**Course Change Proposal**

**Form A**

<table>
<thead>
<tr>
<th>Academic Group (College):</th>
<th>Academic Organization (Department):</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and Human Services</td>
<td>Physical Therapy</td>
<td>2/8/2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Course Proposal:</th>
<th>Department Chair:</th>
<th>Submitted by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>New ___ Change <em>x</em> Deletion ___</td>
<td>Dr. McGinty</td>
<td>Dr. Barakatt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does this course fulfill a requirement for single-subject or multiple subject credential students?</th>
<th>For Catalog Copy:</th>
<th>Semester Effective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes ___ No <em>x</em></td>
<td>Yes <em>x</em> No ___</td>
<td>Fall <em>x</em> Spring __, 20_12</td>
</tr>
</tbody>
</table>

| CCE (Extension): | |
|-----------------| |
| Yes ___ No _x_ | |

**This course replaces experimental course Subject Area (prefix) and Catalog Nbr (course number):**

If changing an existing course, should new version be considered a repeat of the original version? If so, the same Course ID will be maintained. If not, a new Course ID will be assigned. Note: In PeopleSoft terminology, the Course ID is the unique system identifier, not the Catalog Nbr.

| Yes ___ | No ___ |

**Change from:**

<table>
<thead>
<tr>
<th>Subject Area (prefix) &amp; Catalog Nbr (course no.):</th>
<th>Title:</th>
<th>Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 200</td>
<td>Pathokinesiology</td>
<td>5</td>
</tr>
</tbody>
</table>

**Change to:**

<table>
<thead>
<tr>
<th>Subject Area (prefix) &amp; Catalog Nbr (course no.):</th>
<th>Title:</th>
<th>Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 600</td>
<td>Pathokinesiology</td>
<td>5</td>
</tr>
</tbody>
</table>

**JUSTIFICATION:**

This course is being changed as part of the curriculum changes with the new DPT program required for continued accreditation for the program. No significant changes have been made to this course as the previous course was considered sufficiently rigorous to reflect the expectations in a doctoral program.

**NEW COURSE DESCRIPTION:** (Not to exceed 80 words, and language should conform to catalog copy. See http://www.csus.edu/umanual/acad.htm - Guidelines for Catalog Course Description)

This course will address functional anatomy, surface anatomy with palpation, arthrology, biomechanics, pathologies related the musculoskeletal and nervous systems. Both normal motion and pathological motion will be addressed. Students will gain competence in surface anatomy and palpation skills. **Open to Physical Therapy majors only.**

**Note:**

**Prerequisite:** None

**Enforced at Registration:** Yes _x_ No ___

**Corequisite:**

- BIO 633 Human Gross Anatomy for Physical Therapists
- PT 608 PT/Patient/Professional Interactions
- PT 630 Pathophysiology
- PT 602 Evidence Informed Practice I

**Enforced at Registration:** Yes ___ No _x_

**Graded:** Letter _x_ Credit/No Credit ___

**Instructor Approval Required:** Yes ___ No _x_

**Course Classification (e.g., lecture, lab, seminar, discussion):** Lecture and lab C-02; C-16

**Title for CMS (not more than 30 characters):** Pathokinesiology

**Cross Listed?** Yes ___ No _x_

**If yes, do they meet together and fulfill the same requirement, and what is the other course.**

**How Many Times Can This Course be Taken for Credit?** _1_

**Can the course be taken for Credit more than once during the same term?** Yes ___ No _x_
Description of the Expected Learning Outcomes: Describe outcomes using the following format: “Students will be able to: 1), 2), etc.” See the example at http://www.csus.edu/aacsf/example.htm

All course objectives reference the overall educational goals and outcomes of the Department of Physical Therapy. At the conclusion of this course, the student is expected to be able to:

**Goal 1.0: Demonstrate Professional Physical Therapist Effectiveness**

1.1 Compare and contrast normal biological, physiological, and psychological mechanisms of the human body with pathophysiological factors that lead to impaired body functions and structure.
   1.1.1 Discuss the etiology and clinical features of major disorders.
       1.1.1.1 Pertaining to the musculoskeletal and nervous system with emphasis on pathophysiology and biomechanical considerations.
   1.1.2 Describe how pathological processes affect normal function.
       1.1.2.1 Emphasizing the pathomechanics of the musculoskeletal system resulting from pathological processes
       1.1.2.2 Recognizing clinical features of common musculoskeletal problems through examination and evaluative problem solving experiences.
   1.1.3 Discuss common medical/surgical treatments for major disorders.
       1.1.3.1 Emphasizing how medical/surgical treatments aim toward improving biomechanics to minimize impairments and functional limitations
       1.1.3.2 Describe kinesiological basis for the response of tissue to load, muscle and connective tissue function and mechanics as applied to a program of injury prevention or rehabilitation of pathological conditions

1.2 Determine the physical therapy needs of any individual seeking services.
   1.2.3 Carry out appropriate and comprehensive patient examinations including tests and measures in a safe and client-centered manner.
       1.2.3.1 Identify for each major joint of the human body arthrokinematics, range of motion, kinetics, muscle function, pathomechanics and pathophysiology.
       1.2.3.2 Palpate and identify all clinically relevant boney prominences, joint features, ligaments, tendons and muscles of the body.
       1.2.3.3 Identify features of the normal gait cycle and common pathomechanical gait patterns
   1.2.4 Evaluate data from the patient examination (history, systems review, tests and measures) to make clinical judgments.
       1.2.4.1 Differentiate between pain behaviors at varying levels of tissue inflammation and between pain behaviors involving inflamed musculotendinous tissue versus inflamed non-contractile tissue
       1.2.4.2 Integrate and evaluate data that are obtained during the examination to describe the patient condition in terms that will guide the prognosis, the plan of care and intervention strategies.
       1.2.4.3 Recognize the general level of expected vigor of therapeutic exercises for patients with irritable versus non-irritable pain complaints.

