

School of Kinesiology
Faculty of Health Sciences
Western University

**KIN 4420B - Impact of Exercise During Pregnancy on Chronic Disease Risk
Winter 2020**

<p>Instructor: Dr. Michelle Mottola, Director R Samuel McLaughlin Foundation Exercise & Pregnancy Lab Office: 3M Centre Rm 2214 Email: mmottola@uwo.ca Phone: 519/661-2111 x85480 Office Hrs: by appointment</p> <p>GTA: @uwo.ca</p>	<p>Lectures: Mo 2:30pm – 4:30pm</p> <p>Room: Arts & Humanities Bldg Rm 1B06</p>
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NOTE: All course information including grades, assignment outlines, deadlines, etc. are available via OWL. Check the website regularly for course announcements.

Calendar Description (including prerequisites/anti-requisites):

Discussion of human pregnancy and the impact of exercise to prevent or treat cardiovascular disease, obesity and metabolic syndrome/type 2 diabetes will occur. The theory of the 'Thrifty phenotype' will be discussed and the mother/fetal link to chronic disease risk. Active living during pregnancy and exercise prescription will be emphasized.

Antirequisite(s): Kinesiology 4471B (if taken to 2009-10).

Prerequisite(s): [Kinesiology 2222A/B](#) or [Health Sciences 2300A/B](#) or [Health Sciences 2330A/B](#) or [Anatomy and Cell Biology 2221](#) or the former Anatomy and Cell Biology 3319; and [Kinesiology 3337A/B](#).

Extra Information: 1 lecture hour, 1 seminar hour.

Course Format: One lecture hour, followed by one hour seminar discussion

You are responsible for ensuring that you have successfully completed all course pre-requisites, and that you have not taken an anti-requisite course.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

NOTE: If you wish to enroll in this course without the stated pre-requisite(s), you must obtain written approval from the course instructor. The approval should then be forwarded to your academic counsellor.

My Course Description:

This course provides an overview of human pregnancy and the impact of exercise to prevent or treat cardiovascular disease, obesity and metabolic syndrome/type 2 diabetes. The theory of the “Thrifty phenotype” will be discussed and the mother/fetal link to chronic disease risk, including discussion of “Developmental Origins of Health and Disease”. Active living during pregnancy will be emphasized using the *2019 Canadian guideline for physical activity throughout pregnancy* and the PARmed-X for pregnancy for low-risk pregnant women. In addition, exercise prescription for special populations of pregnant women across the exercise continuum including women with gestational diabetes or obesity will also be discussed.

Learning Objectives: Upon completion of this course students will:

- 1) Gain knowledge and understanding of different theories of fetal origins of adult diseases.
- 2) Gain knowledge and understanding of current research in the area of exercise during pregnancy for a low risk pregnant population.
- 3) Gain knowledge and understanding of current research in the area of how exercise during pregnancy can prevent or be used to treat different disease states.
- 4) Engage in seminar discussions, present orally on a research paper to the class and to evaluate the research literature critically.
- 5) Create and implement an exercise and lifestyle intervention for active low risk pregnant women and pregnant women with disease risk.

Topics for Discussion:

- 1) The “Downside of Upright”
- 2) “Thrifty genotype” and “Thrifty phenotype” – developmental influences of adult diseases. DOHaD – Developmental Origins of Health and Disease.
- 3) DOHaD and adult diseases that may have origin from fetal life.
 - a. Cardiovascular disease
 - b. Obesity
 - c. Type 2 diabetes/Metabolic syndrome
- 4) Impact of exercise during pregnancy on chronic disease risk.
- 5) Importance of active living during pregnancy
 - a. *2019 Canadian Guideline for Physical Activity throughout Pregnancy* and the PARmed-X for pregnancy – medical prescreening, aerobic exercise guidelines, muscle conditioning guidelines and safety considerations for low risk pregnant women
 - b. Promoting active living during pregnancy in low risk women.
- 6) Designing an exercise program for pregnant women across the exercise continuum – from activity restricted to recreational to elite athlete.
- 7) Using an exercise and lifestyle intervention to prevent excessive weight gain and gestational diabetes in pregnant women with risk factors.

Course Evaluation Summary:

- 1) Class participation & on line discussion forum – 15%
- 2) Paper Critique – Journal Article Review - 15% **(Due Monday Feb. 24th)**
- 3) Group presentation to Class – 20% **(March 16th, 23rd, 30th, or April 6th)**
- 4) Final exam - 50%

Discussion Forums on OWL:

Students will be divided into groups of 6 to form a discussion group forum on OWL relating to specific questions regarding special topics relating to the course.

Paper Critique - Journal Article Review: (Due Monday Feb. 24th, 2020)

Each student will choose a paper from the literature (upon approval of Instructor) related to class and critically evaluate it in one page of assessment.

