

# No. 367-2019 Canadian Guideline for Physical Activity throughout Pregnancy

This Clinical Practice Guideline has been prepared by the Guidelines Consensus Panel, reviewed by the Society of Obstetricians and Gynaecologists of Canada (SOGC)'s Maternal Fetal Medicine and Guideline Management and Oversight Committees, and approved by the Board of the SOGC, and the Board of Directors of the Canadian Society for Exercise Physiology (CSEP).

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## KEY MESSAGES

1. Exercise reduces the risk of common pregnancy complications.
2. Previously inactive women can safely start exercise with the goal of achieving the recommended minimum activity. Exercise can be initiated at any point during pregnancy.
3. All types of physical activity contribute to a woman's fitness during pregnancy. Activities as simple as walking can reduce pregnancy complications. Aerobic exercise plus other types of exercise (e.g., resistance training) contribute to fitness.
4. Women can achieve the recommended physical activity in this guideline in many ways, including activities, such as walking, that have no added expense.
5. When exercising women should be cautious of activities where falling or direct physical contact may result in harm to themselves or their fetus.

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The following organizations have reviewed this document and endorse the Joint SOGC/CSEP Canadian Guidelines for Physical Activity throughout Pregnancy:

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- Directorate for Chief Medical Officer and Chief Scientist Office of Scotland • Exercise is Medicine Canada • Ontario Public Health Association
- ParticipACTION • Perinatal Services BC • Sociedad Espanola de Ginecologia y Obstetricia (The Spanish Society of Gynecology and Obstetrics)

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Women have the right and responsibility to make informed decisions about their care in partnership with their health care providers. In order to facilitate informed choice, women should be provided with information and support that is evidence based, culturally appropriate, and tailored to their needs. The values, beliefs, and individual needs of each woman and their family should be sought, and the final decision about the care and treatment options chosen by the woman should be respected.

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#### DISCLOSURE STATEMENT

Disclosure statements have been received from all authors.

## Abstract

**Objective:** The objective is to provide guidance for pregnant women, and obstetric care and exercise professionals, on prenatal physical activity.

**Outcomes:** The outcomes evaluated were maternal, fetal, or neonatal morbidity or fetal mortality during and following pregnancy.

**Evidence:** Literature was retrieved through searches of Medline, EMBASE, PsycINFO, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Scopus and Web of Science Core Collection, CINAHL Plus with Full-text, Child Development & Adolescent Studies, ERIC, Sport Discus, ClinicalTrials.gov, and the Trip Database from database inception up to January 6, 2017. Primary studies of any design were eligible, except case studies. Results were limited to English, Spanish, or French language materials. Articles related to maternal physical activity during pregnancy reporting on maternal, fetal, or neonatal morbidity or fetal mortality were eligible for inclusion. The quality of evidence was rated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology.

**Values:** The *Guidelines Consensus Panel* solicited feedback from end-users (obstetric care providers, exercise professionals, researchers, policy organizations, and pregnant and postpartum women). The development of this guideline followed the Appraisal of Guidelines for Research Evaluation (AGREE) II instrument.

**Benefits, harms, and costs:** The benefits of prenatal physical activity are moderate, and no harms were identified; therefore, the difference between desirable and undesirable consequences (net benefit) is expected to be moderate. The majority of stakeholders and end-users indicated that following these recommendations would be feasible, acceptable, and equitable. Following these recommendations is likely to require minimal resources from both individual and health systems perspectives.

**Preamble:** This guideline provide evidence-based recommendations regarding physical activity throughout pregnancy in the promotion of maternal, fetal, and neonatal health. In the absence of contraindications (see later for a detailed list), following this guideline is associated with: (1) fewer newborn complications (i.e., large for gestational age); and (2) maternal health benefits (i.e., decreased risk of preeclampsia, gestational hypertension, gestational diabetes, Caesarean section, instrumental delivery, urinary incontinence, excessive gestational weight gain, and depression; improved blood glucose; decreased total gestational weight gain; and decreased severity of depressive symptoms and lumbopelvic pain). Physical activity is not associated with miscarriage, stillbirth, neonatal death, preterm birth, preterm/

