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1. Plain language summary

In the past, pregnant women were discouraged from exercise. However, this was mainly due to social and cultural biases and unfounded concerns about safety for the fetus, rather than based on scientific investigation. Today, the benefits of regular exercise for pregnant women without contraindications are well-established. These include physical benefits for maternal fitness and the prevention of excessive weight gain, as well as benefits for psychological well-being. In addition to these pregnancy-specific benefits, regular exercise confers significant life-long benefits for all adults including reduced risk of cardiovascular disease, type 2 diabetes and some cancers. Despite these important benefits, many women remain inactive, or significantly reduce their exercise participation during pregnancy. This statement summarises recommendations for exercise prescription during pregnancy to assist women to safely and confidently achieve the benefits that can be gained from regular exercise participation.

2. Summary of recommendations

Recommendation 1	Grade
Women without contraindications should participate in regular aerobic and strength conditioning exercise during pregnancy.	Evidence-based Recommendation B
Recommendation 2	Grade
Women should be advised that there is no evidence that regular exercise during an uncomplicated pregnancy is detrimental to the woman or fetus.	Evidence-based Recommendation B
Good Practice Point	Grade
Assessment of medical and obstetric risks should be undertaken to identify potential contraindications to exercise for the pregnant woman prior to commencing an exercise program.	Consensus-based Recommendation
Good Practice Point	

3. Introduction

Regular exercise has many well-established benefits for women with uncomplicated pregnancy. These include physical benefits for maternal fitness and the prevention of excessive weight gain, as well as psychological benefits related to body image, perceived health status and reduced symptoms of depression.¹⁻⁶ There is also growing indication of benefits of regular exercise for the prevention and management of maternal-fetal diseases such as gestational diabetes and pre-eclampsia.^{7,8} Regular exercise during pregnancy has also been associated with shorter and less complicated labour, as well as fewer neonatal complications,⁹⁻¹¹ although the evidence is not conclusive.¹² Regarding the offspring, animal studies have demonstrated benefits of maternal exercise for glucose tolerance, insulin sensitivity and body composition in offspring,¹³ but studies in humans are limited to some preliminary evidence for beneficial effects of maternal exercise on childhood body composition¹⁴ and infant cardiac autonomic control.¹⁵

Importantly, there is no evidence to suggest that regular exercise during an uncomplicated pregnancy is detrimental to the woman or fetus.^{1,16} Accordingly, all women with

4. Discussion and recommendations

4.1 Pre-exercise screening

Assessment of medical and obstetric risks should be undertaken to identify potential contraindications to exercise for the pregnant woman prior to commencing an exercise program. Contraindications to exercise (irrespective of pregnancy) may include

active on most days of the week for at least 30 minutes at a time. While no evidence exists for an upper limit to exercise duration, it is probably unwise to extend exercise duration beyond 60 minutes per session, unless the intensity is relatively light. This is primarily related to concerns about thermoregulation (see section 4.3). For previously inactive women and those that are overweight or obese, a shorter duration of exercise (15-20 minutes) may be necessary at the commencement of a program, before slowly building up to 30 minutes.

Intensity of exercise. The precise intensity of exercise prescribed to the pregnant woman will depend on her baseline level of fitness and previous exercise routine. For previously inactive women, an intensity of moderate exercise is adequate to obtain benefits for health and well-being. Likewise, a woman accustomed to moderate intensity exercise pre-pregnancy should aim to maintain this level of intensity during pregnancy. However, there is limited research regarding exercise at higher intensities and accordingly, no evidence-based safe upper limit for the intensity of exercise has been established. For women with a high level of fitness that are accustomed to regular vigorous exercise, there is no evidence to suggest that continued participation in vigorous exercise during pregnancy is harmful, provided the woman adjusts her routine based on changes in comfort and tolerance. However, athletes should be wary of excessive exertion as fetal well-being may be compromised above a certain (high) threshold of intensity (with some evidence of transient fetal heart rate decelerations and alterations in umbilical and uterine artery Dopplers immediately post-exercise), although it is not known whether such transient changes impact neonatal outcomes.²³ Special attention should also be paid to ensuring adequate nutrition, hydration and avoidance of overheating. Regardless of baseline level of fitness and previous exercise routine, pregnancy is not a time for serious competition or aiming to reach peak lifetime fitness.

