

School of Kinesiology  
Faculty of Health Sciences  
Western University

**KIN 4420B**  
**IMPACT OF EXERCISE DURING PREGNANCY ON CHRONIC DISEASE RISK**  
**Winter 2018**

**Instructor:**

Dr. Michelle F. Mottola  
Director,  
R. Samuel McLaughlin Foundation-  
Exercise & Pregnancy Lab.  
Office: Rm 2214, 3-M Centre.  
Phone: 519-661-2111 X85480  
Email: mmottola@uwo.ca  
Office Hours: By appointment.

**Classes:**

Mo 2:30PM-4:30 PM  
Arts & Humanities Bldg  
Room 2B02

Graduate Teaching Assistant: TBA

**NOTE:** All course information including grades, assignment outlines, deadlines, etc. are available via OWL. Check the website regularly for course announcements.

**Calendar Description**

(Academic Calendar found online): 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.

1 lecture hour, 1 seminar hour, 0.5 course

**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 Canadian guidelines (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.

**Anti-requisite(s)!Pre-requisite(s)!Co-requisite(s)**

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 the course department 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.

**Course Format:**

Two hours;

One hour lecture followed by one hour seminar discussion.  
Mon. 2:30- 4:30 pm, Location Arts & Humanities Building Room 2B02

**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 and present orally on a research paper to the class.
- 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. 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) Journal Article Review – 15%
- 3) Group presentation to Class – 20%
- 4) Final exam - 50%

**Journal Article Review:**

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

**Discussion Forums on OWL:**

Students will be divided into groups of 3 to form a discussion group forum on OWL relating to specific questions regarding special topics relating to the course.

**Group presentation to Class:**

Each student will work with their group of 3 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. Other students in the class and the professor will evaluate the presentation.

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

**Jan. 15th, 2018 Topic – “Downside of Upright”**

**Reading(s):**

- 1) Ackerman, J. 2006. The downside of upright. *National Geographic*. 210(1):126-145.
- 2) Mitteroecker, P, Huttegger, S, Fischer, B, Pavlicev, M 2016. Cliff-edge model of obstetric selection in humans. *Proc Natl Acad Sci USA* Dec 5. pii: 201612410.

**Jan. 22nd, 2018 Topic – “Developmental Origins of Health and Disease (DOHaD); thrifty genotype and thrifty phenotypes”**

**Readings:**

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

**Jan. 29th, 2018 Topic – “DOHaD and adult diseases that may have origin from fetal life” – Cardiovascular disease”**

**Readings:**

- 7) Hanson MA, Gluckman PD. Developmental origins of health and disease: moving from biological concepts to interventions and policy. *Int J Gynaecol Obstet.* 2011 Nov;115 Suppl 1:S3-5.
- 8) Martin-Gronert MS, Ozanne SE. Mechanisms underlying the developmental origins of disease. *Rev Endocr Metab Disord.* 2012 Jun;13(2):85-92.
- 9) 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.
- 10) Henry, SL et al. Developmental origins of obesity-related hypertension. *Clin. Exper. Pharm. Physiol.* 2012. 39 (9), 799-806.

**Feb. 5th, 2018 Topic – “DOHaD and adult diseases that may have origin from fetal life” – Obesity”**

**Readings:**

- 11) Ravelli, AC, van Der eulen, JH., Osmond, C., Barker, DJP and Bleker, OP. 1999. Obesity at the age of 50 y in men and women exposed to famine prenatally. *Am. J. Clin. Nutr.* 70:811-816.
- 12) Oken, E. and Gillman, MW. 2003. Fetal origins of obesity. *Obes. Res.* 11:496-506.
- 13) Davenport, MH, Ruchat, S, Giroux, I, Sopper, M, Mottola, MF. 2013. Timing of excessive pregnancy-related weight gain and offspring adiposity at birth. *Obstet Gynecol.* 122(2, PART 1):255-261.

**Feb. 12th, 2018 Topic – “DOHaD and adult diseases that may have origin from fetal life” – Type 2 diabetes/metabolic syndrome”**

**Readings:**

- 14) Hales, CN and Barker, DJP 1992. Type 2 diabetes mellitus: the thrifty phenotype hypothesis. *Diabetologia* 35:595-601.

- 15) Martin-Gronert, M, Ozanne S. 2013. Early life programming of obesity. *Dev Period Med XVII(1):7-12.*
- 16) Boney, CM et al. 2005. Metabolic syndrome in childhood: association with birth weight, maternal obesity and gestational diabetes mellitus. *Pediatrics 115:e290-296.*
- 17) Hattersley, AT and 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. 26th, 2018 Topic – “Impact of exercise during pregnancy on chronic disease risk”**

**Readings:**

- 18) Wojtyła A, Kapka-Skrzypczak L, Paprzycki P, Skrzypczak M, Biliński P. 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.*
- 19) Weissgerber, T, Wolfe, LA, Davies, G, Mottola, MF. 2006. Exercise in the prevention and treatment of maternal-fetal disease: A review of the literature. *Applied Physiol. Nutrition & Metabolism 31:661-674.*
- 20) 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.*
- 21) Mottola MF, Artal R. 2016. Role of exercise in reducing gestational diabetes mellitus. *Clin Obstet Gynecol Sep;59(3):620-628*