prelabour rupture of membranes, neonatal hypoglycemia, low birth weight, birth defects, induction of labour, or birth complications. In general, more physical activity (frequency, duration, and/or volume) is associated with greater benefits. However, evidence was not identified regarding the safety or additional benefit of exercising at levels significantly above the recommendations. Prenatal physical activity should be considered a front-line therapy for reducing the risk of pregnancy complications and enhancing maternal physical and mental health. For pregnant women not currently meeting this guideline, a progressive adjustment toward them is recommended. Previously active women may continue physical activity throughout pregnancy. Women may need to modify physical activity as pregnancy progresses. There may be periods when following the guideline is not possible due to fatigue and/or discomforts of pregnancy; women are encouraged to do what they can and to return to following the recommendations when they are able. This guideline were informed by an extensive systematic review of the literature, expert opinion, end-user consultation and considerations of feasibility, acceptability, costs, and equity.

**Recommendations:** The specific recommendations in this 2019 *Canadian Guideline for Physical Activity Throughout Pregnancy* are provided below with corresponding statements indicating the quality of the evidence informing the recommendations and the strength of the recommendations (explanations follow).

1. All women without contraindication should be physically active throughout pregnancy (strong recommendation, moderate quality evidence). Specific subgroups were examined:
  - a. Women who were previously inactive (strong recommendation, moderate quality evidence).
  - b. Women diagnosed with gestational diabetes mellitus (weak recommendation,<sup>a</sup> low quality evidence).
  - c. Women categorized as overweight or obese (pre-pregnancy body mass index  $\geq 25$  kg/m<sup>2</sup>) (strong recommendation,<sup>b</sup> low quality evidence).
2. Pregnant women should accumulate at least 150 minutes of moderate-intensity<sup>c</sup> physical activity each week to achieve clinically meaningful health benefits and reductions in pregnancy complications (strong recommendation, moderate quality evidence).
3. Physical activity should be accumulated over a minimum of 3 days per week; however, being active every day is encouraged (strong recommendation, moderate quality evidence).
4. Pregnant women should incorporate a variety of aerobic exercise and resistance training activities to achieve greater benefits. Adding yoga and/or gentle stretching may also be beneficial (strong recommendation, high quality evidence).
5. Pelvic floor muscle training (e.g., Kegel exercises) may be performed on a daily basis to reduce the risk of urinary incontinence. Instruction in proper technique is recommended to obtain optimal benefits (weak recommendation,<sup>d</sup> low quality evidence).
6. Pregnant women who experience light-headedness, experience nausea, or feel unwell when they exercise flat on their back should modify their exercise position to avoid the supine position (weak recommendation,<sup>e</sup> very low quality evidence).

**Contraindications:** All pregnant women can participate in physical activity throughout pregnancy with the exception of those who have contraindications (listed below). Women with absolute contraindications may continue their usual activities of daily living but should not participate in more strenuous activities. Women with relative contraindications should discuss the advantages and disadvantages of moderate-to-vigorous intensity physical activity with their obstetric care provider prior to participation.

Absolute contraindications to exercise are the following:

- Ruptured membranes
- Premature labour
- Unexplained persistent vaginal bleeding
- Placenta previa after 28 weeks' gestation
- Preeclampsia
- Incompetent cervix
- Intrauterine growth restriction
- High-order multiple pregnancy (e.g., triplets)
- Uncontrolled type 1 diabetes
- Uncontrolled hypertension
- Uncontrolled thyroid disease
- Other serious cardiovascular, respiratory, or systemic disorder

Relative contraindications to exercise are the following:

- Recurrent pregnancy loss
- Gestational hypertension
- A history of spontaneous preterm birth
- Mild/moderate cardiovascular or respiratory disease
- Symptomatic anemia
- Malnutrition
- Eating disorder
- Twin pregnancy after the 28th week
- Other significant medical conditions

**Strength of the Recommendations:** The GRADE system was utilized to grade the strength of the recommendations. Recommendations are rated as strong or weak based on the: (1) balance between benefits and harms; (2) overall quality of the evidence; (3) importance of outcomes (i.e., values and preferences of pregnant women); (4) use of resources (i.e., cost); (5) impact on health equity; (6) feasibility, and (7) acceptability.

