



Benefits of Exercise during Pregnancy



Rita Santos Rocha

March 2023



1

Benefits of exercise during pregnancy



- Potential benefits of prenatal physical activity and exercise, for the mother, the course of pregnancy and fetal development and health, labor and delivery



2

Outline

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



3

Outline

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



4



Benefits of exercise during pregnancy

- **Understanding** the benefits of physical activity and exercise requires different approaches and perspectives, such as:
 - Exercise vs physical activity
 - Metabolic vs biomechanical stimulus
 - Prevention vs treatment (or effectiveness)
 - Evidence-based vs expert opinion



5



Physical Activity vs Exercise

- **Physical activity** is defined as any bodily movement produced by the contraction of skeletal muscles that results in a substantial increase in **caloric requirements** over resting energy expenditure.
- Physical activity can be categorized either by different **contexts**, such as leisure-time, exercise, sports, occupational, household, and transportation activities, or by **intensity**.



6





Physical Activity vs Exercise

- **Exercise** is a type of physical activity consisting of **planned, structured, and repetitive** body movement to improve and/or maintain one or more components of physical fitness.
- Exercise is a subcategory of physical activity. Although energy expenditure is increased during physical activity, it does not necessarily reflect exercise, and should not be confused with *fitness*.
- **Physical fitness** is defined as a set of attributes or characteristics that individuals have or achieve with regards to their ability to perform physical activity.



7



Physical Activity vs Exercise

- Davenport MH, McCurdy AP, 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, Nuspl M, Slater LG, Barakat R, Adamo KB, Davies GA, Ruchat SM. Impact of **prenatal exercise** on both prenatal and postnatal **anxiety and depressive symptoms**: a systematic review and meta-analysis. Br J Sports Med. 2018 Nov;52(21):1376-85.
- Nakamura A, van der Waerden J, Melchior M, Bolze C, El-Khoury F, Pryor L. **Physical activity during pregnancy and postpartum depression**: Systematic review and meta-analysis. J Affect Disord. 2019 Mar 1;246:29-41.



8



Metabolic vs Mechanical Intensity

- Physical activity (and exercise) can be categorized by **METABOLIC INTENSITY**
- MET = Multiple of resting metabolic rate**, used as a measure of exercise intensity
 - Light metabolic intensity = less than 3 METs - metabolic equivalents
 - Moderate metabolic intensity = between 3 and 5.9 METs
 - Vigorous metabolic intensity = 6 METs or more
- In contrast, *sedentary behavior* involves activities of less than 1.5 METs including desk-based office work, driving a car and watching television.



9



Metabolic vs Mechanical Intensity

- Physical activity (and exercise) can be categorized by **BIOMECHANICAL INTENSITY**
- The **ground reaction force** (GRF), especially the vertical component = biomechanical loading in Newton, in Kg, in units of body weight
 - High skeletal loading intensity has been defined as peak-GRF of greater than 4 times body-weight (BW);
 - Moderate intensity as 2-4 BW;
 - Low intensity as GRF less than 2-BW
- Regular exposure to moderately high magnitudes of force is desirable within certain levels:** mechanical stress will induce adaptation on biological structures
- Biomechanical risks of exercise:** the same forces might produce undesirable effects such as discomfort, pain, and orthopedic injury, if is a very high impact and overloading factor, especially when forces are too repetitive in a period of time. On the contrary, if it doesn't meet a minimum amount of loading, leads to a low osteogenic potential.
 - A **minimum osteogenic effect** was related to 1,5-2 BW;
 - OI (one session) = $Peak\ ground\ reaction\ force(BW) * Ln(number\ of\ loading\ cycles+1)$.



10

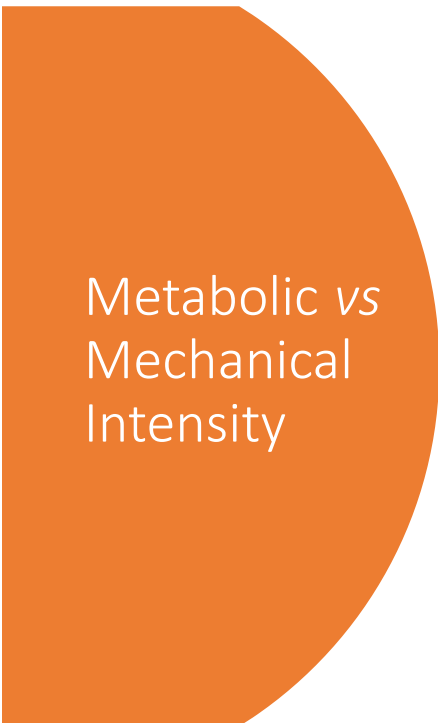


Metabolic vs Mechanical Intensity

- A woman is running for 30 min at a comfortable speed. This stimulus can be translated in
 1. An aerobic effort whose intensity is about 60% of the maximal oxygen uptake, which is consuming a certain amount of calories;
 2. A mechanical effort of which vertical component of the ground reaction force is about 1600 Newton or about two times the person's body weight and it has been applied around 1500 times on each feet.