Table 1.

Table 2. Rating of perceived exertion

6	
7	very, very light
8	
9	somewhat light
10	
11	fairly light
12	
13	somewhat hard
14	
15	hard
16	
17	very hard
18	
19	very, very hard
20	

Mode of exercise. Provided there are no contraindications pregnant women should be encouraged to participate in both aerobic and strengthening exercises. Aerobic exercises involve continuous activities that use large muscle groups and elevate the heart and breathing rate. Walking is a practical mode of exercise during pregnancy, but must be ~~dYfcfa YX UhU Bvfq NdUW ZcfUYfcVJWYbYZHCHYfdcdi Ufa cXYgcZYI YMGY Xi fb~~ pregnancy include stationary cycling and swimming. The weight-supported nature of these activities may be more comfortable in the latter stages of pregnancy. Stationary cycling may also allow women to work at a higher intensity compared with walking late in pregnancy.²⁷ Meanwhile, swimming and other water-based activities may provide benefits for oedema as a result of the redistribution of extravascular fluid with immersion. However, care should be taken to ensure that the water temperature is appropriate (i.e. not too high). As a guide,

water-based aerobics lasting 45 min in water temperatures up to 33.4 degrees Celsius appear unlikely to raise maternal core temperature above 38 degrees Celsius (with 39 degrees Celsius considered the teratogenic threshold).²⁸ Immersion in heated spas and hydrotherapy pools should be limited in duration²⁸, as these are typically kept at temperatures greater than 32 degrees Celsius. Ultimately, the precise mode of exercise and enjoyment, provided that the guidelines are adhered to.

For women who are not previously accustomed to running, it is not advisable to commence during pregnancy although there is a lack of scientific study around this notion. For women

life, with significant cardiovascular, respiratory, metabolic and musculoskeletal changes. Many of these changes have implications for exercise prescription.

- **Increase in body weight.** The increase in body weight as pregnancy progresses is associated with increased loading at the joints. For this reason, weight-supported activities such as water-based exercise or stationary cycling may be more comfortable compared with weight-bearing exercises such as walking in the later stages of pregnancy.
- **Change in weight distribution.** The altered centre of gravity resulting from the change in weight distribution as pregnancy progresses may influence balance. Accordingly, modification of the exercise routine to minimise or avoid fast changes in direction would be a sensible precaution. For this reason, preference may be given to straight-line activities such as walking, swimming or stationary cycling.
- **Increase in ligament laxity.** The increase in ligament laxity associated with pregnancy may have implications for the risk of injury. For this reason, the pregnant woman should take care with weight-bearing exercise and activities involving frequent changes in direction (i.e. court sports). Despite a lack of scientific evidence in this area, it is wise to avoid activities involving jumping. Stretching should always be performed in a slow and controlled manner.
- **Decrease in blood pressure.** To minimise the risk of dizziness or fainting associated with a reduction in blood pressure, the pregnant woman should take care to avoid rapid changes in posture (i.e. from lying or sitting to standing). Exercise should always be completed with a slow and sustained a cool-down and never stopped suddenly.
- **Increase in resting and submaximal heart rate.** This has implications for monitoring of exercise intensity using heart rate, since lower workloads are required to reach pre-pregnancy target heart rates. For this reason, pregnancy-specific heart rate zones are recommended and best used in combination with ratings of perceived exertion.

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- **Increase in metabolic rate.** Animal studies suggest that a substantial increase in core body temperature during embryogenesis is associated with congenital defects. Despite a lack of evidence in humans, the pregnant woman should take precautions to avoid exercising in high temperatures and humidity, ensure adequate hydration and wear loose-fitting clothing. As a guide, up to 35 min of high-intensity exercise (90% of maximum heart rate) in air temperatures up to 25°C and 45% relative humidity is unlikely to attain a core temperature exceeding 39.0°C.²⁸
- **Enlarged uterus.** As the uterus grows with advancing pregnancy, the weight of the enlarged uterus may obstruct venous return. Therefore ly. Abf f f f 4-3.99547(st.96 Tf2(xi)-5.98586(01876(i)-

that these activities may be best avoided, or at least undertaken with awareness and serious consideration of the potential risks.

- **Weakened pelvic floor.** Activities that involve jumping or bouncing may add extra load to the pelvic floor muscles and are probably best avoided. Targeted exercises to strengthen the pelvic floor muscles are recommended.