*Strong recommendation:* Most or all pregnant women will be best served by the recommended course of action.

*Weak recommendation:* Not all pregnant women will be best served by the recommended course of action; there is a need to consider other factors such as the individual's circumstances, preferences, values, resources available, or setting. Consultation with an obstetric care provider may assist in decision-making.

**Quality of the Evidence:** The quality of the evidence refers to the level of confidence in the evidence and ranges from very low to high.

*High quality:* The *Guideline Consensus Panel* is very confident that the estimated effect of physical activity on the health outcome is close to the true effect.

*Moderate quality:* The *Guideline Consensus Panel* is moderately confident in the estimated effect of physical activity on the health outcome; the estimate of the effect is likely to be close to the true effect, but there is a possibility that it is substantially different.

*Low quality:* The *Guideline Consensus Panel's* confidence in the estimated effect of physical activity on the health outcome is limited; the estimate of the effect may be substantially different from the true effect.

*Very low quality:* The *Guideline Consensus Panel* has very little confidence in the estimated effect of physical activity on the health outcome; the estimate of the effect is likely to be substantially different from the true effect.

<sup>a</sup>This was a weak recommendation because the quality of evidence was low, and the net benefit between women who were physically active and those who were not was small.

<sup>b</sup>This was a strong recommendation because, despite low quality evidence supporting physical activity during pregnancy for women categorized as overweight or obese, there was evidence from randomized controlled trials demonstrating an improvement in gestational weight gain and blood glucose.

<sup>c</sup>Moderate-intensity physical activity is intense enough to noticeably increase heart rate; a person can talk but not sing during activities of this intensity. Examples of moderate-intensity physical activity include brisk walking, water aerobics, stationary cycling (moderate effort), resistance training, carrying moderate loads, and household chores (e.g., gardening, washing windows).

<sup>d</sup>This was a weak recommendation because urinary incontinence was not rated as a "critical" outcome and the evidence was low quality.

<sup>e</sup>This was a weak recommendation because: (1) the quality of evidence was very low; and (2) although harms were investigated there was limited available information to inform the balance of benefits and harms. This recommendation was primarily based on expert opinion.

## ABBREVIATIONS

AGREE	Appraisal of Guidelines for Research and Evaluation (AGREE) II
CSEP	Canadian Society for Exercise Physiology
GDM	gestational diabetes mellitus
GRADE	Grading of Recommendations Assessment, Development and Evaluation
PFMT	pelvic floor muscle training
RCT	randomized controlled trial
SOGC	Society of Obstetricians and Gynaecologists of Canada

## INTRODUCTION

Regular physical activity across the lifespan is associated with substantial health benefits including improvements in physical fitness and mental health, as well as decreased risk of chronic disease and mortality.<sup>1</sup> Pregnancy is a unique period of a woman's life in which lifestyle behaviours, including physical activity, can significantly affect her health as well as that of her fetus.<sup>2–13</sup> Although guidelines around the world recommend women without contraindication engage in prenatal physical activity,<sup>14</sup> less than 15% of women will actually achieve the minimum recommendation of 150 minutes per week of moderate-intensity physical activity during their pregnancy.<sup>15</sup> Unfortunately, uncertainty among some pregnant women and obstetric care providers as to whether prenatal physical activity may increase the risk of miscarriage, growth restriction, preterm birth, fatigue, or harm to the fetus has served as a barrier to being active.<sup>16</sup> Concerns over harms have not been substantiated by research, and the risks of *not* engaging in prenatal physical activity have not been adequately emphasized. Over the last 3 decades, rates of pregnancy complications such as GDM, preeclampsia, gestational hypertension, and newborn macrosomia have risen dramatically, most likely as a consequence of rising rates of maternal obesity.<sup>17,18</sup> Physical activity has been proposed as a preventative or therapeutic measure to reduce pregnancy complications and optimize maternal-fetal health.<sup>19,20</sup>

This evidence-based guideline apply to pregnant women and target users including obstetric care providers, policy-makers, and fitness professionals who provide guidance on the impact of prenatal physical activity on maternal, fetal, and neonatal health outcomes.

