

University of Florida
College of Public Health & Health Professions Syllabus
RSD 6710: Motor Control in Rehabilitation
(3 credit hours)

Summer Semester, 2023
May 15-August 11
Wednesday, 8:30 – 11:45 a.m.

Delivery Format: On-Campus

Instructor Name: Dorian Rose, MS, Ph.D, PT.
Room Number: HPNP 1101
Phone Number: 352-273-8307
Email Address: dkrose@phhp.ufl.edu
Office Hours: by appointment
Teaching Assistants: N/A
Preferred Course Communications: email

Prerequisites This course is open to all Rehabilitation Science PhD students. As such, admission to the RSD program is a prerequisite. Graduate students from other programs are encouraged to register with prior permission of the instructor.

PURPOSE AND OUTCOME

Course Overview

This course defines fundamental concepts and theories related to motor control and movement science and discusses these concepts in the context of neurorehabilitation. The course also emphasizes atypical motor control functions and underlying neurophysiological mechanisms following disease/injury. Students will practice scientific writing and presentation skills through weekly in-class presentations.

Relation to Program Outcomes

This course relates to the following student learning objectives in the RSD program:

1. Develop critical reading, thinking and scientific communication skills
2. Learn how to present research data to a diverse audience through written formats and academic presentations
3. Learn how to receive and answer research questions through academic presentations
4. Teach students how to critically evaluate research theories, methodologies, findings, conclusions and study limitations
5. Teach students how to evaluate different clinical assessments, evaluations, and interventions in the context of rehabilitation science

Course Objectives and/or Goals

Following completion of the course, the student will be able to:

1. Discuss fundamental concepts and theories related to motor control and movement science;
2. Utilize foundational knowledge of motor control to evaluate atypical behavioral and physical deficits observed in neurologic conditions;
3. Propose areas of further studies in basic science and clinical & translational research to examine gaps in our current knowledge relative to disease diagnosis, clinical evaluations and interventions;

4. Communicate scientific research and activities through written formats and academic presentations.

Instructional Methods

This course will utilize a seminar format. All students will read the directed articles each week before the class. One student will be assigned to create a PowerPoint presentation which will be used to lead the discussion of the article. The presenting student will also create two questions for each assigned article to query the class as part of the article discussion. Students not assigned to present the article will create and submit three questions (or insights) that arose from reading the article. All students will participate in the discussion related to these readings and contribute their insights they discovered or in response to questions raised by the presenter.

Required: directed readings (see below)

Optional:

- Shumway-Cook, A., & Woollacott, M. H. (2007). *Motor control: translating research into clinical practice*. Lippincott Williams & Wilkins
- Rosenbaum, D. A. (2010). *Human Motor Control* (2nd Ed.). Elsevier
- Schmidt, R.A. & Lee, T.D. (2019). *Motor control and Learning: A Behavioral Emphasis* (6th Ed.). Human Kinetics

DESCRIPTION OF COURSE CONTENT

The course will begin with an overview of how movement is controlled and a review of physiology of motor control including basic discussions of central and peripheral nervous system properties. The course will then transition to discuss motor skills necessary for human functioning and of interest to rehabilitation scientists such as postural control, reaching and grasping, gait, swallowing and turning. Control in both health and disease states will be discussed. Each of these units will review the current understanding of motor control of a particular system in health, and how that control is impaired in the presence of disease or injury.

Topical Outline/Course Schedule

Week (Date)	Topic(s)	Readings
1 (5/17)	Theories of Motor Control Physiology of Motor Control Principles of Simple Movement Arousal and Performance Facilitator: Dr. Dorian Rose	No Readings Assigned
2 (5/24)	Potential solutions to solving the Degrees of Freedom problem during Gait Facilitator: Dr. Dorian Rose	Ting LH, McKay JL. Neuromechanics of muscle synergies for posture and movement. <u>Curr Opin Neurobiol</u> . 2007; 17:622-628. Seamon BA, Neptune RR, Kautz SA. Using a Module-Based Analysis Framework for Investigating Muscle Coordination during Walking in Individuals Poststroke: A Literature Review and Synthesis. <u>Appl Bionics Biomech</u> . 2018 Jun 3;2018:3795754. doi: 10.1155/2018/3795754.

