D1: Evidence on physical activity for pregnant and postpartum women

Guiding Questions

D1. What is the association between **physical activity** and health-related outcomes?

a. Is there a dose response association (volume, duration, frequency, intensity)?
b. Does the association vary by type or domain or timing (pre-pregnancy, antenatal or postnatal) of physical activity?

Inclusion Criteria

Population: Pregnant women and postpartum mothers
Exposure: Greater volume, duration, frequency or intensity of physical activity
Comparison: No physical activity or lesser volume, duration, frequency, or intensity of physical activity

Outcomes	Importance
Excessive weight gain	Critical
Gestational diabetes mellitus	Critical
Gestational hypertension/pre-eclampsia	Critical
Mental health (e.g., anxiety symptoms, depressive symptoms, post-partum depression)	Critical
Fetal outcomes (e.g., preterm birth, birthweight)	Critical
Adverse outcomes (e.g., miscarriage, stillbirth)	Critical
Delivery complications	Important

Included Evidence

The GRADE Evidence Profiles (EPs) developed for the *Canadian Guideline for Physical Activity Throughout Pregnancy (1)* were used as a basis for this update, given the rigor in methods and recency in included evidence. The original EPs can be found in the supplemental materials of seven systematic reviews prepared to inform the guideline *(2-8)*. Five additional reviews were conducted to inform the Canadian Guideline but are not included here given the outcomes addressed(i.e., urinary incontinence *(9)*, glucose response *(10)*, fetal heart rate and umbilical and uterine blood flow *(11)*, low back pain, pelvic girdle and lumbopelvic pain *(12)*) and type of exercise (i.e., supine exercise *(13)*).

Given the recency of the systematic reviews that were conducted to inform the Canadian Guideline, we compared the included studies within each of those systematic reviews with that of any new systematic reviews. In cases where the bodies of evidence were entirely overlapping, we only included the Canadian review (exclusions are noted in **Table 5.1**).

Seven reviews that informed the development of the Canadian guideline were included *(2-8)*. Ten additional reviews (published in 2018 or 2019) were identified by the WHO team that examined the association between physical activity and health-related outcomes among pregnant or postpartum women *(14-23)*. Four of these reviews were excluded because they were duplicative and less comprehensive than the reviews that were published to inform the Canadian Guideline *(15, 18, 22, 23)*. One additional review was excluded because it was a review of reviews which included outdated literature *(17)* and another publication was excluded because it was an RCT that updated the point estimate from a 2011 review with their study results *(21)*. **Table 5.1** presents the 6 reviews that were excluded and their reason for exclusion. **Table 5.2** presents the 4 reviews that were included and the outcomes they each reported.

Table 5.3 presents the ratings for each included review according to all the AMSTAR 2 main domains. None of the systematic reviews were rated as having high credibility based on the AMSTAR 2 instrument. Three were rated as having moderate credibility and 1 was rated as having low credibility**.**

Table 5.1. Excluded Systematic Reviews, with Reasons for Exclusion

Author, Year	Reason for Exclusion	Rationale
Bennett 2018 *(15)*	Redundancy	All included evidence is included in reviews by Davenport *(5)*
Farpour-Lambert 2018 *(17)*	Design	Review of reviews
Guo 2018 *(18)*	Redundancy	All included evidence is included in the review by Davenport *(5)*
Nobles 2018 *(21)*	Design	Not a systematic review
Syngelaki 2019 *(22)*	Redundancy	All included evidence is included in reviews by Ruchat *(8)* and Davenport *(5)*
Yu 2018 *(23)*	Redundancy	All included evidence is included in reviews by Davenport *(5)*

Table 5.2. Included Systematic Reviews

Author, Year	Excessive weight gain	GDM	Gestational HYP/ preeclampsia	Mental health outcomes	Fetal outcomes (e.g., preterm birth, birth-weight)	AEs (e.g., miscarriage, stillbirth)	Delivery complications	Last Search Date	# of Included Studies	AMSTAR 2
Beetham 2019 *(14)*	X				X			Nov-2018	15	Moderate
Du 2018 *(16)*	X	X	X		X		X	Apr-2018	13	Low
Mijatovic-Vukas 2018 *(19)*		X						Feb-2017	17	Moderate
Nakamura 2019 *(20)*				X				Oct-2017	21	Moderate

Abbreviations: AE = adverse event; GDM = gestational diabetes mellitus; HYP = hypertension

Table 5.3. Credibility Ratings (AMSTAR 2)

Author, Year	PICO[1]	Apriori Methods[2]	Study Design Selection[3]	Lit Search Strategy[4]	Study Selection[5]	Data Extraction[6]	Excluded Studies[7]	Included Studies[8]	RoB Assessment[9]	Funding Sources[10]	Statistical Methods[11]	Impact of RoB[12]	RoB Results[13]	Hetero-geneity[14]	Publication Bias[15]	COI[16]	Overall Rating[17]
Beetham 2019 *(14)*	Y	Y	Y	PY	Y	Y	N	Y	Y	N	Y	Y	N	N	N	Y	**Moderate**
Du 2018 *(16)*	Y	PY	N	PY	Y	Y	N	Y	Y	N	Y	N	N	Y	N	N	**Low**
Mijatovic-Vukas 2018 *(19)*	Y	Y	Y	PY	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	**Moderate**
Nakamura 2019 *(20)*	Y	PY	N	PY	Y	Y	N	PY	PY	N	Y	N	Y	Y	Y	Y	**Moderate**

Abbreviations: COI = conflict of interest; N = no; PICO = population, intervention, comparator, outcome; PY = partial yes; RoB = risk of bias; Y = yes

[1] Did the research questions and inclusion criteria for the review include the components of PICO?

[2] Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
[3] Did the review authors explain their selection of the study designs for inclusion in the review?
[4] Did the review authors use a comprehensive literature search strategy?
[5] Did the review authors perform study selection in duplicate?
[6] Did the review authors perform data extraction in duplicate?
[7] Did the review authors provide a list of excluded studies and justify the exclusions?
[8] Did the review authors describe the included studies in adequate detail?
[9] Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?
[10] Did the review authors report on the sources of funding for the studies included in the review?
[11] If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?
[12] If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?
[13] Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?
[14] Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?
[15] If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?
[16] Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?
[17] Shea et al. 2017. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *(24)*

D.1. Physical Activity

Table D.1.a. Excessive weight gain and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profile from the systematic review (Ruchat 2018 *(8)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. Red font denotes additions based on WHO update using review of existing systematic reviews. Two systematic reviews were identified that addressed the relationship between physical activity and excessive weight gain *(14, 16)*.

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies* **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **excessive gestational weight gain**												
15 [a]	randomized trials	serious [b]	not serious	not serious	not serious	none	601/1798 (33.4%)	694/1721 (40.3%)	**OR 0.68** (0.57 to 0.80)	**88 fewer per 1 000** (from 52 fewer to 125 fewer)	⊕⊕⊕◯ MODERATE	CRITICAL
							Narrative Synthesis: **Additional data from studies (n=3) included in the pooled estimate** **2/3 studies** reported lower odds of EGWG in the exercise-only intervention group compared to the control group (Barakat, 2016; Ruiz, 2013). **1/3 study** reported no difference in the odds of EGWG between the exercise-only intervention group and control group (Renault, 2015). [d]					
Beetham 2019 *(14)* Moderate 4 randomized trials 3 cohort studies		serious[e]	serious[f]	not serious	serious[g]	none	No significant difference in **maternal weight gain** was apparent for women who engaged in vigorous intensity exercise (MD = − 0.46 kg [95% CI −2.05 to 1.12], n = 1834, k = 7, I^2 = 68.94). Findings were consistent across study design and comparison condition. Two RCTs targeting overweight and obese pregnant women did show a significant reduction in maternal weight gain compared to a control group.				⊕⊕◯◯ LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies* **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Du 2018 *(16)* Low 12 randomized trials		not serious	not serious	not serious	not serious	none	Physical activity interventions were associated with reduced **gestational weight gain** in pregnant women who were overweight or obese (MD = -1.14 kg [95% CI -1.67 to -0.62], 12 RCTS, n=1,172, I^2=10%).				⊕⊕⊕⊕ HIGH	CRITICAL
Association between prenatal exercise-only interventions and **postpartum weight retention**												
3 [d]	randomized trials	serious [b]	not serious	not serious	not serious	none	213	207	-	MD **0.92 lower** (1.84 lower to 0)	⊕⊕⊕◯ MODERATE	CRITICAL
							Narrative summary: **Additional data from studies (n=1) included in the pooled estimate** The study by Seneviratne (2015) reported that in the intervention group, compliance with the exercise protocol (i.e the percentage of prescribed exercised session completed) was associated with maternal postnatal BMI.					

