



Exercise Testing and Prescription during Pregnancy



Rita Santos Rocha
March 2023



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Outline

- What is it?
- What do we know about it?



2

Outline



- **What is it?**
- What do we know about it?



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Exercise testing and prescription during pregnancy



- **Physical activity** and **exercise** should be part of an **active lifestyle** during pregnancy, as shown by growing evidence on its impact on the maternal **health** and **fitness** parameters.
- The **knowledge of health benefits** can lead to more favorable attitudes towards exercise during pregnancy, among women, exercise professionals and healthcare providers.

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CONCEPT ANALYSIS

How is exercise different from physical activity? A concept analysis

Nancy A. Dasso MSN, FNP-C

First published: 17 October 2018 | <https://doi.org/10.1111/nuf.12296> | Citations: 33



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Exercise testing and prescription during pregnancy

- **Physical activity** and **exercise** should be part of an **active lifestyle** during pregnancy, as shown by growing evidence on its impact on the **maternal health and fitness parameters**.

Review > Curr Opin Cardiol. 2017 Sep;32(5):541-556. doi: 10.1097/HCO.0000000000000437.

Health benefits of physical activity: a systematic review of current systematic reviews

Darren E R Warburton¹, Shannon S D Bredin

Affiliations + expand

PMID: 28708630 DOI: 10.1097/HCO.0000000000000437

Meta-Analysis > BMC Public Health. 2020 Nov 16;20(1):1724. doi: 10.1186/s12889-020-09855-3.

Exercise/physical activity and health outcomes: an overview of Cochrane systematic reviews

Pawel Posadzki^{1 2}, Dawid Pieper³, Ram Bajpai⁴, Hubert Makaruk⁵, Nadja Könsgen⁶, Annika Lena Neuhaus⁶, Monika Semwal⁷

Affiliations + expand

PMID: 33198717 PMCID: PMC7670795 DOI: 10.1186/s12889-020-09855-3



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Exercise testing and prescription during pregnancy

- **Every move counts (WHO)**, but ... supervised, tailored, effective, sustained, and safe exercise programs are more likely to improve adherence and effectiveness, and are under the **responsibility of exercise professionals**

© IMiD, Wydawnictwo Aluna

Developmental Period Medicine, 2018;XXII:2

EDITORIAL

DOI: 10.34763/devperiodmed.20182202.107112

Anna Szumilewicz, PhD

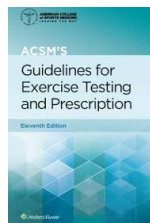
WHO AND HOW SHOULD PRESCRIBE AND CONDUCT EXERCISE PROGRAMS FOR PREGNANT WOMEN? RECOMMENDATIONS BASED ON THE EUROPEAN EDUCATIONAL STANDARDS FOR PREGNANCY AND POSTNATAL EXERCISE SPECIALISTS



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Exercise testing and prescription during pregnancy

- Recommendations and **guidelines** for physical activity and exercise...
- **Exercise testing and prescription** in pregnancy is the plan of exercise and fitness-related activities designed to meet the health and fitness **goals** and **motivations** of the pregnant woman.
- It should address the **health-related fitness components** and the **pregnancy-specific conditions**, based on previous health and exercise assessments, and take into account the **body adaptations** and the pregnancy-related **symptoms** of each stage of pregnancy and postpartum, in order to provide safe and effective exercise.



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Exercise testing and prescription during pregnancy

- Exercise professionals should be familiar with several **sources of information**:
 - Interpretation of evidence-based **studies** (different types and levels of evidence)
 - International **recommendations** for physical activity and exercise PR&PP
 - **Communication** with health professionals (health conditions, complications, contraindications)
 - Body **adaptations** and pregnancy-related symptoms
 - Exercise testing and prescription **guidelines** (steps and tools)
- **How to translate knowledge into (exercise) practice?**

Murad et al. How to read a systematic review and meta-analysis and apply the results to patient care: users' guides to the medical literature. JAMA. 2014 Jul;312(2):171-9.



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Outline



- What is it?
- **What do we know about it?**



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USDHHS, 2018

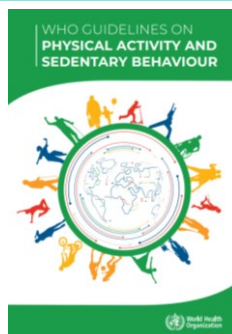


Key Guidelines for Women During Pregnancy and the Postpartum Period

- ✓ Women should do at least 150 minutes (2 hours and 30 minutes) of moderate-intensity aerobic activity a week during pregnancy and the postpartum period. Preferably, aerobic activity should be spread throughout the week.
- ✓ Women who habitually engaged in vigorous-intensity aerobic activity or who were physically active before pregnancy can continue these activities during pregnancy and the postpartum period.
- ✓ Women who are pregnant should be under the care of a health care provider who can monitor the progress of the pregnancy. Women who are pregnant can consult their health care provider about whether or how to adjust their physical activity during pregnancy and after the baby is born.

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WHO (2021)





Consensus statement

2019 Canadian guideline for physical activity throughout pregnancy

Michelle F Mottola,¹ Margie H Davenport,² Stephanie-May Ruchat,³ Gregory A Davies,⁴ Veronica J Poltras,⁵ Casey E Gray,⁶ Alejandra Jaramillo Garcia,⁵ Nick Barrowman,⁷ Kristi B Adamo,⁸ Mary Duggan,⁹ Ruben Barakat,¹⁰ Phil Chillibeck,¹¹ Karen Fleming,¹² Milena Forte,¹³ Jillian Korolnek,¹⁴ Taniya Nagpal,¹ Linda G Slater,¹⁵ Deanna Stirling,¹⁶ Lori Zehr¹⁷

This joint SOGC/CSEP Clinical Practice Guideline has been prepared by the Guidelines Consensus Panel, reviewed by the Society of Obstetricians and Gynaecologists of Canada's (SOGC) Maternal Fetal Medicine and Guideline Management and Oversight Committee, and approved by the Board of the SOGC and the Board of Directors of the Canadian Society for Exercise Physiology (CSEP). This article is being copublished in the *Journal of Obstetrics and Gynaecology Canada*: English version 2018;40(11):1549-1559. <https://doi.org/10.1016/j.jogc.2018.07.001>; French version: 2018;40(11):1560-1570. <https://doi.org/10.1016/j.jogc.2018.09.003>.



Committee Opinion No. 804

April 2020

Physical Activity and Exercise During Pregnancy and the Postpartum Period

Activity restriction should not be prescribed routinely as a treatment to reduce preterm birth... engaged in vigorous-intensity aerobic activity or who were physically active before pregnancy can continue these... Physical inactivity is the fourth-leading risk factor for early mortality worldwide 2. ... Some women are capable of resuming physical activities within days of delivery.