Group Presentations to the Class:

Each student will work with their group of 4 to choose one research paper from the literature (on approval of Professor) and present it to the class for 10 minutes, followed by 5 minutes of questions. The professor and GTA will evaluate the presentation. Each group of 4 students will pick a time to present on one of the following 4 days:

March 16th, 23rd, 30th, and April 6th will be designated as Student presentation days.

Course Evaluation:

Assignments are due as stated in the course syllabus and will not be accepted late, except under medical or other compassionate circumstances. Submitting a late assignment without appropriate documentation will result in a zero (0) grade. Acceptable reasons might include hospital stays, serious illness, family emergencies (like serious accidents, illness or death) or similar circumstances.

Mandatory Readings (*Preliminary List*): All required readings will be posted on OWL

Jan. 6, 2020 Topic – Introduction to course.

Jan. 13, 2020 Topic – “Downside of Upright”

Reading(s):

- 1) Ackerman J. 2006. The downside of upright. *National Geographic*. 210(1):126-145.
- 2) Mitteroecker P, et al. 2016. Cliff-edge model of obstetric selection in humans. *Proc Natl Acad Sci* 113(51):14680–14685.
- 3) Grossman, R. 2017. Are human heads getting larger? *Proc Natl Acad Sci* 114(8):E1304. (Comment to Mitteroecker et al. 2016)
- 4) Mitteroecker P, et al. 2017 The role of natural selection for the increase of Caesarean section rates. *Proc Natl Acad Sci* . 114(8):E1305. (Comment to Grossman 2017)

Jan. 20, 2020 Topic – “Developmental Origins of Health and Disease (DOHaD); thrifty genotype and thrifty phenotypes”

Readings:

- 5) Prentice AM. 2005. Early influences on human energy regulation: Thrifty genotypes and thrifty phenotypes. *Physiol. Behav.* 640-645.
- 6) Hales CN and Barker DJP. 2001. The thrifty phenotype hypothesis. *Br. Med. Bull.* 60:5-20.
- 7) Prentice AM, Rayco-Solon P. and Moore S.E. 2005. Insights from the developing world: thrifty genotypes and thrifty phenotypes.
- 8) Barker DJP 2004. The developmental origins of adult disease. *J. Am. Coll. Nutr.* 23:588S-595S.

Jan. 27, 2020 Topic – “DOHaD and adult diseases that may have origin from fetal life” – Cardiovascular disease”

Readings:

- 9) Hanson MA, Gluckman PD. 2011 Developmental origins of health and disease: moving from biological concepts to interventions and policy. *Int J Gynaecol Obstet.* Nov;115 Suppl 1:S3-5.
- 10) Martin-Gronert MS, Ozanne SE. 2012 Mechanisms underlying the developmental origins of disease. *Rev Endocr Metab Disord.* Jun;13(2):85-92.

- 11) Law CM et al. 2002. Fetal, infant and childhood growth and adult blood pressure: a longitudinal study from birth to 22 years of age. *Circulation*. 105:1088-1092.
- 12) Henry SL et al. 2012 Developmental origins of obesity-related hypertension. *Clin. Exper. Pharm. Physiol.* 39 (9), 799-806.

Feb. 3, 2020 Topic – “DOHaD and adult diseases that may have origin from fetal life” – Obesity”

Readings:

- 13) Ravelli AC, et al, 1999. Obesity at the age of 50 y in men and women exposed to famine prenatally. *Am. J. Clin. Nutr.* 70:811-816.
- 14) Oken E, Gillman MW. 2003. Fetal origins of obesity. *Obes. Res.* 11:496-506.
- 15) Davenport MH, et al. 2013. Timing of excessive pregnancy-related weight gain and offspring adiposity at birth. *Obstet Gynecol.* 122(2, PART 1):255-261.
- 16) Penkler et al. 2018. DOHaD in science and society: emergent opportunities and novel responsibilities. *J Dev Orig Health Dis* doi:10.1017/S2040174418000892.

Feb. 10, 2020 Topic – “DOHaD and adult diseases that may have origin from fetal life” – Type 2 diabetes/metabolic syndrome”

Readings:

- 17) Hales CN, Barker DJP 1992. Type 2 diabetes mellitus: the thrifty phenotype hypothesis. *Diabetologia* 35:595-601.
- 18) Martin-Gronert M, Ozanne S. 2013. Early life programming of obesity. *Dev Period Med XVII(1):7-12.*
- 19) Boney CM et al. 2005. Metabolic syndrome in childhood: association with birth weight, maternal obesity and gestational diabetes mellitus. *Pediatrics* 115:e290-296.
- 20) Hattersley AT, Tooke JE. 1999. The fetal insulin hypothesis: an alternative explanation of the association of low birthweight with diabetes and vascular disease. *Lancet.* 353:1789-1792.