## METHODS

This 2019 *Canadian Guideline for Physical Activity Throughout Pregnancy* were developed according to the methodological strategy outlined in the AGREE II instrument.<sup>21</sup> The goal of this guideline was to provide evidence-based recommendations regarding physical activity during pregnancy in the promotion of maternal, fetal, and neonatal health. The *Guidelines Consensus Panel* consisted of researchers in the field of prenatal exercise; methodological experts (AGREE II, GRADE; statistician, and librarian); and exercise professionals and representatives from the CSEP, SOGC, the College of Family Physicians of Canada, the Canadian Association of Midwives, the Canadian Academy of Sport and Exercise Medicine, Exercise is Medicine Canada, and a

public health representative (the Middlesex-London Health Unit). Prior to convening the *Guidelines Consensus Panel*, 10 pregnant women were recruited by convenience sampling and invited to provide input on the perceived benefits and harms of physical activity, as well as to identify pregnancy outcomes that were most important to them. During Consensus Meeting #1, the *Guidelines Consensus Panel* selected 37 outcomes related to maternal, fetal, and neonatal health, 20 of which were rated as “critical” and 17 as “important” taking into consideration the feedback from pregnant women and the perspective of obstetric care providers based on their expert opinion (see [Table 1](#) for outcomes). The *Guidelines Consensus Panel* also identified 4 a priori subgroups of women believed to be at higher risk of pregnancy complications. These include women who were previously inactive, women diagnosed with GDM, women categorized as overweight or obese prior to pregnancy, and women  $\geq 35$  years of age. Twelve systematic reviews were prepared to describe the effect of physical activity on “critical” and “important” outcomes and to present the balance between benefits and potential harms of physical activity.<sup>2–13</sup> A comprehensive search was created and run by a research librarian in the following databases: MEDLINE, EMBASE, PsycINFO, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Scopus and Web of Science Core Collection, CINAHL Plus with Full-text, Child Development & Adolescent Studies, ERIC, Sport Discus, ClinicalTrials.gov and the Trip Database up to January 6, 2017 for randomized and observational studies examining the relationships between prenatal physical activity and the identified health outcomes in women without contraindication. Overall, 27 624 titles and abstracts were screened, and 675 unique studies were included. The recommendations were primarily based on a subset of exercise-only RCTs ( $n = 104$ ) and cohort studies ( $n = 4$ ). Detailed methodology and results are available in a special supplement of the *British Journal of Sports Medicine*.<sup>2–13,22</sup> Consensus Meeting #2 was held in October 2017 to review evidence and draft the recommendations. In April 2018, feedback from stakeholder groups and pregnant women was solicited through the networks of the *Guidelines Consensus Panel* via surveys in both English and French. The recommendations were revised based on this feedback, and a second round of surveys was distributed. A draft of the guideline was shared with the Boards of CSEP and SOGC, as well as the *Guidelines Consensus Panel* members in May 2018. The guideline was further revised, and the final version of the recommendations was sent to the SOGC and CSEP Executive for review and endorsement.

**Table 1. “Critical” and “important” outcomes selected by the *Guidelines Consensus Panel***

“Critical” outcomes	“Important” outcomes
• Miscarriage	• Antepartum hemorrhage
• Stillbirth	• Inadequate gestational weight gain
• Neonatal death	• Total gestational weight gain
• Preterm birth	• Delivery complications (instrumental delivery, length of labour, vaginal tears)
• Gestational diabetes mellitus	
• Preeclampsia	
• Gestational hypertension	• Birth defects
• Caesarean section	• Lower back pain
• Maternal mental health (depression and anxiety during and following pregnancy)	• Pelvic girdle pain
	• Urinary incontinence (during and following pregnancy)
• Excessive gestational weight gain	• Induction of labour
• Postpartum weight retention	• Long-term maternal outcomes (cardiovascular disease, osteoporosis, diabetes, hypertension, obesity)
• Glucose tolerance	• Adverse outcomes (musculoskeletal injury, trauma, dehydration, hyperthermia, cardiovascular or respiratory events, maternal hypoglycemia, fatigue)
• Preterm/prelabour rupture of membranes	• Gestational age at birth
• Diastasis recti	
• Fetal responses to physical activity (fetal heart rate, uterine/umbilical blood flow)	
• Low birth weight (SGA, <2500 g, <10th/15th percentile for gestational age)	• Birth weight
• Intrauterine growth restriction	• Body composition (newborn adiposity, BMI)
• High birth weight (LGA, macrosomia, >4000 g, >90th percentile for gestational age)	• Birth complications (including shoulder dystocia, brachial plexus injury, Apgar, NICU admittance, metabolic acidosis)
• Neonatal hypoglycemia	• Hyperbilirubinemia
• Long-term offspring outcomes (obesity, cardiovascular and metabolic diseases).	• Offspring developmental milestones (cognitive, psychosocial, motor skills).