Guidelines with recommendations for physical activity during pregnancy & postpartum



Artículo Especial

Guías clínicas para el ejercicio físico durante el embarazo

Rubén Barakat,¹ A Díaz-Blanco,² E Franco,³ Agustina Rubin-Malmierca,⁴ Maira Briz,⁵ M Vargel,⁶ C Silva,⁷ M Sánchez-Pedra,⁸ J Gil,⁹ M Peralta,¹⁰ M Mottola,¹¹ G de Rosa,¹² Tino Pérez Medina¹³

¹Grupo de Investigación ATPE, Universidad Politécnica de Madrid; ²Servicio de Obstetricia y Ginecología, Hospital Universitario Severo Ochoa (Leganes, Madrid); ³Universidad del Cádiz; ⁴Hospital Universitario del Infanta Beatriz; ⁵Universidad Carlos III de Madrid; ⁶Univ. de Zaragoza; ⁷Univ. de Granada; ⁸Univ. de Sevilla; ⁹Univ. de Murcia; ¹⁰Univ. de Valencia; ¹¹Univ. de Toronto; ¹²Univ. de Zaragoza; ¹³Univ. de Zaragoza; ¹⁴Univ. de Zaragoza; ¹⁵Univ. de Zaragoza; ¹⁶Univ. de Zaragoza; ¹⁷Univ. de Zaragoza

Focus HealthPro
Support ExPro
Not specific ExPro
Lack specific content

Exercise and pregnancy in recreational and elite athletes IOC (2016-2018)

Consensus statement

Exercise and pregnancy in recreational and elite athletes: 2016 evidence summary from the IOC expert group meeting, Lausanne. Part 1—exercise in women planning pregnancy and those who are pregnant

Kari Be,¹ Raul Artal,² Ruben Barakat,³ Wendy Brown,⁴ Gregory A L Davies,⁵ Michael Dooley,⁶ Kelly R Evenson,⁷ Lene A H Haakstad,⁸ Karin Larsen,⁹ Bengt Kayser,¹⁰ Tarja I Kinnunen,¹¹ Michelle F Mottola,¹² Ingrid Nygaard,¹³ Mireille van Poppel,¹⁴ Britt Stuge,¹⁵ Karim M Khan¹⁶



Consensus statement

Exercise and pregnancy in recreational and elite athletes: 2016/17 evidence summary from the IOC Expert Group Meeting, Lausanne. Part 3—exercise in the postpartum period

Kari Be,¹ Raul Artal,² Ruben Barakat,³ Wendy J Brown,⁴ Gregory A L Davies,⁵ Michael Dooley,⁶ Kelly R Evenson,⁷ Lene A H Haakstad,⁸ Bengt Kayser,⁹ Tarja I Kinnunen,¹⁰ Karin Larsen,¹¹ Michelle F Mottola,¹² Ingrid Nygaard,¹³ Mireille van Poppel,¹⁴ Britt Stuge,¹⁵ Karim M Khan,¹⁶ IOC Medical Commission¹⁷

Consensus statement

Exercise and pregnancy in recreational and elite athletes: 2016 evidence summary from the IOC expert group meeting, Lausanne. Part 2—the effect of exercise on the fetus, labour and birth

Kari Be,¹ Raul Artal,² Ruben Barakat,³ Wendy Brown,⁴ Michael Dooley,⁵ Kelly R Evenson,⁶ Lene A H Haakstad,⁸ Karin Larsen,⁹ Bengt Kayser,¹⁰ Tarja I Kinnunen,¹¹ Michelle F Mottola,¹² Ingrid Nygaard,¹³ Mireille van Poppel,¹⁴ Britt Stuge,¹⁵ Gregory A L Davies,¹⁶ IOC Medical Commission

Exercise and pregnancy in recreational and elite athletes: 2016/17 evidence summary from the IOC expert group meeting, Lausanne. Part 4—Recommendations for future research

Kari Be,¹ Raul Artal,² Ruben Barakat,³ Wendy J Brown,⁴ Gregory A L Davies,⁵ Mike Dooley,⁶ Kelly R Evenson,⁷ Lene A H Haakstad,⁸ Bengt Kayser,⁹ Tarja I Kinnunen,¹⁰ Karin Larsen,¹¹ Michelle F Mottola,¹² Ingrid Nygaard,¹³ Mireille van Poppel,¹⁴ Britt Stuge,¹⁵ Karim M Khan¹⁷

Consensus statement

Exercise and pregnancy in recreational and elite athletes: 2016/2017 evidence summary from the IOC expert group meeting, Lausanne. Part 5. Recommendations for health professionals and active women

Kari Be,^{1,2} Raul Artal,³ Ruben Barakat,⁴ Wendy J Brown,⁵ Gregory A L Davies,⁶ Michael Dooley,⁷ Kelly R Evenson,⁸ Lene A H Haakstad,⁹ Bengt Kayser,¹⁰ Tarja I Kinnunen,¹¹ Karin Larsen,¹² Michelle F Mottola,¹³ Ingrid Nygaard,¹⁴ Mireille van Poppel,¹⁵ Britt Stuge,¹⁶ Karim M Khan¹⁷



Be J Sports Med first published as 10.1136/bjsports-2017-097000





Guidelines with recommendations for physical activity during pregnancy & postpartum

Health Prof / Pregnant W



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Guidelines with recommendations for physical activity during pregnancy & postpartum



- Several official guidelines on exercise during pregnancy have been **updated** recently.
- Most of these guidelines were **reviewed** by other authors and in **textbooks**.

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Guidelines with recommendations for physical activity during pregnancy & postpartum

PREGNANCY AND EXERCISE

According to 2019 Canadian Guidelines for Physical Activity Throughout Pregnancy, all women without medical restrictions should be physically active throughout pregnancy.

STUDIES SHOW PHYSICAL ACTIVITY THROUGHOUT PREGNANCY CAN REDUCE THE RISK OF:

- Evidence suggests that women who are physically active throughout pregnancy are 25% less likely to experience gestational diabetes.
- Women who are physically active throughout pregnancy are 40% less likely to experience gestational hypertension.

150 MINUTES of moderate-intensity physical activity each week is recommended for pregnant women.

RESISTANCE TRAINING

UPPER BODY	LOWER BODY
PROCELSA 2 x 10 min	IRON WORKS GREAT 2 x 10 min
TRICEPS 2 x 10 min	LEGS 2 x 10 min
UPRIGHT ROW 2 x 10 min	CALL RAISED 2 x 10 min

Guidance for Medical, Health & Fitness Professionals to Support Women in Returning to Running Postnatally

Weeks Postnatal | **Example of Exercise Progression**

Weeks 1-2: Walking, light jogging, interval training, strength training.

Weeks 3-4: Jogging, interval training, strength training, core strengthening.

Weeks 5-6: Jogging, interval training, strength training, core strengthening, long runs.

Weeks 7-8: Jogging, interval training, strength training, core strengthening, long runs, tempo runs.

Being Active During Pregnancy

Exercise is Medicine | **AMERICAN COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS**

Do you want to feel better, sleep better and do something healthy for you and your baby? Studies show that physical activity throughout pregnancy is both safe and beneficial for you and your baby. Pregnant women who do 150 minutes/week of moderate-intensity activity are 25% less likely to have high blood glucose (gestational diabetes), high blood pressure, gain too much weight or suffer from depression. The risk of giving birth to a big baby is also reduced. Even some lower-intensity physical activity leads to health benefits during pregnancy.

Women should be active throughout pregnancy, starting as early as they can. Studies show that physical activity during the first trimester is safe for the baby. In fact, being inactive can actually increase your risk of developing health problems. Talk with your health care provider about what you can do for you and your baby.

Being active while pregnant is good for you and your baby. Start now – every minute counts!

Physical activity for pregnant women

How to control blood sugar | How to prevent pre-eclampsia | How to prevent placental problems | How to prevent gestational hypertension | How to prevent gestational diabetes | How to prevent iron deficiency

150 minutes of moderate-intensity activity every week

Home | Out and about | Leisure

Every activity counts. 15 minutes of activity 10 times a week.

