1600-0412.2012.01483.x.	X					
Kinser PA, Pauli J, Jallo N, et al. Physical activity and yoga-based approaches for pregnancy-related low back and pelvic			X			

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
pain. *J Obstet Gynecol Neonatal Nurs*. 2017;46(3):334-346. doi:10.1016/j.jogn.2016.12.006.						
Kuhlmann AK, Dietz PM, Galavotti C, England LJ. Weight-management interventions for pregnant or postpartum women. *Am J Prev Med*. 2008;34(6):523-528. doi:10.1016/j.amepre.2008.02.010.				X		
Lamina S, Agbanusi E. Effect of aerobic exercise training on maternal weight gain in pregnancy: a meta-analysis of randomized controlled trials. *Ethiop J Health Sci.* 2013;23(1):59-64.						X
Lawrence A, Lewis L, Hofmeyr GJ, Styles C. Maternal positions and mobility during first stage labour. *Cochrane Database Syst Rev*. 2013;(10):CD003934. doi:10.1002/14651858.CD003934.pub4.				X		
Lawrence A, Lewis L, Hofmeyr GJ, Dowswell T, Styles C. Maternal positions and mobility during first stage labour. *Cochrane Database Syst Rev*. 2009;(2):Cd003934. doi:10.1002/14651858.CD003934.pub2.				X		
Liddle SD, Pennick V. Interventions for preventing and treating low-back and pelvic pain during pregnancy. *Cochrane Database Syst Rev*. 2015;(9):Cd001139. doi:10.1002/14651858.CD001139.pub4.	X					
Madhuvrata P, Govinden G, Bustani R, Song S, Farrell TA. Prevention of gestational diabetes in pregnant women with risk factors for gestational diabetes: a systematic review and meta-analysis of randomised trials. *Obstet Med*. 2015;8(2):68–85. doi:10.1177/1753495X15576673.	X					
Magro-Malosso ER, Saccone G, Di Mascio D, Di Tommaso M, Berghella V. Exercise during pregnancy and risk of preterm birth in overweight and obese women: a systematic review and meta-analysis of randomized controlled trials. *Acta Obstet Gynecol Scand*. 2017;96(3):263–273. doi:10.1111/aogs.13087.	X					
Manna P, Jain SK. Obesity, oxidative stress, adipose tissue dysfunction, and the associated health risks: causes and therapeutic strategies. *Metab Syndr Relat Disord*. 2015;13(10):423-444. doi:10.1089/met.2015.0095.	X					
Marc I, Toureche N, Ernst E, et al. Mind-body interventions during pregnancy for preventing or treating women's anxiety.						X

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
Cochrane Database Syst Rev. 2011;(7):Cd007559. doi:10.1002/14651858.CD007559.pub2.						
Mathias PC, Elmhiri G, de Oliveira JC, et al. Maternal diet, bioactive molecules, and exercising as reprogramming tools of metabolic programming. *Eur J Nutr*. 2014;53(3):711-722. doi:10.1007/s00394-014-0654-7.			X			
McCurdy AP, Boule NG, Sivak A, Davenport MH. Effects of exercise on mild-to-moderate depressive symptoms in the postpartum period: a meta-analysis. *Obstet Gynecol*. 2017;129(6):1087–1097. doi:10.1097/AOG.0000000000002053.	X					
Mead GE, Morley W, Campbell P, Greig CA, McMurdo M, Lawlor DA. Exercise for depression. *Cochrane Database Syst Rev.* 2008;(4):CD004366. doi:10.1002/14651858.CD004366.pub3.		X				
Meher S, Duley L. Exercise or other physical activity for preventing pre-eclampsia and its complications. *Cochrane Database Syst Rev*. April 2006;(2):Cd005942. doi:10.1002/14651858.CD005942.					X	
Meher S, Duley L. Rest during pregnancy for preventing pre-eclampsia and its complications in women with normal blood pressure. *Cochrane Database Syst Rev*. 2006;(2):Cd005939. doi:10.1002/14651858.CD005939.					X	
Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. *J Clin Endocrinol Metab.* 2008;93(11)(suppl 1):S9–S30. doi:10.1210/jc.2008-1595.		X				
Moran LJ, Hutchison SK, Norman RJ, Teede HJ. Lifestyle changes in women with polycystic ovary syndrome. *Cochrane Database of Systematic Reviews*. 2011;(2):CD007506. doi:10.1002/14651858.CD007506.pub2.		X				
Morkved S, Bo K. Effect of pelvic floor muscle training during pregnancy and after childbirth on prevention and treatment of urinary incontinence: a systematic review. *Br J Sports Med*. 2014;48(4):299-310. doi:10.1136/bjsports-2012-091758.	X					
Nascimento SL, Surita FG, Parpinelli MA, Cecatti JG. Physical exercise, weight gain, and perinatal outcomes in overweight and						X

Citation	Outcome	Population	Study Design	Exposure	Not ideal fit for replacement of de novo search	Other
obese pregnant women: a systematic review of clinical trials. *Cad Saude Publica.* 2011;27(3):407-416.						
Nascimento SL, Surita FG, Cecatti JG. Physical exercise during pregnancy: a systematic review. *Curr Opin Obstet Gynecol*. 2012;24(6):387-394. doi:10.1097/GCO.0b013e328359f131.						X
Nasiri-Amiri F, Bakhtiari A, Faramarzi M, Adib Rad H, Pasha H. The association between physical activity during pregnancy and gestational diabetes mellitus: a case-control study. *Int J Endocrinol Metab.* 2016;14(3):e37123. doi:10.5812/ijem.37123.			X			
O'Brien OA, McCarthy M, Gibney ER, McAuliffe FM. Technology-supported dietary and lifestyle interventions in healthy pregnant women: a systematic review. *Eur J Clin Nutr*. 2014;68(7):760-766. doi:10.1038/ejcn.2014.59.				X		
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