SGA: small for gestational age; LGA: large for gestational age; BMI: body mass index; NICU: neonatal intensive care unit.

## WHO SHOULD BE PHYSICALLY ACTIVE DURING PREGNANCY?

This guideline is intended for women who do not have contraindications (Table 2) that would prevent them from engaging in physical activity. Women with absolute contraindications may continue the usual activities of daily living but should not participate in more strenuous exercise. Women with relative contraindications should discuss the advantages and disadvantages of moderate-to-vigorous intensity physical activity with their obstetric care provider.

### Recommendation

1. All women without contraindication should be physically active throughout pregnancy (strong recommendation, moderate quality evidence).

Specific subgroups were examined:

- a. Women who were previously inactive (strong recommendation, moderate quality evidence).
- b. Women diagnosed with gestational diabetes mellitus (weak recommendation, low quality evidence).
- c. Women categorized as overweight or obese (pre-pregnancy body mass index  $\geq 25$  kg/m<sup>2</sup>) (strong recommendation, low quality evidence).

One hundred and four exercise-only RCTs were identified regarding the effects of physical activity on 1 or more prioritized outcomes. These data represent “moderate” quality evidence of a beneficial effect of prenatal physical activity on maternal, fetal, and newborn health outcomes. Prenatal physical activity was associated with a reduction in the odds of GDM (38%; 39 fewer per thousand [from 25

**Table 2. Absolute and relative contraindications to physical activity during pregnancy**

Absolute contraindications	Relative contraindications
• Ruptured membranes, premature labour	• Recurrent pregnancy loss
• Unexplained persistent vaginal bleeding	• History of spontaneous preterm birth
• Placenta previa after 28 weeks gestation	• Gestational hypertension
• Preeclampsia	• Symptomatic anemia
• Incompetent cervix	• Malnutrition
• Intrauterine growth restriction	• Eating disorder
• High-order multiple pregnancy (e.g., triplets)	• Twin pregnancy after the 28th week
• Uncontrolled type I diabetes, uncontrolled hypertension, or uncontrolled thyroid disease	• Mild/moderate cardiovascular or respiratory disease
• Other serious cardiovascular, respiratory, or systemic disorder	• Other significant medical conditions

fewer to 50 fewer]), preeclampsia (41%; 12 fewer per thousand [from 2 fewer to 19 fewer]), gestational hypertension (39%; 15 fewer per thousand [from 6 fewer to 22 fewer]), prenatal depression (67%; 134 fewer per thousand [from 90 fewer to 163 fewer]), and macrosomia (39%; 30 fewer per thousand [from 6 fewer to 47 fewer]) without increasing the odds of adverse outcomes including preterm birth, low birth weight, miscarriage, and perinatal mortality.<sup>2-4,7,11</sup> Feedback from stakeholders (n = 429) and pregnant women (n = 170) indicated that a large proportion of women agreed that the benefits of physical activity during pregnancy outweighed the costs (51% strongly agree, 22% agree) and that physical activity was feasible (27% strongly agree, 41% agree), acceptable (36% strongly agree, 45% agree), and equitable (62% strongly agree, 21% agree) for pregnant women. The survey results supported strong recommendations in favour of prenatal physical activity.