No evidence of harm | Listen to your body and adjust | Don't bump the bump

Pregnancy Physical Activity

Recommendations:

- Physical activity is recommended throughout pregnancy. Aim for at least 150 minutes of moderate-intensity activity each week.
- Physical activity programs should be available for all pregnant women.
- A variety of physical activity options should be offered, including walking, swimming, and prenatal yoga.
- Physical activity programs should be available for all pregnant women.
- Physical activity programs should be available for all pregnant women.

- Moreover, other organizations published these guidelines in a more accessible language to reach pregnant women.



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2019 Canadian guideline for physical activity throughout pregnancy

- All women without contraindication should be physically active throughout pregnancy. Strong recommendation, moderate-quality evidence.**
Specific subgroups were examined:
 - Women who were previously **inactive**. *Strong recommendation, moderate-quality evidence.*
 - Women diagnosed with **gestational diabetes mellitus**. *Weak recommendation, low-quality evidence.*
 - Women categorised as **overweight** or obese (prepregnancy body mass index ≥ 25 kg/m²). *Strong recommendation, low-quality evidence.*
- Pregnant women should accumulate **at least 150 min of moderate-intensity physical activity** each week to achieve clinically meaningful health benefits and reductions in pregnancy complications. *Strong recommendation, moderate-quality evidence.*
- 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.*

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2019 Canadian guideline for physical activity throughout pregnancy

4. Pregnant women should incorporate a **variety of aerobic 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 (PFMT)** (eg, Kegel exercises) may be performed on a daily basis to reduce the risk of urinary incontinence. Instruction on the **proper technique** is recommended to obtain optimal benefits. *Weak recommendation, low-quality evidence.*

6. Pregnant women who experience light-headedness, 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.*



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When to Start	First Trimester, More Than 12 weeks of gestation
Duration of a session	30–60 minutes
Times per week	At least 3–4 (up to daily)
Intensity of exercise	Less than 60–80% of age-predicted maximum maternal heart rate*
Environment	Thermoneutral or controlled conditions (air conditioning; avoiding prolonged exposure to heat)
Self-reported intensity of exercise (Borg scale)	Moderate intensity (12–14 on Borg scale)
Supervision of exercise	Preferred, if available
When to end	Until delivery (as tolerated)

*Usually not exceeding 140 beats per minute.
Modified from Berghella V, Saccone G. Exercise in pregnancy! Am J Obstet Gynecol 2017;216:335–7.

[Table 3]

Characteristics of a Safe and Effective Exercise Regimen in Pregnancy

Source

Physical Activity and Exercise During Pregnancy and the Postpartum Period: ACOG Committee Opinion Summary, Number 804

Obstetrics & Gynecology 135(4):991-993, April 2020.



ACOG, 2020

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Safety precautions (CSEP 2019)

Consensus statement

Box 1 Safety precautions for prenatal physical activity

- ▶ Avoid physical activity in excessive heat, especially with high humidity.
- ▶ Avoid activities which involve physical contact or danger of falling.
- ▶ Avoid scuba diving.
- ▶ Lowlander women (ie, living below 2500 m) should avoid physical activity at high altitude (>2500 m). Those considering physical activity above those altitudes should seek supervision from 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 guidelines should seek supervision from 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 healthcare provider immediately if they occur (see Box 2).

Box 2 Reasons to stop physical activity and consult a healthcare provider

- ▶ Persistent excessive shortness of breath that does not resolve on 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 on rest.

IOC released a series of recommendations to guide elite athletes during and following pregnancy.³³⁻³⁵

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 impact on the range of movement, thereby increasing the risk of injury.³⁶

All women should stop activity and seek medical attention if they experience any of the symptoms identified in box 2.



Br J Sports Med: first published as 10.1136/bjsports-2018-100056 on 11

Mottola et al. (2019)

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Exercise Testing and Prescription

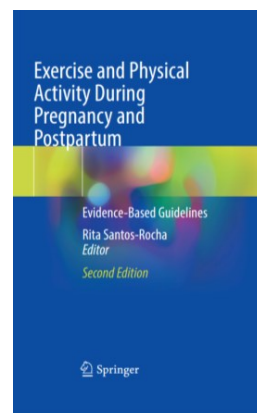
Health screening

Pre-exercise assessment

Fitness testing

Exercise prescription

Exercise adaptations - effective and safe exercise programs

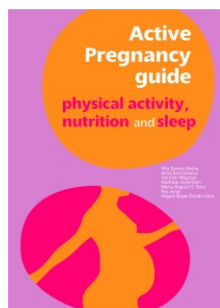


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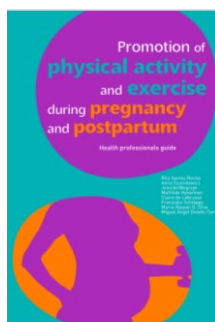


Exercise Testing and Prescription

Active Pregnancy Guide



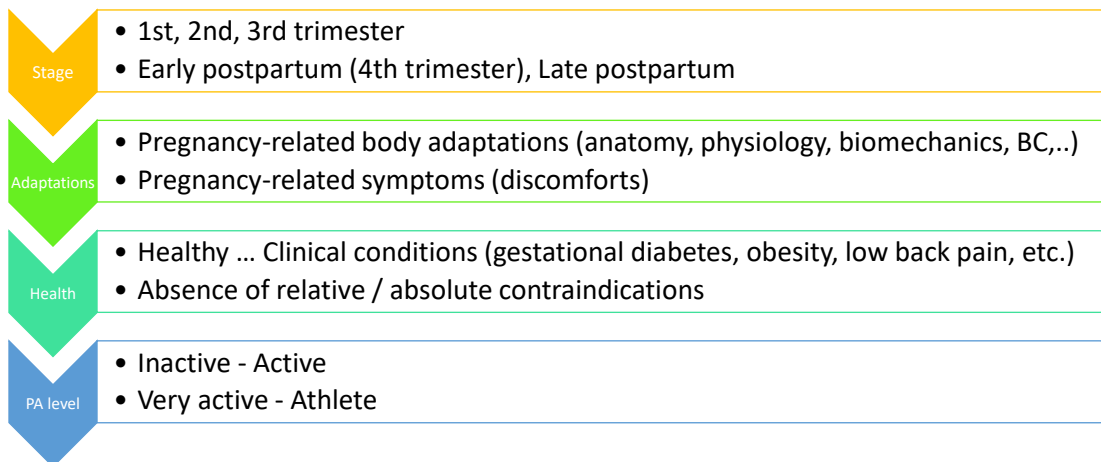
Health Professionals' Guide



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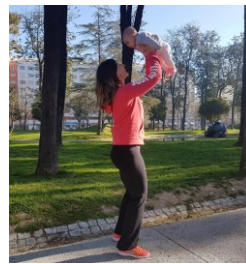
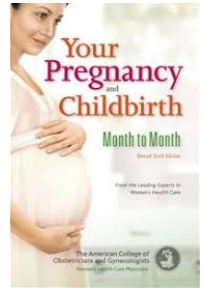


Health screening and pre-exercise assessment



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Health screening



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Health screening



2020 PAR-Q+

The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear, but your doctor should always be consulted before starting a new exercise program. Participating in an active lifestyle is an important lifestyle choice. Please print and complete this questionnaire to determine the best level of activity for you. Discuss the results of this questionnaire with your doctor or a qualified exercise professional before beginning your physical activity.

