PHTH 440: CLINICAL EXERCISE PHYSIOLOGY

Instructor: Marc Roig, Ph.D.
Office: Davis House D30.
Telephone: (514) 398-4400 ext. 00841.
Email: marc.roigpull@mcgill.ca
Office hours: By appointment only.
Laboratory instructor: Ana Maria Moga, MSc.
Email: ana.moga@mcgill.ca
Lecture days, time & location: Tuesday & Thursday, 2.35PM to 3.55PM, Room EDUC 129.
Date range: September 5 to December 7.

COURSE CONCEPTUAL MAP

COURSE STRUCTURE

21 x 1.5 hours of lectures, quizzes and other class activities

- ***Block 1: Exercise Physiology (lectures 2-6)****:* will cover basic concepts of exercise physiology and metabolism as well as of neural control of movement and muscle structure and function.
- ***Block 2: Acute responses to exercise (lectures 7-9)****:* will cover common physiological responses to acute exercise of the different bodily systems with an emphasis on the cardiorespiratory system.
- ***Block 3: Exercise testing (lectures 10-12)****:* will cover basic principles of exercise testing and guidelines for the interpretation of the most commonly used tests to assess cardiorespiratory fitness, strength and flexibility.
- ***Block 4: Chronic adaptations to exercise (lectures 17-19)****:* will cover main physiological adaptations to chronic exercise with an emphasis on the cardiorespiratory, muscular and nervous system.
- ***Block 5: Exercise prescription (lectures 20-23)****:* will cover general concepts of exercise prescription with a special emphasis on clinical populations.

1 x 3 hours laboratory practice

- ***Laboratory practice***: one laboratory session on how to perform pulmonary function (PFT) and graded exercise tests (GXT).

1 x 20 minutes case study presentation

- ***Presentation of case study****:* a presentation solving a clinical case for exercise prescription.

LEARNING OBJECTIVES

The learning objectives of the course have been classified using the essential competency levels for Physiotherapists in Canada. The course will help students develop the following core competencies:

Expert:

1. Explain the principles of exercise physiology and metabolism.
2. Describe the main physiological responses to acute and chronic exercise.
3. Be able to understand the principles of exercise testing and to interpret the results of clinical exercise tests.
4. Learn how to safely and effectively perform PFT as well GXT.
5. Explain the principles for the safe and effective prescription of exercise in special populations.
6. Know the evidence behind the effectiveness of exercise interventions in special populations and in some of the most prevalent health clinical conditions.

***Communicator*:**

1. Demonstrate effective and appropriate verbal, non-verbal, written communication when interacting with patients (peers) during the laboratory practice.
2. Be able to collect, note and analyze data and share data during the laboratory practice.
3. Be able to present main findings of research to other students in an effective and appropriate manner during the presentation of the term paper.

Collaborator:

1. Demonstrate the ability to work respectfully and collaborative during the different group assignments and presentations.

Manager:

1. Demonstrate organizational skills to establish priorities and individualized roles in the group assignments.

Advocate:

1. Promote a healthy lifestyle and the prevention of functional limitations through the practice of physical activity.
2. Promote the use of different types of exercise as a therapeutic tool in rehabilitation.
3. Increase the visibility and relevance of physical therapists in the testing and prescription of exercise in clinical populations.

Scholarly practitioner:

1. Be able to critically evaluate the quality of scientific evidence from the literature through the review of the literature of the term paper.
2. Show the ability to formulate clinical questions and use the available resources to answer those questions in the term paper.

Professional:

1. Contribute to the development of the role of physical therapy in clinical exercise prescription

EVALUATION

20%: Midterm examination: lectures 1-12.
20%: Presentation of case study.
15%: Laboratory report.
20%: Quizzes.
25%: Final examination: lectures 17-24.

Midterm/final examination
Multiple-choice questions.

Presentation of case Study
Students will work in groups of 6 (you can sign up on mycourses and select the groups) to prepare a 15 + 10 minutes' presentation about a specific case study. A copy of the presentation should be sent to the instructor no later than **Nov 24th. After this date, the presentation cannot be modified.** The objective of the presentation is to evaluate your capacity to perform an initial assessment of a patient and prepare a comprehensive exercise program based on the clinical condition/s and the goals of the patient. **On September 21, an example of a case study presentation will be given in class.**

The presentation should contain the following sections:
Initial assessment: determine the risk level of the patient and define absolute and relative contraindications to exercise based on the information provided. Identify the most common red flags and things to consider during initial assessment. Describe which clinical tests you will do/require and mention additional information that you are lacking and that you would like to have.
Exercise testing: define and describe which exercise tests are needed in this specific case. You cannot do all the tests but you can select and prioritize the most important ones to be used. Explain why you choose those tests and if modifications of the protocols are required for this patient. Describe which outcomes you will obtain and how will you measure them.
Exercise prescription: using the information provided and gathered during the exercise testing develop a specific training program including the types of exercises and parameters required (frequency/intensity/volume). Discuss the progression of training, how you will establish this progression and establish specific milestones that the patient will need to achieve.