* Unless otherwise stated, all studies are included in the pooled estimate.

Abbreviations: BMI = body mass index; CI = confidence interval; EGWG = excessive gestational weight gain; MD = mean difference; OR: Odds ratio; RCT = randomized clinical trial

[a] Two studies reported data on different subgroups of women. These studies were counted only once.
[b] Serious risk of bias. High risk of performance bias.
[c] Renault 2015 and Renault 2014 reported data from the same RCT and were counted as one study. Data from Renault 2014 were included in the meta-analysis; data from Renault 2015 were reported narratively.
[d] One study reported data on different subgroups of women (postpartum weight retention at 16 weeks and at 12 month). This study was counted only once.
[e] Serious risk of bias. High risk of attrition bias; exposure and control groups pulled from different cohorts; all studies did not control for confounding factors.
[f] Serious inconsistency. Direction and magnitude of effects was highly variable across studies; I^2>50%
[g] Serious imprecision. The 95% CI crossed the line of no effect, and was wide, such that interpretation of the data would be different if the true effect were at one end of the CI or the other.

Table D.1.b. Gestational diabetes mellitus and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profile from the systematic review (Davenport 2018 *(5)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. Red font denotes additions based on WHO update using review of existing systematic reviews. Two systematic reviews were identified that addressed the relationship between physical activity and gestational diabetes *(16, 19)*.

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions/prenatal exercise and **gestational diabetes mellitus**												
26	randomized trials	serious [a]	not serious	not serious	not serious	none	271/3505 (7.7%)	380/3429 (11.1%)	**OR 0.62** (0.52 to 0.75)	**39 fewer per 1 000** (from 25 fewer to 50 fewer)	⊕⊕⊕◯ MODERATE	CRITICAL
Du 2018 *(16)* Low 10 randomized trials		not serious	not serious	not serious	not serious	none	Physical activity interventions during pregnancy were associated with reduced **risk of GDM** in pregnant women who were overweight or obese (RR = 0.71 [95% CI, 0.57 to 0.89], 10 RCTs, n=1,120; I^2=0%).				⊕⊕⊕⊕ HIGH	CRITICAL
1 [b]	non-randomized studies	serious [c]	serious [d]	not serious	not serious [e]	none	Narrative Summary: In the study by Dyck (1999) (supervised exercise intervention, n=7), 3 women (43%) developed GDM.				⊕◯◯◯ VERY LOW	CRITICAL
14 (pooled estimate of effect [f], n=9; 5 studies	cohort studies	serious [g]	not serious	not serious	not serious	none	189/6975 (2.7%)	154/2620 (5.9%)	**OR 0.69** (0.54 to 0.88)	**17 fewer per 1 000** (from 7 fewer to 26 fewer)	⊕◯◯◯ LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	No exercise	Relative (95% CI)	Absolute (95% CI)		
synthesized narratively)							Narrative Synthesis: Five cohort studies were included (n=19,803). 3/5 (n=16,814) reported between 11 to 90% decreased odds of GDM with prenatal physical activity compared to no exercise (Iqbal, 2007; Morkrid, 2014; Chasan-Taber, 2008). 2/5 (n=2989) reported that prenatal physical activity did not affect odds of GDM compared to no physical activity (Currie 2014; Chasan-Taber, 2015). Additional data from Badon (2016b) showed an association between LTPA and GDM. [h]					
Mijatovic-Vukas 2018 *(19)* Moderate 17 cohort studies		serious [p]	not serious	not serious	not serious	none	Physical activity was self-reported in all studies, with 10 studies measuring PA in pre-pregnancy and 9 studies measuring PA in early pregnancy. Overall, physical activity was reported to be protective against developing GDM in 13/17 studies. Engaging in PA before pregnancy was significantly associated with a reduced risk of **GDM** (OR = 0.70 [95% CI, 0.57 to 0.85], 11 studies, I^2=52%) as was engaging in any PA during early pregnancy (OR = 0.79 [95% CI, 0.64 to 0.97], 8 studies, I^2=26%). There was evidence that participating in higher (>15 MET-hr/wk) vs. lower (<15 MET-hr/wk) of LTPA pre-pregnancy was associated with a significantly lower risk of GDM (OR = 0.54 [95% CI, 0.34 o 0.87], 6 studies, I^2=95%) as was participating in 90 min/week of LPTA during pre-pregnancy (OR = 0.54 [95% CI 0.34 to 0.87], 4 studies, I^2=70%).				⊕⊕◯◯ LOW	CRITICAL
7 (pooled estimate of effect, n=4 [i]; 3 studies	cross-sectional studies	serious [j]	not serious	not serious	not serious	none	86/3265 (2.6%)	50/2375 (2.1%)	**OR 0.66** (0.45 to 0.97)	**7 fewer per 1 000** (from 1 fewer to 11 fewer)	⊕◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
synthesized narratively)							Narrative Synthesis: Three cross-sectional studies were included (n=12,189). 2/3 (n=739) reported no association between prenatal physical activity and (Li, 2014; Momeni Javid 2015). 1/3 (n=11,450) showed a decrease in odds of GDM with moderate to high activity compared to low activity (Leng, 2016). Additional data from Oken (2006) showed no effect of any light, moderate or vigorous intensity physical activity on GDM. [k]					
3 [l]	case-control studies	not serious [m]	serious [n]	not serious	serious [o]	none	74/271 (27.3%)	122/376 (32.4%)	**OR 0.63** (0.30 to 1.31)	**92 fewer per 1 000** (from 62 more to 199 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: Nasiri-Amiri (2016) (GDM, n=100; no GDM, n=100) found no association between prenatal physical activity and GDM, no matter the intensity of physical activity.					

* Unless otherwise stated, all studies are included in the pooled estimate.

Abbreviations: CI = confidence interval; GDM = gestational diabetes mellitus; hr = hour; LTPA = leisure-time physical activity; MET = metabolic equivalent of task; OR = odds ratio; PA = physical activity; RCT = randomized clinical trial; RR = risk ratio; wk = week

[a] Serious risk of bias. High risk of performance and attrition bias. Reporting bias was an issue in one study (results were reported narratively).
[b] This study did not include a control group such that it could not be included in the meta-analysis (results were reported narratively).
[c] Serious risk of bias. High risk of performance bias. This study did not include a control group such that it could not be included in the meta-analysis (narrative synthesis only).
[d] Serious inconsistency. Only one study was included.
[e] No serious imprecision; only one study but already downgraded for serious inconsistency for this reason.
[f] Five studies could not be pooled due to incomplete reporting of results; results were reported narratively.
[g] Serious risk of bias. Reporting bias was an issue in 6 studies (2/3 of the sample) (results were reported narratively).
[h] Badon 2016a and Badon 2016b reported data from the same cohort study and were counted as one study. Data from Badon 2016a were included in the meta-analysis; data from Badon 2016b were reported narratively (incomplete reporting of data).
[i] Three studies could not be pooled due to incomplete reporting of results; results were reported narratively.