**March 5th, 2018 Topic – “Importance of active living during pregnancy and evidence-based exercise guidelines”**

**Readings:**

- 22) Mottola, MF. 2016. Components of exercise prescription and pregnancy. *Clinical Obstet Gynecol 59(3):552-558.*
- 23) 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>
- 24) Mottola MF. 2013. ACSM's Guidelines for Exercise Testing and Prescription, 9th edition. Chpt 8. "Exercise Prescription for Healthy Populations with Special Considerations" (Deborah Riebe, Ed). Lippcott-Williams & Wilkins: USA. Pp.194-200.
- 25) Mottola MF, Artal R. 2016. Fetal and maternal metabolic responses to exercise during pregnancy. *Early Hum Dev. 94:33–41.*
- 26) Davies, G, Wolfe, LA, Mottola, MF, MacKinnon, C. 2003. Joint SOGC/CSEP Clinical Practice Guideline: Exercise in Pregnancy and the Postpartum Period. *J Obstet Gynecol Can. 25(6):516-22.*

**March 12th, 2018 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:**

- 27) Brun, C, Shoemaker, JK, Bocking, A, Hammond, J, Poole, M, Mottola, MF 2011. Bed-rest-exercise, activity restriction and high-risk pregnancies: A feasibility study. *Applied Physiol Nutrit Metabolism. 36(4):577-82.*
- 28) 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.
- 29) 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.
- 30) Bo K, Artal R, Barakat R, Brown W, Davies G, Dooley M, Evenson K, Haakstad L, Henriksson-Larsen K, Kayser B, Kinnunen T, Mottola MF, Nyaard I, van Poppel M, Stuge B, Khan K. 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

### **Group Presentations to the Class:**

**Each group of 3 students will pick a time to present on one of the following 3 days:**

**March 19th, 26th and April 2nd (April 9th if necessary) will be designated as Student presentation days.**

### **Course/University Policies**

1. **Lateness/Absences:** Assignments are due at the beginning of class on the assigned due date and will not be accepted late, except under medical or other compassionate circumstances. Electronic submission of assignments will not be accepted (unless otherwise specified) under any circumstances. Submitting a late assignment without appropriate documentation will result in a zero (0) grade. Appropriate documentation for assignments worth less than 10% should be submitted to the instructor. A missed mid-term examination without appropriate documentation will result in a zero (0) grade. The course policy is not to allow make-ups for scheduled midterms, presentations or final exams, nor to assign a grade of Incomplete without acceptable and verifiable medical (or equivalent compassionate) reasons. Acceptable reasons might include hospital stays, serious illness, family emergencies (like serious accidents or illness, death) or similar circumstances.

2. **Written documentation:** Students who require academic accommodation should provide notification and documentation in advance of due dates, examinations, etc. stating specific reasons and dates. Students must follow up with their professors and their Academic Counselling office in a timely manner. Documentation for any request for accommodation shall be submitted directly, as soon as possible, to the appropriate Academic Counselling office of the student's Faculty/School of registration (ex. KIN students ~ KIN Undergraduate Office), **not** to the instructor, with a request for relief specifying the nature of the accommodation being requested. In the event of a medical request, the documentation should be obtained at the time of the initial consultation with the physician or walk-in clinic. An "Accommodation Consideration Request Form" found online or in the Kinesiology Undergraduate Office" for ALL such accommodation requests must be submitted into the appropriate Academic Counselling office of the student's Faculty/School of registration. 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.

See <https://studentservices.uwo.ca/secure/index.cfm> for specific policy and forms relating to accommodation.

3. **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.

**15% of course grades will be posted by the last day to drop a course.**

4. **Scholastic 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:

[http://www.uwo.ca/univsec/handbook/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/handbook/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 might 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.

5. **Formatting** (as recommended by the course instructor): example- APA style is the approved style of writing for all assignments produced for this course. Please refer to Western University Library webpage for information on citation style and format or consult the APA publication manual: Publication manual of the American Psychological Association (6th ed.). (2009). Washington, DC: American Psychological Association.

6. According to the **Examination Conflict policy**, “A student who is scheduled to write more than two examinations in any 24-hour period may request alternative arrangements through the office of their Academic Counsellor.” \*This policy does NOT apply to mid-term examinations. There will be no make-up for the mid-term exam. Students who miss this exam with a valid reason will have the final re-weighted accordingly.

7. **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. I reserve the right to lock the classroom door and deny entrance if lateness becomes a common occurrence. Excessive talking during class time is disruptive, disrespectful, and will not be tolerated. Students engaging in such behaviour may be asked to leave the room. Cellular phones, pagers, and text-messaging devices are disruptive when they ring in class. If you must bring these with you, please place them on silent mode or turn them off during class. Failure to do so may result in your being asked to leave.

8. Laptops for the **purpose of typing lecture notes** are permitted in class, but please be respectful to your fellow students and turn the sound off. If I receive complaints from other students regarding noise or other disruptive behaviour (e.g., watching videos on YouTube.com, updating your Facebook status, playing Solitaire), your classroom laptop privileges will be revoked.

9. Audio and/or videotaping of lectures is not permitted unless approval has been sought from the instructor in advance.

## **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

<http://www.uwo.ca/univsec/board/code.pdf>

## **ENGLISH PROFICIENCY FOR THE ASSIGNMENT OF GRADES**

Visit the website <http://www.uwo.ca/univsec/handbook/exam/english.pdf>

## **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 -- <http://www.shs.uwo.ca/student/studenthealthservices.html>
3. Registrar's Office -- <http://www.registrar.uwo.ca/>
4. Ombuds Office -- <http://www.uwo.ca/ombuds/>

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