Feb. 24, 2020 Topic – “Impact of exercise during pregnancy on chronic disease risk”

Readings:

- 21) Wojtyła A, et al. 2012 Epidemiological studies in Poland on effect of physical activity of pregnant women on the health of offspring and future generations – adaptation of the hypothesis DOHaD. *Ann Agric Environ Med.* 19(2): 315-326.
- 22) Weissgerber T, et al. 2006. Exercise in the prevention and treatment of maternal-fetal disease: A review of the literature. *Applied Physiol. Nutrition & Metabolism* 31:661-674.
- 23) Hopkins S, Cutfield W. 2011. Exercise in Pregnancy: Weighing up the long-term impact on the next generation. *Exerc Sports Science Reviews* 39(3):120-127.
- 24) Mottola MF, Artal R. 2016. Role of exercise in reducing gestational diabetes mellitus. *Clin Obstet Gynecol Sep;59(3):620-628.*

Mar. 2, 2020 Topic – “Importance of active living during pregnancy and evidence-based exercise guidelines”

Readings:

- 25) Bo K, et al. 2016. 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. *Br J Sports Med* 50:571–589
- 26) Mottola MF, Davenport MH, Ruchat SM et al. 2019 Canadian guideline for physical activity throughout pregnancy. *Br J Sports Med* 2018;52:1339–1346.
- 27) Wolfe, LA and Mottola MF 2015. PARmed-X for Pregnancy. Canadian Society Exercise Physiology. Pp. 1-4. website:
<http://www.csep.ca/CMFiles/publications/parq/parmed-xpreg.pdf>
- 28) 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Part F. Chapter 8. Women Who Are Pregnant or Postpartum.
https://health.gov/paguidelines/second-edition/report/pdf/14_F-

[8 Women Who are Pregnant or Postpartum.pdf](#)

- 29) Mottola MF. 2016. Components of Exercise Prescription and Pregnancy. Clin Obstet Gynecol. 59(3):552-8.

Mar. 9, 2020 Topic “Designing an exercise program across the continuum – from activity restricted to recreational to the elite athlete and using exercise and lifestyle interventions to prevent excessive weight gain and gestational diabetes in pregnant women with risk factors”

Readings:

- 30) Brun C, et al. 2011. Bed-rest-exercise, activity restriction and high-risk pregnancies: A feasibility study. Applied Physiol Nutr Metabolism. 36(4):577-82.
- 31) Mottola MF. 2010. Resistance-Training Strategies During Pregnancy. In: Resistance Training for Special Populations. (Swank, A, Hagerman, P Eds). New York: Delmar Cengage Learning. Pp. 345-356.
- 32) Mottola, MF 2015. Pregnancy, physical activity and weight control to prevent obesity and future chronic disease risk in both mother and child. Current Women's Health Reviews. 11(1):31-40.
- 33) Bø K, Artal R, Barakat R et al. 2018. 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. Br J Sports Med 52(17):1080-1085.

Course/University Policies

1. Statement on Use of Personal Response Systems (“Clickers”)

If Personal Response Systems (“Clickers”) are used in the course, a reference to the Guidelines for their use (Guidelines are shown below). Instructors are to communicate clearly to students information on how clickers are used including: how the student’s privacy will be protected, how clickers may be used by the instructor for data gathering and for evaluating the students, and why they cannot be used by anyone but the student (since the students involved in misuse of a clicker may be charged with a scholastic offence).

2. **Academic offences:** They are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

A) Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar). All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between Western University and Turnitin.com <http://www.turnitin.com>

B) Computer marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

3. Electronic Device Usage:

During Exams - Unless you have medical accommodations that require you to do so, or explicit permission from the instructor of the course, you may not use any of the following electronic devices during ANY of the tests, quizzes, midterms, examinations, or other in-class evaluations: cellphones, smart phones, smart watches, smart glasses, audio players or recorders of any sort, video cameras,

video games, DVD players, televisions, laptop/notebook/netbook computers, flashlights or laser pointers.

During Lectures and Tutorials: Although you are welcome to use a computer during lecture and tutorial periods, you are expected to use the computer for scholastic purposes only, and refrain from engaging in any activities that may distract other students from learning. Please be respectful to your fellow students and turn the sound off. If the professor receives complaints from other students regarding noise or other disruptive behavior (e.g. watching videos on YouTube.com, updating your Facebook status, playing Solitaire), your classroom privileges will be revoked. From time to time, your professor may ask the class to turn off all computers, to facilitate learning or discussion of the material presented in a particular class. **Unless explicitly noted otherwise, you may not make audio or video recordings of lectures – nor may you edit, re-use, distribute, or re-broadcast any of the material posted to the course website.**

4. Health and Wellness:

Information regarding health and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<http://www.health.uwo.ca/>) for a complete list of options about how to obtain help.