**Goal 2.0: Demonstrate Professional Behaviors**

2.5 Demonstrate entry level generic abilities, including:
   2.5.1 Professional accountability and commitment to learning.
       2.5.1.1 Appropriately completing and promptly turning in assignments.
   2.5.3 Effective use of constructive feedback.
       2.5.3.1 Adequately revise assignment based on feedback provide
   2.5.4 Effective use of time and resources.
       2.5.4.1 Effectively work with colleagues on scholarly activities

**Assessment Strategies:** A description of the assessment strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers) which will be used by the instructor to determine the extent to which students have achieved the learning outcomes noted above:

Midterm Written Examination .........................................................................................................................25%
Final Written Examination ..............................................................................................................................25%
6 Written Quizzes (each 10% of grade with lowest quiz score dropped) .......................................................50%
Midterm and Final Practical Exams (Pass/Fail) .......Must pass both practical exams to pass course
**For whom is this course being developed?**
Majors in the Dept. x Majors of other Depts. ____ Minors in the Dept. ____ General Education ____ Other ____

Is this course required in a degree program (major, minor, graduate degree, certificate)? Yes x No __

If yes, identify program(s): DPT

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer facilities, faculty, etc.)? Yes ____ No x ____

If yes, attach a description of resources needed and verify that resources are available.

Indicate which department or programs will be affected by the proposed course (if any). Physical Therapy ______

**The Department Chair's signature below indicates that affected programs have been sent a copy of this proposal form.**

**Approvals:** If proposed change, new course or deletion is approved, sign and date below. If not approved, forward without signing to the next reviewing authority, and attach an explanatory memorandum to the original copy.

<table>
<thead>
<tr>
<th>Signatures:</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Chair:</td>
<td>8-16-11</td>
</tr>
<tr>
<td>College Dean or Associate Dean:</td>
<td></td>
</tr>
<tr>
<td>CPSP (for school personnel courses ONLY)</td>
<td>8-16-11</td>
</tr>
<tr>
<td>Associate Vice President</td>
<td></td>
</tr>
<tr>
<td>and Dean for Academic Programs</td>
<td></td>
</tr>
</tbody>
</table>

**Distribution:** Academic Affairs (original), Department Chair and College Dean. Dean's office to send original after approval to Academic Affairs, at mail zip 6016. An electronic copy must also be sent.

9/10/2008
PT 600 – Pathokinesiology

Fall Semester

COURSE CREDIT: 5 units

INSTRUCTORS: TBA

LOCATION: TBA

DAY and TIME: Lectures: TBA.
Labs: TBA

COURSE DESCRIPTION:
This course will address functional anatomy, surface anatomy with palpation, arthrology, biomechanics, and pathologies related to the musculoskeletal and nervous systems. Both normal motion and pathological motion will be addressed. Students will gain competence in surface anatomy and palpation skills. Open to Physical Therapy majors only.

CO-REQUISITES:
BIO 633 Human Gross Anatomy for Physical Therapists
PT 608 PT/Patient/Professional Interactions
PT 630 Pathophysiology
PT 602 Evidence Informed Practice I

REQUIRED TEXTS:
Hoppenfeld, S., Physical Examination of the Spine and Extremities, Prentice Hall, 1976

COURSE LECTURES AND HANDOUTS:
All powerpoint lectures, laboratory handouts with exercises concerning musculoskeletal topics, palpation lists, biomechanics problems, and patient case-presentation problems will be posted on SacCT.

COURSE OBJECTIVES:
All course objectives reference the overall educational goals and outcomes of the Department of Physical Therapy.

At the conclusion of this course, the student is expected to be able to:

Goal 1.0: Demonstrate Professional Physical Therapist Effectiveness
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1.1.1 Discuss the etiology and clinical features of major disorders.
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1.2 Determine the physical therapy needs of any individual seeking services.
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   1.2.3.1 Identify for each major joint of the human body arthology, arthrokinematics, range of motion, kinetics, muscle function, pathomechanics and pathophysiology.
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   2.5.4 Effective use of time and resources.
      2.5.4.1 Effectively work with colleagues on scholarly activities
TEACHING STRATEGIES AND LEARNING ACTIVITIES:
1. Combination of lecture, discussion and laboratory demonstrations
2. Assigned readings/independent study
3. Laboratory practice of palpation, examination and evaluative techniques
4. Group presentations of laboratory exercises
5. Role playing patient presentations
6. Mock examinations and evaluations of peers role playing patient presentations
7. Special biomechanics/pathomechanics topic presentations
8. Guest lecturer(s) from the medical community

Laboratory:
Weekly lab problems provided by the instructors will give students an opportunity to integrate theory into practice. Students will perform palpation and examination techniques on other students, assess their findings and organize these findings to present what they have formulated for constructive criticism and feedback from fellow classmates. Group presentations based on lab exercises will occur in order to ensure proper synthesis of the lab exercises. Electromyographic (EMG) demonstrations and exercise analyses may also be integrated into select labs to illustrate and provide application to course material. Bony and soft tissue palpations for each region of the body will also be introduced and practiced (the Hoppenfeld book is required during palpation laboratories). Laboratory attire includes shorts and bathing suit top or sport bra for females, and shorts for males. Keep lab clothes in assigned locker so they are always available for each class session. Lab attendance, participation, and appropriate attire are mandatory - failure to comply may lead to disciplinary action as determined by the instructor (e.g., grade reduction).