11



Metabolic vs Mechanical Intensity

- Cai C, Ruchat SM, Sivak A, Davenport MH. Prenatal Exercise and **Cardiorespiratory Health and Fitness**: A Meta-analysis, *Medicine & Science in Sports & Exercise*. July 2020;52(7):1538-48.
- Davenport MH, Marchand AA, Mottola MF, Poitras VJ, Gray CE, Jaramillo Garcia A, Barrowman N, Sobierajski F, James M, Meah VL, Skow RJ, Riske L, Nuspi M, Naggal TS, Courbalay A, Slater LG, Adamo KB, Davies GA, Barakat R, Ruchat SM. Exercise for the prevention and treatment of **low back, pelvic girdle and lumbopelvic pain** during pregnancy: a systematic review and meta-analysis. *Br J Sports Med*. 2019 Jan;53(2):90-98.
- Díaz-Burrucco JR, Cano-Ibáñez N, Martín-Peláez S, Khan KS, Amezcua-Prieto C. Effects on the maternal-fetal health outcomes of **various physical activity types** in healthy pregnant women. A systematic review and meta-analysis. *Eur J Obstet Gynecol Reprod Biol* 2021;262:203-15.
- Watts NB, Binkley N, Owens CD, Al-Hendy A, Puscheck EE, Shebley M, Schlaff WD, Simon JA. **Bone Mineral Density** Changes Associated With Pregnancy, Lactation, and Medical Treatments in Premenopausal Women and Effects Later in Life. *J Womens Health (Larchmt)*. 2021 Oct;30(10):1416-30.
- Kyle EM, Miller HB, Schueler J, Clinton M, Alexander BM, Hart AM, Larson-Meyer DE. Changes in **Bone Mineral Density** and **Serum Lipids** across the First Postpartum Year: Effect of Aerobic Fitness and Physical Activity. *Nutrients*. 2022 Feb 8;14(3):703.

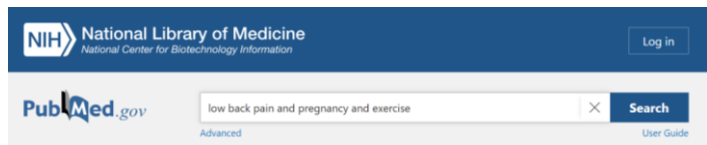


12



Prevention vs Treatment

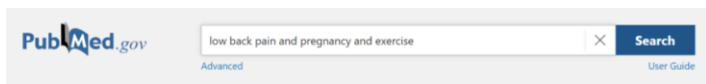
- Search in PubMed:
- low back pain and pregnancy and exercise



13



Effectiveness (acute vs chronic)



14





Prevention vs Treatment

Meta-Analysis > Br J Sports Med. 2019 Jan;53(2):90-98. doi: 10.1136/bjsports-2018-099400. Epub 2018 Oct 18.

Exercise for the prevention and treatment of low back, pelvic girdle and lumbopelvic pain during pregnancy: a systematic review and meta-analysis

Margie H Davenport¹, Andree-Anne Marchand², Michelle F Mottola³, Veronica J Poitras⁴, Casey E Gray⁵, Alejandra Jaramillo Garcia⁴, Nick Barrowman⁶, Frances Sobierajski¹, Marina James¹, Victoria L Meah⁷, Rachel J Skow¹, Laurel Riske¹, Megan Nuspl⁸, Taniya S Nagpal³, Anne Courbalay², Linda G Slater⁹, Kristi B Adamo¹⁰, Gregory A Davies¹¹, Ruben Barakat¹², Stephanie-May Ruchat¹³

Affiliations + expand

PMID: 30337344 DOI: 10.1136/bjsports-2018-099400

FULL TEXT LINKS

BMJ Full Text

ACTIONS

Cite

Favorites

SHARE



PAGE NAVIGATION

- PREVENTION
- TREATMENT
- EFFECTIVENESS



15



Prevention vs Treatment/Effectiveness PROTOCOLS



PubMed.gov low back pain and pregnancy and exercise Search

Search results Save Email Send to Display options

Meta-Analysis > Medicine (Baltimore). 2020 Jan;99(3):e17318. doi: 10.1097/MD.00000000000017318.

Effects of exercise therapy for pregnancy-related low back pain and pelvic pain: A protocol for systematic review and meta-analysis

Xiang Hu¹, Ming Ma², Xiangzhu Zhao², Wudong Sun², Yanli Liu², Zengyuan...

Affiliations + expand

PMID: 32011431 PMID: PMC7220333 DOI: 10.1097/MD.00000000000017318

Free PMC article

FULL TEXT LINKS

Wolters Kluwer

PMC Full text

ACTIONS

Cite

Favorites

SHARE

BMJ Open. 2020 Jun 15;10(6):e033844. doi: 10.1136/bmjopen-2019-033844.

Effectiveness of breathing exercises, foot reflexology and back massage (BRM) on labour pain, anxiety, duration, satisfaction, stress hormones and newborn outcomes among primigravidae during the first stage of labour in Saudi Arabia: a study protocol for a randomised controlled trial

Kamiya Jamal Baljon¹, Muhammad Hibaullah Romli², Adibah Hani...

Affiliations + expand

PMID: 32540887 PMID: PMC7299053 DOI: 10.1136/bmjopen-2019-033844

Free PMC article

FULL TEXT LINKS

BMJ Full Text

PMC Full text

ACTIONS

Cite

Favorites

SHARE



PAGE NAVIGATION



16





Evidence-based vs Expert opinion

Types of studies & sources of information

- GUIDELINES FOR EXERCISE AND PHYSICAL ACTIVITY
- STATEMENTS / POSITION STAND / EXPERT OPINION
- REVIEW STUDIES / SCOPING REVIEWS
- OBSERVATIONAL STUDIES
- RANDOMIZED CONTROL TRIALS (RCT)
- SYSTEMATIC REVIEWS / UMBRELLA REVIEWS