[j] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure). Reporting bias was an issue in 4 studies (3/4 of the sample); results were reported narratively.
[k] Oken (2006) reported data that were included in the meta-analysis and data that were not (incomplete reporting of data; additional data were reported narratively)
[l] One study could not be pooled due to incomplete reporting of results; results were reported narratively.
[m] Reporting bias was an issue in one study (results were reported narratively).
[n] Serious inconsistency. High heterogeneity (I2≥50%).
[o] Serious imprecision. The 95% CI crossed the line of no effect, and was wide, such that interpretation of the data would be different if the true effect were at one end of the CI or the other.
[p] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure).

Table D.1.c. Gestational hypertension/pre-eclampsia and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profile from the systematic review (Davenport 2018 *(5)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. Red font denotes additions based on WHO update using review of existing systematic reviews. One systematic review was included that addressed the relationship between physical activity and gestational hypertension and pre-eclampsia *(16)*.

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **gestational hypertension**												
24 (pooled estimate of effect, n =22 [a,b]; 2 studies synthesized narratively)	randomized trials	not serious [c]	not serious	not serious	not serious	none	61/2627 (2.3%)	105/2689 (3.9%)	**OR 0.61** (0.43 to 0.85)	**15 fewer per 1 000** (from 6 fewer to 22 fewer)	⊕⊕⊕⊕ HIGH	CRITICAL
							Narrative Synthesis: Two superiority trials were included (n=107). Yeo (2008) reported that GH incidence was 22 % in women randomized to a walking intervention (n=41) and 40% in those randomized to a stretching intervention (n=38). McAuley (2005) reported 2 cases of GH in both groups of women (aerobic and muscular exercise group [n=14] and muscular exercise group [n=14]).					
Du 2018 *(16)* Low 5 randomized trials		not serious	not serious	not serious	not serious	none	Among pregnant women with overweight or obesity, there was no significant difference in the incidence of **gestational hypertension** between physical activity intervention groups vs. standard antenatal care (RR = 0.63 [95% CI 0.38 to 1.05], 5 RCTs, n=671, I^2=0%).				⊕⊕⊕⊕ HIGH	CRITICAL

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	No exercise	Relative (95% CI)	Absolute (95% CI)		
2 [d]	non-randomized intervention studies	serious [e]	not serious	not serious	not serious	none	Narrative Synthesis: Two studies were included (n=367). Narendran (2005) reported no difference in GH incidence between women who practiced yoga (n=169) and those who walked (n=166) during pregnancy (p=0.25). O'Connor (2011) reported one case of severe hypertension (among 32 women, 3%) during a strength training intervention (no control group).				⊕◯◯◯ VERY LOW	CRITICAL
8 (pooled estimate of effect, n=5 [f]; 3 studies synthesized narratively)	cohort studies	serious [g]	not serious	not serious	serious [h]	none	199/3777 (5.3%)	133/1460 (9.1%)	**OR 0.86** (0.64 to 1.15)	**12 fewer per 1 000** (from 12 more to 31 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Synthesis: Three cohort studies were included (n=76,260). 1/3 (n=1,749) reported 49% lower odds of GH with sports/exercise compared to no exercise (Currie, 2014). 2/3 (n=74,511) found no association between GH and prenatal exercise (Juhl, 2010; Chasan-Taber, 2015). Additional data from Vollebregt (2010) showed no effect of prenatal exercise on GH, regardless of how it was examined (total LTPA vs sport, weekly duration or percentiles). [i]					
5 (pooled estimate of effect, n=4 [j]; 1 study reported narratively)	cross-sectional studies	serious [k]	not serious	not serious	serious [h]	none	107/1575 (6.8%)	80/1090 (7.3%)	**OR 0.89** (0.66 to 1.21)	**8 fewer per 1 000** (from 14 more to 24 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: Martin (2010) reported lower odds of GH in women who were active at least once a week over the last 3 months of their pregnancy compared to those who were (n=3,348).					

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
4	Case-control studies	serious [l]	serious [m]	not serious	serious [h]	none	9037/20443 (44.2%)	27980/55331 (50.6%)	**OR 0.89** (0.68 to 1.16)	**29 fewer per 1 000** (from 37 more to 95 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: Additional data from Marcoux (1989) (n=931) showed no association between LTPA during the first 20 weeks of pregnancy and GH, no matter the way LTPA was examined (hours/week, energy expenditure as kcal/min or kcal/week).[n]					
Association between exercise-only interventions and **preeclampsia**												
16 (pooled estimate of effect, n =15 [o,p]; 1 study reported narratively)	randomized trials	serious [q]	not serious	not serious	not serious	none	34/1719 (2.0%)	49/1603 (3.1%)	**OR 0.59** (0.37 to 0.94)	**12 fewer per 1 000** (from 2 fewer to 19 fewer)	⊕⊕⊕◯ MODERATE	CRITICAL
							Narrative Summary: Yeo (2008) reported that PE incidence was 14.6% in women randomized to a walking intervention (n=41) and 2.6% in those randomized to a stretching intervention (n=38).					

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	No exercise	Relative (95% CI)	Absolute (95% CI)		
Du 2018 *(16)* Low 4 randomized trials		not serious	not serious	not serious	serious [h]	none	Among pregnant women with overweight or obesity, there was no significant difference in the incidence of **preeclampsia** between physical activity intervention groups vs. standard antenatal care (RR = 1.39 [95% CI, 0.66 to 2.93], 4 RCTs, n=596, I^2=0%).				⊕⊕⊕◯ MODERATE	CRITICAL
1 [r]	non-randomized intervention studies	serious [q]	serious [s]	not serious	not serious [t]	none	Narrative Summary: In the study by Dyck (1999) (supervised exercise intervention, n=7), one woman (14%) developed PE.				⊕◯◯◯ VERY LOW	CRITICAL
9 (pooled estimate of effect, n =6; 3 studies synthesized narratively)	cohort studies	serious [g]	not serious	not serious	not serious	none	1952/51843 (3.8%)	653/15639 (4.2%)	**OR 0.87** (0.78 to 0.97)	**5 fewer per 1 000** (from 1 fewer to 9 fewer)	⊕◯◯◯ LOW	CRITICAL
							Narrative Synthesis: Three cohort studies were included (n=76,260) 3/3 found no association between prenatal exercise and PE, no matter the intensity or volume of exercise (Currie, 2014; Juhl, 2010; Chasan-Taber, 2015). Additional data from Rudra (2008) and Magnus (2008) indicated lower odds of PE with prenatal physical activity. However, additional data from Vollebregt (2010) showed no association between prenatal exercise and PE. [u]					
2	cross-sectional studies	serious [v]	not serious	not serious	serious [h]	none	45/1595 (2.8%)	32/1107 (2.9%)	**OR 0.64** (0.39 to 1.05)	**10 fewer per 1 000** (from 1 more to 17 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
4	case-control studies	serious [w]	not serious	not serious	not serious	none	409/1464 (27.9%)	310/4154 (7.5%)	**OR 0.75** (0.59 to 0.99)	**18 fewer per 1 000** (from 1 fewer to 29 fewer)	⊕◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality of evidence	Importance
№ of studies * Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	No exercise	Relative (95% CI)	Absolute (95% CI)		
							Narrative Summary: Additional data from Marcoux (1989) (n=931) indicated 47 to 43% lower odds of PE with heavy LTPA compared to light/moderate LTPA. [n]					

* Unless otherwise stated, all studies are included in the pooled estimate.