GRADING PROCEDURE:
All quizzes and exams will be in a multiple choice format covering material from lectures, powerpoint notes, handouts, labs, and assigned readings from text. Each quiz will consist of approximately 25 questions. Sample questions (and answers) for each quiz are posted on SacCT. The text book also offers practice problems at the end of each chapter. Midterm practical and written exams will cover material from weeks 1-7, and final practical and written exams will cover material from weeks 9-15. The midterm and final written exams will each consist of approximately 60-65 questions. Quizzes and exams will require use of a standard scantron form (e.g., FORM No. 882-ES or 882-E). Practical exams will primarily consist of identifying surface anatomical structures involving bony and soft tissue palpations, and recognizing clinical presentations of specific tissue pathologies. Grades will be awarded on the following bases:

Grading:
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\[ \begin{align*}
\geq 93.0\% &= A; \quad 93.0\% &> A- > 90.0\%; \quad 90.0\% &> B+ \geq 87.0\%; \quad 87.0\% &> B \geq 83.0\%; \\
83.0\% &> B- \geq 80.0\%; \quad 80.0\% &> C+ \geq 77.0\%; \quad 77.0\% &> C \geq 70.0\%; \quad 70.0\% &> D \geq 60.0\%; \quad <60.0\% &= F
\end{align*} \]

Midterm Written Examination...........................................................................................................25%
Final Written Examination ..................................................................................................................25%
6 Written Quizzes (each 10% of grade with lowest quiz score dropped)........................................50%
Midterm and Final Practical Exams (Pass/Fail).....Must pass both practical exams to pass course

Attendance: Daily attendance and timeliness is expected. Courtesy and professional responsibility requires notification of the instructor for any absence in advance. Failure to notify the professor of an absence can result in lowering your participation grade and is considered unprofessional. Students are responsible for any missed work and may be required to complete make-up assignments.

Behavioral expectations: Students are responsible for appropriate behaviors as defined by the
generic abilities. Failure to comply with behavioral expectations during class may result in a student first being warned that behavior is inappropriate, then, if inappropriate behavior continues, a student may be asked to leave a class. Repeated failure to comply with behavioral expectations can lead to failure in the course. Cell phones and beepers should be off or silent (set to vibration mode) during the class. No text messaging is permitted in class.

**Special accommodations:** During the course of the year, some students may utilize prearranged accommodations. If you are a student with a learning disability, physical disability, or other special needs, please let me know as soon as possible if you need special accommodation. These kinds of confidential discussions are best handled during my office hours or by special appointment. You can expect confidentiality and cooperation regarding any circumstances and needs that have been verified through the Office of Services to Students with Disabilities (SSWD).

**COURSE OUTLINE**

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topics, Quizzes and Exams</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1:</td>
<td>Introduction to Pathokinesiology and Biomechanics, Biomechanics of Bone, Articular Cartilage and Articulations</td>
<td>Neuman - Chapters 1, 2, 4</td>
</tr>
<tr>
<td>Week 2:</td>
<td>Biomechanics of Tendons and Ligaments, Biomechanics of Skeletal Muscle and Neuromuscular Function</td>
<td>Neuman - Chapter 3</td>
</tr>
<tr>
<td>Week 3:</td>
<td><strong>Quiz #1</strong> (material listed above for weeks 1-2)</td>
<td>Neuman – Chapters 9, 10</td>
</tr>
<tr>
<td></td>
<td>The Lumbar Spine</td>
<td>Hoppenfeld – Chapter 9</td>
</tr>
<tr>
<td>Week 4:</td>
<td>The Hip</td>
<td>Neuman – Chapter 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hoppenfeld – Chapter 6</td>
</tr>
<tr>
<td>Week 5:</td>
<td><strong>Quiz #2</strong> (material on the Lumbar Spine and Hip)</td>
<td>Neuman – Chapter 13</td>
</tr>
<tr>
<td></td>
<td>The Knee</td>
<td>Hoppenfeld – Chapter 7</td>
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<tr>
<td>Week 6:</td>
<td>Special Presentation: Knee Rehabilitation</td>
<td>Neuman – Chapter 14</td>
</tr>
<tr>
<td></td>
<td>The Ankle and Foot</td>
<td>Hoppenfeld – Chapter 8</td>
</tr>
<tr>
<td>Week 7:</td>
<td><strong>Quiz #3</strong> (material on the Knee, Ankle, and Foot)</td>
<td>Neuman – Chapter 15</td>
</tr>
<tr>
<td></td>
<td>Gait Analysis</td>
<td>Hoppenfeld – Chapter 5</td>
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<tr>
<td></td>
<td>Special Presentation: Shriner’s Childrens Hospital Gait Analysis Laboratory</td>
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<tr>
<td>Week 8:</td>
<td><strong>Midterm Exam</strong></td>
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<td></td>
<td><strong>Practical Exam</strong></td>
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<tr>
<td>Week 9:</td>
<td>The Cervical Spine</td>
<td>Neuman – Chapters 9, 10</td>
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<tr>
<td></td>
<td>EMG Demonstration</td>
<td>Hoppenfeld – Chapter 9</td>
</tr>
<tr>
<td>Week 10:</td>
<td>The Thoracic Spine</td>
<td>Neuman – Chapters 9, 10, 11</td>
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<tr>
<td></td>
<td>Posture, The TMJ</td>
<td>Hoppenfeld – Chapter 4</td>
</tr>
<tr>
<td>Week 11:</td>
<td><strong>Quiz #4</strong> (material on the Cervical and Thoracic Spines, and Posture)</td>
<td>Neuman – Chapter 5</td>
</tr>
<tr>
<td></td>
<td>The Shoulder Complex</td>
<td>Hoppenfeld – Chapter 1</td>
</tr>
<tr>
<td></td>
<td>Thanksgiving Break</td>
<td></td>
</tr>
<tr>
<td>Week 12:</td>
<td>The Shoulder Complex</td>
<td>Neuman – Chapters 5, 6</td>
</tr>
<tr>
<td></td>
<td><strong>Quiz #5</strong> (material on the TMJ and Shoulder Complex)</td>
<td>Hoppenfeld – Chapter 2</td>
</tr>
<tr>
<td></td>
<td>The Elbow Complex</td>
<td></td>
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<tr>
<td>Week 13:</td>
<td>The Wrist and Hand</td>
<td>Neuman – Chapters 7 &amp; 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hoppenfeld – Chapter 3</td>
</tr>
</tbody>
</table>
STUDENTS SHOULD READ AND BECOME FAMILIAR WITH THE UNIVERSITY’S ACADEMIC HONESTY, POLICY & PROCEDURES WHICH CAN BE FOUND AT: www.csus.edu/admbus/umanual/UMA00150.htm The following are direct quotes from the first sections of that document:

