Western Washington University
Department of Physical Education, Health and Recreation
KIN 507 Motor Control
Fall 2018

Instructor: Gordon Chalmers, Ph.D.
Office: ET 275 Phone: 650-3113   Email: gordon.chalmers@wwu.edu
Course Web Page: http://myweb.facstaff.wwu.edu/chalmers
Office hours: Mon 1:30-2:30, Wed 1:30-2:30, Fri 1:30-4.
   Note: If my office hours are booked but you need to discuss class topics with me, email me and request a
meeting and we will set a time to meet outside of office hours.
Course Time: Tues & Thurs 3:00 – 4:15   Location: CV 264   Credits: 3

COURSE DESCRIPTION: If I were rename this course I would call it “Neuroscience of Human Movement and
Performance”. The scope of neuroscience related topics related to kinesiology and human performance has
expanded greatly beyond motor control and proprioceptive systems. The objective of this course is to help
students develop an understanding of Human Movement and Performance Neuroscience so that research
projects and literature involving variables such as muscle force, muscle power, EMG, mental practice,
proprioception, and inter muscle coordination, producing movement or static posture, and topics such as
the role of exercise in maximizing human cognition, and performance enhancement may be critically
analyzed. To do this, the course will examine human kinesiology and performance related neuroscience by
examining several current issues in the basic research and applied human performance literature.
Research papers related to each of these issues will be examined and discussed so that students develop
and practice the skill of critical reading of scientific literature. These discussions will allow us to draw
conclusions regarding each of the issues examined. These discussions are not considered to be exhaustive
reviews of the topic, due to limited time within the class. Rather, they are intended to introduce you to,
and educate you about some pertinent kinesiology and human performance neuroscience topics, and allow
you to explore these, and related topics further as literature in the field progresses in the future. Students
will also examine one kinesiology and human performance neuroscience topic of personal interest through
a research paper assignment.
GOALS: Students will:
   1. Develop the skills to research, critically evaluate, and draw conclusions regarding motor control
topics.
   2. Become knowledgeable on the topics discussed.
   3. Be able to apply knowledge gained in (1) and (2), when applicable, in their work with people.

Course Units: Note: we will not have the time to cover all these topics, and may not cover them in the
order listed. New topics may be added based on class interest areas.

- Introduction
- discuss research asst.
- KIN 506 grad school/student intro
- Assigning readings for next day

TOPIC: Student topics, and/or articles, of interest? e.g., health, clinical, training regular people, training athletes,
   basic science.
   1. ?
   2. ? etc.

TOPIC: Can you change your fiber types? * = all students read
1. BEFORE STUDENTS READ: Brief intro lecture from KIN 410: differences in AB vs AX classification systems.


Additional paper(s) on above topic suggested by students

Related topic(s) students would like to explore:

- ?
- any papers to suggest?

Summary: what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. What comes next in this topic?

**TOPIC: Recruitment. Can you voluntarily activate all of your muscle mass? Central Governor Model.** * = all students read


Additional paper(s) on above topic suggested by students

Related topic(s) students would like to explore:

- ?
- any papers to suggest?

Summary: what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. What comes next in this topic?

**TOPIC: Higher centers control of movement**

1. Lecture notes material
3. Video: HumanRoboticArm.avi
5. Video: for above article: The nerve bypass how to move a paralyzed hand.mp4

Additional paper(s) on above topic suggested by students

Related topic(s) students would like to explore:

- ?
- any papers to suggest?

Summary: what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. What comes next in this topic?

**TOPIC: Locomotion, Central Pattern Generators**


Additional paper(s) on above topic suggested by students

Related topic(s) students would like to explore:

- ?
- any papers to suggest?

Summary: what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. What comes next in this topic?

**TOPIC: Exercise & Brain Health** * = all students read

* Introductory newspaper article: Walk, Jog or Dance: It’s All Good for the Aging Brain http://nyti.ms/1S4rQsF

Discussion Goals: We have “prescriptions” for training of the cardiovascular, muscular and skeletal systems for health goals (freq, intensity, types, time, FITT). What do you think should be the “prescription” for training for brain health? What benefits of this exercise do you predict?