Abbreviations: CI = confidence interval; GH = gestational hypertension; LTPA = leisure time physical activity; OR = odds ratio., RCT = randomized clinical trial; RR = risk ratio

[a] Two superiority trials could not be pooled due to absence of a no-exercise control group; results were reported narratively.
[b] One study reported no cases of GH (not estimable result) and was not included in the pooled analysis.
[c] No serious risk of bias. Unclear risk of selection bias; it was unknown if allocation concealment was adequate.
[d] The two studies could not be pooled due to absence of a no-exercise control group; results were reported narratively.
[e] Serious risk of bias. High risk of performance bias. Unclear risk of attrition bias; attrition rate is unknown.
[f] Three studies could not be pooled due to incomplete reporting of results; results were reported narratively.
[g] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure). Reporting bias was an issue in three studies; results were reported narratively.
[h] Serious imprecision. The 95% CI crossed the line of no effect, and was wide, such that interpretation of the data would be different if the true effect were at one end of the CI or the other.
[i] Vollebregt (2010) reported data that were included in the meta-analysis and data that were not (incomplete reporting of data; additional data were reported narratively).
[j] One study could not be pooled due to incomplete reporting of results; results were reported narratively.
[k] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure). Reporting bias was an issue in one study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).
[l] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure).
[m] Serious inconsistency. High heterogeneity (I2≥50%)
[n] Marcoux (1989) reported data that were included in the meta-analysis and data that were not (incomplete reporting of data; additional data were reported narratively).
[o] One superiority trial could not be pooled due to absence of a no-exercise control group; results were reported narratively.
[p] One study reported no cases of PE (not estimable result) and was not included in the pooled analysis.
[q] Serious risk of bias. High risk of performance bias.
[r] This study could not be included in the meta-analysis due to absence of a no-exercise control group; results were reported narratively.
[s] Serious inconsistency. Only one study was included.
[t] No serious imprecision; only one study but already downgraded for serious inconsistency for this reason.
[u] Rudra (2008), Magnus (2008) and Vollebregt (2010) reported data that were included in the meta-analysis and data that were not (incomplete reporting of data; additional data were reported narratively).
[v] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure).
[w] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure).

Table D.1.d. Mental health outcomes and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profile from the systematic review (Davenport 2018 *(3)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. Red font denotes additions based on WHO update using review of existing systematic reviews. One systematic review was identified that addressed the relationship between physical activity and postpartum depression *(20)*.

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **prenatal depressive symptoms**												
15 (pooled estimate of effect, n =13; 2 studies reported narratively)	randomized trials	serious [a]	not serious	not serious	not serious	none	590	585	-	SMD **0.39 SD lower** (0.51 lower to 0.26 lower)	⨁⨁⨁◯ MODERATE	CRITICAL
							Narrative Synthesis: A superiority RCT comparing yoga (n=51) with non-yoga (n=45) antenatal exercises showed an improvement in depressive symptoms with yoga, but not with other antenatal exercise (Satyapriya 2013). In contrast, one RCT found no influence of prenatal exercise on the severity of depressive symptoms during pregnancy (exercise = 429, control = 426; Gustafsson 2015).					
4	non-randomized intervention studies	serious [b]	serious [c]	not serious	not serious	none	215	205	-	SMD **0.81 lower** (1.14 lower to 0.49 lower)	⨁◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
8 (pooled estimate of effect, n =3; 5 studies reported narratively	cohort studies	serious [d]	not serious	not serious	serious [e]	none	94	170	-	SMD **0.16 SD lower** (0.47 lower to 0.14 higher)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Synthesis: Five cohort studies were included (n=5,060). 4/5 (n=4,982) reported a favourable effect of prenatal exercise on depressive symptoms (Gjestland 2013; Demissie 2011; Orr 2006; Downs 2008). 1/5 (n=78) reported no association between depression scores and physical activity (Tendais 2011).					
2 (pooled estimate of effect, n =1; 1 study reported narratively	case-control studies	not serious	serious [f]	not serious	not serious [g]	none	39	17	-	MD **0.2 lower** (0.49 lower to 0.09 higher)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: One case-control study was included (case, n=80; control, n=258) and indicated that women meeting the recommendations for 150 minutes/week of moderate intensity physical activity had similar depressive symptoms when compared to women not meeting the recommendations (OR = 1.94; 95%CI: 0.83, 4.56 adjusted for age, parity, education and pre-pregnancy body mass index. Kolu 2014)					
4 (pooled estimate of effect, n =1; 3 study	cross-sectional studies	serious [d]	not serious	not serious	not serious	none	117	86	-	MD **11.26 lower** (14.36 lower to 8.16 lower)	⊕◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
reported narratively							Narrative Synthesis: Three cross-sectional studies were included (n=439). 3/3 indicated an inverse association between prenatal physical activity level and prenatal depressive symptoms (Loprinzi 2012; Petrovic 2016; de Wit 2015).					
5	randomized trials	serious [h]	not serious	not serious	not serious	none	32/354 (9.0%)	72/329 (21.9%)	**OR 0.33** (0.21 to 0.53)	**134 fewer per 1 000** (from 90 fewer to 163 fewer)	⊕⊕⊕◯ MODERATE	CRITICAL
Association between exercise-only interventions and **prenatal depression**												
1	non-randomized intervention study	serious [i]	serious [f]	not serious	not serious [g]	none	13/50 (26.0%)	41/50 (82.0%)	**OR 0.08** (0.03 to 0.20)	**553 fewer per 1 000** (from 343 fewer to 700 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
1	cohort study	serious [j]	serious [f]	not serious	not serious [g]	none	3/53 (5.7%)	24/127 (18.9%)	**OR 0.26** (0.07 to 0.90)	**132 fewer per 1 000** (from 16 fewer to 173 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
1	cross-sectional study	serious [d]	serious [f]	not serious	not serious [g]	none	Narrative Summary: Bowen (2009) found that women who did at least 20 minutes of exercise per day during pregnancy were less likely to experience prenatal depression (assessed using the Edinburgh Postnatal Depression Scale) than women who exercise occasionally (OR 2.23, 95%CI 1.26, 3.92) or did not exercise during pregnancy (OR 3.18, 95%CI 1.47, 6.87).				⊕◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **postnatal depressive symptoms**												
4	randomized trials	serious [k]	not serious	not serious	serious [e]	none	537	496	-	SMD **0.01 lower** (0.13 lower to 0.12 higher)	⊕⊕◯◯ LOW	CRITICAL
Nakamura 2019 *(20)* Moderate 6 randomized trials 11 cohort studies 4 cross-sectional studies		serious [s]	serious [c]	not serious	not serious	none	17/21 studies were included in meta-analysis (6 trials and 11 observational studies). When all study designs were combined, there was a significant association between physical activity and **postpartum depression scores** (SMD = -0.22 [95% CI, -0.42 to -0.01]), I^2=86.4%). Physical activity interventions showed a significant inverse relationship with PA during pregnancy and symptoms of post-partum depression (MD = -0.58 [95% CI, -1.09 to -0.08], I^2=90.7%). Observational evidence also showed an inverse, but not significant relationship between PA during pregnancy and post-partum depression scores (SMD = -0.07 [95% CI, -0.20 to 0.06], I^2-74.4%).				⊕⊕◯◯ LOW	CRITICAL
3 (pooled estimate of effect, n =2; 1 study reported narratively	non-randomized intervention studies	serious [l]	serious [c]	not serious	serious [e]	none	135	117	-	MD **0.69 lower** (1.91 lower to 0.52 higher)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: One non-randomized intervention including depressed women (intervention, n=34)(Battle 2015) demonstrated that a 10 week yoga intervention had a clinically meaningful decrease in depression severity. Using regression analysis, a dose-response relationship was observed where the more time spent practicing yoga, the greater reduction in depressive symptoms in a given week.					