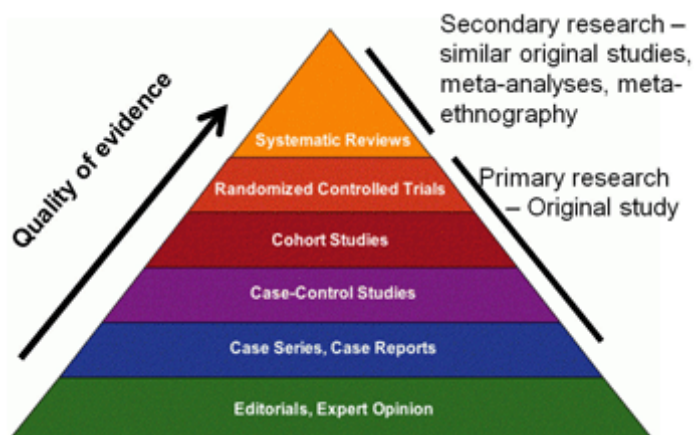
- TYPE OF EVIDENCE?
- LEVEL OF EVIDENCE?
- MECHANISMS?
- ACUTE OR CHRONIC?



17



https://flexiblelearning.auckland.ac.nz/pilson/51_5.html



18





Evidence-based vs Expert opinion

Pregnancy & Fetus

EXERCISE DURING PREGNANCY

A Prescription for Improved Maternal/Fetal Well-being
by Margie H. Davenport, Ph.D.

Apply It!

- Pregnant women are recommended to engage in at least 150 minutes of moderate-intensity physical activity over three or more days per week.
- This level of PA significantly reduces the odds of developing pregnancy complications (i.e., diabetes and hypertension) without increasing the odds of miscarriage, early delivery, or a small baby.
- Engaging in physical activity during pregnancy reduces the odds of developing depression by 67% and reduces the severity of depressive symptoms.
- Increasing the amount of weekly exercise concurrently reduces the odds of developing pregnancy-related complications.

Key words: Exercise, Guidelines, Pregnancy, Prenatal, Physical Activity

Women are not just small men, but biologically different, and a woman's life span has events that are women specific, such as menstruation, pregnancy, and menopause. Although each is important to their own right, pregnancy is unique in that events occurring during gestation can have a lifelong effect on the health and wellness of both mother and baby. Over the nine short months of pregnancy, rapid and profound physiological adaptations occur to enable every system in the body to support the growing fetus. The cardiovascular system in particular experiences some of the most pronounced changes, with the mother experiencing an increase in blood volume (~50%), cardiac output (~30%), heart rate (10 to 15 BPM at rest), and heart size (~30%), with a concurrent reduction in arterial resistance (1). With these myriad changes, and the impending birth of a baby, maintaining optimal wellness during pregnancy is paramount for a healthy delivery and for setting a strong foundation of lifelong well-being.

In addition to the many physiological adaptations occurring, women face numerous sociocultural changes both during and after pregnancy, which is a life-altering event for most new mothers. Pregnancy involves a unique and complex mix of emotions, and each woman responds to these in a different manner. In addition to the stress of hoping for a safe and health pregnancy, many women worry about their relationship with the baby, what family support will look like, if they will have to go to work. These unavoidable stresses, along with the numerous hormonal changes occurring during and after pregnancy, all contribute to serious issues like pregnancy-induced and postpartum depression. Therefore, supporting women both physically and emotionally throughout pregnancy is critical to ensuring the health of both mother and fetus and to the springboard toward greater lifetime wellness.

Journal of Mother and Child

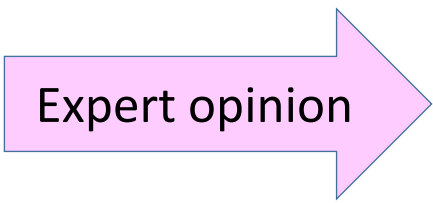
Dev Period Med, 2018 Jun; 22(2): 107–112. PMID: 30056396

Published online 2018 Jun 30. doi: 10.34763/devperiodmed.20182202_107112

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

Anna Szumlewiec, PhD, Assistant Professor* 1

* Author information • Article notes • Copyright and License information [Disclaimer](#)



Evidence-based vs Expert opinion

Hindawi Publishing Corporation
The Scientific World Journal
Volume 2014, Article ID 127980, 5 pages
http://dx.doi.org/10.1155/2014/127980

Review Article

Biomechanics of Gait during Pregnancy

Marco Branco,^{1,2} Rita Santos-Rocha,^{1,2} and Filomena Vieira^{1,2}

¹Interdisciplinary Centre for the Study of Human Performance (CIPER), Faculty of Human Kinetics (FAMH), University of Lisbon (ULIS), 1499-002 Cruz Queiroz Dafunde, Portugal
²Sport Sciences School of Rio Maior (ESDRM), Polytechnic Institute of Santarém (IPS), 2040-413 Rio Maior, Portugal
³Faculty of Human Kinetics (FAMH), University of Lisbon (ULIS), 1499-002 Cruz Queiroz Dafunde, Portugal

Correspondence should be addressed to Marco Branco; marcobranco@redim.ipsantarem.pt

Received 25 October 2014; Accepted 27 November 2014; Published 21 December 2014
Academic Editor: Naval Vikram

Exercise Prescription for Overweight and Obese Women: Pregnancy and Postpartum

Michelle F. Mottola, PhD, MSc, PhD^{1,2,3,4*}

KEYWORDS

- Maternal exercise
- Overweight
- Obese
- Postpartum
- Weight management

Women of childbearing age are at an increased risk for obesity¹ and diabetes² because of excessive weight gain during pregnancy and weight retention after delivery.³ Population estimates of maternal obesity and being overweight range from 34%⁴ to 39%⁵ worldwide, with an increasing prevalence of 69% over 10 years (1993 to 2003) in nine states in the United States.⁶ A study of 18,633 patients collected from 1987 to 1997 showed a prevalence of 23% for overweight and obese pregnant women,⁷ which may be an underestimation of the current situation.