“The principles of truth and honesty are recognized as fundamental to a community of scholars and teachers. California State University, Sacramento (CSUS) expects that both faculty and students will honor these principles, and in so doing, will protect the integrity of academic work and student grades. CSUS is a publicly-assisted institution legislatively empowered to certify competence and accomplishment in general and discrete categories of knowledge. The President and faculty of CSUS are therefore obligated not only to the world at large but also to California to guarantee that substantive knowledge is actually acquired and the ability to acquire it is actually demonstrated by those to whom they assign grades and whom they recommend for degrees. Academic dishonesty defrauds all those who depend upon the integrity of the University, its courses and its degrees. This fraud is accomplished to the extent that faculty, students or campus employees knowingly or unwittingly allow academic dishonesty to work its deception.”

“….Plagiarism is a form of cheating. At CSUS plagiarism is the use of distinctive ideas or works belonging to another person without providing adequate acknowledgement of that person’s contribution. Regardless of the means of appropriation, incorporation of another’s work into one’s own requires adequate identification and acknowledgement. Plagiarism is doubly unethical because it deprives the author of rightful credit and gives credit to someone who has not earned it. Acknowledgement is not necessary when the material used is common knowledge.”
Department of Physical Therapy

PT 600 – Pathokinesiology
Spine Lab

While it is important to know the anatomical structures and the structural and biological pathologies of the spine, most frequently as a physical therapist you will be treating patients with spinal pain without knowing the exact anatomical structure involved or the exact pathology causing the patient’s pain and disability.

Physical therapists have developed a number of paradigms for the examination and evaluation of a patient’s low back pain (LBP) based on recognizing limitations in a patient’s motion and the behavior of a patient’s pain. If you keep track of specific pieces of information you will be able to form a hypothesis concerning a patient’s LBP problem which will guide you to developing a treatment program.

We will use McKenzie’s paradigm for categorizing LBP but the information gathering process is the same for other paradigms.

1st – McKenzie describes 3 different major categories of low back pain:

Postural problems – a patient suffers LBP due to remaining in a posture at end range of movement for an extended period of time. A movement analysis for a patient with this problem will reveal:

1. no limitations in ROM in any direction, and
2. no pain associated with any end range motion during
   a. single active motions in any direction
   b. repeated active motions in any direction

Tightness problems (McKenzie calls these dysfunctions) – a patient suffers LBP due to moving in a direction that has a tightness problem (passive insufficiency) (example – forward bending but not being able to touch your toes). A movement analysis for a patient with this problem will reveal:

1. a limitation in ROM associated with reproduction of a patient’s pain complaint
2. pain occurs at the end of the range of motion that the patient is limited in
   a. the pain goes away as soon as the patient returns from the movement that reproduces his pain
   b. repeated movements in that direction continue to reproduce the patient’s pain at end range but the pain goes away each time the patient returns from the movement that reproduces his pain
   c. (the pain might even improve with repetitive movements)

Pain problems (McKenzie calls these derangements and associates this problem with a disc bulge – not a full herniation.....but the biological cause is really beside the point here). A movement analysis for a patient with this problem will reveal:

1. a limitation in ROM associated with reproduction of a patient’s pain complaint
2. pain occurs at the end of ROM or earlier with an active movement (usually flexion)
   a. the pain may or may not go away when the patient returns from the movement that reproduces his pain
   b. repeated movements definitely cause the patient’s pain to increase and remain increased following completion of the repeated movements

Below is a blank evaluation grid followed by Evaluation Grids completed to represent presentations typically seen clinically. With your partner playing the patient role by reporting pain and acting out limitations in motion, perform the low back examination using a blank Evaluation Grid and determine your “patient’s” low back pain clinical presentation.