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	prenatal exercise	no exercise	Relative (95% CI)	Absolute (95% CI)		
1	cohort studies	serious [m]	serious [f]	not serious	not serious [g]	none	26	8	-	MD **2.71 lower** (4.93 lower to 0.49 lower)	⊕◯◯◯ VERY LOW	CRITICAL
1	cross-sectional studies	very serious [n]	serious [f]	not serious	not serious [g]	none	Narrative Summary: Data from the North Carolina Pregnancy Risk Assessment Monitoring System 2004-2005 found no significant association between third trimester exercise and postnatal depressive symptoms (Ersek 2009). However, women who were physically active both before pregnancy and during the third trimester of pregnancy had a reduction in severity of depressive symptoms (OR 0.66, 95%CI 0.49, 0.87; after controlling for age and marital status).				⊕◯◯◯ VERY LOW	CRITICAL
Association between exercise-only interventions and **postnatal depression**												
2	randomized trials	serious [k]	not serious	not serious	serious [e]	none	7/417 (1.7%)	13/376 (3.5%)	**OR 0.48** (0.18 to 1.22)	**18 fewer per 1 000** (from 7 more to 28 fewer)	⊕⊕◯◯ LOW	CRITICAL
1	cohort study	serious [o]	serious [f]	not serious	not serious [g]	none	419/26494 (1.6%)	886/44372 (2.0%)	**OR 0.79** (0.70 to 0.89)	**4 fewer per 1 000** (from 2 fewer to 6 fewer)	⊕◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	prenatal exercise	no exercise	Relative (95% CI)	Absolute (95% CI)		
							Narrative Summary: Additional data from the Danish National Birth Cohort (Strom 2009) could not be included in the meta-analysis. They showed that women had a decreased odds of postpartum depression diagnosis if they were vigorously active (OR 0.81, 95%CI 0.66, 0.99), exercising 2-3 hours per week (OR 0.75, 95% CI 0.58-0.98) or achieving 8-15 MET h/week (OR 0.79, 95%CI 0.63, 0.99 compared to no exercise). All ORs were adjusted for maternal age, parity, pre-pregnancy BMI, alcohol intake, smoking, occupation, education, home ownership, marital status, social support and history of previous depression.					
1	case-control study	serious [o]	serious [f]	not serious	not serious [g]	none	Narrative Summary: One case-control study (n=57) (Sexton 2012) reported higher prenatal exercise frequency in women who were likely to be depressed during pregnancy (Beck Depression Index, BDI-II >10) predicted postpartum recovery of depression (OR 1.23, 95%CI 0.08, 0.92).				⊕◯◯◯ VERY LOW	CRITICAL
1	cross-sectional study	serious [o]	serious [f]	not serious	not serious [g]	none	Narrative Summary: One cross-sectional study (n=6,330) (Guida 2012) showed that women who did not exercise during the third trimester of pregnancy were more likely to experience postpartum depression than women who exercised 5 or more days per week (OR 1.36, 95% CI 1.15, 1.62). Exercising 1-4 times per week had no observable effect on postpartum depression (OR 1.10, 95% CI 0.93, 1.32).				⊕◯◯◯ VERY LOW	CRITICAL
Association between exercise-only interventions and **prenatal state anxiety symptoms**												

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	prenatal exercise	no exercise	Relative (95% CI)	Absolute (95% CI)		
6 (pooled estimate of effect, n =5; 1 study reported narratively)	randomized trials	serious [p]	not serious	not serious	serious [d]	none	136	140	-	SMD **0.03 SD higher** (0.21 lower to 0.27 higher)	⊕⊕◯◯ LOW	CRITICAL
							Narrative Summary: A superiority RCT comparing yoga (n=51) with non-yoga (n=45) antenatal exercises showed an improvement in state anxiety symptoms with yoga, but not other antenatal exercise (Satyapriya 2013).					
1	non-randomized intervention studies	serious [q]	serious [f]	not serious	not serious [g]	none	Narrative Summary: Beddoe (2009) showed that seven weeks of a mindfulness-based yoga intervention did not reduced state anxiety symptoms, whether the intervention was introduced in 2nd or 3rd trimester of pregnancy (n=16).				⊕◯◯◯ VERY LOW	CRITICAL
1	cohort studies	serious [j]	serious [f]	not serious	not serious [g]	none	38	142	-	SMD **0.36 lower** (0.72 lower to 0)	⊕◯◯◯ VERY LOW	CRITICAL
1	cross-sectional studies	not serious	serious [f]	not serious	not serious [g]	none	117	86	-	SMD **0.82 lower** (1.11 lower to 0.53 lower)	⊕◯◯◯ VERY LOW	CRITICAL
Association between exercise-only interventions and **prenatal trait anxiety symptoms**												

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
3 (pooled estimate of effect, n =2; 1 study reported narratively)	randomized trials	serious [r]	not serious	not serious	serious [e]	none	49	41	-	SMD **0.21 SD lower** (0.63 lower to 0.2 higher)	⊕⊕◯◯ LOW	CRITICAL
							Narrative Summary: A superiority RCT comparing yoga (n=51) with non-yoga (n=45) antenatal exercises showed an improvement in trait anxiety symptoms with yoga, but not other antenatal exercise (Satyapriya 2013).					
1	non-randomized intervention study	serious [q]	serious [f]	not serious	not serious [g]	none	Narrative Summary: Beddoe (2009) reported that 7 weeks of a mindfulness-based yoga intervention reduced trait anxiety symptoms when the intervention was introduced in the third (but not second trimester) (n=16).				⊕◯◯◯ VERY LOW	CRITICAL
1	cross-sectional study	not serious	serious [f]	not serious	not serious [g]	none	117	86	-	SMD **0.82 SD lower** (1.11 lower to 0.53 lower)	⊕◯◯◯ VERY LOW	CRITICAL
1	case-control study	not serious	serious [f]	not serious	not serious [g]	none	17	39	-	MD **0.19 lower** (0.4 lower to 0.02 higher)	⊕◯◯◯ VERY LOW	CRITICAL
Association between exercise-only interventions and **postnatal State anxiety symptoms**												

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	prenatal exercise	no exercise	Relative (95% CI)	Absolute (95% CI)		
1	randomized trial	serious [p]	serious [f]	not serious	not serious [g]	none	39	40	-	SMD **0.01 higher** (0.43 lower to 0.45 higher)	⊕⊕◯◯ LOW	CRITICAL

* Unless otherwise stated, all studies are included in the pooled estimate.

Abbreviations: CI = confidence interval; MD = mean difference; OR = odds ratio; SMD = standardised mean difference;

[a] Serious risk of bias. High risk of performance bias and attrition bias. Unclear risk of selection bias; it was unknown if allocation adequately concealed. Reporting bias was an issue in one study and one study did not have a non-exercise control group (superiority trial); results were reported narratively.
[b] Serious risk of bias. High risk of performance bias (compliance to the intervention not reported; women who did not complete the majority of the intervention [>75%] were excluded) and attrition bias.
[c] Serious inconsistency. High heterogeneity (I2 > 50%).
[d] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure) and reporting bias (incomplete reporting of data in four studies such that they could not be included in the meta-analysis; results were reported narratively).
[e] Serious imprecision. The 95% CI crosses the line of no effect, and is wide, such that the interpretation of the data would be different if the true effect were at one end of the CI or the other.
[f] Serious inconsistency. Only one study was included.
[g] No serious imprecision; only one study but already downgraded for serious inconsistency for this reason.
[h] Serious risk of bias. High risk of attrition bias. Unclear risk of selection bias; it was unknown if allocation was adequately concealed.
[i] Serious risk of bias. High risk of performance and attrition bias (all women who did not complete the majority of the intervention [80%] were excluded). Unclear risk of selection bias; it was unknown if the methods of sequence generation and allocation concealment were adequate.
[j] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure).
[k] Serious risk of bias. High risk of performance bias.
[l] Serious risk of bias. High risk of performance and attrition bias (women who did not complete the majority of the intervention [>75%] were excluded; active and inactive groups made on the basis of compliance to physical activity recommendation at the end of the intervention). Reporting bias was an issue in one study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).
[m] Serious risk of bias. High risk of attrition and of other bias (extreme imbalance in baseline data between the groups likely to influence the outcome).
[n] Very serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of retrospective physical activity measure), detection bias (potentially flawed measurement of the outcome; unknown validity of postnatal depression symptoms measure). Reporting bias was an issue in this study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).
[o] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure). Reporting bias was an issue in one study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).
[p] Serious risk of bias. High risk of performance bias and attrition bias. Unclear risk of selection bias; it was unclear if sequence generation and allocation concealment were adequate.
[q] Serious risk of bias. High risk of performance and attrition bias. This study has no control group such that it could not be included in the meta-analysis; results were reported narratively.
[r] Serious risk of bias. High risk of attrition bias. Unclear risk of selection bias; it was unclear if sequence generation was adequate.