Reading guidelines: Focus primarily on the paper contents that will allow you to contribute to the “Discussion
Goals” stated above. This means focus primarily on what exercise was done (and it’s parameters and the population involved) and its effect on cognitive function, brain health, or brain anatomy. Secondarily note any other aspects of interest in the paper that are interesting. Finally, the mechanism(s) by which exercise has an effect on the brain is not of primary importance (except for the paper that examines the effect of exercise on BDNF, the BDNF is the outcome measure of brain health, but it is also a mechanism of brain health). Note also that for some articles I provide additional guidelines for the reading after the citation, “WHEN YOU READ THIS ARTICLE, FOCUS ON...”.

1. Katrin Weigmann. Why exercise is good for your brain. DOI 10.15252/embr.201439051 |Published online 18.06.2014. EMBO reports(2014)embr.201439051


Additional paper(s) on above topic suggested by students

Related topic(s) students would like to explore:
• ?
• any papers to suggest?

Summary: what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. Discussion: We have "prescriptions" for training of the cardiovascular, muscular and skeletal systems for health (freq, intensity, types, time, FITT). What do you think should be the “prescription” for training for brain health? What benefits of this exercise do you predict?

TOPIC: Brain Stimulation to enhance physical performance  * = all students read

1. Discussion Goals: Would you use brain stimulation to enhance the athletic performance of a client you are working with? Would you use brain stimulation to enhance your athletic performance? SHOW HALO WEB SITE https://www.haloneuro.com/

Introductory magazine articles:

a) * US Olympic track star out to prove Halo Sport headphones make him faster, stronger - CNET 2016.pdf


4. Brief overview of use of brain stimulation to facilitate motor recovery following stroke(.docx) THE ABSTRACTS
FOR ALL THESE ARTICLES ARE AVAILABLE IN MEDLINE


5. Brain Stim on Healthy Subjects (.docx)


Angius, L; Hopker, J; Mauger, AR. The ergogenic effects of transcranial direct current stimulation on exercise performance. Frontiers In Physiology 2017;8:.
http://dx.doi.org/10.3389/fphys.2017.00090

6. Safety and experimental design

7. https://www.haloneuro.com/
For these articles, focus only on their methods, their data analysis, and their results. You don't need to discuss the intro, that is their version of a lit review, and we have already done our own version of that. Don't focus on their discussion, that is their interpretation of results, we want to make our own. Make your own conclusion of results that you can make (and that can be compared to their conclusion briefly listed in the abstract or start of the discussion).
   a) A Real-World Investigation into the Benefits of Transcranial Direct Current Stimulation to the Primary Motor Cortex on Muscular Performance in Elite Athletes
   b) Bihemispheric Transcranial Direct Current Stimulation with Halo Neurostimulation System Over Primary Motor Cortex Enhances Rate of Force Development in an Isometric Lateral Pinch Force Task
   c) Bihemispheric Transcranial Direct Current Stimulation with Halo Neurostimulation System Over Primary Motor Cortex Enhances Fine Motor Skills Learning in a Complex Hand Configuration Task

Additional paper(s) on above topic suggested by students
Related topic(s) students would like to explore:
- ?
- any papers to suggest?
**Summary:** what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. What comes next in this topic?

**Discussion Goals:** Would you use brain stimulation to enhance the athletic performance of a client you are working with? Would you use brain stimulation to enhance your athletic performance?

**TOPIC: Mirror Training**

1. Ramachandran & Altschuler, The use of visual feedback, in particular mirror visual feedback, in restoring brain function, Brain July 1, 2009 132: 1693-1710
2. Ezendam, Bongers, Jannink, Systematic review of the effectiveness of mirror therapy in upper extremity function, Disability and Rehabilitation, 2009,Vol.31(26),p.2135-2149

Additional paper(s) on above topic suggested by students

Related topic(s) students would like to explore:
- ?
- any papers to suggest?

**Summary:** what are meanings, implications, how to use this info for applications such as: health, clinical, training regular people, training athletes. What comes next in this topic?

