This course will survey the role of different cerebral cortical and sub-cortical areas in controlling voluntary movements. Following a review of the fundamental concepts in motor control and basic neuroanatomy, students will give presentations summarizing what is currently known about the motor function of different brain regions. Data from theoretical, experimental, and patient studies will be used to illustrate how various areas such as primary motor, premotor, parietal, and cerebellar cortices are involved in the planning and execution of sensory-guided voluntary motor behaviour. There will be two articles assigned for each topic which, along with the presentation, will be discussed in class. Course evaluation will be based on class participation, a presentation, article discussions, and weekly article-based quizzes.

Prerequisites: Intermediate motor control / motor learning course, introductory neuropsychology course or permission of course director

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Lectures: March 9 – May 20, 2009, Mondays 11h30 – 14h30
Location: Calumet College 335

Readings/Textbooks: The articles to be presented each week will be assigned in the first class. The following textbooks may be of use and are in the Steacie Library:

Course Evaluation: Presentation & handout 30%
Article discussion & handout 15%
Participation 10%
Weekly quizzes (9) 45%
KINESIOLOGY AND HEALTH SCIENCE

Brain Mechanisms of Movement in Health and Disease
KAHS 6150 / PSY 6235 / BIOL 5137 3.0

Presentations and handout:
- The presentation should be 30-40 minutes long. The following five points should be discussed for each brain area / topic (if possible):
  1) anatomical connections,
  2) clinical consequences of a lesion in the area,
  3) relevant behavioural experimental results, psychophysical or imaging studies,
  4) findings from neurophysiological (animal model) studies, and
  5) what the data suggest about the role of this particular area in the control of sensory-guided movement.
- **You will need to provide the class with a 1-2 page summary of these five points on the day of your talk.** This will count towards 5% of your presentation mark.

Article discussion - *Roundtable format (not a presentation). NO powerpoint!!*
- You are to lead a discussion of an article. The intent is to exercise your critical analysis skills. You will need to present to the group:
  1) the premise of the experiment: review the background studies referred to in the paper, the assumptions being made, and the hypothesis being tested.
  2) the methods of the experiment: review the experimental approach, and the logic behind the paradigm being used.
  3) the results: review the findings. In particular, go through the figures to ascertain how they support the claims being made by the authors.
  4) review the discussion points made by the authors, and how they relate to the study's data and hypothesis.
  5) lead a discussion on how well the experiment tested the hypothesis. Were there untenable assumptions? Were there flaws or critical omissions in the analyses? Was something overlooked? Did the discussion overreach the data? How crucial / important / timely was this information to the advancement of our understanding of the brain and its control of movement?!
  6) **A summarizing handout (1 page) **

**Everyone needs to think about these points for each reading**. Your contribution to the article discussion will be the basis of your class participation mark, and the quiz questions will be based on the articles.

The full class schedule will be posted on-line after the first class.

*Class timeline (minutes):*
KINESIOLOGY AND HEALTH SCIENCE

Brain Mechanisms of Movement in Health and Disease
KAHS 6150 / PSY 6235 / BIOL 5137

Schedule, Winter 2009

March 9
Introduction, assignment of topics
Reading: Kandel et. al. Essentials of Neuroscience and Behaviour, Chapter 26: Introduction to movement - provided

March 16
1. Spinal cord injury and rehabilitation

2. Cerebellum & motor learning

March 23
1. Basal Ganglia

2. Brain stem / Coma

March 30
1. Medial motor areas

2. Primary motor cortex / stroke
Article: M1 contributes to the intrinsic but not the extrinsic components of motor-skills. Romei et al. Cortex, 2009 (Epub ahead of print – dowload from course site)

April 6
1. Prefrontal cortex, response inhibition, dementia
Article: Oculomotor function in frontotemporal lobar degeneration, related disorders and Alzheimer’s disease. Garbutt et al., Brain, 2008; 131, 1268-1281

2. Dorsal Premotor areas
April 13

1. Ventral Premotor areas

*Article:* Virtual lesion of ventral premotor cortex impairs visual perception of biomechanically possible but not impossible actions. Candidi et al. Social Neuroscience, 2008, 3 (3-4), 388-400.

2. Inferior parietal area & agnosias


April 20

1. Superior parietal areas & apraxias


2. Vestibulo-motor integration


April 27

1. Music and movement, rhythm


2. Sensorimotor integration & transcortical oscillatory activity

*Article:* Defective Inhibition and Inter-Regional Phase Synchronization in Pianists With Musician’s Dystonia: An EEG Study. Ruiz et al. (2009) Hum. Br. Mapping (epub ahead of print- download from course site)

May 4

1. Seizures and Epilepsy

*Article:* The peri-ictal state: cortical excitability changes within 24 h of a seizure. Badaway et al. Cortex, 2009 (epub ahead of print- download from course site)

2. Lateralization: split-brain studies


May 11: Class cancelled (professor away)

May 20**

1. Acquired brain injury, concussion


2. Brain machine interface


*Note, this final class is on a Wednesday, since Monday the 18th is a holiday.*