[5] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure), attrition bias, and reporting bias.

Table D.1.e. Fetal health outcomes and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profiles from two systematic reviews (Davenport 2018 *(4)* and Davenport 2019 *(7)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. Red font denotes additions based on WHO update using review of existing systematic reviews. Two systematic reviews were identified that addressed the relationship between physical activity and fetal health outcomes *(14, 16)*.

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Prenatal exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **birthweight <2500 g**												
17 (pooled estimate of effect; n=15 [a,b]; 2 studies synthesized narratively.	randomized trials	serious [c]	not serious	not serious	serious [d]	none	114/1858 (6.1%)	126/1926 (6.5%)	**OR 0.91** (0.70 to 1.20)	**6 fewer per 1,000** (from 12 more to 19 fewer)	⊕⊕◯◯ LOW	CRITICAL
							Narrative synthesis: Two RCTs were included (Intervention, n=158; Control, n=99) and reported no association between prenatal exercise and birthweight <2500 g (Baciuk et al. 2009; deOliveria et al. 2012). **Additional data from studies (n=3) included in the pooled estimate.** All three studies reported no association between prenatal exercise and birth weight <2500 g (Kasawara et al. 2013; Barakat et al. 2016; Ussher et al. 2015). [e]					
Beetham 2019 *(14)* Moderate 2 randomized trials 2 cohort studies		serious [t]	not serious	not serious	serious [d]	none	There was no significant increase in risk of **LBW (< 2500 g)** (RR = 0.44 [95% CI − 0.83 to 1.7], n = 2454, k = 4, I^2 = 0). Results were consistent with no significant differences when limited by study design (RCT, prospective cohort, or retrospective cohort) or by comparison condition.				⊕⊕◯◯ LOW	CRITICAL
Du 2018 *(16)* Low 6 randomized trials		not serious	not serious	not serious	serious [d]	none	Among pregnant women with overweight or obesity, there was no significant difference in the risk of **SGA** between physical activity intervention groups vs. standard antenatal care (RR = 1.02 [95% CI, 0.54 to 1.92], 6 RCTs, n=863, I^2=13%).				⊕⊕⊕◯ MODERATE	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies Review (AMSTAR 2 rating)	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Prenatal exercise	No exercise	Relative (95% CI)	Absolute (95% CI)		
Association between exercise-only interventions and **birth weight < 10th percentile**												
10 [f]	randomized trials	not serious	not serious	not serious	serious [d]	none	44/713 (6.2%)	36/549 (6.6%)	**OR 0.98** (0.61 to 1.57)	**1 fewer per 1,000** (from 25 fewer to 34 more)	⊕⊕⊕◯ MODERATE	CRITICAL
							Additional data from one study included in the pooled analysis. Simmons et al. (2016) did not find a relationship between the odds of having a small for gestational age (<10th percentile) baby at birth. [f, g]					
Association between exercise-only interventions and **birth weight >4000 g**												
17 (pooled estimate of effect; n=15[h], 2 studies synthesized narratively)	randomized trials	not serious [i]	not serious	not serious	not serious	none	109/1835 (5.9%)	151/1835 (8.2%)	**OR 0.61** (0.41 to 0.92)	**30 fewer per 1,000** (from 6 fewer to 47 fewer)	⊕⊕⊕⊕ HIGH	CRITICAL
							Narrative synthesis: Two studies were included (Intervention, n=186; Control, n=121) and reported no relationship between prenatal exercise and birthweight > 4000 g (deOliveria et al. 2012; Oostdam et al. 2012). **Additional data from studies (n=4) included in the pooled estimate**. **3/4 studies** reported no relationship between prenatal exercise and birthweight >4000 g (Kasawara et al. 2013; Barakat et al. 2013; Tomic et al. 2013). **1/4 studies** suggested women who were not active during pregnancy had an increased risk of having a baby >4000g [OR 2.53; CI:1.03,6.20] (Barakat et al. 2016).				
Du 2018 *(16)* Low 7 randomized trials		not serious	not serious	not serious	serious [d]	none	Among pregnant women with overweight or obesity, there was no significant difference in the risk of L**GA** between physical activity intervention groups vs. standard antenatal care (RR = 0.90 [95% CI, 0.65 to 1.25], 7 RCTs, n=961, I^2=0%).				⊕⊕⊕◯ MODERATE	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Prenatal exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **birth weight >90th percentile.**												
11	randomized trials	serious [j]	not serious	not serious	serious [d]	none	96/775 (12.4%)	81/632 (12.8%)	**OR 1.00** (0.71 to 1.40)	**0 fewer per 1,000** (from 34 fewer to 43 more)	⊕⊕◯◯ LOW	CRITICAL
							Additional data from one study included in the pooled analysis. Simmons et al. (2016) reported no relationship between the odds of having a large for gestational age (>90th percentile) baby at birth.					
Association between prenatal exercise and **IUGR**												
1	randomized trial	not serious	serious [k]	not serious	not serious [l]	none	12/166 (7.2%)	11/168 (6.5%)	**OR 1.11** (0.48 to 2.60)	**7 more per 1,000** (from 33 fewer to 89 more)	⊕⊕⊕◯ MODERATE	CRITICAL
							Additional data from one study included in the pooled analysis. Tomic et al. (2013) did not find an association between prenatal exercise and IUGR.					
2 (pooled estimate of effect; n=1[f]; 1 study reported narratively)	cohort studies	serious [m]	serious [k]	not serious	not serious [l]	none	76/533 (14.3%)	69/216 (31.9%)	**OR 0.36** (0.25 to 0.53)	**175 fewer per 1,000** (from 120 fewer to 214 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: Rego et al. (2016) (n=1380) did not find an association between prenatal exercise and IUGR.					
1 study reported narratively	Case control study	not serious [n]	serious [k]	not serious	not serious [l]	none	Narrative summary: Takito et al. (2010) (Cases; n=272; Control; n=546) did not find an association between prenatal exercise and IUGR.				⊕◯◯◯ VERY LOW	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Prenatal exercise**	**No exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **preterm birth**												
28 (pooled estimate of effect; n=27 [o, h], 1 study reported narratively)	randomized trials	serious [p]	not serious	not serious	serious [d]	none	168/2680 (6.3%)	145/2603 (5.6%)	**OR 1.12** (0.88 to 1.42)	**6 more per 1,000** (from 6 fewer to 22 more)	⊕⊕◯◯ LOW	CRITICAL
							Narrative summary: One study was included (Intervention, n= 34; Control, n=37) and found no association between prenatal exercise and preterm birth (Cavalcante et al. 2009).					
Beetham 2019 *(14)* Moderate 2 randomized trials 2 cohort studies		serious [t]	not serious	not serious	not serious	none	A small, but significant, reduced risk of **preterm birth** existed in babies of mothers who engaged in vigorous physical activity (RR = − 0.20 [95% CI −0.36 to − 0.03], , n = 3025, k = 4, I^2 = 0); however the effect was not significant when limited to the 2 RCTs (RR = − 0.41 [95% CI − 1.64 to 0.82], n = 312, k = 2) or when using only light intensity exercise as a comparison (RR = − 0.16 [95% CI − 0.32 to 0.01] n = 1644, k = 3).				⊕⊕⊕◯ MODERATE	CRITICAL
Du 2018 *(16)* Low 6 randomized trials		not serious	not serious	not serious	serious [d]	none	Among pregnant women with overweight or obesity, there was no significant difference in the risk of **preterm birth** between physical activity intervention groups vs. standard antenatal care (RR = 1.18 [95% CI, 0.59 to 2.39], 6 RCTs, n=737, I^2=0%).				⊕⊕⊕◯ MODERATE	CRITICAL
Association between exercise-only interventions and **neonatal hypoglycemia**												
1	randomized trials	serious [q]	serious [k]	not serious	not serious [l]	none	4/37 (10.8%)	3/37 (8.1%)	OR 1.37 (0.29 to 6.61)	**27 more per 1,000** (from 56 fewer to 287 more)	⊕⊕◯◯ LOW	CRITICAL
Association between prenatal exercise-only interventions and **congenital anomalies**												