5. Support Services

There are various support services around campus and these include, but are not limited to:

1. Student Development Centre -- <http://www.sdc.uwo.ca/ssd/>
2. Student Health & Wellness -- <http://www.health.uwo.ca/>
3. Registrar's Office -- <http://www.registrar.uwo.ca/>
4. Ombudsperson Office -- <http://www.uwo.ca/ombuds/>

6. Documentation for Academic Accommodation (Illness, Medical/Non-Medical Absences):

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_12

Students who experience an extenuating circumstance (illness, injury, or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

- (i) Submitting a Self-Reported Absence (see below for conditions)
 - (ii) For medical absences exceeding 48 hours, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to their Academic Counselling in their Faculty of registration in order to be eligible for Academic Consideration; or
 - (iii) For non-medical absences exceeding 48 hours, submitting appropriate documentation (e.g., obituary, police report, accident report, court order, etc.) to Academic Counselling in their Faculty of registration in order to be eligible for academic consideration. Students are encouraged to contact their Academic Counselling unit to clarify what documentation is appropriate.
- Students seeking academic consideration **must communicate with their instructors no later than 24 hours** after the end of the period covered by either the self-reported absence or SMC, or immediately upon their return following a documented absence.

The following conditions are in place for self-reporting of medical or extenuating circumstances:

- a. a maximum of two self-reported absences between September and April and one self-reported absence between May and August;
- b. any absences in excess of the number designated in clause a above will require students to present a Student Medical Certificate (SMC) or appropriate documentation supporting extenuating circumstances to the Academic Counselling unit in their Faculty of registration no later than two business days after the date specified for resuming responsibilities.
- c. The duration of the excused absence will be for a maximum of 48 hours from the time the Self-Reported Absence form is completed through the online portal, or from 8:30 am the following

morning if the form is submitted after 4:30 pm;

d. The duration of the excused absence will terminate prior to the end of the 48 hour period should the student undertake significant academic responsibilities (write a test, submit a paper) during that time;

e. The duration of an excused absence will terminate at 8:30 am on the day following the last day of classes each semester regardless of how many days of absence have elapsed;

f. Self-reported absences will not be allowed for scheduled final examinations; for midterm examinations scheduled during the December examination period; or for final lab examinations scheduled during the final week of term;

g. Self-reporting may not be used for assessments (e.g. midterm exams, tests, reports, presentations, or essays) worth more than 30% of any given course;

For medical and non-medical absences that are not eligible for self-reporting Kinesiology students must submit an Academic Consideration Request form found online https://www.uwo.ca/fhs/kin/undergrad/files/accommodation_request.pdf in addition to an SMC or appropriate documentation in the event of a non-medical absence. These documents will be retained in the student's file, and will be held in confidence in accordance with the University's Official Student Record Information Privacy Policy.

7. **Grades:** Where possible assignment objectives and rubrics will be posted on OWL. Should you have a concern regarding the grade you received for an assignment or feel that it is unfair in any way, you must wait 24 hours from the receipt of the assignment to approach the instructor or TA. In doing so, please make an appointment and prepare in writing, with evidence, why you feel your grade is inappropriate. Please be aware that in requesting a grade reassessment, your grade could go up/down/or stay the same. Note that calculations errors (which do occur!) should be brought to my attention immediately.

Generally, students can expect some form of feedback on their performance in a course before the drop date.

- November 9th, 2019 (for first term half-courses)
- November 27th, 2019 (for full-year courses)
- March 4th, 2020 (for second term half-or full year courses)

A+	90-100	<i>One could scarcely expect better from a student at this level</i>
A	80-89	<i>Superior work that is clearly above average</i>
B	70-79	<i>Good work, meeting all requirements and eminently</i>
C	60-69	<i>Competent work, meeting requirements</i>
D	50-59	<i>Fair work, minimally acceptable.</i>
F	below 50	<i>Fail</i>

Rounding of Grades (for example, bumping a 79 to 80%):

This is a practice some students request. **This practice will not occur here.** The edges of this course are clear and sharp. The mark attained is the mark you achieved and the mark assigned; there is no rounding to the next grade level, or 'giving away' of marks. Please don't ask me to do this for you; the response will be "please review the course outline where this is presented".

8. **Classroom Behaviour:** Class will begin promptly at the time specified at the top of page one of this syllabus. In the event that you must arrive late, please enter the classroom with a minimal disturbance to the class. Please keep all electronic devices on silent and avoid distracting classmates.

9. Student Code of Conduct

The purpose of the Code of Student Conduct is to define the general standard of conduct expected of students registered at Western University, provide examples of behaviour that constitutes a breach of this standard of conduct, provide examples of sanctions that may be imposed and set out the disciplinary procedures that the University will follow. For more information, visit <https://www.uwo.ca/univsec/pdf/board/code.pdf>