GENERAL HEALTH QUESTIONS		YES	NO
Please read the 7 questions below carefully and answer each one honestly: check YES or NO.			
1) Has your doctor ever said that you have a heart condition OR high blood pressure?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>
2) Do you feel pain in your chest at rest, during your daily activities of living, OR when you do physical activity?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>
3) Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? (Does not count if your dizziness was associated with motion sickness, seasickness, or motion sickness.)	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>
4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? Please list conditions below.	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>
5) Are you currently taking prescribed medications for a chronic medical condition? Please list conditions and medications below.	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>
6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Please answer that you had a problem in the past and do not check that you are currently able to actively exercise. Please list conditions and dates below.	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>
7) Has your doctor ever said that you should only do medically supervised physical activity?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/>	<input type="checkbox"/>

If you answered NO to all of the questions above, you are cleared for physical activity. Please sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.

If you answered YES to any of the questions above, read carefully and complete Pages 2 and 3.

Participant Declaration:

I, _____, have read, understood the content or essence of the content of your printed, printed, printed or online version of this questionnaire, and I understand that this questionnaire is not a medical examination, and that I understand that I am responsible for the accuracy of the information I provide. I understand that I am responsible for the accuracy of the information I provide. I understand that I am responsible for the accuracy of the information I provide. I understand that I am responsible for the accuracy of the information I provide.

NAME: _____ DATE: _____

SIGNATURE OF PARTICIPANT: _____

SIGNATURE OF HEALTHCARE PROVIDER: _____

If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.

Delta becoming more active:

Yes, I have a health condition and I need to consult with my doctor before starting a new exercise program.

No, I do not have a health condition and I do not need to consult with my doctor before starting a new exercise program.

Yes, I have a health condition and I need to consult with my doctor before starting a new exercise program.

No, I do not have a health condition and I do not need to consult with my doctor before starting a new exercise program.

GET ACTIVE QUESTIONNAIRE FOR PREGNANCY

CSEP SCPE

NAME (NAME OF PREGNANT/GRAVIDA IF APPLICABLE) (PLEASE PRINT): _____

YOUR DATE (DD/M/YYYY): _____ YOUR DUE DATE (DD/M/YYYY): _____ NO. OF WEEKS PREGNANT: _____ SEX: _____

Physical activity during pregnancy has many health benefits and is generally not risky for you and your baby. But for some conditions, physical activity is not recommended. This questionnaire is to help decide whether you should speak to your Obstetric Health Care Provider (e.g., your physician or midwife) before you begin or continue to be physically active.

Please answer YES or NO to each question to the best of your ability. If your health changes as your pregnancy progresses you should fill in this questionnaire again.

- In this pregnancy, do you have:
 - a. Mild, moderate or severe respiratory or cardiovascular diseases (e.g., chronic bronchitis)? YES NO
 - b. Epilepsy that is not stable? YES NO
 - c. Type 1 diabetes that is not stable or your blood sugar is outside of target ranges? YES NO
 - d. Thyroid disease that is not stable or your thyroid function is outside of target ranges? YES NO
 - e. An eating disorder(s) or malnutrition? YES NO
 - f. Twins (2 weeks pregnant or later)? Or are you expecting triplets or higher multiple births? YES NO
 - g. Low red blood cell number (anemia) with high levels of fatigue and/or light-headedness? YES NO
 - h. High blood pressure (pre-eclampsia, gestational hypertension, or chronic hypertension that is not stable)? YES NO
 - i. A baby that is growing slowly (intrauterine growth restriction)? YES NO
 - j. Unexplained bleeding, ruptured membranes or labour before 37 weeks? YES NO
 - k. A placenta that is partially or completely covering the cervix (placenta previa)? YES NO
 - l. Weak cervical tissue (cervical insufficiency)? YES NO
 - m. A stitch or tape to reinforce your cervix (cervical)? YES NO
- In previous pregnancies, have you had:
 - a. Recurrent miscarriages (loss of your baby before 20 weeks gestation two or more times)? YES NO
 - b. Early delivery (before 37 weeks gestation)? YES NO
- Do you have any other medical condition that may affect your ability to be physically active during pregnancy? What is the condition? Specify: YES NO
- Is there any other reason you are concerned about physical activity during pregnancy? YES NO

Go to Page 2 Describe Your Physical Activity Level



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Absolute and relative contraindications to PA during pregnancy (Canadian 2019)

Consensus statement

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 praevia after 28 weeks' gestation.	▶ Gestational hypertension.
▶ Pre-eclampsia.	▶ Symptomatic anaemia.
▶ Incompetent cervix.	▶ Malnutrition.
▶ Intrauterine growth restriction.	▶ Eating disorder.
▶ High-order multiple pregnancy (eg, 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.

Mottola et al. (2019)

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Review

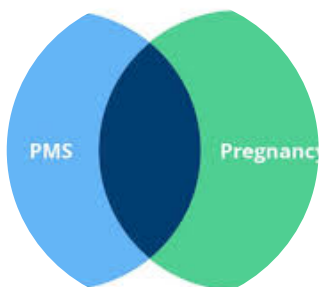
Why can't I exercise during pregnancy? Time to revisit medical 'absolute' and 'relative' contraindications: systematic review of evidence of harm and a call to action

Victoria L. Meah ¹, Gregory A. Davies, ² Margie H. Davenport ¹

Br J Sports Med: first published



Pregnancy-related symptoms



Foxcroft et al. BMC Pregnancy and Childbirth 2013, 13:3
http://www.biomedcentral.com/1471-2390/13/3



RESEARCH ARTICLE

Open Access

Development and validation of a pregnancy symptoms inventory

Kate F Foxcroft¹, Leonie K Callaway², Nuala M Byrne^{3*} and Joan Webster⁴

Abstract

Background: Physical symptoms are common in pregnancy and are predominantly associated with normal physiological changes. These symptoms have a social and economic cost, leading to absenteeism from work and additional medical interventions. There is currently no simple method for identifying common pregnancy related problems in the antenatal period. A validated tool, for use by pregnancy care providers would be useful. The aim of this study was to develop and validate a Pregnancy Symptoms Inventory for use by health professionals.
Methods: A list of symptoms was generated via expert consultation with health professionals. Focus groups were conducted with pregnant women. The inventory was tested for face validity and piloted for readability and comprehension. For test-re-test reliability, the tool was administered to the same women 2 to 3 days apart. Finally, midwives trialled the inventory for 1 month and rated its usefulness on a 10cm visual analogue scale (VAS).

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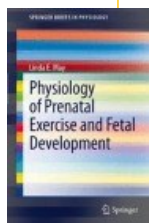




Physical and physiologic adaptations

Anatomical and physiological changes

- Circulatory system (blood, breathing, metabolic)
- Locomotion system (coordination, balance)
- Endocrine system and hormonal changes
- Weight gain



Body biomechanical and musculoskeletal adaptations

- Changes in the curvatures of the spine
- Altered range of joint motion
- Shifting the centre of gravity
- Locomotion system (gait)
- Pelvic organs and pelvic floor muscles



Psychological changes

- Anxiety
- Depression
- Stress

This requires verification of the selected exercises and modification of their techniques, as well as increased supervision for safety reasons.



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Pre-exercise assessment



Epidemiology

Development and Validation of a Pregnancy Physical Activity Questionnaire

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J Phys Act Health. 2009 Nov;6(6):790-804. doi: 10.1123/jpah.6.6.790.