1	randomized trials	serious [r]	serious [k]	not serious	not serious [l]	none	9/346 (2.6%)	6/348 (1.7%)	**OR 1.52** (0.54 to 4.32)	**9 more per 1,000** (from 8 fewer to 53 more)	⨁⨁◯◯ LOW	CRITICAL
1	cohort study	serious [s]	serious [k]	not serious	not serious [l]	none	908/18330 (5.0%)	2832/54942 (5.2%)	OR 0.96 (0.89 to 1.04)	2 fewer per 1,000 (from 2 more to 5 fewer)	⨁◯◯◯ VERY LOW	CRITICAL

Abbreviations: CI = confidence interval; LGA = large for gestational age; OR = odds ratio; RCT = randomized clinical trial; RR = risk ratio; SGA = small for gestational age

[a] Two studies reported no cases of birthweight <2500 g (not estimable result) and are not included in the pooled analysis.
[b] Two studies reported data on different sub-groups of women. These studies were counted only once.
[c] Serious risk of bias. High risk of performance (women who did not complete the majority of the intervention [>75%] were excluded) and attrition bias. Reporting bias was an issue in two studies; results were reported narratively. One study included "other risk" of bias (included women who smoked during pregnancy that may have affected birthweight).
[d] Serious imprecision. The 95% CI crosses the line of no effect, and is wide, such that interpretation of the data would be different if the true effect were at one end of the CI or the other.
[e] All three studies reported data that were included in the meta-analysis and additional data reported narratively. These studies were counted only once.
[f] One study reported data on different sub-groups of women. This study was counted only once.
[g] One study reported data that was included in the meta-analysis and additional data reported narratively. This study was counted only once.
[h] Two studies reported data on different sub-groups of women. These studies were counted only once.
[i] No serious risk of bias. Reporting bias was an issue in 3 studies; results were reported narratively.
[j] Serious risk of bias. High performance risk of bias.
[k] Serious inconsistency. Only one study was included.
[l] No serious imprecision; only one study but already downgraded for serious inconsistency for this reason
[m] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure). Reporting bias was an issue in one study; results were reported narratively.
[n] No serious risk of bias. Reporting bias was an issue in one study; results were reported narratively.
[o] Four studies reported no cases of preterm birth (not estimable result) and are not included in the pooled analysis.
[p] Serious risk of bias. High risk of performance bias (women who did not complete the majority of the intervention [>75%] were excluded). Reporting bias was an issue in one study; results were reported narratively. One study included "other risk" of bias (included women who smoked during pregnancy that may have affected preterm birth).
[q] Serious risk of bias. High risk of performance and attrition bias. Unclear risk of selection bias; it was unknown if sequence was adequately generated.
[r] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure).
[s] Serious risk of bias. High risk of other bias (all women were smokers which may have affected the odds of congenital anomalies).
[t] Serious risk of bias. High risk of performance and attrition bias. Unclear risk of selection bias.

Table D.1.f. Adverse effects and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profile from the systematic review (Davenport 2019 *(2)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. No new systematic reviews were identified that addressed the relationship between physical activity and delivery complications.

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions and **miscarriage**												
10 [a]	randomized trials	serious [b]	not serious	not serious	serious [c]	none	22/1160 (1.9%)	30/1088 (2.8%)	**OR 0.69** (0.40 to 1.22)	**8 fewer per 1 000** (from 6 more to 16 fewer)	⊕⊕◯◯ LOW	CRITICAL
							Additional data from study included in the pooled estimate. Ussher (2015) indicated no effect of prenatal exercise on the odds of miscarriage after adjustment for recruitment centre [as a stratification factor]. [d]					
1	Non-randomized intervention studies	not serious	serious [e]	not serious	not serious [f]	none	1/33 (3.0%)	1/61 (1.6%)	**OR 1.88** (0.11 to 30.98)	**14 more per 1 000** (from 15 fewer to 324 more)	⊕◯◯◯ VERY LOW	CRITICAL
3 (pooled estimate of effect, n = 2 [g]; 1 study reported narratively)	cohort studies	serious [h]	not serious	not serious	serious [c]	none	21/621 (3.4%)	11/244 (4.5%)	**OR 0.60** (0.27 to 1.36)	**18 fewer per 1 000** (from 15 more to 32 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: One cohort study of 92,671 women (Madsen, 2007) found a progressive increase in the odds of miscarriage with increasing exercise volume. Exercising more than 7 hours/week before 18 weeks gestation was associated with a 3.7 higher odds of miscarriage. However, secondary analyses that included only women who were interviewed about exercise habits prior to a miscarriage (approximately 1/3 of the cohort) revealed that the association was no longer significant (Nilsson 2014).					

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
2	case-control studies	serious [i]	not serious	not serious	serious [c]	none	Narrative Synthesis: One case-control study (case, n=267; control, n=285; Zhang, 2011) reported a protective dose-response effect of exercise on miscarriage (after adjusted for several potential confounding factors). In constrast, Maconochie (2007) found no association between different levels of exercise compared to rare or no exercise and odds of miscarriage (cases, n=603; controls, n=6116, adjusted for year of conception, maternal age, previous miscarriage and previous live birth).				⊕◯◯◯ VERY LOW	CRITICAL
Association between exercise-only interventions and **stillbirth**												
6	randomized trials	Serious [j]	not serious	not serious	serious [c]	none	5/860 (0.6%)	6/791 (0.8%)	**OR 0.79** (0.26 to 2.38)	**2 fewer per 1 000** (from 6 fewer to 10 more)	⊕⊕◯◯ LOW	CRITICAL
							Additional data from study included in the pooled estimate. Ussher (2015) indicated no effect of prenatal exercise on the odds of stillbirth after adjustment for recruitment centre [as a stratification factor]. [d]					
3 [k]	Non-randomized intervention studies	serious [l]	serious [l]	not serious	serious [c]	none	1/47 (2.1%)	1/43 (2.3%)	**OR 1.00** (0.06 to 16.93)	**0 fewer per 1 000** (from 22 fewer to 264 more)	⊕◯◯◯ VERY LOW	CRITICAL
2 (pooled estimate of effect, n = 1 [m]; 1 study reported narratively)	cohort studies	serious [n]	serious [e]	not serious	not serious [f]	none	9/533 (1.7%)	6/216 (2.8%)	**OR 0.72** (0.25 to 2.05)	**8 fewer per 1 000** (from 21 fewer to 28 more)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: One study (n=59,573) found no effect of exercising > once/week on odds of stillbirth compared to no exercise (Magnus, 2008).					