Week (Date)	Topic(s)	Readings
3 (5/31)	Control of Gait following Neurologic Injury Facilitator: Dr. Emily Fox	TBD TBD
4 (6/7)	Reaching and Grasp in Health and Disease Facilitator: Dr. Dorian Rose	Feingold-Polak R, Yelkin A, Edelman S, et al (2021). The effects of an object's height and weight on force calibration and kinematics when post-stroke and healthy individuals reach and grasp. <u>Scientific Reports</u> 11;20599. DOI: 10.1038/s41598-021-00036-9 Flanagan JR, Wing AM. Modulation of grip force with load force during point-to-point arm movements. <u>Exp Brain Res.</u> 1993;95:131-143. Mani S, Mutha PK, Przybyla A, et al (2013). Contralesional motor deficits after unilateral stroke reflect hemisphere-specific control mechanisms. <u>Brain</u> 136: 1288-1303. DOI: 10.1093/brain/aws283
5 (6/14)	Motor neurons and interneurons Facilitator: Dr. Gordon Mitchell	Dasen JS, Jessell TM (2009). Hox Networks and the Origins of Motor Neuron Diversity <u>Curr Topics Dev Biol.</u> 88: 169-200 Fuller DD, Rana, S, Smuder AJ, Dale EA (2022). The phrenic neuromuscular system. <u>Handbook Clin Neuro,</u> 188: 393-408. Watson K, Egerton T, Sheers N, et al. Respiratory muscle training in neuromuscular disease: a systematic review and meta-analysis. <u>Eur Respir Rev</u> 2022; 31: 220065 [DOI: 10.1183/16000617.0065-2022].
6 (6/21)	Executive Control of Gait Facilitator: Dr. Dave Clark	Clark DJ. Automaticity of walking: functional significance, mechanisms, measurement and rehabilitation strategies. <u>Front Hum Neurosci.</u> 2015 May 5;9:246. DOI: 10.3389/fnhum.2015.00246 Clark DJ, Chatterjee SA, Skinner JW, Lysne PE, Sumonthee C, Wu SS, Cohen RA, Rose DK, Woods AJ. Combining frontal tDCS with walking rehabilitation to enhance mobility and cognition: a pilot clinical trial. <u>Neuromodulation: Technology at the Neural Interface.</u> <u>Neuromodulation.</u> 2021;24:950-959. https://doi.org/10.1111/ner.13250
(6/28)	No class	Semester Break

Week (Date)	Topic(s)	Readings
7/5	Swallow / Cough in health and disease Facilitator: Dr. Alicia Vose	Humbert IA. New Directions for Understanding Neural Control n Swallowing: The Potential and Promise of Motor Learning. 2013;28: 1-10. doi:10.1007/s00455-012-9432-y Vose AK, Marcus A, Humber I. Kinematic Visual Feedback Improves Accuracy of Swallowing Maneuver Training and Accuracy of Clinician Cues During Training in Stroke Patients with Dysphagia. Phys Med Rehab. 2019; 11: 1159-1169. doi: 10.1002/pmrj.12093
8 (7/12)	Postural Control in Health and Disease Facilitator: Dr. Kelly Hawkins	Pollack AS, Durward BR et al. (2000). What is Balance? Clinical Rehabilitation. 14:402-406. Herman T, Mirelman A et al. (2018). Executive Control Deficits as a Prodrome to Falls in Healthy Older Adults: A Prospective Study Linking Thinking, Walking and Fall. J Gerontol: Med Sci; 65A(10): 1086-1092. Ivanenko Y, Gurfinkel VS. (2018). Human Postural Control. Front Neuroscience. 12:171.
9 (7/19)	Turning in Health and Disease Facilitator: Dr. Clayton Swanson	Piloni G, Choi C, Shaw MT, et al. Walking in multiple sclerosis improves with tDCS: a randomized, double-blind, sham-controlled study. Annals Clin and Trans Neurology 7 (11): 2310-2319, 2020. https://doi.org/10.1002/acn3.51224 Swanson CW, Proessl F, Stephens, JA, et al. Non-invasive brain stimulation to assess neurophysiologic underpinnings of lower limb motor impairment in multiple sclerosis Journal of Neuroscience Methods 356 (2021) 109143.
10 (7/26)	Breathing in health and disease Facilitator: Drs. Gordon Mitchell & David Fuller	Mitchell GS, Baker-Herman TL et al. (2008). Respiration. Encyclopedia of Neuroscience. Gonzalez-Rothi EJ, Lee KZ, Dale EA, Reier PJ, Mitchell GS, Fuller DD. Intermittent hypoxia and neurorehabilitation. J Appl Physiol 119: 1455–1465, 2015. doi:10.1152/jappphysiol.00235.2015 Sankari A, Vaughan S, et al. Sleep-Disordered Breathing nad Spinal Cord Injury. Chest 2019; 155(2):438-445