Global physical activity questionnaire (GPAQ): nine country reliability

Fiona C Bull¹, Tahira S M

Affiliations + expand
 PMID: 20101923 DOI: 10.1186/1475-2875-9-10

Abstract

Purpose: Instruments to

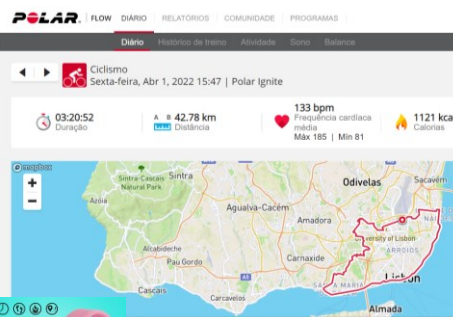
Reliability and concurrent validity of the International Physical Activity Questionnaire short form among pregnant women

Brigitte Sandoz^{1,2*}, Ingvild Vistad², Lene Annette Hagen Haakstad², Svenung Berntsen¹, Linda Reme Sagedal², Hilde Lohne-Sæller¹ and Monica Kløngeland Torstveit¹

Abstract: Sandoz B, Vistad I, Haakstad LAH, Berntsen S, Sagedal LR, Lohne-Sæller H, Torstveit MK. Reliability and concurrent validity of the International Physical Activity Questionnaire short form among pregnant women. **Background:** The International Physical Activity Questionnaire short-form (IPAQ-SF) is frequently used to assess physical activity (PA) level in the general adult population including pregnant women. However, the reliability and validity of the questionnaire in pregnancy is unknown. Therefore, the aims of the present study were to investigate test-retest reliability and concurrent validity of IPAQ-SF among pregnant women, and whether PA is reported differently among those who fulfill (active) vs. do not fulfill (inactive) recommendations of 2:150 min of weekly



PHYSICAL ACTIVITY questionnaires and trackers

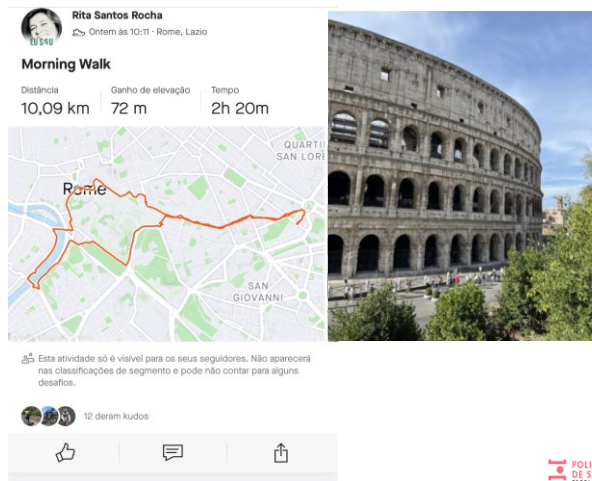
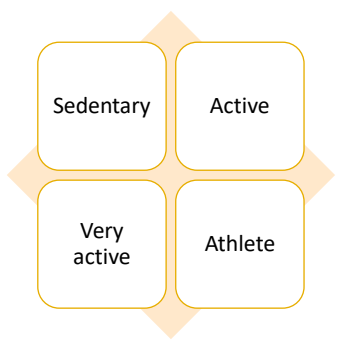


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Pre-exercise assessment



OBJECTIVES
MOTIVATIONS



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Exercise testing

- Pregnant client' **purposes** (e.g., clinical, motivation, education, goals)
- Research purposes (e.g., effectiveness)
- Anatomical and musculoskeletal **changes**
- Reliability / **Validation**
- Availability / Cost (e.g., biomechanics lab, software)
- **Expertise** (exercise physiologist / medical doctor / physiotherapist)



Cardiopulmonary exercise testing during pregnancy

Review | Birth Defects Res. 2021 Feb; 113(2):248-254. doi: 10.1002/bdr2.1796. Epub 2020 Sep 7.

Jenna B Woodside¹, Marge H Davenport¹

Affiliations → expand PMID: 32884003 DOI: 10.1002/bdr2.1796

Abstract

¹ The goal of this review is to examine practical considerations when conducting cardiopulmonary exercise testing during pregnancy in a clinical and research setting. Cardiopulmonary exercise testing during pregnancy requires identifying underlying cardiopulmonary conditions, quantifying the individual cardiopulmonary responses, as well as interpreting external factors (environmental). This review encompasses information regarding the unique physiological adaptations that occur throughout gestation (e.g., changes in resting heart rate, blood pressure, glucose, etc.) and how these adaptations impact the interpretation of physiological measurements. There are also key concerns that are unique to pregnant populations that should be considered when participating in exercise (i.e., fetus, ventilation, rehydration, urinary incontinence, low back pain, and pelvic girdle pain). This step-by-step review of cardiopulmonary exercise testing outlines pregnancy related adjustments to standardized methods (i.e., screening/documentation, pre- and post-test measurements, protocol specific, modality selection, and fetal monitoring) which should be considered for the safety of both the participant and fetus. Currently, pregnancy specific exercise testing guidelines are lacking.



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Exercise testing

- CARDIORESPIRATORY
- RESISTANCE / POSTURAL
- FLEXIBILITY
- BALANCE



- Ergometric protocols (cycloergometry and treadmill)
- Field protocols (walk tests)
- Adapted protocols from adult population (e.g., flexibility, strength)
- Protocols for older populations (e.g., balance, agility)
- Biomechanics of walking and balance
- Functional and postural tests
- Questionnaires

Guidelines????



Assessing physical fitness during pregnancy: validity and reliability of fitness tests, and relationship with maternal and neonatal health-related outcomes. A systematic review

L. Romero-Gallardo, O. Roldan-Reoyo, J. Castro-Piñero, L. May, O. Ocón, V.A. Aparicio, A. Soriano-Maldonado

doi: <https://doi.org/10.1101/2021.06.26.21259584>

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Exercise testing

Received: 6 July 2020 | Revised: 14 August 2020 | Accepted: 16 August 2020
DOI: 10.1002/bd2.1796

REVIEW ARTICLE



Cardiopulmonary exercise testing during pregnancy

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Program for Pregnancy and Postpartum Health, Faculty of Kinesiology, Sports and Recreation, Women and Children's Health Research Institute, Alberta Diabetes Institute, University of Alberta, Edmonton, Alberta, Canada

Abstract

The goal of this review is to examine practical considerations when conducting cardiopulmonary exercise testing during pregnancy. In a clinical and research setting, cardiopulmonary exercise testing during pregnancy is valuable in identifying underlying cardiopulmonary conditions, stratifying the risk of adverse

Original Research

Journal of Strength and Conditioning Research

Validity of the 6-Minute Walk Test and YMCA Submaximal Cycle Test During Midpregnancy

Rachel A. Tinus,¹ Maire Blankenship,² Jill M. Maples,³ Bailey C. Pitts,¹ Karen Furgal,³ Elizabeth S. Norris,³ Donald L. Hoover,⁴ Alyssa Olenick,¹ Joshua Lambert,⁵ and William Todd Cade⁶

¹Exercise Science Program, School of Kinesiology, Recreation and Sport, Western Kentucky University, Bowling Green, Kentucky; ²School of Nursing, Western Kentucky University, Bowling Green, Kentucky; ³Department of Physical Therapy, Western Kentucky University, Bowling Green, Kentucky; ⁴Department of Physical Therapy, Western Michigan University, Kalamazoo, Michigan; ⁵Department of Collaborative Statistics, University of Kentucky, Lexington, Kentucky; and ⁶Program in Physical Therapy, Washington University School of Medicine, St. Louis, Missouri