**Evaluation Grid:**

<table>
<thead>
<tr>
<th>Movement</th>
<th>Limitation (+/-)</th>
<th>Pain reproduced (+/-)</th>
<th>Pain persistence (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion in standing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated flexion in standing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension in standing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated extension in standing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion in lying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated flexion in lying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension in lying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated extension in lying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight leg raise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prone knee bend</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Evaluation Grid: A postural problem presentation**

<table>
<thead>
<tr>
<th>Movement</th>
<th>Limitation (+/-)</th>
<th>Pain reproduced (+/-)</th>
<th>Pain persistence (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion in standing</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Repeated flexion in standing</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Extension in standing</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Straight leg raise</td>
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### Evaluation Grid: An extension dysfunction

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### Evaluation Grid: A posterior derangement

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### Patient problem #1
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### Evaluation Grid: Patient problem #3

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### Answers:

Patient problem #1 – flexion dysfunction; note no persistent pain, pain at end range associated with movement limitations at end range.

Patient problem #2 – anterior derangement; note persistent pain associated with extension activities which may displace nucleus pulposis anteriorly.

Patient problem #3 – hamstring tightness problem (posterior back, thigh, leg, palmar surface of the foot fascial tightness problem)
Choose the one best answer

1) A patient with degenerative disc disease has a narrowing of the left C5-C6 intervertebral foramen. At its end range, which of the following cervical movements would increase the left C5-C6 intervertebral foramen?
   a. Left lateral flexion
   b. Left rotation
   c. Flexion
   d. Extension
   e. Combined extension and left lateral flexion

2) Which of the following movements may be weak in a patient with a C5 nerve root lesion?
   a. Shoulder abduction and elbow flexion
   b. Elbow extension and wrist extension
   c. Wrist flexion and finger flexion
   d. Finger extension and finger abduction
   e. Grip strength

3) Which list below describes what occurs to cervical spine tissues during lower cervical extension?
   a. The anterior annulus fibrosus is compressed, the supraspinous ligament becomes taut, and the cervical facet joints approximate (are compressed)
   b. The posterior annulus fibrosus is compressed, the anterior longitudinal ligament becomes taut, and the cervical facet joints are not compressed
   c. The anterior annulus fibrosus is in tension, the ligamentum flavum becomes taut, and the cervical facet joints approximate
   d. The posterior annulus fibrosus is compressed, the anterior longitudinal ligament becomes taut, and the cervical facet joints approximate
   e. The anterior annulus fibrosus is compressed, the ligamentum nuchae becomes taut, and the cervical facet joints approximate

4) Which of the following injuries are likely to occur during a hyperflexion whiplash injury that occurs when a car, after being struck from behind, strikes a car in front causing the patient’s cervical spine to forcefully flex?
   a. An anterior annulus fibrosus compression injury, an anterior longitudinal ligament sprain, and a facet joint capsule injury
   b. An anterior annulus fibrosus traction (stretch) injury, a longus colli muscle strain, and a facet joint surface compression injury
   c. A posterior annulus fibrosus traction injury, a longus capitus muscle strain, and a facet joint capsule stretch injury
   d. A posterior annulus fibrosus compression injury, an anterior longitudinal ligament sprain, and a facet joint traction injury
   e. A posterior annulus fibrosus traction injury, a posterior longitudinal ligament strain, a splenius capitus muscle strain

5) Lesions in which of the following nerve roots will most likely result in weakness in 1) finger abduction and 2) abnormal sensation over the medial elbow region?
   a. 1) C7 and 2) C8
   b. 1) C8 and 2) C8
   c. 1) C8 and 2) T1
   d. 1) T1 and 2) T1
   e. 1) C7 and 2) T1
6) When moving from a slumped sit position to a sitting upright posture.....
   a. the lower cervical spine flexes and upper cervical spine extends
   b. the upper cervical spine flexes and lower cervical spine extends
   c. both the upper and lower cervical spine flex
   d. both the upper and lower cervical spine extend
   e. the cervical spine should not be affected since posture change starts at the pelvis

7) Based on anatomical location, which of the following has the greatest moment arm for lateral flexion of the thoracic spine?
   a. Iliocostalis thoracis
   b. Spinalis thoracis
   c. Longissimus thoracis
   d. Semispinalis thoracis
   e. Intertransversarius

8) Which of the following groups of muscles are responsible for maintaining the static head position shown below in the figure below?
   a. Rectus capitis anterior, sternocleidomastoid, and longus capitus
   b. Longus colli, sternocleidomastoid, and obliquus capitis superior
   c. Splenius capitis, semispinalis capitis, and upper trapezius
   d. Longus capitus, sternocleidomastoid, and rectus capitis posterior major
   e. Splenius capitus, scalenus anterior, levator scapula

9) Disc herniation and intervertebral foramen stenosis may be associated with which of the following?
   a. Brachial plexus lesions
   b. Cervical nerve root lesions
   c. Facet syndrome
   d. Thoracic outlet syndrome
   e. Carpal tunnel syndrome

10) Based on what you know about the size and location of the transversospinalis muscles, which of the following is true regarding this muscle group of the thoracic spine?
    a. In general, the transversospinalis muscle group flexes the thoracic spine
    b. In general, the transversospinalis muscles are better suited as prime movers rather than stabilizers
    c. Uniquely, muscles of this group only cross one vertebral level per muscle
    d. Transversospinalis muscles that have a more vertical line-of-force orientation are better suited to perform spinal lateral flexion or extension compared to spinal rotation
    e. The transversospinalis muscles that are rotators are ipsilateral rotators

11) Scoliosis that is due to a bony abnormality that can not be corrected by a postural correction is known as.....
    a. Functional scoliosis
    b. Bony scoliosis
    c. Posture resistant scoliosis
    d. Structural scoliosis
    e. Ankylosing scoliosis
12) Which of the following is true regarding abnormal forward head posture with an individual in sitting?
   a. There is abnormal extension in the lower to cervical spine and abnormal flexion in the upper craniocervical region
   b. When viewed from the side, the mastoid process is posterior to the tip of the acromion process relative to the frontal plane
   c. The occlusion of the teeth is changed such that the bottom teeth rest in a more anterior position relative to the top teeth when compared to sitting with the cervical spine in a neutral posture
   d. Excessive lumbar lordosis often is found with this abnormal forward head posture
   e. A protracted & anterior tilted scapulae that accompanies abnormal forward head posture may result in decreased shoulder flexion range of motion