Week (Date)	Topic(s)	Readings
11 (8/2)	<p>Final Exam:</p> <p>Student presentations based on Weeks 3-10.</p> <p>Assignment: create a research statement as follows (see an example on Canvas)</p>	<p>1. Pick one of the topics covered in weeks 3-10 and discuss how it relates to your primary research interest.</p> <p>2. The research statement shall include: Research focus; Research Project 1 Research Project 2</p> <p>3. Potential problems, alternative strategies</p> <p>4. Requirement: 1-2 pages; Margins: Narrow Font: Arial; Font size: 11; Save the file to pdf; Name the file: RSD6710_2023 Summer_Final_LastName</p> <p>Due date: Upload the PPT slides to Canvas on 8/13/23 before midnight</p>
12 (8/9)	<p>Central pattern generators (CPG)</p> <p>Facilitator: Dr. David Fuller</p>	<p>Minassian, K., et al. (2017). "The Human Central Pattern Generator for Locomotion: Does It Exist and Contribute to Walking?" <i>The Neuroscientist</i> 23(6): 649-663.</p> <p>Marder, E. and D. Bucher (2001). "Central pattern generators and the control of rhythmic movements." <i>Current Biology</i> 11: R986-R996.</p>

For technical support for this class, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- <https://lss.at.ufl.edu/help.shtml>

ACADEMIC REQUIREMENTS AND GRADING

Grading

The grade for the course will be calculated based on the following criteria:

1. **Presentation of directed reading (80 points total):** Each student will present 4 (20 points each) original research articles to the class during the semester. The student will prepare a 20-25 minute presentation. The presentation needs to include: i) a general introduction (background) of the topic being discussed; ii) a statement on the goal(s) and central question(s) of the paper; iii) a critical evaluation of the experimental techniques/methodologies presented in the paper; iv) a clear explanation of the figures presented in the paper; v) an explanation as to how the data addressed or did not address the hypotheses/goals of the paper; vi) an overview of the strengths and weaknesses of the study/review; vii) a discussion of the scientific implications of the work; viii) a discussion as to whether the interpretations/conclusions were justified based on the data/results, and; ix) a final evaluation of the paper. The student will upload his/her PowerPoint slides on Canvas for grading (20 points of each PowerPoint file).

2. **Questions distributed by the presenter (20 points total):** Each week, the student who presents will submit at least 2 questions to Canvas (5 points per presentation described in #1) that will be incorporated into the article presentation described above. The questions need to be directly related to the assigned readings.

3. **Questions submitted by non-presenters for in class discussion (60 points total):** For each article you are not presenting, submit to CANVAS three questions (or insights) that arose from reading the article. Each student must contribute a question/discussion item related to the research article being presented (20 articles; 3 points per article).

4. **Final PowerPoint presentation (25 points) and final written paper (25 points):**

Final PowerPoint presentation (25 points) will be evaluated based on the following criteria:

- Topic: the topic shall be related to the student's research projects. Topics will be reviewed and discussed with the instructor to ensure they are suitable for the students' backgrounds and research experience.
- The content of the presentation:
 - Background (i.e., research focus/interest)
 - Significance (i.e, the impact of the proposed study; how this proposed study significantly contributes to our current understanding of rehabilitation science)
 - Research Questions & Hypotheses (detailed explanation of your research questions and hypotheses)
 - Approach & Method (detailed explanation of the approaches/methodologies that will be used in this proposed study)
 - Preliminary Data (Optional)
- Relevance (i.e., How this course relates to your research projects? How to integrate the knowledge you've learned to your research studies)
- Presentation skills

Final written paper (25 points) is a written research statement which students will upload to Canvas before the due date. Students shall pick up at least one of the topics covered in weeks 1-10 and discuss how it relates to their primary research interest. The paper can be a summary of your dissertation proposal/work completed or a proposal for upcoming research. It often includes both current aims and findings, and future goals.