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Prenatal exercise**	**no exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
1	cross-sectional studies	serious [o]	serious [e]	not serious	not serious [f]	none	6/839 (0.7%)	33/1718 (1.9%)	**OR 0.37** (0.15 to 0.88)	**12 fewer per 1 000** (from 2 fewer to 16 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
							Additional data from study included in the pooled estimate. Dumith (2012) reported results that were adjusted for potential confounding factors and found no association between exercise and stillbirth (adjusted for maternal age, marital status, level of schooling, family income, parity, prenatal consultation and twin delivery). [d]					
1	case-control studies	serious [p]	serious [e]	not serious	not serious [f]	none	Narrative Summary: Xu (2014) (n= 620 cases; n=1,240 controls) reported a protective effect of exercising 30 minutes ≥2 times/week compared to not exercising (adjusted for history of miscarriage, previous induced abortion, frequency of night shift, frequent staying up late, regular physical exercise, smoking, and alcohol consumption).				⊕◯◯◯ VERY LOW	CRITICAL

Abbreviations: CI = confidence interval; OR = odds ratio

[a] One study reported no cases of miscarriage (not estimable result) and is not included in the pooled analysis.
[b] Serious risk of bias. High risk of performance bias and other bias (all women who were included in one study were smokers, a risk factor for miscarriage).
[c] Serious imprecision. The 95% CI crosses the line of no effect, and is wide, such that the interpretation of data would be different if the true effect were at one end of the CI or the other.
[d] One study reported data that was included in the meta-analysis and additional data reported narratively. This study was counted only once.
[e] Serious inconsistency. Only one study was included.
[f] No serious imprecision; only one study but already downgraded for serious inconsistency for this reason.
[g] Two studies reported data on different sub-groups of women. These studies were counted only once.
[h] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure). Reporting bias was an issue in one study (incomplete reporting of data; results are reported narratively).
[i] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of retrospective physical activity measure). Reporting bias was an issue in both studies (incomplete reporting of data; results are reported narratively).
[j] Serious risk of bias. High risk of performance bias and other bias (all women who were included in one study were smokers, a risk factor for stillbirth).
[k] Two studies reported no cases of stillbirth (not estimable result) and were not included in the pooled analysis.
[l] Serious inconsistency. OR values were not estimable in 2 studies.
[m] One study included different sub-groups of women. This study was counted only once.
[n] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure). Reporting bias was an issue in one study (incomplete reporting of data; results are reported narratively).

[o] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of prospective and retrospective physical activity measure). Reporting bias was an issue in the study (incomplete reporting of data; additional results are reported narratively).
[p] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of retrospective physical activity measure). Reporting bias was an issue in the study (incomplete reporting of data; results are reported narratively).

Table D.1.g. Delivery complications and physical activity, pregnant and postpartum women

Black font is from original GRADE Evidence Profile from the systematic review (Davenport 2019 *(6)*) to support the 2019 Canadian Guideline for Physical Activity Throughout Pregnancy. One systematic review was included that addressed the relationship between physical activity and risk of cesarean delivery *(16)*.

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies **Review (AMSTAR 2 rating)**	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**exercise (acute or chronic)**	**no exercise or different frequency, intensity, duration, volume or type of exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between exercise-only interventions or prenatal exercise and **preterm/prelabour rupture of membranes**												
2 [a]	randomized trials	not serious [b]	serious [c]	not serious	serious [d]	none	3/99 (3.0%)	3/99 (3.0%)	**OR 1.01** (0.20 to 5.16)	**0 fewer per 1 000** (from 24 fewer to 109 more)	⊕⊕◯◯ LOW	CRITICAL
5 (pooled estimate of effect, n = 4; 1 study reported narratively)	cohort studies	serious [e]	not serious	not serious	serious [d]	none	79/747 (10.6%)	68/830 (8.2%)	**OR 1.13** (0.79 to 1.62)	**10 more per 1 000** (from 16 fewer to 44 more)	⊕◯◯◯ VERY LOW	CRITICAL
							Narrative Summary: No association between weekly minutes of exercise and risk of preterm rupture of membranes (n = 190, Putnam et al. 2013)					
Association between exercise-only interventions and **cesarean section**												
47 (pooled estimate of effect, n = 46; 1 study reported	randomized trials	not serious [f]	not serious	not serious	not serious	none	892/4006 (22.3%)	965/3994 (24.2%)	**OR 0.91** (0.79 to 1.05)	**17 fewer per 1 000** (from 9 more to 41 fewer)	⊕⊕⊕⊕ HIGH	CRITICAL

narratively)							Narrative Summary: The superiority exercise- only interventions by Kariminia et al. (2004) reported similar rates of cesarean section between the walking group (n=1255) and the pelvic rocking exercise group (n=1292).		
Du 2018 *(16)* Low 10 randomized trials		not serious	not serious	not serious	serious [d]	none	Among pregnant women with overweight or obesity, there was no significant difference in the incidence of **caesarean delivery** between physical activity intervention groups vs. standard antenatal care (RR = 1.02 [95% CI, 0.87 to 1.20]], 10 RCTs, n=982, I^2=0%).	⊕⊕⊕◯ MODERATE	CRITICAL

Quality assessment							№ of participants		Effect		Quality	Importance
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**exercise (acute or chronic)**	**no exercise or different frequency, intensity, duration, volume or type of exercise**	**Relative (95% CI)**	**Absolute (95% CI)**		
Association between prenatal exercise and **caesarean section/instrumental delivery**												
2	cohort studies	serious [g]	not serious	not serious	not serious	none	14/77 (18.2%)	33/67 (49.3%)	**OR 0.19** (0.08 to 0.42)	**337 fewer per 1 000** (from 203 fewer to 420 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
1	cross-sectional study	serious [g]	serious [h]	not serious	not serious [i]	none	355/1773 (20.0%)	406/1989 (20.4%)	**OR 0.98** (0.83 to 1.14)	**3 fewer per 1 000** (from 22 more to 29 fewer)	⊕◯◯◯ VERY LOW	CRITICAL
Association between exercise-only interventions and **diastasis recti**												
1	randomized trials	serious [j]	serious [h]	not serious	not serious [i]	none	Narrative Summary: The superiority trial by Banerjee et al. (2013) (n=50) indicated a protective effect of abdominal exercises on diastasis rectus abdominis measured at 3 days postpartum compared to routine antenatal exercise.				⊕⊕◯◯ LOW	CRITICAL
1	non-randomized intervention study	serious [k]	serious [h]	not serious	not serious [j]	none	1/8 (12.5%)	9/10 (90.0%)	OR 0.02 (0.00 to 0.30)	**747 fewer per 1 000** (from -- to 170 fewer)	⊕◯◯◯ VERY LOW	CRITICAL

Abbreviations: CI = confidence interval; MD = mean difference; OR = odds ratio

[a] One study reported no cases of preterm/prelabour rupture of membranes (not estimable result) and were not included in the pooled analysis.
[b] No serious risk of bias. Unclear risk of selection bias; unknown if allocation concealment was adequate.
[c] Serious inconsistency. Heterogeneity was not estimable.
[d] Serious imprecision. The 95% CI crossed the line of no effect, and was wide, such that interpretation of the data would be different if the true effect were at one end of the CI or the other.

[e] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of physical activity measure). Reporting bias was an issue in one study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).

[f] No serious risk of bias. Unclear risk of selection bias; it was unknown if allocation concealment was adequate. Reporting bias was an issue in one study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).

[g] Serious risk of bias. High risk of performance bias (potentially flawed measurement of the exposure; unknown validity of retrospective physical activity measure).

[h] Serious inconsistency. Only one study was included.

[i] No serious imprecision; only one study but already downgraded for serious inconsistency for this reason.

[j] Serious risk of bias. High risk of performance and attrition bias. Unclear risk of selection bias; it was unknown if sequence generation and allocation concealment were adequate. Reporting bias was an issue in one study (incomplete reporting of data such that it could not be included in the meta-analysis; results were reported narratively).

[k] Serious risk of bias. High risk of performance bias.

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