13) Which of the following is true regarding structures of the atlanto-occipital and atlanto-axial joints?
   a. The atlanto-axial joint is better suited for flexion compared to the atlanto-occipital joint
   b. The alar ligaments help limit rotation at the atlanto-axial joint
   c. The atlanto-occipital joint is better suited for rotation compared to the atlanto-axial joint
   d. The transverse ligament separates the dens of the axis from the vertebral body of atlas
   e. The tectorial ligament blends with and becomes the anterior longitudinal ligament

14) Which of the following muscles contribute to opening the mouth?
   a. Lateral pterygoid
   b. Medial pterygoid
   c. Masseter
   d. Temporalis
   e. None of the above

15) Which of the following muscles are responsible for mandibular retrusion?
   a. Lateral pterygoid
   b. Medial pterygoid
   c. Masseter
   d. Temporalis
   e. None of the above

16) A patient is diagnosed with a right TMJ adhesion. This adhesion allows no anterior translation to occur at the right TMJ. Her left TMJ is normal. Which of the following is likely to occur during mandibular depression (mouth opening)?
   a. During the early phase of mandibular depression the mouth opens symmetrically but during the late phase the mandible deviates to the left
   b. During the early phase of mandibular depression the mandible deviates to the right and then moves symmetrically during the late phase
   c. During the early phase of mandibular depression symmetrical motion occurs and during the late phase the mandible deviates to the right
   d. During the early and late phase of mandibular depression the mandible deviates to the left
   e. An s-curve of mandibular deviations will occur in this situation

17) How may forward head posture adversely affect the temporomandibular joint?
   a. The mandible may be pulled into protrusion
   b. The mandible may be pulled into retrusion
   c. Impingement on the retrodiscal tissues may occur, leading to retrodiscitis
   d. The mandible may be held in lateral excursion
   e. Forward head does not adversely affect the temporomandibular joint

18) Which of the following represents the myotome being assessed in finger extension?
   a. C5
   b. C6
   c. C7
   d. C8
19) If a patient exhibits abnormal sensation over the tip of his thumb, which dermatome is most likely affected?
   a. C5
   b. C6
   c. C7
   d. C8
   e. T1

20) Which of the following represents the dermatome and peripheral nerve being assessed over the skin of the deltoid muscle?
   a. Dermatome level: C5; Nerve: radial
   b. Dermatome level: C6; Nerve: radial
   c. Dermatome level: C7; Nerve: ulnar
   d. Dermatome level: C6; Nerve: axillary
   e. Dermatome level: C5; Nerve: axillary

21) Which of the following muscles depress the scapula when an individual pushes down on axillary crutch handles?
   a. Upper trapezius and lower trapezius
   b. Lower trapezius and rhomboids
   c. Serratus anterior and levator scapulae
   d. Pectoralis major and rhomboids
   e. Lower trapezius and pectoralis minor

22) Shoulder girdle scapulohumeral rhythm in full upper extremity (UE) elevation refers to the fact that.....
   a. the scapulothoracic joint contributes 90° to UE elevation while the glenohumeral joint contributes 90° to UE elevation.
   b. the scapulothoracic joint contributes 120° to UE elevation while the glenohumeral joint contributes 60° to UE elevation.
   c. the scapulothoracic joint contributes 120° to UE elevation while the glenohumeral joint contributes 120° to UE elevation.
   d. the scapulothoracic joint contributes 60° to UE elevation while the glenohumeral joint contributes 120° to UE elevation.
   e. the scapulothoracic joint contributes 60° to UE elevation while the glenohumeral joint contributes 100° to UE elevation.

23) Which of the following glenohumeral movements result in a roll of the humeral head in the anterior direction and slide of the humeral head in the posterior direction?
   a. Internal rotation with the shoulder abducted 0°
   b. External rotation with the shoulder abducted 0°
   c. Shoulder horizontal abduction with the shoulder abducted 90°
   d. Shoulder abduction
   e. Scaption

24) Which of the following rotator cuff muscles does not help counteract the superiorly directly force component from the deltoids?
   a. Subscapularis
   b. Teres Minor
   c. Infraspinatus
   d. Supraspinatus
   e. None of the above
25) Which of the following pathologies may contribute to depression and/or inferior subluxation of the humeral head in the glenoid fossa?
   a. Increased muscle tone in the deltoids
   b. Increased joint compression force of the glenohumeral joint
   c. An increase in the upward rotation posture of the scapula associated with slump sitting
   d. Severe weakness of the lower trapezius and serratus anterior
   e. Severe weakness of the rhomboids and pectoralis minor.

