

## PHTH 440: CLINICAL EXERCISE PHYSIOLOGY

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**Office hours:** By appointment only.

**Lecture days, time & location:** Wednesday & Friday, 11.30 to 13.00, Room EDUC 624 McIntyre Medical Building.

**Date range:** Sept 05 to Dec 6.

### COURSE STRUCTURE

23 x 1.5 hours lectures

- ***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 7-10)***: will cover common physiological responses to acute exercise of the different bodily systems with an emphasis on the cardiorespiratory system.
- ***Block 3: Chronic responses to exercise (lectures 11-13)***: will cover main physiological adaptations to chronic exercise with an emphasis on the cardiorespiratory, muscular and well as the nervous system.
- ***Block 4: Exercise testing (lectures 15-18)***: will cover basic principles of exercise testing and guidelines for the interpretation of the most commonly used tests to assess cardiorespiratory fitness.
- ***Block 5: Exercise prescription (lectures 19-23)***: will cover general concepts of exercise prescription with a special emphasis on special and clinical populations.

1 x 2.5 hours laboratory practice

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

1 x 15 minutes presentation

- ***Presentation***: will cover one short presentation with the main findings of the term paper.

### 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 develop the role of physical therapy in clinical exercise prescription

**EVALUATION**

25%: Midterm examination: lectures 2-13.

30%: Paper & presentation.

20%: Laboratory report.

25%: Final examination: lectures 15-23.

***Midterm/final examination (50% final mark)***

Multiple-choice questions.

***Paper & presentation (30% final mark)***

Students will work in groups of 6 (students can now sign up on mycourses and select the group). Students will need to write a review paper (**no more than 4000 words excluding references, figures and tables**) investigating the evidence against or in favor of the effectiveness of the use of a specific exercise intervention. The most appropriate format (e.g. abstract structure) can be used. However, **Times New Roman 12 font, line spacing of 1 and margins set at 1cm are required**. Students cannot use condensed font types or go beyond the allowed word count. On the first page of the paper (title page) students will need to include the name of each member of the group and the part of the paper this person has worked on. A short power point **presentation** (15 minutes) outlining the main findings of the paper should be prepared for the final class of the course (lecture 24). **The paper will be evaluated based on the following criteria:**

**Style (5%):** writing quality, coherence, clarity, lack of grammatical mistakes and typos, accuracy in referencing. 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.

**Search (5%):** completeness (e.g. electronic databases, hand searching, grey literature) and systematic search of the different available sources (at least one or two databases). Reporting search terms and filters is important (the search needs to be clearly enough so I can perform it again and check if the results are the same). Reporting PICO (Population/Intervention/Comparison/Outcomes) and explaining them is essential. Similarly, exclusion and inclusion criteria need to be clearly stated.

**Analysis (5%):** objective and balanced appraisal of the evidence based on the quality of the sources and the results of the studies. To analyze the methodological quality of the selected studies and integrate this in the interpretation of the results is key.

**Interpretation (5%):** accurate and critical interpretation of the evidence based on the results of the analysis. To integrate the analysis of the quality of the studies is essential to assess evidence.

**Presentation (5%):** clear, comprehensive, collaborative (all members of the group should participate in a balanced manner) and adjusted to the time allowed.

**Group assessment (5%):** evaluation of each member of the group by their peers. Each student **will send the TA 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.

### **Evaluation grid**

	5 (Excellent)	4 (Very good)	3 (Good)	2 (Satisfactory)	1 (Unsatisfactory)
Style					
Search					
Analysis					
Interpretation					
Presentation					
Group-assessment					

### **Evaluation Criteria\***

#### **Introduction**

- Includes basic epidemiological data of the disease including incidence/prevalence/morbidity/mortality
- Clearly outlines objectives of the paper justifying the selection of the exercise intervention

#### **Methods**

- Clearly defines PICO (**P**opulation/**I**ntervention/**C**omparison/**O**utcomes) used in the search.
- Contains inclusion and exclusion criteria to narrow down the search (which papers you will include and or exclude based on scope and quality).
- Provides a complete/systematic search plan (databases/key words) including major databases and other resources.
- Explains how methodological quality is to be assessed.
- Describes statistical methods if necessary.

#### **Results**

- Shows a detailed description of the results of the search so that it can be easily replicated.
- Gives information about papers that have been included and excluded (in the last selection of papers only).