¹Overweight women who have experienced previous weight retention start their next



Review > Birth Defects Res. 2021 Feb 1;113(3):248-264. doi: 10.1002/bdr2.1796. Epub 2020 Sep 7.

Cardiopulmonary exercise testing during pregnancy

Jenna B Wozdzia¹, Margie H Davenport¹

Affiliations + expand
PMID: 32894003 DOI: 10.1002/bdr2.1796



Downloaded from <http://bjpm.bmj.com/> on October 19, 2015 - Published by group.bmj.com

Review



Exercise during pregnancy. A narrative review asking: what do we know?

Ruben Barakat,¹ Maria Perales,¹ Nuria Garatachea,^{2,3} Jonatan R Ruiz,⁴ Alejandro Lucia^{2,5}

¹AFPE Research Group, Faculty of Physical Activity and Sports Sciences-INEF, Technical University of Madrid, Madrid, Spain
²Research Institute of the Hospital 12 de Octubre ("+12"), Madrid, Spain
³Faculty of Health and Sport Science, University of Zaragoza, Huesca, Spain
⁴PROFIT+ Promoting Fitness and Health through physical activity research group, Faculty of Sport Sciences, Department of Physical Education and Sports, University of Granada, Granada, Spain
⁵European University, Madrid, Spain

Correspondence to: Dr Ruben Barakat, AFPE Research Group, Faculty of Physical Activity and Sports Sciences-INEF, Technical University of Madrid c/Martin Fierro 7, Madrid 28040, Spain; barakatruben@gmail.com

ABSTRACT
 Although there is no consensus as to whether exercise is beneficial during pregnancy, most studies report it poses no risk to either the mother or the fetus, and many suggest it to be beneficial to both. This review, which examines the evidence available, also reveals the many differences in study design followed, the type of exercise undertaken and the variables measured, which make it difficult to compare results. Advances in our understanding of the effects of exercise during pregnancy might best be made by undertaking randomised clinical trials with standardised protocols. However, most of the studies examining the relationship between exercise and pregnancy report no complications on maternal or fetal well-being. This is also in line with recent review studies advising that the pregnant population without obstetric contraindications should be encouraged to exercise during pregnancy. Therefore, the results of the present review stimulate those responsible for the healthcare of the pregnant woman to recommend moderate exercise throughout pregnancy without risk to maternal and fetal health.

essential for normal fetal development, also accumulate, and hormonal changes promote water retention.¹³ Maternal weight gain, normally some 10–13 kg,¹⁴ is one of the most obvious changes of pregnancy. The Institute of Medicine recommends weight gains for underweight, normal weight, overweight and obese women of 12.5–18, 11.5–16, 7–11.5 and 5–9 kg, respectively.^{15–17}
 Extensive changes occur in the respiratory system during pregnancy, including anatomical and functional alterations; these occur early on under the influence of (mainly) progesterone, even before the growing uterus mechanically impairs ventilation. The diaphragm rises by about 4 cm due to a flaring of the lower ribs.¹² This helps produce the slight increase in tidal volume and oxygen consumption (VO₂) noted in pregnant women, presumably to help supply the oxygen requirements of the fetus.¹⁸
 The growing breast, uterus and fetus, along with increased lumbar lordosis, result in a shift in the mother's centre of gravity, which may cause balance problems.¹⁹ During pregnancy, hormonal changes are thought to induce a greater laxity of the joints, helping to soften the pubic symphysis and thus accommodate delivery. Increased joint



The Benefits of Physical Activity During Pregnancy

W Brown

School of Human Movement Studies, The University of Queensland, Queensland, Australia.

Brown, W. (2002). The benefits of physical activity during pregnancy. *Journal of Science and Medicine in Sport* 5 (1): 37-45.

The aims of this paper are (1) to comment on the evidence relating to the health risks and benefits of physical activity (PA) for pregnant women and their unborn foetuses, and (2) to discuss the public health benefits of participation in appropriate physical activity during pregnancy. Evidence from recent original research and review papers suggests that there are potential benefits of appropriate PA in terms of maternal weight control and fitness, which are likely to have significant long term public health benefits. Concerns about the potential ill-effects of PA during pregnancy, such as hyperthermia, shortened gestational age and decreased birth weight, are not supported by the most recent scientific reviews. The physiological adaptations to exercise during pregnancy appear to protect the foetus from potential harm and, while an upper level of safe activity has not been established, the benefits of continuing to be active during pregnancy appear to outweigh any potential risks. All decisions about participation in physical activity during pregnancy should however be made by women in consultation with their medical advisers.



21



SPECIAL COMMUNICATIONS

Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy Adults: Guidance for Prescribing Exercise

Scand J Med Sci Sports 2015; (Suppl. 3) 25: 1–72
 doi: 10.1111/sms.12581

© 2015 The Author. *Scandinavian Journal of Medicine & Science in Sports* published by John Wiley & Sons Ltd
 SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS



AMERICAN COLLEGE OF SPORTS MEDICINE
 POSITION STAND

This pronouncement was written for the American College of Sports Medicine by Craig E. Garber, Ph.D., FACSM; (Chair); Bryan Blumner, Ph.D.; Michael R. Deschenes, Ph.D., FACSM; Barry A. Franklin, Ph.D., FACSM; Michael J. Lamontagne, Ph.D., FACSM; Helen Lee, M.D., Sc.D., FACSM; David C. Nieman, Ph.D., FACSM; and David P. Swain, Ph.D., FACSM.