26) What following combination of joint movements do you expect to see when you ask a patient to shrug her shoulders up toward her ears?
   a. Scapulothoracic depression, sternoclavicular protrusion, acromioclavicular posterior tilt
   b. Scapulothoracic elevation, sternoclavicular elevation, acromioclavicular downward rotation
   c. Scapulothoracic downward rotation, sternoclavicular elevation, acromioclavicular upward rotation
   d. Scapulothoracic elevation, sternoclavicular protrusion, acromioclavicular upward rotation
   e. Scapulothoracic upward rotation, sternoclavicular downward rotation, acromioclavicular upward rotation

27) Which of the following rolling and sliding movements occur at the sternoclavicular joint?
   a. During shoulder abduction, roll and slide of the medial end of the clavicle are in the same direction
   b. During shoulder abduction, roll and slide of the medial end of the clavicle are in the opposite direction
   c. During scapular retraction, roll and slide of the medial end of the clavicle are in the opposite direction
   d. During scapular protraction, roll and slide of the medial end of the clavicle are in the opposite direction
   e. None of the above

28) Which of the following represent the movements most affected by an injury to the musculocutaneous nerve?
   a. Shoulder extension, elbow extension
   b. Shoulder external rotation, elbow extension
   c. Shoulder adduction, forearm supination
   d. Shoulder abduction, forearm pronation
   e. Shoulder flexion, elbow flexion

29) Which of the following provides anteroinferior stability to the glenohumeral joint at 0° abduction?
   a. Superior glenohumeral ligament
   b. Coracohumeral ligament
   c. Inferior glenohumeral ligament
   d. Suprapinatus
   e. Infraspinatus

30) Which of the following is true regarding the relationship between the humeral head and the elevation motions?
   a. Scaption occurs with the arm horizontally adducted approximately 35° from the sagittal plane
   b. In scaption, the apex of the greater tubercle is positioned under the “high point” of the coracoacromial arch, minimizing impingement
   c. The head of the humerus in anteverted approximately 60° from the frontal plane which improves glenohumeral joint congruence and stability
   d. The motion of scaption requires more external rotation of the humerus than does the motion of abduction
   e. None of the above

31) In which direction should a therapist apply force to the humeral head during joint mobilization glides to help increase glenohumeral abduction range of motion?
   a. Inferiorly
   b. Superiorly
   c. Anteriorly
   d. Posteriorly
   e. Cranially
32) Which of the following represents the function of the four rotator cuff muscles at the glenohumeral joint?
   a. Supraspinatus (internal rotation); Infraspinatus (external rotation); Teres minor (external rotation); Subscapularis (internal rotation)
   b. Supraspinatus (abduction); Infraspinatus (external rotation); Teres minor (internal rotation); Subscapularis (internal rotation)
   c. Supraspinatus (abduction); Infraspinatus (external rotation); Teres minor (external rotation); Subscapularis (internal rotation)
   d. Supraspinatus (abduction); Infraspinatus (external rotation); Teres minor (external rotation); Subscapularis (external rotation)
   e. Supraspinatus (abduction); Infraspinatus (external rotation); Teres minor (external rotation); Subscapularis (external rotation)

33) Which of the following ligaments are commonly injured in acromioclavicular dislocations when a person fall on the side of her shoulder?
   a. Coracoacromial ligament and sternoclavicular ligament
   b. Coracoclavicular ligament and coracoacromial ligament
   c. Acromioclavicular ligament and coracoclavicular ligament
   d. Acromiohumeral ligament and anterior glenohumeral ligament
   e. Sternoclavicular ligament and acromioclavicular ligament

34) A lesion to which peripheral nerve results in claw hand?
   a. Ulnar nerve
   b. Radial nerve
   c. Median nerve
   d. Axillary nerve
   e. Musculocutaneous nerve

35) Which of the following is the second most commonly fractured carpal bone and what is a common sequela of this injury?
   a. Scaphoid; intercalating deformity
   b. Pisiform; avulsed flexor carpi radialis tendon
   c. Trapezius; gamekeeper’s thumb
   d. Capitate; ulnar drift
   e. Lunate; avascular necrosis

36) Which of the following is true regarding the triceps brachii?
   a. The lateral head becomes actively insufficient with full shoulder and elbow extension activities
   b. The long head is active during rapid, forceful shoulder flexion and elbow extension activities
   c. The long head becomes passively insufficient with full shoulder and elbow extension activities
   d. Its primary innervation is the C6 nerve root
   e. It is innervated by the median nerve

37) Which of the following joints abduct and adduct?
   a. The MCP, PIP, and DIP joints
   b. The MCP and DIP joints
   c. The MCP joints
   d. The DIP joints and PIP joints
   e. The PIP joints

38) Repetitive contractions and overuse of which of the following muscles can lead to medial epicondylitis?
   a. Flexor digitorum profundus, pronator teres
   b. Extensor digitorum, supinator
   c. Flexor carpi radialis, extensor carpi radialis longus
   d. Flexor carpi ulnaris, extensor carpi ulnaris
   e. Flexor digitorum profundus, extensor digitorum
39) Which of the following tests reproduce pain in a patient with lateral epicondylitis?
   a. Passive wrist and finger flexion with elbow extended and forearm pronated, palpation of the pronator teres
   b. Passive wrist and finger extension with elbow extended and forearm supinated, palpation of the flexor carpi ulnaris
   c. Vigorous grip strength test, passive wrist and finger extension with the elbow extended and the forearm pronated
   d. Active wrist flexion, passive wrist and finger flexion with the elbow extended and forearm supinated
   e. Active wrist extension against resistance, palpation of the supinator muscle

40) If a patient complains of abnormal sensation in the hand when his therapist taps just distal and radial to the pisiform bone, which of the following nerves is most likely affected, and where will the abnormal sensation most likely be felt?
   a. Ulnar nerve is affected and abnormal sensation is felt in the thenar region of the hand
   b. Ulnar nerve is affected and abnormal sensation is felt in the medial one and a half digits
   c. Median nerve is affected and abnormal sensation is felt in the thenar region of the hand
   d. Median nerve is affected and abnormal sensation is felt in the lateral three and a half digits
   e. None of the above