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**EVALUATION:**

<table>
<thead>
<tr>
<th>EVALUATION ITEM</th>
<th>% OF FINAL GRADE</th>
<th>DUE DATES</th>
<th>EVALUATION ITEM CONTRIBUTES TO THESE SLOs®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Assignment Topic Contract ^*</td>
<td>0</td>
<td>Oct 9</td>
<td></td>
</tr>
<tr>
<td>Midterm (open book)</td>
<td>20</td>
<td>Oct 30¹</td>
<td>1, 2, 3, 7, 9, 10</td>
</tr>
<tr>
<td>Research Assignment</td>
<td>40</td>
<td>Dec 4 ##</td>
<td>1, 2, 3, 4, 7, 8, 9, 10</td>
</tr>
<tr>
<td>Research presentation (12-15 min each)</td>
<td>10</td>
<td>Dec 4 &amp; Dec 6</td>
<td>1, 2, 3, 6, 7, 8, 9, 10</td>
</tr>
<tr>
<td>Class attendance, discussion participation &amp; contribution#</td>
<td>10</td>
<td>All Term</td>
<td>1, 2, 3, 5, 6, 7, 9, 10</td>
</tr>
<tr>
<td>Final (open book)</td>
<td>20</td>
<td>Wednesday, December 12 1:00 - 3:00 PM</td>
<td>1, 2, 3, 6, 7, 9, 10</td>
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^ The description of the research paper assignment and the grading sheet for the assignment can be downloaded from the course web site (http://myweb.facstaff.wwu.edu/chalmers, not a Canvas page).

* When the Research Assignment Topic Contract is submitted it is the FINAL version. This means you should have been meeting with Dr. Chalmers between when the assignment was distributed and the due date to discuss and define your topic. These discussions should take place in person.

¹ Date of midterm may be switched, based on progress of class through the course content. Students will get at least 1 week notification before midterm.

# Grading key for class attendance, discussion participation & contribution grade: There are up to 16 class days when there may be discussions. Part of some of these days will be some lecture, but will be counted as discussion days if lecture is less than 50% of the time. Accordingly, on each discussion day you will have the potential to score 2 points according to the following scale.

0 = lack of preparation and/or participation, and/or contribution
1 = some, but not complete preparation, some participation and/or contribution
Some discussion days are ones in which you are presenting a paper, others are when others are presenting papers. You will be rigorously graded for participation on days you are presenting (Hint: coming to class and it is clear you have not read the paper and understood its details when you are responsible for presenting will be frowned up). On days you are not presenting, lesser participation can yield full points.

Reports are due in class, at the start of class, on the due date announced in class. Reports submitted after this deadline will lose 10% of the maximum potential score per day, including weekends. Reports must be typed, include page numbers, and be stapled. You are required to participate in, and submit, all of the tests and assignments in this class. If any are omitted, you will receive a grade of F.

Kinesiology Graduate Program Student Learning Objectives:
Graduates of the program will be positioned to contribute to their profession and be life-long learners in a diverse society by demonstrating:

1. skilled written and oral communication
2. critical and creative thinking
3. effective information acquisition and utilization
4. content-specific technology use
5. collaboration and collegiality
6. professionalism and ethical behavior
7. the capability of synthesizing and applying information across the field of Kinesiology
8. the ability to apply appropriate methods to develop and investigate research questions
9. mastery of content knowledge in the core and applicable specialization areas of Kinesiology
10. mastery of content application in the core and applicable specialization areas of Kinesiology

This syllabus is subject to change. Changes, if any, will be announced in class. Students will be held responsible for all changes.

Grading Key:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>&gt;92%</td>
</tr>
<tr>
<td>A-</td>
<td>90 - 92%</td>
</tr>
<tr>
<td>B</td>
<td>87 - 89%</td>
</tr>
<tr>
<td>B+</td>
<td>83 - 86%</td>
</tr>
<tr>
<td>C</td>
<td>73 - 76%</td>
</tr>
<tr>
<td>C+</td>
<td>70 - 72%</td>
</tr>
<tr>
<td>D</td>
<td>67 - 69%</td>
</tr>
<tr>
<td>D+</td>
<td>63 - 66%</td>
</tr>
<tr>
<td>D</td>
<td>60 - 62%</td>
</tr>
<tr>
<td>F</td>
<td>below 60%</td>
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Reasonable Accommodation Policy: Reasonable accommodation for persons with documented disabilities should be established within the first week of class and arranged through Disability Resources for Students: telephone 650-3083; email drs@wwu.edu; and on the web at Disability Resources (http://www.wwu.edu/depts/drs/)