- Provides a description of the papers selected including PICO (intervention/population/outcomes/results)
- Provides a quantitative (optional) and qualitative (mandatory) analysis of the results

#### **Discussion**

- Discusses the evidence based on the results of the search
- Weighs the evidence based on the methodological quality of each paper (this is key to obtain a good mark in the interpretation)

#### **Conclusion**

- Summarizes main points of the review based on the evidence
- Outlines weaknesses/limitations of the review
- Suggests gaps and directions for further research based on the results of the review

\* **Roig M** et al. The effects of cardiovascular exercise on human memory: a review with meta-analysis. **Neuroscience Biobehavioral Reviews**. 2013:1645-1666.

#### ***Laboratory report (20% final mark)***

Please note that **assistance to the laboratory practice is mandatory**. Only 7 time slots are available and these slots will be taken in a first-come first-served basis. Students will need to form groups of 6 (students can now 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 2.5 hours approximately. Two of the students will volunteer as testing subjects (please bring sports clothing). Students will be instructed by a TA on how to perform a PFT and a GXT. The laboratory practice will be assessed by one per-group laboratory report of **no more than 1500 words excluding tables, figures and references**. The most appropriate format can be used. However, **Times New Roman 12 font, line spacing of 1 and margins set at 1cm are required**. The data of the students will be used for writing the laboratory report. Detailed instructions of the tasks of the laboratory practice will be provided in due course. 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.

**Professionalism:** the TA will evaluate the professionalism, care and concentration of the group during the tests.

**Style:** writing quality, coherence, clarity, lack of grammatical mistakes and typos.

**Analysis:** accurate and complete description of the data (clinical and exercise test findings) provided.

**Interpretation:** accurate and critical analysis of the data (exercise test findings) provided in relation to normative values.

### Evaluation grid

	5 (Excellent)	4 (Very good)	3 (Good)	2 (Satisfactory)	1 (Unsatisfactory)
Professionalism					
Style					
Analysis					
Interpretation					

#### **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/](http://www.mcgill.ca/mycourses/)). Students are encouraged to read these materials before each lecture.

##### ***Additional bibliographic resources (recommended)***

For those who want to expand their knowledge additional references relevant to the course content to be covered in each lecture will be provided.

##### ***Other reference textbooks (not required)***

Exercise physiology

- McArdle WD, Katch FI & Katch VL. Exercise Physiology: Nutrition, Energy and Human Performance, 7<sup>th</sup> Edition. Lippincott Williams & Wilkins 2010
- Powers SK & Howley ET. Exercise Physiology: Theory and Application to Fitness and Performance, 8<sup>th</sup> Edition. McGraw Hill, New York, USA, 2012.
- Brooks GA, Fahey TD, Baldwin KM. Exercise Physiology. Human Bioenergetics and its Applications. 4<sup>th</sup> 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
<b>EXERCISE PHYSIOLOGY</b>		
1	Sept 4	Bioenergetics
2	Sept 9	Exercise metabolism (I)
3	Sept 11	Exercise metabolism (II)
4	Sept 16	Neural control of movement
5	Sept 18	Skeletal muscle structure and function
6	Sept 23	Fatigue
<b>ACUTE RESPONSES TO EXERCISE</b>		
7	Sept 25	Circulatory and respiratory responses to exercise (I)
8	Sept 30	Circulatory and respiratory responses to exercise (II)
9	Oct 2	Circulatory and respiratory responses to exercise (III)
<b>CHRONIC RESPONSES TO EXERCISE</b>		
10	Oct 7	Adaptations to exercise (I)
11	Oct 9	Adaptations to exercise (II)
12	Oct 14	Adaptations to exercise (III)
	Oct 16	<b>No Class</b>
13	Oct 21	<b>Midterm Exam in Class</b>
<b>EXERCISE TESTING</b>		
14	Oct 23	Cardiopulmonary testing (I)
15	Oct 28	Cardiopulmonary testing (II)
16	Oct 30	Strength testing
	Nov 4	<b>Laboratory week</b>
	Nov 6	<b>Laboratory week</b>
<b>EXERCISE PRESCRIPTION</b>		
17	Nov 11	Principles of training
18	Nov 13	Special populations I
19	Nov 18	Special populations II
20	Nov 20	Clinical populations I
21	Nov 25	Clinical populations II
22	Nov 27	Clinical populations III <b>Laboratory report needs to be handed in at the end of the lecture</b>
TBD		<b>Final exam – during exam period (Lectures 15-22)</b>

**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/](http://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/](http://www.mcgill.ca/students/srr/honest/))."*