The presentation will be evaluated based on the following criteria:
Completeness (5%): all sections described above must be presented. The use of diverse sources of information (e.g. electronic databases, journals, recommendations) will be considered. The idea is to gather as much information as possible to perform an appropriate assessment, exercise testing and prescription.
Interpretation (5%): Accurate and critical interpretation of the information provided (e.g. medical history, laboratory tests and diagnosis). It is important to identify the most

important information in relation to exercise testing and prescription. Identify red flags, facilitators and barriers and plan your exercise testing and prescription accordingly.

Questions (10%): in the last 5-10 minutes the instructor will ask questions in relation to the case study. Responses will be evaluated based on your ability to respond appropriately and accurately.

Peer evaluation (-5%): evaluation of each member of the group by their peers. Each student **will send Ana Maria Moga an email with the evaluation of each other member of the group no later than the deadline**. Consider the quantity and quality of the work performed and assess it based on the criteria of the evaluation grid using whole numbers (1 to 5). This assessment will be kept confidential. Please note that the **peer evaluation score DOES NOT add points to your mark, it only subtracts them (e.g. you need to obtain a 5 from all members of your group if you want to keep your mark).**

Evaluation grid*

	5 (Excellent)	4 (Very good)	3 (Good)	2 (Satisfactory)	1 (Unsatisfactory)
Completeness					
Interpretation					
Questions	X2	X2	X2	X2	X0
Peer-evaluation					

Please note that although style is not formally in the grid it will be taken into account. Aspects such as writing quality, coherence, clarity, lack of grammatical mistakes and typos and accuracy in referencing will be considered. More than 5 typos/grammatical mistakes, lack of clarity and accuracy in referencing will lower the mark significantly. Please note that even though each criterion is assessed independently, a poor score in style may affect the rest of the criteria.

Laboratory report

Please note that **attendance to the laboratory practice is mandatory.** Only 8 time slots are available and these slots will be taken on a first-come first-served basis. Students will need to form groups of 6 (students will be told when to sign up on mycourses and select the group based on availability). Students will come to the **MEMORY-LAB** (old vestibular laboratory) located at the Jewish Rehabilitation Hospital (JRH) in Laval. The laboratory practice will last 3 hours approximately. Two of the students will volunteer as testing subjects (please bring sports clothing). The laboratory instructor will teach students how to perform a pulmonary function test (PFT) and a graded exercise test (GXT). The laboratory practice will be assessed by one per-group laboratory report of **no more than 1500 words excluding tables, figures and references**. Times New Roman 12 font, double line spacing and margins set at 1cm are required. Use the most convenient reference style. The exercise testing data collected during the laboratory practice will be used for writing the laboratory report. Detailed instructions of the tasks of the laboratory practice will be provided on October 18th in class. The general **objective of the report is to present a comprehensive analysis and interpretation of the collected data**. These are the aspects to be evaluated.

Presentation (7.5%): accurate and complete description and presentation and of the data (clinical and exercise test findings) provided.
Interpretation (7.5%): accurate and critical analysis and interpretation of the data (exercise test findings) provided in relation to normative values.
Peer evaluation (-5%): evaluation of each member of the group by their peers. Each student will send **Ana Maria Moga an email with the evaluation of each other member of the group no later than the deadline**. Consider the quantity and quality of the work performed and assess it based on the criteria of the evaluation grid using whole numbers (1 to 5). This assessment will be kept confidential. Please note that the **peer evaluation score DOES NOT add points to your mark, it only subtracts them (e.g. you need to obtain a 5 from all members of your group if you want to keep your mark).**

Evaluation grid*

	5 (Excellent)	4 (Very good)	3 (Good)	2 (Satisfactory)	1 (Unsatisfactory)
Presentation					
Interpretation					
Peer evaluation					

Please note that although style is not formally in the grid it will be taken into account. Aspects such as writing quality, coherence, clarity, lack of grammatical mistakes and typos and accuracy in referencing will be considered. More than 5 typos/grammatical mistakes, lack of clarity and accuracy in referencing will lower the mark significantly. Please note that even though each criterion is assessed independently, a poor score in style may affect the rest of the criteria.