Abstract

Tinus, RA, Blankenship, M, Maples, JM, Pitts, BC, Furgal, K, Norris, ES, Hoover, DL, Olenick, A, Lambert, J, and Cade, WT. Validity of the 6-minute walk test and Young Men's Christian Association (YMCA) submaximal cycle test during midpregnancy. *J Strength Cond Res* XXX; 000-000, 2019—Submaximal exercise testing can be a feasible alternative to maximal testing when special populations to safely predict fitness levels; however, submaximal exercise testing has not been well-validated for use during pregnancy. The purpose of this study was to determine the concurrent validity of the 6-minute walk test (6MWT) and the YMCA submaximal cycle test (YMCACT) to predict $\dot{V}O_{2max}$ in physically active women during midpregnancy. Thirty-seven ($n = 37$) pregnant

Open access Systematic review

BMJ Open Sport & Exercise Medicine

Assessment of physical fitness during pregnancy: validity and reliability of fitness tests, and relationship with maternal and neonatal health – a systematic review

Lidia Romero-Gallardo,^{1,2} Olga Roldan Reoyo,^{3,4} Jose Castro-Piñero,^{5,6} Linda E May,^{7,8} Olga Ocón-Hernández,^{9,10} Michelle F Mottola,¹¹ Virginia A Aparicio,^{12,13} Alberto Soriano-Maldonado,^{13,14}

To cite: Romero-Gallardo L, Roldan Reoyo O, Castro-Piñero J, et al. Assessment of physical fitness during pregnancy: validity and reliability of fitness tests, and relationship with maternal

ABSTRACT

Objectives To systematically review studies evaluating one or more components of physical fitness (PF) in pregnant women, to answer two research questions: (1) What tests have been employed to assess PF in pregnant women? and (2) What is the validity and reliability of these

WHAT IS ALREADY KNOWN/WHAT IS ALREADY KNOWN ON THIS TOPIC

→ The assessment of physical fitness during pregnancy requires special considerations to preserve fetal and maternal health.



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Exercise testing



- **Objectives** To systematically review studies evaluating one or more components of physical fitness (PF) in pregnant women, to answer two research questions: (1) What tests have been employed to assess PF in pregnant women? and (2) What is the validity and reliability of these tests and their relationship with maternal and neonatal health?
- **Design** A systematic review. **Data sources** PubMed and Web of Science. **Eligibility criteria** Original English or Spanish full-text articles in a group of healthy pregnant women which at least one component of PF was assessed (field based or laboratory tests).
- **Results** A total of 149 articles containing a sum of 191 fitness tests were included. Among the 191 fitness tests, 99 (ie, 52%) assessed cardiorespiratory fitness through 75 different protocols, 28 (15%) assessed muscular fitness through 16 different protocols, 14 (7%) assessed flexibility through 13 different protocols, 45 (24%) assessed balance through 40 different protocols, 2 assessed speed with the same protocol and 3 were multidimensional tests using one protocol. A total of 19 articles with 23 tests (13%) assessed either validity (n=4), reliability (n=6) or the relationship of PF with maternal and neonatal health (n=16).
- **Conclusion** Physical fitness has been assessed through a wide variety of protocols, mostly lacking validity and reliability data, and no consensus exists on the most suitable fitness tests to be performed during pregnancy.

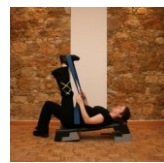


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Exercise Prescription during Pregnancy



- What forms of exercise are safe?
 - Walking, Swimming, Cycling, Aerobics, Running (for runners), Pilates.....
- The most popular forms of exercise referred in the guidelines are:
 - Low Impact Aerobics, Walking, Stationary Cycling, Water Exercise, Swimming, Strengthening, Stretching, Pelvic Floor Exercise...

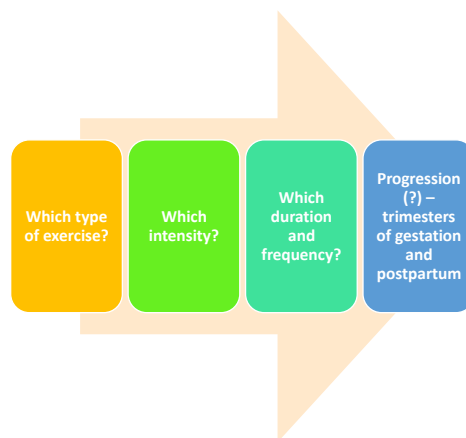


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Exercise Prescription

Exercise prescription is the plan of exercise and fitness-related activities designed to meet the health and fitness **goals** and **motivations** of the pregnant woman: It should address the **health-related fitness components** and the **pregnancy-specific conditions**, based on previous health and exercise assessments

- F – **Frequency** (how many exercise sessions per week?)
- I – **Intensity** (how hard or difficult is the exercise?) (how to monitor?)
- T - **Time** (how long is each exercise session?)
- T - **Type of exercise** (which mode of exercise?)
- V – **Volume** (which amount?)
- P – **Progression** (how to advance? How to adapt to the different trimesters?).

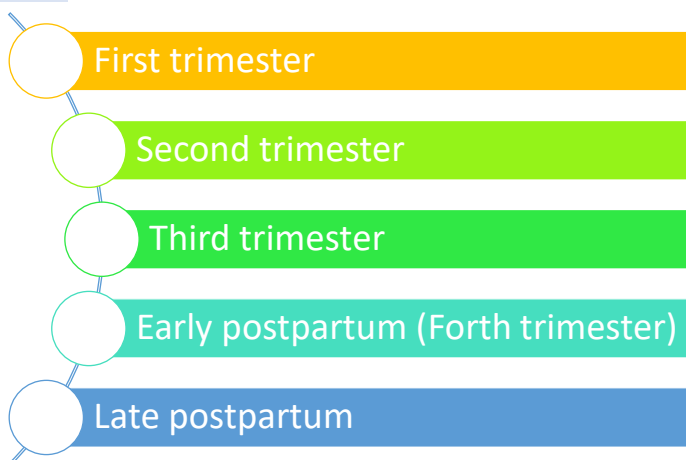


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Exercise Prescription



- AEROBIC
- RESISTANCE / POSTURAL
- FLEXIBILITY
- BALANCE and COORDINATION
- PELVIC FLOOR MUSCLES TRAINING



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How to monitor intensity?



- Some guidelines recommend the exercise intensity in the range of 65-85% of the individual maximum capacity, and the use of the "talk test" and the rate of perceived exertion scale.
- OMNI scales of perceived exertion for walking/running and cycling are also available

Table 1. The 15-Grade Scale for Ratings of Perceived Exertion ↵

6	
7	Very, very light
8	
9	Very light
10	
11	Fairly light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	



Davies et al. (2003); ACOG (2015); ACSM-RMETP7 (2014)

Reprinted from Borg GA. Psychophysical bases of perceived exertion. Med Sci Sports Exerc 1982;14:377-81.

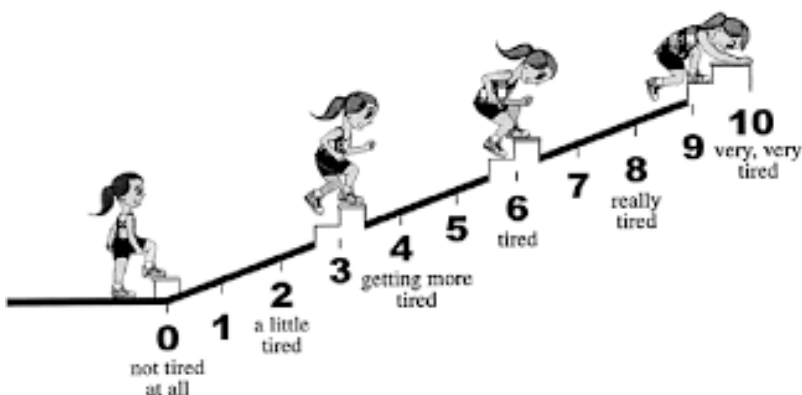


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How to monitor intensity?