Recommendation 6	Grade
Exercise prescription for the pregnant woman should take into account the physiological adaptations to pregnancy, and consider the gestation at which it prescribed.	Consensus-based recommendation

In addition to these special considerations for exercise prescription for the pregnant woman, warning signs to stop exercise and seek medical attention include;

- chest pain
- unexplained shortness of breath
- dizziness, feeling faint or headache
- muscle weakness
- calf pain, swelling or redness
- sudden swelling of the ankles, hands or face
- vaginal bleeding or amniotic fluid loss
- decreased fetal movement
- uterine contractions or pain in the lower back, pelvic area or abdomen (potentially indicating pre-term labour)

5. Conclusion

There are many benefits to be gained from participating in regular exercise during pregnancy. However, many women are insufficiently active to achieve these benefits. The present guidelines are intended to assist women to safely and confidently achieve the benefits that can be gained from regular exercise participation. Importantly, for women that have not previously engaged with exercise, pregnancy may be a time when behavioural intervention may be most effective given the potential for enhanced motivation for change for the benefit of their unborn child. Indeed, pregnancy may be one of the most important times to adopt a routine of regular exercise given that lifestyle during pregnancy imprints the future health of the child.

6.

15. May LE, Scholtz SA, Suminski R, Gustafson KM. Aerobic exercise during pregnancy influences infant heart rate variability at one month of age, *Early Hum Dev.* 2014;90(1):33-8.
16. Davenport MH, Kathol AJ, Mottola MF, Skow RJ, Meah VL, Poitras VJ, Jaramillo Garcia A, Gray CE, Barrowman N, Riske L, Sobierajski F, James M, Nagpal T, Marchand AA, Slater LG, Adamo KB, Davies GA, Barakat R, Ruchat SM. Prenatal exercise is not associated with fetal mortality: a systematic review and meta-analysis. *Br J Sports Med.* 2019;53(2):108-115.
17. de Jersey SJ, Nicholson JM, Callaway LK, Daniels LA. An observational study of nutrition and physical activity behaviours, knowledge, and advice in pregnancy, *BMC Pregnancy Childbirth.* 2013;13:115.
- 18.

Appendices

Appendix A Women's Health Committee Membership

Name	Position on Committee
Professor Yee Leung	Chair and Board Member
Dr Gillian Gibson	Deputy Chair, Gynaecology
Dr Scott White	Deputy Chair, Obstetrics and Subspecialties Representative
Associate Professor Ian Pettigrew	Member and EAC Representative
Dr Kristy Milward	Member and Councillor
Dr Will Milford	Member and Councillor
Dr Frank O'Keefe	Member and Councillor
Professor Sue Walker	Member
Dr Roy Watson	Member and Councillor
Dr Susan Fleming	Member and Councillor
Dr Sue Belgrave	Member and Councillor
Dr Marilyn Clarke	ATSI Representative
Associate Professor Kirsten Black	Member
Dr Thangeswaran Rudra	Member
Dr Nisha Khot	Member and SIMG Representative
Dr Judith Gardiner	Diplomate Representative
Dr Angela Brown	Midwifery Representative, Australia
Ms Adrienne Priday	Midwifery Representative, New Zealand
Ms Ann Jorgensen	Community Representative

Appendix B Overview of the development and review process for this statement

i Steps in developing and updating this statement

This statement was developed in July 2016 and most recently reviewed in March 2020.

The following table outlines the process of reviewing this statement:

- Declarations of interest were sought from all members prior to reviewing this statement.
- Structured clinical questions were developed and agreed upon.
- An updated literature search to answer the clinical questions was undertaken.
- At the February 2020 teleconference, the existing consensus-based recommendations were reviewed and updated (where appropriate) based on the available body of evidence and clinical expertise. Recommendations were graded as set out below in Appendix B part iii)

ii. Declaration of interest process and management

Declaring interests is essential in order to prevent any potential conflict between the private interests of members, and their duties as participants in the review process.

A declaration of interest form specific to guidelines and statements was developed by the Health Committee. Health Committee members were required to declare their relevant interests in writing on this form prior to participating in the review of this statement.

	opinion and expertise
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Appendix C Full Disclaimer

This information is intended to provide general advice to practitioners, and should not be