SUMMARY



Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases

B. K. Pedersen¹, B. Saltin²

¹The Centre of Inflammation and Metabolism and The Center for Physical Activity Research, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark, ²The Copenhagen Muscle Research Centre, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

Corresponding author: Bente Klarlund Pedersen, Rigshospitalet Section 7641, Blegdamsvej 9, DK-2100, Copenhagen, Denmark. Tel.: +45 35 45 77 97, Fax: +45 35 45 76 44, E-mail: bkp@rh.dk

Accepted for publication 16 September 2015

This review provides the reader with the up-to-date evidence-based basis for prescribing exercise as medicine in the treatment of 26 different diseases: psychiatric diseases (depression, anxiety, stress, schizophrenia); neurological diseases (dementia, Parkinson's disease, multiple sclerosis); metabolic diseases (obesity, hyperlipidemia, metabolic syndrome, polycystic ovarian syndrome, type 2 diabetes, type 1 diabetes); cardiovascular diseases (hypertension, coronary heart disease, heart failure, cerebral apoplexy, and

classification intermittent); pulmonary diseases (chronic obstructive pulmonary disease, asthma, cystic fibrosis); musculo-skeletal disorders (osteoarthritis, osteoporosis, back pain, rheumatoid arthritis); and cancer. The effect of exercise therapy on disease pathogenesis and symptoms are given and the possible mechanisms of action are discussed. We have interpreted the scientific literature and for each disease, we provide the reader with our best advice regarding the optimal time and dose for prescription of exercise.



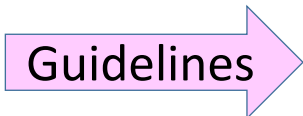
22





Evidence-based vs Expert opinion GUIDELINES

- **Practice guidelines have become an increasingly popular tool for synthesis of clinical information.**
- Clinical guidelines are commonly defined as systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances, which objectives are to enhance appropriateness of practice, improve quality of care, lead to better patient outcomes, improve cost effectiveness, help authorities to decide on the approval of drugs and devices, and identify areas of research needed.
- **A profusion of guidelines has been issued over the past 6 years** by different national and international obstetrics, gynecology, or sports medicine organizations, which are a trustworthy and comprehensive source of information in terms of safety and health benefits of exercise during pregnancy.



23



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 Chilibeck,¹¹ Karen Fleming,¹² Milena Forte,¹³ Jillian Korolnek,¹⁴ Taniya Nagpal,¹⁴ Linda G Slater,¹⁵ Deanna Stirling,¹⁶ Lori Zehr¹⁷



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



PROGRESOS DE

Obstetricia y Ginecología

Revista Oficial de la Sociedad Española de Obstetricia y Ginecología

Artículo Especial

Guías clínicas para el ejercicio físico durante el embarazo
Clinical guidelines for physical exercise during pregnancy

Rubén Barakat,¹ A Días Blanco,² E Franco,³ Agustina Bullán-Malmuerta,⁴ Maira Birk,⁵ M Nargat,⁶ C Silva,⁷ M Sánchez-Pokar,⁸ J Gil,⁹ M Peraldo,¹⁰ M Mottola,¹¹ G de Rosa,¹² Trino Pérez Medina¹³

¹Unión de Investigación AFPE, Universidad Politécnica de Madrid, Servicio de Obstetricia y Ginecología, Hospital Universitario Severo Ochoa, Leganes, Madrid; ²Universidad del Cantón, Hospital Universitario del Cantón, Barranquilla; ³Universidad Central del Ecuador, Escuela de Salud Maternal; ⁴Foundation-Campus and Pregnancy Laboratory, School of Obstetrics, Faculty of Health Sciences, Department of Anatomy and Cell Biology, Schullch School of Medicine, Coimbra; ⁵Children's Health Research Institute, University of Western Ontario, London, Ontario, Canada; ⁶Universidad de Pinar del Rio, Argentina; ⁷Servicio de Obstetricia y Ginecología, Hospital Universitario Puerta de Hierro, Madrid, España

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

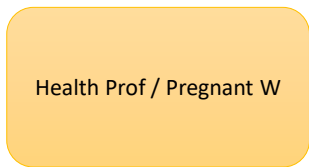


Focus HealthPro
Support ExPro
Not specific ExPro
Lack specific content

24



Guidelines with recommendations for physical activity during pregnancy & postpartum



25



[Exercise during pregnancy: a comparative review of guidelines](#), Tsakiridis I, Bakaloudi DR, Oikonomidou AC, Dagklis T, Chourdakis M. J Perinat Med. 2020 Jul 28;48(6):519-525. doi: 10.1515/jpm-2019-0419. PMID: 32619194 Review.

[Clinical Practice Guidelines That Address Physical Activity and Exercise During Pregnancy: A Systematic Review](#), Yang X, Li H, Zhao Q, Han R, Xiang Z, Gao L. J Midwifery Womens Health. 2022 Jan;67(1):53-68. doi: 10.1111/jmwh.13286. Epub 2021 Nov 28. PMID: 34841649 Review.