The research statement will be evaluated based on the following criteria:

- Topic: the topic shall be related to the student's research studies/projects as well as the course topics
- The content of the presentation shall include:
 - Background (i.e., an introduction of the research focus)
 - Significance (i.e, a statement re the impact of the proposed study; how this proposed study significantly contributes to our current understanding of the selected topic)
 - Research Questions & Hypotheses (i.e., specific research questions that the proposed studies intend to address and hypotheses related to these questions)
 - Approach & Method (detailed explanation of approaches/methodologies you will use for this proposed study)
 - Preliminary Data (Optional)
 - Potential problems and alternative strategies
- Relevance
- The research statement needs to be well-written to receive the full points

Requirement	Due date	Point distribution
Presentation of directed reading	Various	80 points (4 presentations worth 20 points each)
Questions prepared by the presenter	Various	20 points (4 question sets worth 5 points each)
Questions prepared by non-presenter	Various	60 points (20 question sets worth 3 points each)
Final Presentation	08/02/23	25 points
Final Research Statement	08/02/23	25 points

Point system used (i.e., how do course points translate into letter grades).

Example:

Points earned	93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	Below 60
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

Please be aware that a C- is not an acceptable grade for graduate students. The GPA for graduate students must be 3.0. based on all 5000 level courses and above to graduate. A grade of C counts toward a graduate degree only if a sufficient number of credits in courses numbered 5000 or higher have been earned with a B+ or higher.

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	WF	I	NG	S-U
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0	0.0	0.0	0.0	0.0

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Exam Policy

Policy Related to Make up Exams or Other Work

Excused absences will be handled in accordance with UF policy for excused absences.

For other cases, if you are unable to present on your scheduled day, it is your responsibility to inform both course director and lead speakers by email and make arrangement to switch with another student. If you are unable to make proper arrangement before the class, you still need to prepare for the ppt presentation as well as schedule an individual meeting with the instructor to present your slides to receive the grade. Coordination of any make-up work with instructor is encouraged to take place in advance whenever possible and must be approved by the instructor.

Policy Related to Required Class Attendance

Attendance and participation in group discussions is mandatory and will determine successful completion of this course.

Please note all faculty are bound by the UF policy for excused absences

Excused absences must be consistent with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Policy Related to Guests Attending Class:

Only registered students are permitted to attend class. However, we recognize that students who are caretakers may face occasional unexpected challenges creating attendance barriers. Therefore, by exception, a department chair or his or her designee (e.g., instructors) may grant a student permission to bring a guest(s) for a total of two class sessions per semester. This is two sessions total across all courses. No further extensions will be granted. Please note that guests are **not** permitted to attend either cadaver or wet labs. Students are responsible for course material regardless of attendance. For additional information, please review the Classroom Guests of Students policy in its entirety. Link to full policy:

<http://facstaff.php.ufl.edu/services/resourceguide/getstarted.htm>

STUDENT EXPECTATIONS, ROLES, AND OPPORTUNITIES FOR INPUT

Expectations Regarding Course Behavior

Professional behavior is exemplified by:

1. Attendance to all classes
2. Not using electronic devices for personal use during class
3. Timeliness
4. Respectful and polite interaction with peers and instructors
5. Active learning as demonstrated by questions and discussion

Communication Guidelines

Laptop / tablet policy

Please bring a laptop or tablet to class with a copy of your assignment loaded on it. Please do not use these devices for personal internet use (e.g. email) during class.

Phones

Professionalism is expected. Please do not use these devices for personal internet use (e.g. email) during class.

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>
<http://gradschool.ufl.edu/students/introduction.html>

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Online Faculty Course Evaluation Process

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

SUPPORT SERVICES

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, it is strongly recommended you register with the Dean of Students Office <http://www.dso.ufl.edu> within the first week of class or as soon as you believe you might be eligible for accommodations. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations. Please do this as soon as possible after you receive the letter. Students with disabilities should follow this procedure as early as possible in the semester. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: <http://www.counseling.ufl.edu>. On line and in person assistance is available.
- You Matter We Care website: <http://www.umatter.ufl.edu/>. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.

- The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: <https://shcc.ufl.edu/>
- Crisis intervention is always available 24/7 from:
Alachua County Crisis Center:
(352) 264-6789
<http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.asp>
X

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.