Physical activity during the first trimester did not increase the odds of miscarriage or congenital anomalies.<sup>3,8</sup> Importantly, there was also evidence suggesting that not engaging in physical activity from the first trimester increased the odds of pregnancy complications (i.e., GDM, preeclampsia, gestational hypertension, excessive gestational weight gain, and severity of depressive symptoms).<sup>2,5,23-26</sup> As such, it is the opinion of the *Guidelines Consensus Panel* that physical activity should be encouraged throughout pregnancy.

Regarding a priori subgroup analyses, the evidence supported recommendations in favour of physical activity during pregnancy across subgroups, and the survey results indicated a large proportion of women and stakeholders agreed that the benefits of physical activity outweighed the costs, and that physical activity was feasible, acceptable, and equitable. The *Guidelines Consensus Panel* made a strong recommendation for previously inactive

women based on moderate quality data and the results of the surveys. This was a strong recommendation because, despite low quality evidence supporting physical activity during pregnancy for women categorized as overweight or obese, there was evidence from RCTs demonstrating an improvement in gestational weight gain and blood glucose. The recommendation for women with GDM was a weak recommendation because the quality of evidence was low, and the net benefit between women who were physically active and those who were not was small. No studies exclusively examining women 35 years of age or older were identified; therefore, no recommendation for this subgroup was provided.

## WHAT PHYSICAL ACTIVITY IS RECOMMENDED DURING PREGNANCY?

### Recommendations

2. Pregnant women should accumulate at least 150 minutes of moderate-intensity physical activity each week to achieve clinically meaningful reductions in pregnancy complications (strong recommendation, moderate quality evidence).
3. Physical activity should be accumulated over a minimum of 3 days per week; however, being active every day is encouraged (strong recommendation, moderate quality evidence).
4. Pregnant women should incorporate a variety of aerobic exercise and resistance training activities to achieve greater benefits. Adding yoga and/or gentle stretching may also be beneficial (strong recommendation, high quality evidence).
5. Pelvic floor muscle training (e.g., Kegel exercises) may be performed on a daily basis to reduce the odds of urinary incontinence. Instruction in proper technique is recommended to obtain optimal benefits (weak recommendation, low quality evidence).
6. Pregnant women who experience light-headedness, experience nausea, or feel unwell when they exercise flat on their back should modify their exercise position to avoid the supine position (weak recommendation, very low quality evidence).

The results of the systematic reviews identified that, compared with no physical activity, accumulating at least 150 minutes of moderate-intensity physical activity over 3 or more days per week was associated with clinically meaningful reductions in the odds of developing GDM, preeclampsia, and gestational hypertension.<sup>11</sup> Accumulating more physical activity (frequency, duration, or volume) over the week was associated with greater benefits; however, physical activity below the recommendations also incurred some benefit. The findings of the systematic reviews also demonstrated that combining aerobic exercise and resistance training during pregnancy was more effective at improving health outcomes than interventions focused on aerobic exercise alone.<sup>7,8</sup> We further identified a dose-response relationship between increasing intensities of physical activity and decreasing odds of preeclampsia, GDM, gestational hypertension, and a reduction in depressive symptoms and circulating maternal blood glucose.<sup>2,6,11</sup> It is important to note that for many outcomes, lower intensity physical activity also imparts benefits. Therefore, pregnant women should be encouraged to be physically active, even if they are unable to meet these recommendations. However, evidence was not identified regarding the safety or additional benefit of exercising at levels significantly above the recommendations. Indeed, the highest intensity of physical activity prescribed in the RCTs was 7.0 METs (equivalent to jogging). As such the safety and efficacy of chronic high-intensity physical activity for mother, fetus, and neonate is not known. Accordingly, the *Consensus Panel* recommends high-intensity physical activity only in a monitored environment. Moderate-intensity physical activity is recommended throughout pregnancy.

Maternal heart rate is a measure of physical activity intensity. Table 3 presents pregnancy-specific target heart rate zones for women who wish to monitor their heart rate during physical activity. Other measures of physical activity intensity include the “talk test.”<sup>27,28</sup> As the term “talk test” implies, the woman is at a comfortable intensity if she is able to maintain a conversation during physical activity and should reduce the intensity if this is not possible.