41) Cutaneous distribution of the radial nerve is best tested on what part of the hand?
   a. Dorsal webspace between the first and second metacarpal bones
   b. Dorsal aspect of the index and middle fingers (2nd and 3rd digits)
   c. Dorsal aspect of the ring and little fingers (4th and 5th digits)
   d. Anywhere on the dorsal aspect of the hand
   e. Volar aspect of the ring finger (on the pulp)

42) A therapist observes the dorsal aspect of her patient’s hand and notices atrophy of all the dorsal interossei. Which of the following best represents the nerve that may be affected?
   a. Ulnar nerve
   b. Median nerve
   c. Radial nerve
   d. Both the radial and median nerve due to dual innervation
   e. Both the ulnar and median nerve due to dual innervation

43) Which of the following is true regarding wrist joint osteokinematics?
   a. The normal wrist can flex slightly more than it extend
   b. The normal wrist can radially deviate slightly more than it can ulnarily deviate
   c. A portion of wrist flexion and extension occurs at the midcarpal joint
   d. The amount of flexion and extension of the wrist is about equal
   e. The amount of ulnar deviation and radial deviation of the wrist is about equal

44) Which of the following joints are classified as saddle joints?
   a. The acromioclavicular joint and the metacarpophalangeal joint of the long finger
   b. The distal radioulnar joint and carpometacarpal joint of hamate and 4th metacarpal
   c. The radiocarpal joint and the metacarpophalangeal joint of the ring finger
   d. The carpometacarpal joint of the thumb and the sternoclavicular joints
   e. The radiohumeral joint and the ulnohumeral joint

45) Which of the following is true regarding the hand’s intrinsic muscles actions through the extensor mechanism?
   a. Both the lumbricals and interossei extend the MCP joints and flex the IP joints
   b. Both the lumbricals and interossei flex the MCP joints and extend the PIP and DIP joints
   c. The lumbricals extend the MCPs and flex the IPs while the interossei flex the MCPs and extend the IPs
   d. The lumbricals flex the MCPs and extend the IPs while the interossei extend the MCPs and flex the IPs
   e. None of the above
46) Why is it difficult to fully flex the fingers when the wrist is fully flexed?
   a. Passive insufficiency of finger flexors and active insufficiency of finger flexors
   b. Passive insufficiency of finger flexors and active insufficiency of finger extensors
   c. Passive insufficiency of finger extensors and active insufficiency of finger flexors
   d. Passive insufficiency of finger extensors and active insufficiency of finger extensors
   e. The median nerve is compressed in the carpal tunnel weakening the extrinsic finger flexors

47) Which of the following is true regarding “drop wrist”, as shown below in the figure below, in which the wrist is unable to extend?
   a. A splint is often used to place the wrist in a slightly flexed position in order for the fingers to be able to produce a powerful grip
   b. It may result from a lesion to the median nerve
   c. It may result from a lesion to the C5 nerve root
   d. The pronator teres can substitute for the wrist extensors by pronating the wrist with the fingers stabilized on a firm surface
   e. If left untreated, will result in passive insufficiency of the extrinsic finger flexors

48) Which of the following best represents the structures that pass through the carpal tunnel?
   a. Median nerve, flexor digitorum profundus, flexor digitorum superficialis, flexor pollicis longus
   b. Median nerve, flexor digitorum profundus, flexor digitorum superficialis, flexor pollicis brevis
   c. Median nerve, flexor digitorum profundus, flexor digitorum superficialis, flexor carpi radialis
   d. Median nerve, flexor carpi radialis, flexor digitorum superficialis, flexor pollicis longus
   e. Ulnar nerve, flexor carpi radialis, flexor digitorum superficialis, flexor pollicis longus

49) In the figure below, the deformity seen at the PIPs is associated with what pathology?
   a. Rheumatoid arthritis
   b. Osteoarthritis
   c. DeQuervain’s syndrome
   d. Gamekeeper’s fingers
   e. Mallet fingers

50) Which of the following group of muscles and nerves below best represents the muscles and nerves that are involved in producing a strong lateral key pinch, as shown below in the figure below?
51) Which nerve is being assessed in the test shown below in which the therapist instructs the patient to squeeze the paper between the thumb and index finger (but to not bend the tip of the thumb as shown on the right) and not let the paper slip between the fingers as the hands attempt to separate?
   a. Musculocutaneous nerve
   b. Axillary nerve
   c. Median nerve
   d. Radial nerve
   e. Ulnar nerve

52) A fracture of the distal radius and ulna is called........
   a. Shepard’s fracture
   b. Colles fracture
   c. Dachshund’s fracture
   d. Gamekeeper’s fracture
   e. Drop wrist fracture
BONUS #1 (Write answers to bonus below): Briefly describe the following deformities in the space below:
Swan neck deformity of the hand –

Boutinerre’s deformity of the hand –

Mallet finger of the hand –

BONUS #2 (Write answer to bonus below): Which of the following may occur if the nerve that passes through Guyon’s tunnel is compressed?
   a. Weakness in all four lumbrical muscles, and the adductor pollicis
   b. Weakness in the 1st and 2nd (lateral radial half) dorsal interossei
   c. Weakness in the adductor pollicis and the opponens pollicis
   d. Weakness in the half the flexor pollicis brevis and the entire flexor pollicis longus
   e. Weakness in half the two ulnar lumbrical muscles and the all the palmar interossei
BONUS #1: Infraspinatus, external rotation, suprascapular nerve, C5, C6; Supraspinatus, abduction, suprascapular nerve, C5, C6

BONUS #2:  e