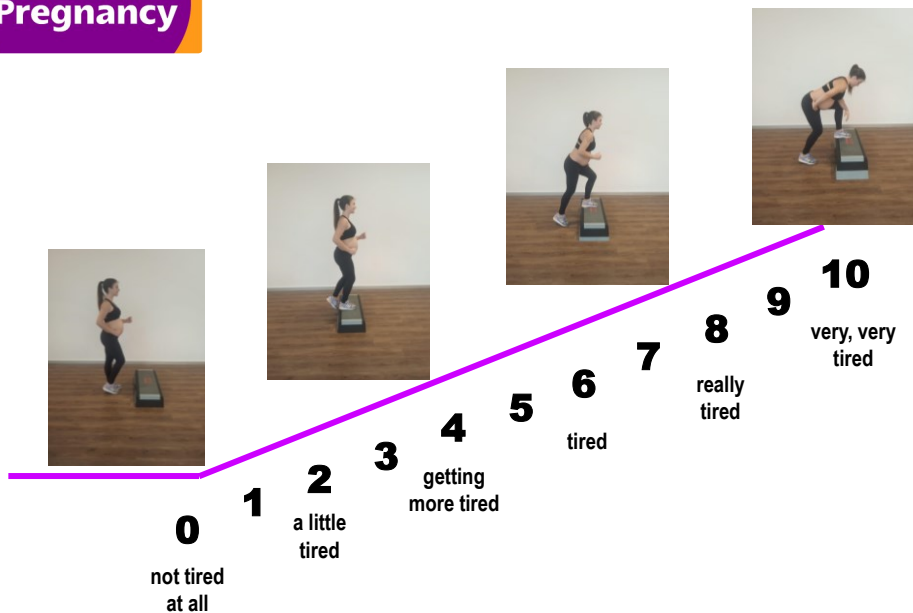


- OMNI scales of perceived exertion for walking, running and cycling are also available



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Active Pregnancy



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Active Pregnancy

How to monitor intensity?

- 2019 Canadian Guidelines - target zones for heart rate for pregnant women, depending on age and intensity.

HR target = (HRRreserve x Intensity) + HR rest

- HRRreserve = HR max – HR rest
- HR max = 207 – (0.7 x age)
- HR max = 192 – (0.007 x age²)



Mottola et al. (2019); Gellish et al. (2006)

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Consensus statement

Table 3 Heart rate ranges for pregnant women

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

Moderate-intensity physical activity (40%–59% heart rate reserve (HRR)); vigorous-intensity physical activity (60%–80% HRR).

Target heart rate ranges were derived from peak exercise tests in medically screened, low-risk pregnant women.^{26,27}

*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.



How to monitor intensity?

- Nevertheless, instructors must take into account that the pregnant body is additionally burdened by the development of pregnancy itself, which significantly determines its **response to exercise**.
- This additional effort is manifested by higher and larger **fluctuations in heart rate** and increased work of breathing.
- It significantly alters the management of the **intensity** of each training session, which sometimes requires extended warm-up and/or cancellation of interval exercises.



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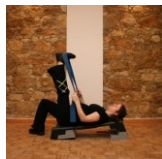
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Exercise Prescription During Pregnancy



AEROBIC EXERCISE				
Type	Intensity	Duration	Frequency	Progression / Adaptation
Exercises that activate large muscle groups in a rhythmic and continuous fashion	Moderate intensity exercise (3-5.9 METs; RPE = 12-13; 40%-60% VO _{2reserve})	30 min / day of accumulated moderate intensity exercise to total at least 150 min / week	Previous sedentary: up to 3 days / week	The optimal time to progress is after the 1st trimester (13 wk) because the discomforts and risks of pregnancy are lowest at that time
A variety of weight- and non-weight-bearing activities are well tolerated during pregnancy	Vigorous intensity exercise (>6 METs; RPE = 14-17) for women who were highly active prior to pregnancy or for those who progress to higher fitness levels during pregnancy	75 min / week of vigorous intensity	Previous active: 3-5 days / week to most days of the week	Avoid activities with risk of fall and trauma
Aerobic exercises can be categorized by the intensity and skill demands		Previous inactive women should progress from 15 to 30 min / day		Activities that require jumping movements and quick changes in direction which can stress joints should be done with caution to minimize the risk of joint injury

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Exercise Prescription During Pregnancy

RESISTANCE				
Type	Intensity	Duration	Frequency	Progression / Adaptation
A variety of machines, free weights, and body weight exercises are well tolerated during pregnancy	Intensity that permits multiple submaximal repetitions (i.e., 8-10 or 12-15 repetitions) to be performed to the point of moderate fatigue (40%-60% of estimated one repetition maximum)	<p>1 set for beginners</p> <p>2-3 sets for intermediate and advanced</p> <p>Target major muscles groups</p> <p>A basic program includes 8-10 different exercises</p>	2-3 nonconsecutive days / week	<p>Consider exercising in the supine position after 16 wk of pregnancy to ensure that venous obstruction does not occur</p> <p>Avoid performing the Valsalva maneuver during exercise</p> <p>Heavy-resistance weight lifting and intense repetitive isometric exercises should be limited until more data is available</p>

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Exercise Prescription During Pregnancy

FLEXIBILITY				
Type	Intensity	Duration	Frequency	Progression / Adaptation
A series of active or passive static and dynamic flexibility exercises for each muscle-tendon unit	Stretch to the point of feeling tightness or slight discomfort	<p>Hold static stretch for 10-30 s (up to 60 s)</p> <p>2-4 repetitions of each exercise</p>	At least 2-3 up to 7 days / week	Avoid excessive joint stress

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Exercise Prescription During Pregnancy

NEUROMOTOR				
Type	Intensity	Duration	Frequency	Progression / Adaptation
Exercises involving motor skill, e.g., balance, agility, coordination, gait), proprioceptive training, and multifaceted activities (e.g., Pilates, Yoga, tai chi)	<p>Intensity in balance training refers to the degree of difficulty of the postures, movements, or routines practiced</p> <p>An effective intensity (and volume) of neuromotor exercise has not been determined</p>	20-30 to 60 min / day	At least 2-3 up to 7 days / week	<p>Can be included in daily activities</p> <p>The only supervision requirement is the safety considerations and the level of fall risk</p> <p>Ensure proper technique</p> <p>Avoid positions that are uncomfortable or likely to result in loss of balance and falling</p>

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Exercise Prescription During Pregnancy

PELVIC FLOOR TRAINING				
Type	Intensity	Duration	Frequency	Progression / Adaptation
<p>Complex training for pelvic-floor muscles should be focused both on their contraction and relaxation</p> <p>Various devices can be used to increase the effectiveness and attractiveness of exercise, e.g. vaginal cones</p>	An effective intensity (and volume) of pelvic floor exercise has not been determined	10-30 min / day	1-7 days / week	<p>Can be done anywhere, anytime</p> <p>Should be incorporated in any prenatal exercise program</p> <p>Ensure proper technique</p> <p>Different exercises should be performed to improve pelvic floor muscle speed, strength, endurance and muscular coordination, and engaging both fast and slow twitch muscle fibers</p>

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Exercise Prescription During Pregnancy

> Int J Environ Res Public Health. 2022 Apr 18;19(8):4902. doi: 10.3390/ijerph19084902.