The *Consensus Panel* developed recommendations on 2 specific types of physical activity: PFMT and supine exercise. PFMT is recommended to prevent urinary incontinence even though it was not rated as a “critical” outcome and was based on low quality evidence. Prenatal PFMT is associated with a 50% reduction in prenatal and 35% reduction in postnatal urinary incontinence, which the *Consensus Panel* deemed warranted a weak recommendation.<sup>9</sup> The *Consensus Panel* recommended instruction in

**Table 3. Heart rate ranges for pregnant women<sup>a</sup>**

Maternal age	Intensity <sup>b</sup>	Heart rate range (beats/min)
<29	Light	102–124
	Moderate	125–146
	Vigorous	147–169 <sup>c</sup>
30+	Light	101–120
	Moderate	121–141
	Vigorous	142–162 <sup>c</sup>

<sup>a</sup> Target heart rate ranges were derived from peak exercise tests in medically screened low-risk pregnant women.<sup>27,28</sup>

<sup>b</sup> Moderate-intensity physical activity (40% to 59% heart rate reserve; HRR); vigorous-intensity physical activity (60% to 80% HRR).

<sup>c</sup> As there is minimal information regarding the impact of physical activity at the upper end of the vigorous-intensity heart rate ranges, women wishing to be active at this intensity (or beyond) are encouraged to consult their obstetric care provider.

proper technique to obtain optimal benefits. The recommendation for women to modify their physical activity position to avoid the supine position when feeling unwell was deemed weak as the quality of evidence was very low.<sup>12</sup> In addition, although harms were investigated, there was limited information from RCTs to inform the balance of benefits and harms. This recommendation was primarily based on expert opinion, resulting in a weak recommendation.

## CONSIDERATIONS FOR IMPLEMENTATION

The following guidance is based on the expert opinion of the *Guidelines Consensus Panel*.

### Safety Precautions

General safety precautions for women who are pregnant and physically active are presented in Table 4. Some sport activities carry significant risk in pregnancy and are considered contraindicated. Women should not scuba dive in pregnancy as the fetus is not protected from decompression sickness and gas embolism.<sup>29</sup> Women are recommended to avoid activities that involve physical contact or danger of falling, which may increase the risk of fetal trauma. These activities include, but are not limited to, horseback riding, downhill skiing, ice hockey, gymnastics, or Olympic lifts. Pregnant women are recommended to avoid non-stationary cycling as this activity may carry a higher risk of falling due to changes in body mechanics and the ability to respond to the environment (e.g., traffic, unsteady surfaces) as pregnancy progresses. As an alternative, brisk walking, stationary cycling, swimming, and aquafit are aerobic activities that are associated with less risk of falling or physical contact. With appropriate

**Table 4. Safety precautions for prenatal physical activity**

- Avoid physical activity in excessive heat, especially with high humidity.
- Avoid activities that involve physical contact or danger of falling.
- Avoid scuba diving.
- Lowlander women (i.e., living below 2500 m) should avoid physical activity at high altitude (>2500 m). Those considering physical activity above those altitudes should seek supervision by an obstetric care provider with knowledge of the impact of high altitude on maternal and fetal outcomes.
- Those considering athletic competition or exercising significantly above the recommended guideline should seek supervision by an obstetric care provider with knowledge of the impact of high-intensity physical activity on maternal and fetal outcomes.
- Maintain adequate nutrition and hydration – drink water before, during, and after physical activity.
- Know the reasons to stop physical activity, and consult a qualified health care provider immediately if they occur (see [Table 5](#)).

acclimatization, moderate-intensity physical activity at altitudes up to 1,800–2,500 m (6,000–8,250 ft) does not appear to significantly alter maternal or fetal well-being.<sup>30,31</sup> However, women should be wary of hiking in a location where they might fall. It is also important that women stay hydrated and avoid vigorous physical activity in excessive heat, especially with high humidity, to avoid dehydration (e.g., hot yoga).