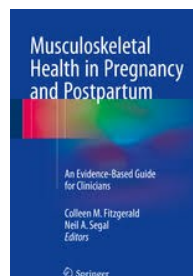
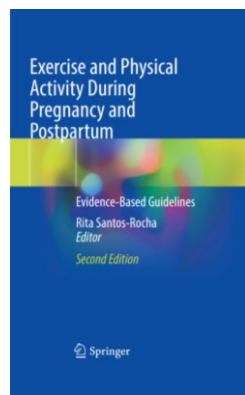
[\[Physical exercise and pregnancy. Evidence based medicine \[EBM\]\]](#), Gallo-Galán LM, Gallo-Vallejo MA, Gallo-Vallejo JL. Semergen. 2022 Sep;48(6):423-430. doi: 10.1016/j.semerg.2022.02.008. Epub 2022 May 6. PMID: 35527186 Review. Spanish.

[Physical activity and exercise during pregnancy in Africa: a review of the literature](#), Okafor UB, Goon DT. BMC Pregnancy Childbirth. 2020 Nov 25;20(1):732. doi: 10.1186/s12884-020-03439-0. PMID: 33238920 Free PMC article. Review.

[Review of Recent Physical Activity Guidelines During Pregnancy to Facilitate Advice by Health Care Providers](#), Evenson KR, Mottola MF, Artal R. Obstet Gynecol Surv. 2019 Aug;74(8):481-489. doi: 10.1097/OGX.0000000000000693. PMID: 31418450 Review.

[Physical Activity During the Perinatal Period: Guidelines for Interventions During the Perinatal Period from the French National College of Midwives](#), Boisseau N. J Midwifery Womens Health. 2022 Nov;67 Suppl 1:S158-S171. doi: 10.1111/jmwh.13425. PMID: 36480664 Review.

Guidelines with recommendations for physical activity during pregnancy & postpartum

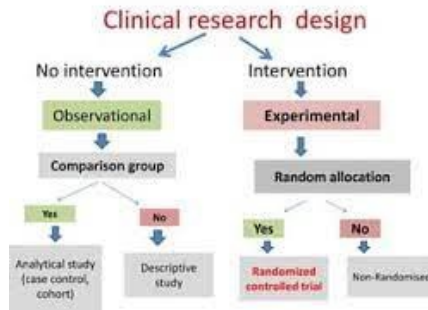
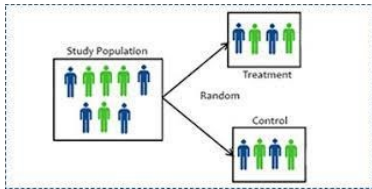


- Several official guidelines on exercise during pregnancy have been **updated** recently.
- Most of these guidelines were **reviewed** by other authors and in **textbooks**.

26



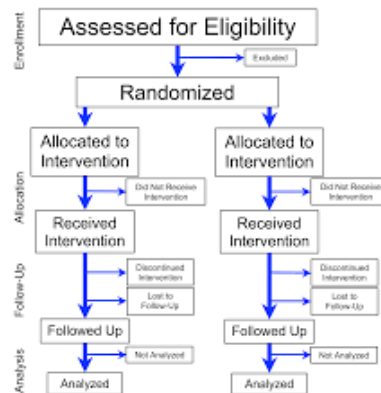
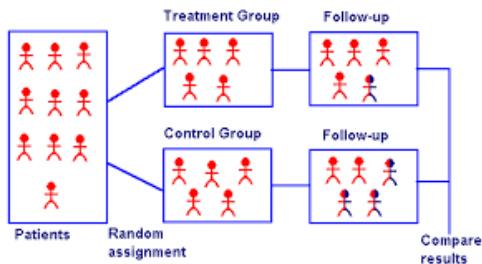
Clinical research design



29



(Randomized) Control Trial (RCT)



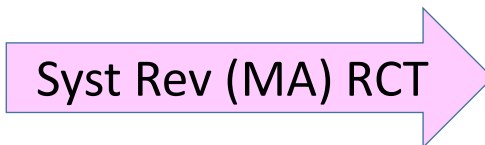
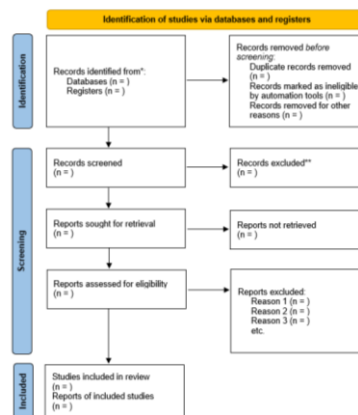
30



What is “evidence-based”?

- A **systematic review** is defined as “a review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyze data from the studies that are included in the review.”
- The methods used must be reproducible and transparent.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers



31

Searching in PubMed...



32





Searching in PubMed...

PubMed.gov search for "physical activity and pregnancy" showing 744 results. Filters applied: Meta-Analysis, Randomized Controlled Trial, Systematic Review, Humans, Female, Adult: 19-44 years. A result is shown: "Physical activity during pregnancy and postpartum depression: Systematic review and meta-analysis." by Nakamura A, et al. (PMID: 30576955).

33

Outline

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



34



Health-enhancing exercise during pregnancy

- A regular and general physical activity program (active and healthy lifestyle) during pregnancy may:
- provide general health benefits for the pregnant woman, the course of pregnancy, fetal development and health, labor and delivery, postpartum recovery, baby, mother and child...