Active Pregnancy: A Physical Exercise Program Promoting Fitness and Health during Pregnancy- Development and Validation of a Complex Intervention

Rita Santos-Rocha ^{1, 2}, Marta Fernandes de Carvalho ¹, Joana Prior de Freitas ¹, Jennifer Wegrzyk ³, Anna Szumilewicz ⁴

Affiliations + expand

PMID: 35457769 PMCID: PMC9028999 DOI: 10.3390/ijerph19084902

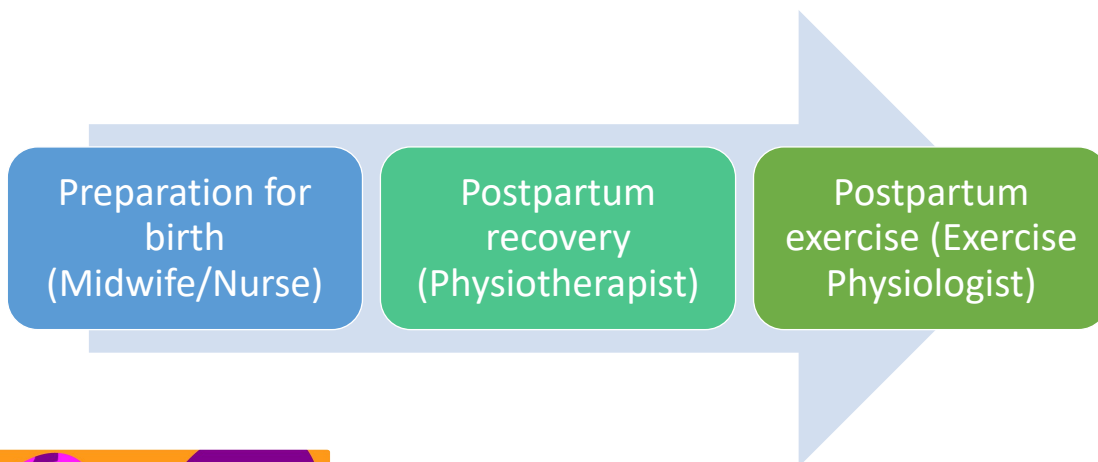
Free PMC article

- 1) warm-up: 5-10 minutes (8-17%);
- 2) aerobic training: 25 minutes (42%);
- 3) neuromotor training (posture, balance and coordination): 5 min (8%);
- 4) resistance training (core, lower and upper limbs): 10 min (17%);
- 5) pelvic floor training: 5 min (8%);
- 6) stretching: 5 min (8%);
- 7) breathing and relaxation: 5 min (8%).



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Exercise Prescription During Pregnancy



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Exercise Selection, Adaptation & Intervention



Resistance and postural exercise



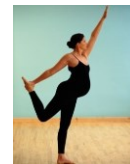
Balance and coordination exercise



Stretching exercise



Pelvic floor muscle training



Low-High-impact aerobic exercise



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Exercise Selection, Adaptation & Intervention



- 1) warm-up: 5-10 minutes (8-17%);
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- 6) stretching: 5 min (8%);
- 7) breathing and relaxation: 5 min (8%).



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Exercise Selection, Adaptation & Intervention



- **Supervision** is recommended to ensure proper technique, provide confidence, and ensure the progression of appropriate levels of intensity and complexity.
- The exercise professional should provide regular feedback, positive reinforcement, and behavioral strategies to enhance **adherence**.
- The exercise professional should also provide the **safest** possible training and testing **environment**, as well as preventing exercise-related emergencies, and be familiar with the safety and emergency procedures available at the fitness setting where the exercise program is delivered.



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Exercise Selection, Adaptation & Intervention

- Each type of exercise or program requires specific adaptations (type of exercises, positions, technique, cadence, weight, impact, repetitions, environment, sportswear ...)



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Active Pregnancy

YouTube

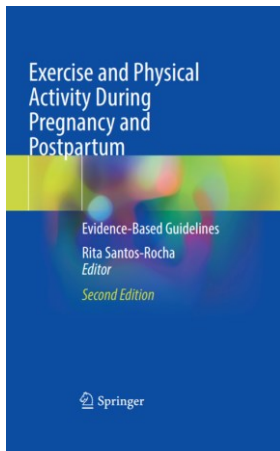
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Exercise and Physical Activity During Pregnancy and Postpartum. Evidence-Based Guidelines

<https://www.springer.com/gp/book/9783319910314>

- 1 - **Physical activity, exercise, and health promotion for the pregnant exerciser** Mireille van Poppel, Katrine Mari Owe, Rita Santos-Rocha, Hélia Dias, and Miguel Ángel Oviedo-Caro
- 2 - **Psychological, social, and behavioural changes during pregnancy: implications for physical activity and exercise** Lou Atkinson and Megan Teychenne
- 3 - **Physiological changes during pregnancy. Main adaptations, discomforts and implications for physical activity and exercise** María Perales, Taniya Singh Nagpal, and Ruben Barakat
- 4 - **Body composition changes during pregnancy and effects of physical exercise** Nuno M. Pimenta, Frøydís Hausmann, Coral Falco, and Mireille van Poppel
- 5 - **Biomechanical adaptations of gait in pregnancy. Implications for physical activity and exercise** Marco Branco, Rita Santos-Rocha, Liliana Aguiar, Filomena Vieira, and António Prieto Veloso
- 6 - **Specific musculoskeletal adaptations in pregnancy: pelvic floor, abdominal muscles, pelvic girdle, and lower back. Implications for physical activity and exercise** Kari Bø, Britt Stuge, and Gunvor Hilde
- 7 - **Evidence-based and practice-oriented guidelines for exercising during pregnancy** Anna Szumilewicz, Aneta Worska, Rita Santos-Rocha, and Miguel Ángel Oviedo-Caro
- 8 - **Exercise testing and prescription in pregnancy** Rita Santos-Rocha, Isabel Corrales Gutiérrez, Anna Szumilewicz, and Simona Pajaujiene
- 9 - **Exercise selection and adaptations during pregnancy** Anna Szumilewicz and Rita Santos-Rocha
- 10 - **Exercise prescription and adaptations in early postpartum** Rita Santos-Rocha, Anna Szumilewicz, and Simona Pajaujiene
- 11 - **Strengthening competences of future healthcare professionals to promote physical activity during pregnancy and post-partum** Jennifer Wegrzyk, Mathilde Hyvärinen, Claire De Labrusse, and Franziska Schläppy
- 12 - **Therapeutic Exercise regarding Musculoskeletal Health of the Pregnant Exerciser and Athlete** Augusto Gil Pascoal, Britt Stuge, Patrícia Mota, Gunvor Hilde, and Kari Bø
- 13 - **Nutritional and energy requirements of the pregnant exerciser and athlete** Maria-Raquel G. Silva, and Belén Rodriguez
- 14 - **Diet Recommendations for the Pregnant Exerciser and Athlete** Rui Jorge, Diana Teixeira, Inês Ferreira, and Ana Luisa Alvarez Falcón



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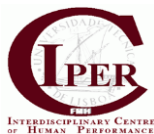


Thank you very much!

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Rita Santos Rocha

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- <http://ciper.fmh.ulisboa.pt/>
- <https://www.youtube.com/channel/UCEUWdoBeh5rgfM0kZOn9Xtg>
 - #AtivoEmCasa #ActiveAtHome
- <https://www.youtube.com/channel/UC0VyookwC0mcQ5T70imtoNA>
 - #GravidezAtiva #ActivePregnancy



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