Test Make-Up Policy:
1. If a student misses a test, they cannot make up the exam unless prior approval has been granted, except under extenuating situations. If you have a medical excuse prior to the test, it must be given to the instructor prior to the test.
2. If a student requests a change in the test date, arrangements must be made at least one week in advance. The student should expect to take the test earlier rather than later.
3. All test arrangements must be made by direct contact, not through a telephone message left for the instructor.

Paper extensions and course incomplete grades: Extensions on the paper due date and incomplete grades for the course will be allowed only for documented medical reasons or very significant personal reasons.
ACADEMIC INTEGRITY:
For students, academic integrity means challenging yourself, striving for excellence, taking risks and learning from your mistakes, doing your own work, and giving credit whenever you use the work of others. It boils down to caring about your schoolwork and always being honest in carrying it out.

I begin with the assumption that you come to Western and this class with integrity. However, academic integrity and honesty can be challenging due to such things as ignorance, confusion, stress, bad advice, and bad choices. So to help you keep your integrity and good reputation intact, I have resources for you (meaning, by the way, that ignorance will not be an excuse):

- WWU's Integrity Website www.wwu.edu/integrity. It provides all the information you need, including why integrity is important, how to promote it, as well as types of academic dishonesty and how to avoid them, particularly plagiarism. It also includes WWU's policy and procedures on academic honesty (appendix D of the WWU Catalog).
- See me, see me, see me if you have any concerns or questions about academic integrity regarding yourself or your classmates. An ounce of prevention is worth a pound of cure, especially where penalties and one's reputation are at stake. I am here to help.

Student Services: Western encourages students to seek assistance and support at the onset of an illness, difficulty, or crisis.

- In the case of a medical concern or question, please contact the Health Center: 650-3400 or visit Student Health (http://www.wwu.edu/chw/student_health/).
- In the case of an emotional or psychological concern or question, please contact the Counseling Center: 650-3400 or visit Counseling Center (http://www.wwu.edu/chw/).
- In the case of a health and safety concern, please contact the University Police: 650-3555 or visit University Police (http://www.wwu.edu/ps/police/index.shtml).
- In the case of a family or personal crisis or emergency, please contact the Dean of Students: 650-3450 or visit Dean of Students (http://wp.wwu.edu/students/).
- To seek confidential support related to sexual violence, please contact CASAS (360-650-3700), the Student Health Center, and/or the Counseling Center. To report sexual violence, please contact University Police, Bellingham Police, and/or the Title IX Coordinator in Western’s Equal Opportunity Office (360-650-3307). Faculty are responsible employees who are required to report sex discrimination, including sexual violence that they learn about to the Title IX Coordinator.

Equal Opportunity: Mutual respect for everyone is key to ensuring a safe environment that promotes learning for all students. Western is committed to an environment free of discrimination and harassment. Federal and State laws, as well as University policies, protect faculty, staff, and students against discrimination based on the following legally protected characteristics: Race, Color, Creed, Religion, National Origin, Sex, (including pregnancy and parenting status), Age, Disability, Marital Status, Sexual Orientation, Gender Identity and Expression, Genetic Information and Veteran Status (See Equal Opportunity and Western’s Policies on Providing Equal Opportunity and Nondiscrimination and Preventing Sexual Harassment). If you feel you have experienced inappropriate behavior based on one of the categories above, please contact the Equal Opportunity Office, (360) 650-3307 (http://www.wwu.edu/eoo/)

Retention of student submitted work:
Dr. Chalmers occasionally saves a copy of work submitted by a student so it can be included in a collection of course material that is viewed by other WWU faculty members for course review purposes, or by future students to understand assignment requirements. In this case, the student’s name is removed from the material. If you do not wish to have your submitted work possibly saved in this manner, please notify your instructor by the end of the second week of classes.