35



Health-enhancing exercise during pregnancy

- A regular and specific exercise program during pregnancy may:
 - provide general fitness benefits for the pregnant woman
 - increase functional capacity
 - promote weight control and prevent gestational diabetes
 - prevent hypertensive disorders
 - promote good posture (and fall prevention)
 - decrease low back and pelvic girdle pain
 - decrease urinary incontinence
 - promote mental health and sleep
 - (...)
 - postpartum “recovery”



36





Health-enhancing exercise during pregnancy

- The preventative role of exercise in relation to any potential **future** cardiac health risk related to **chronic disease**
- The improved sense of **well-being, sleep, and enhanced quality of life** during pregnancy
 - Choong SYX, Tan XYJ, Cheng LJ, Lau Y. Effectiveness of Exercise in Improving Sleep Outcomes among Perinatal Women: A Systematic Review and Meta-analysis of randomised Controlled Trials. *Behav Sleep Med.* 2022 Jul-Aug;20(4):410-428.
- The effect of exercise on **mental health** (e.g., depression, stress, anxiety) during pregnancy and in postpartum
 - Davenport MH et al. Impact of prenatal exercise on both prenatal and postnatal **anxiety and depressive symptoms**: a systematic review and meta-analysis. *Br J Sports Med.* 2018 Nov;52(21):1376-85.
 - Nakamura A et al. Physical activity during pregnancy and postpartum **depression**: Systematic review and meta-analysis. *J Affect Disord.* 2019 Mar 1;246:29-41.



37



Health-enhancing exercise during pregnancy

- The acute and long-term effects related to all **fitness** and **functional** parameters (e.g., cardiovascular, muscular strength and endurance, flexibility, body composition, coordination, balance, posture): health-related and skill-related fitness components
 - Cai C, Ruchat SM, Sivak A, Davenport MH. Prenatal Exercise and **Cardiorespiratory Health and Fitness**: A Meta-analysis, *Medicine & Science in Sports & Exercise.* July 2020;52(7):1538-48.
- The effect of exercise on **bone health**
- The preventative role of exercise in relation to the most prevalent **musculoskeletal disorders** (e.g., low or upper back pain, pelvic-floor disorders, and poor posture, balance and coordination)
 - Davenport MH et al. Exercise for the prevention and treatment of **low back, pelvic girdle and lumbopelvic pain** during pregnancy: a systematic review and meta-analysis. *Br J Sports Med.* 2019 Jan;53(2):90-98.
 - Mørkved S, Bø K. Effect of pelvic floor muscle training during pregnancy and after childbirth on prevention and treatment of **urinary incontinence**: A systematic review. *Br J Sports Med.* 2014;48(4):299-310.



38





Health-enhancing exercise during pregnancy

- The effect of exercise on **increased energy expenditure** (e.g., excess post-exercise oxygen consumption, increased fat loss, preservation of lean body mass, increased metabolic rate, prevention of overweight and obesity in mother and child)
 - Menke BR et al. Physical Activity during Pregnancy and Newborn Body Composition: A Systematic Review. *Int J Environ Res Public Health*. 2022 Jun 10;19(12):7127.
 - Chen Y et al. Effects of Maternal Exercise During Pregnancy on Perinatal Growth and Childhood Obesity Outcomes: A Meta-analysis and Meta-regression. *Sports Med*. 2021 Nov;51(11):2329-47.
- The preventative role of exercise in relation to **dyslipidemia** (e.g., decreased tri-glycerides, slightly decreased low-density lipoprotein, increased high-density lipoprotein)



39



Health-enhancing exercise during pregnancy

- The preventative role of exercise in relation to **gestational diabetes** and **diabetes mellitus type 2** (e.g., lower blood glucose concentration during and after exercise, improved insulin sensitivity and decreased insulin requirement, lower HbA1c levels)
 - Bgeginski R et al. Effects of weekly supervised exercise or physical activity counseling on fasting blood glucose in women diagnosed with **gestational diabetes mellitus**: A systematic review and meta-analysis of randomized trials. *Journal of Diabetes*. 2017(9): 1023–32.
 - Keating N et al. Aerobic or Resistance Exercise for Improved Glycaemic Control and Pregnancy Outcomes in Women with Gestational Diabetes Mellitus: A Systematic Review. *Int J Environ Res Public Health*. 2022 Aug 30;19(17):10791.
- The preventative role of exercise in relation to **hypertension** and **pre-eclampsia** (e.g., improvement in mild to moderate blood pressure)
 - Magro-Malosso ER et al.. Exercise during pregnancy and risk of **gestational hypertensive disorders**: a systematic review and meta-analysis. *Acta Obstet Gynecol Scand*. 2017 Aug;96(8):921-31.
 - Davenport MH et al. Prenatal exercise for the prevention of **gestational diabetes mellitus and hypertensive disorders of pregnancy**: a systematic review and meta-analysis. *Br J Sports Med*. 2018 Nov;52(21):1367-75.
 - Al-Huda F et al.. Association between **Cardiorespiratory Fitness** and **Hypertensive Disorders of Pregnancy**: A Systematic Review and Meta-Analysis. *J Clin Med*. 2022 Jul 27;11(15):4364.



40





Health-enhancing exercise during pregnancy

- The association of exercise with **fertility**, **fetus** development, **birth** outcomes and **baby health**
 - Mena GP, Mielke GI, Brown WJ. The effect of physical activity on reproductive health outcomes in young women: a systematic review and meta-analysis. *Hum Reprod Update*. 2019 Sep 11;25(5):541-563.
- The potentially preventative role of exercise in relation to other **specific conditions** of pregnancy and **postpartum** (e.g., macrosomia, diastasis recti, pelvic girdle pain, postpartum weight retention, coronary heart disease prevention postpartum, etc.).
 - Kubler JM et al. The effects of exercise during pregnancy on placental composition: A systematic review and meta-analysis. *Placenta*. 2022 Jan;117:39-46.