During pregnancy, some women will experience a visible separation of their abdominal muscles, called diastasis recti. Those women are counselled to seek physiotherapy advice and avoid abdominal strengthening exercises (e.g., abdominal curls) as this may worsen the condition,<sup>32</sup> increasing the likelihood of requiring postnatal repair. However, continuing aerobic exercise such as walking is associated with decreased odds of developing diastasis recti.<sup>2</sup> Although there has been less research on resistance exercises as compared with aerobic exercises in pregnancy, available evidence regarding resistance exercise in pregnancy has not identified adverse impacts on mother, fetus, or neonate. Therefore, resistance training that adheres to the safety considerations in [Table 4](#) is encouraged. Further, our systematic reviews identified that “mixed” interventions combining aerobic and resistance training activities demonstrated greater improvements in pregnancy outcomes than aerobic activity alone. Women who experience light-headedness with excessive Valsalva manoeuvre (straining while holding one’s breath) when exercising should avoid the breath hold.

Women considering athletic competition or exercising significantly above the recommended guideline should speak

**Table 5. Reasons to stop physical activity and consult a health care provider**

- Persistent excessive shortness of breath that does not resolve upon rest
- Severe chest pain
- Regular and painful uterine contractions
- Vaginal bleeding
- Persistent loss of fluid from the vagina indicating rupture of the membranes
- Persistent dizziness or faintness that does not resolve upon rest

to their obstetric care provider to clarify risk and make modifications, if necessary. Elite athletes who continue to train during pregnancy are advised to seek supervision by an obstetric care provider with knowledge of the impact of vigorous-intensity physical activity on maternal, fetal, and neonatal outcomes. Recently, the International Olympic Committee released a series of recommendations to guide elite athletes during and following pregnancy.<sup>33–36</sup>

Finally, it is suggested that a warm-up and cool-down period be included in any physical activity regimen. Ligaments become relaxed during pregnancy due to increasing hormone levels and may have an impact upon range of movement, thereby increasing the risk of injury.<sup>37</sup>

All women should stop activity and seek medical attention if they experience any of the symptoms identified in [Table 5](#).

## **HOW TO START BEING ACTIVE DURING PREGNANCY?**

Previously inactive women are encouraged to start physical activity in pregnancy but may need to begin gradually, at lower intensity, and increase the duration and intensity as their pregnancy progresses. It is important to note that when dose-response relationships between physical activity and pregnancy outcomes were identified, more physical activity (frequency, intensity, duration, and volume) was associated with greater health benefits. However, an upper limit was not established.

It may be difficult for some women to follow this guideline without additional support or advice. Obstetric care professionals and exercise professionals must carefully consider the potential costs and perceived barriers to prenatal physical activity to facilitate participation. This guideline may be appropriate for women with a disability or medical condition; however, an obstetric care professional should be consulted for additional guidance. Although the majority of the



evidence base for these recommendations utilized supervised exercise, physical activity during pregnancy does not need to be done in a supervised setting or with any specific equipment. For those with financial or other barriers to participating in organized exercise, activities as simple as walking can have positive benefits.

### Other Healthy Lifestyle Habits During Pregnancy

In addition to physical activity, other components of a healthy lifestyle, including adequate nutrition and sleep, as well as abstinence from smoking, alcohol, marijuana, and illicit drugs, are highly encouraged.<sup>38–40</sup>

### RESOURCES FOR THE HEALTH CARE PROVIDER, EXERCISE PROFESSIONAL, AND PREGNANT WOMEN

The Physical Activity Readiness Medical Examination for Pregnancy (PARmed-X for Pregnancy) was developed by CSEP and endorsed by SOGC and Health Canada (and available in English, French and Spanish through CSEP's website: <http://www.csep.ca/view.asp?ccid=517>) as an aid for health care providers and exercise professionals to identify contraindications for pregnant women prior to their participation in physical activity.<sup>41</sup>

### SUMMARY

The 2019 Canadian Guideline for Physical Activity Throughout Pregnancy represent a foundational shift in our view of prenatal physical activity from a recommended behaviour to improve quality of life to a specific prescription for physical activity to reduce pregnancy complications and optimize health across the lifespan of 2 generations. It is critical that these guidelines be implemented into clinical practice to achieve the significant and potentially lifelong health benefits for both mother and child.

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