

POTH 639 MOTOR CONTROL

Credits: 3

Prerequisites: none

Instructors: Mindy Levin, PT, PhD (Co-ordinator)
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Date and time of lectures: Mondays, 10:30-13:30, Thursdays 13:30-16:30 (2 lectures)

Course Structure: One to two 3 hour lectures/labs per week

Calendar Course Description: Theoretical course with practical demonstrations and applications providing an overview of basic anatomy of the motor system, current knowledge of how movement is controlled by the nervous system and how motor skills are learned. Models of motor control will be introduced and discussed including the action-perception theory, force control theory, internal models and the equilibrium point theory. Motor learning theories related to muscular and neurological plasticity as it applies to orthopaedic and neurology clinical practice will be introduced and discussed.

Online Course Evaluations: Students are strongly encouraged to complete the online course evaluations at the end of the term. Data obtained from these evaluations are used to provide instructors with feedback as well as for identifying situations where a course or instructor needs assistance. The feedback and suggestions contained in the responses are highly valued and helpful in ensuring that instructors make appropriate changes to courses as needed in order to facilitate student learning.

General Learning Outcomes:

With attendance and active participation in class and in laboratory activities, the student will be actively engaged in developing the following core competencies as they related to the roles for physiotherapists in the context of the practice of physiotherapy.

Expert

1. Describe current theories of the production and organization of movement;
2. Understand the controversies and discriminating features of different theories of motor control;
3. Describe current theories of motor learning.
4. Appraise the evidence for the effectiveness of different types and delivery schedules of feedback for motor learning in different patient populations;
5. Integrate motor control and motor learning theories in the design of treatment approaches to optimize motor function in different patient populations.

Communicator

1. Demonstrate effective and appropriate terminology used to describe motor control and motor learning in both verbal and written form.

Scholarly practitioner

1. Apply concepts based on current theories of the production and organization of movement to physiotherapy practice and/or motor rehabilitation;
2. Apply concepts based on current theories of motor learning to physical therapy practice and/or motor rehabilitation; and use of extrinsic information;
3. Apply elements of motor control used to assess movement quality and motor learning in the evaluation and treatment of simulated cases in orthopaedics and neurology.
4. Select and incorporate into practice optimal assessment methods and outcome measures related to motor behavior.

Course Content:

1. Introduction: Course content and requirements
Review of basic anatomy and physiology of the sensorimotor system
2. Motor Control Theories 1: historical perspective, philosophy of motor control, early motor control theories starting from Sherrington (e.g., motor programming, schema theory).
3. Motor Control Theories 2: dynamical approaches/modeling/equilibrium-point theory
4. Motor Control Theories 3 – equilibrium point theory, Controversies in motor control
5. Motor Learning 1 - historical overview and current theories
6. Motor Learning 2 – used of enhanced information – feedback
7. Neural plasticity, compensation and recovery
8. Approaches to clinical evaluation and measurement

*** Note:** Some lectures/labs will be given in different buildings across the campus, and sometimes off campus.

Instructional Methods: The course combines lectures, labs and small group presentations

Course Materials:

Required Textbook:

Mark L. Latash. Fundamentals of Motor Control, 1st Edition. 2012

Imprint: Academic Press

ISBN: 9780124159563

Suggested Readings:

Kandel and Schwartz – Principles of Neural Science. Ch.19,35 (Ghez),37,38,40-42

Boyd LA, Winstein CJ. Explicit information interferes with implicit motor learning of both continuous and discrete movement tasks after stroke. *Journal of Neurologic Physical Therapy*. 30:46-57, 2006

Calota A., Feldman A.G., Levin M.F. Spasticity measurement based on tonic stretch reflex threshold in stroke using a portable device. *Clinical Neurophysiology*, 119:2329-2337, 2008

Calota A., Levin M.F. Tonic stretch reflex threshold as a measure of spasticity: implications for clinical practice. *Topics in Stroke Rehabilitation*, 16(3):177-188, 2009

Greeno J.G. Gibson's affordances. *Psychological Review* 101:336-342, 1994

Gibson JJ. Reasons for Realism. Chapter 4.9. Erlbaum: New Jersey 1982

Levin MF, Panturin E. Sensorimotor integration for functional recovery and the Bobath approach. *Motor Control* 15(2): 285-301, 2011

Turvey MT, Fitch HL, Tuller B. The Bernstein Perspective. I. The Problem of degrees of freedom and context-conditioned variability. P. 239-262.

Winstein CJ, Meriens A.S., Sullivan K.J. Motor learning after unilateral brain damage. *Neuropsychologia*, 37:975-987, 1999. ,

Student Assignments and Evaluation:

Assignment/evaluation	Description	%
Class participation	Attendance in class and participation in small group discussions	10%
Reading assignments worth 20% each - individual	Students will be assigned research papers to read for which they will prepare a 5 page (1.5 spacing, 12 Times New Roman font) assignment that includes a) a summary of the papers and b) an application of the ideas presented in the paper to physical therapy or sport.	30%
Lab Reports	There will be 3 lab reports worth 10% each. Students will be working in assigned groups.	30%
In class presentation	Students will present applications of course material (motor control theory and motor learning) to specific patient-based cases.	30%

Special Requirements for Course Completion and Program Continuation:

In order to pass the course, a grade of at least B- (70%) must be obtained as a total course mark. Please refer to Section 3.6 Examinations, of the 2011-2012 [McGill University Health Sciences Calendar](#) for information on University regulations regarding final examinations and supplementals.

This course falls under the regulations concerning theoretical and practical evaluation as well as individual and group evaluation. Please refer to the section on Marks in the Rules and Regulations.

Plagiarism/Academic Integrity: "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/)."

Attendance: Students who have missed more than 10% of small group sessions without prior approval will lose 10% of their total course mark.

Right to submit in English or French written work that is to be graded: 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)."

Consequences of Not Completing Assignments as Requested: An individual who does not complete a required assignment and does not have a university recognized reason for deferral would receive a 0 in that portion of the evaluation.

Disability: If you have a disability please contact the instructor to arrange a time to discuss your situation. It would be helpful if you contact the Office for Students with Disabilities at 398-6009 before you do this.