41



Health-enhancing exercise during pregnancy

- Nascimento SL, Surita FG, Cecatti JG. **Physical exercise during pregnancy**: a systematic review. *Curr Opin Obstet Gynecol*. 2012 Dec;24(6):387-94.
- Jorge C, Santos-Rocha R, Bento T. Can **Group Exercise** Programs Improve Health Outcomes in Pregnant Women? A Systematic Review, *Current Women's Health Reviews* 2015; 11(1).
- Perales M, Santos-Lozano A, Ruiz JR, Lucia A, Barakat R. Benefits of **aerobic or resistance training** during pregnancy on maternal health and perinatal outcomes: A systematic review. *Early Hum Dev*. 2016 Mar;94:43-8.
- Chan CWH, Au Yeung E, Law BMH. Effectiveness of **Physical Activity Interventions** on Pregnancy-Related Outcomes among Pregnant Women: A Systematic Review. *International Journal of Environmental Research and Public Health*. 2019; 16(10):1840.



42





Health-enhancing exercise during pregnancy

- Díaz-Burrucco JR et al. Effects on the maternal-fetal health outcomes of **various physical activity types** in healthy pregnant women. A systematic review and meta-analysis. Eur J Obstet Gynecol Reprod Biol 2021;262:203-15.
- Ribeiro MM, Andrade A, Nunes I. **Physical exercise** in pregnancy: benefits, risks and prescription. J Perinat Med. 2021 Sep 6.
- de Castro R, Antunes R, Mendes D, Szumilewicz A, Santos-Rocha R. Can **Group Exercise** Programs Improve Health Outcomes in Pregnant Women? An Updated Systematic Review. Int J Environ Res Public Health. 2022 Apr 17;19(8):4875.
- Morales-Suárez-Varela M et al. Maternal **Physical Activity** During Pregnancy and the Effect on the **Mother and Newborn**: A Systematic Review. J Phys Act Health. 2020 Dec 22;18(1):130-47.
- Wang Y, Wu L, Wu X, Zhou C. The Association between Physical Exercise during Pregnancy and **Maternal and Neonatal Health** Outcomes: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Comput Math Methods Med. 2022 Aug 21;2022:3462392.

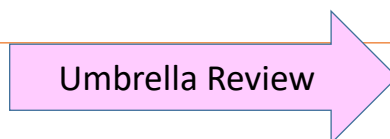


43



Health-enhancing exercise during pregnancy

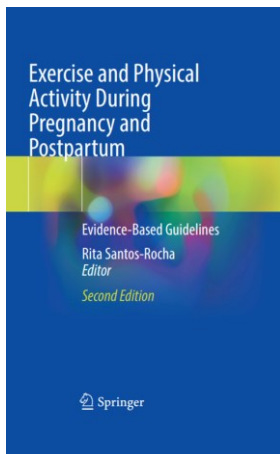
- Dipietro L, Evenson KR, Bloodgood B, Sprow K, Troiano RP, Piercy KL, Vaux-Bjerke A, Powell KE; 2018 PHYSICAL ACTIVITY GUIDELINES ADVISORY COMMITTEE*. **Benefits of Physical Activity** during Pregnancy and Postpartum: An **Umbrella Review**. Med Sci Sports Exerc. 2019 Jun;51(6):1292-302.
- Heslehurst N, Hayes L, Jones D, Newham J, Olajide J, McLeman L, McParlin C, de Brun C, Azevedo L. The effectiveness of smoking cessation, alcohol reduction, diet and physical activity interventions in changing behaviours during pregnancy: A **systematic review of systematic reviews**. PLoS One. 2020 May 29;15(5):e0232774.
- Kouiti M, Hernández-Muñiz C, Youlyouz-Marfak I, Salcedo-Bellido I, Mozas-Moreno J, Jiménez-Moleón JJ. Preventing Gestational Diabetes Mellitus by Improving Healthy Diet and/or Physical Activity during Pregnancy: An **Umbrella Review**. Nutrients. 2022 May 14;14(10):2066.



44

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 Rodríguez
- 14 - Diet Recommendations for the Pregnant Exerciser and Athlete** Rui Jorge, Diana Teixeira, Inês Ferreira, and Ana Luisa Alvarez Falcón

45



Special Issue

https://www.researchgate.net/profile/Rita_Santos-Rocha

International Journal of
*Environmental Research
and Public Health*
an Open Access Journal by MDPI

IMPACT
FACTOR
3.390

Covered in:
PubMed

Physical Activity during Pregnancy

Guest Editors
Dr. Anna Szumilewicz, Prof. Dr. Rita Santos-Rocha

Deadline
15 October 2022

Special Issue

mdpi.com/si/102740

Invitation to submit

Deadline for manuscript submissions: 15 April 2023

46



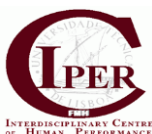
Thank you very much!



Rita Santos Rocha

ritasantosrocha@gmail.com

ritasantosrocha@esdrm.ipsantarem.pt



47

Rita Santos Rocha

- https://www.researchgate.net/profile/Rita_Santos-Rocha
- <https://www.cienciavita.pt/portal/4A15-784A-FC14>
- <http://orcid.org/0000-0001-7188-8383>
- <http://ciper.fmh.ulisboa.pt/>
- <https://www.youtube.com/channel/UCEUWdoBeh5rgfM0kZOn9Xtg>
 - #AtivoEmCasa #ActiveAtHome
- <https://www.youtube.com/channel/UC0VyookwC0mcQ5T70imtoNA>
 - #GravidezAtiva #ActivePregnancy



48