Quizzes
During regular lecture days, we will have quizzes that will prepare you for the multiple choice question exams of the midterm/final. There are 4 quizzes during the course and each one counts 5% of the final mark (20% total). Since the quizzes will be completed in class, not attending the lecture that day will not allow you to obtain the points of the quiz.

COURSE MATERIALS
Main bibliographic resources (required)
References of book chapters as well as original and review articles relevant to the course content to be covered in each lecture will be posted on the PHTH 440 MyCourses site (www.mcgill.ca/mycourses/). Students are encouraged to read these materials before each lecture.

Reference textbooks (not required)
Exercise physiology

- McArdle WD, Katch FI & Katch VL. Exercise Physiology: Nutrition, Energy and Human Performance, 7th Edition. Lippincot Williams & Wilkins 2010

- Powers SK & Howley ET. Exercise Physiology: Theory and Application to Fitness and Performance, 8th Edition. McGraw Hill, New York, USA, 2012.
- Brooks GA, Fahey TD, Baldwin KM. Exercise Physiology. Human Bioenergetics and its Applications. 4th Edition. McGraw Hill, New York, NY, USA, 2005.

Clinical exercise physiology

- Ehrman JK, Gordon PM, Visich PS & Keteyian SJ. Clinical Exercise Physiology, 2nd Edition. Human Kinetics, Windsor, ON, Canada, 2009.
- LeMura L & von Duvillard S. Clinical Exercise Physiology: Application and Physiological Principles. Lippincott Williams & Wilkins, New York, NY, USA, 2004.

Exercise testing

- Wasserman K, Hansen JE, Sue DY, Stringer WW, Sietsma KE, Sun XG & Whipp BJ. Principles of Exercise Testing and Interpretation: Including Pathophysiology and Clinical Applications, 5th Edition. Lippincott Williams & Wilkins, New York, NY, USA, 2012.
- Jones NL. Clinical Exercise Testing, 4th Edition. WB Saunders Company, Philadelphia, Pennsylvania, USA, 1997.

PROGRAM (subject to change)

	Date	Title of Lecture
1	Sept 5	Course presentation
EXERCISE PHYSIOLOGY		
2	Sept 7	Bioenergetics
3	Sept 12	Exercise metabolism I
4	Sept 14	Exercise metabolism II
5	Sept 19	Neuromechanics of movement
6	Sept 21	***Presentation case study by Dr. Roig + Quiz 1 (lectures 1-5)***
ACUTE RESPONSES		
7	Sept 26	Circulatory and respiratory responses to exercise I
8	Sept 28	Circulatory and respiratory responses to exercise II
9	Oct 3	Circulatory and respiratory responses to exercise III
EXERCISE TESTING		
10	Oct 5	Pre-exercise Testing
11	Oct 10	Exercise Testing I + ***Quiz 2 (lectures 7-10)***
12	Oct 12	Exercise Testing II +
13	Oct 17	***Presentation laboratory report by Ana-Maria Moga***
14	Oct 19	***Midterm Exam (Lectures 1-12)***
15	Oct 24	***Laboratory week***
16	Oct 26	***Laboratory week***
CHRONIC ADAPTATIONS		
17	Oct 31	Training Adaptations I
18	Nov 2	Training Adaptations II
19	Nov 7	Training Adaptations III + ***Quiz 3*** (***lectures 11,12-17,18***)
EXERCISE PRESCRIPTION		
20	Nov 9	Prescription and periodization
21	Nov 14	Exercise prescription I: aerobic Fitness
22	Nov 16	Exercise prescription II: muscle strength and endurance
23	Nov 21	Exercise prescription III: coordination and flexibility
24	Nov 23	***Documentary + Quiz 4 (lectures 19-23)***
25	Nov 28	Presentations
26	Nov 30	Presentations
27	Dec 5	Presentations
28	Dec 7	Presentations

November 23rd: *Case study must be handed in*

December 7th: Lab report must be handed in

Right to submit in English or French written work that is to be graded [approved by Senate on 21 January 2009]:

"In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded."

"Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue)."

Academic Integrity Statement [approved by Senate on 29 January 2003]:

"McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information)."

"L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/)."