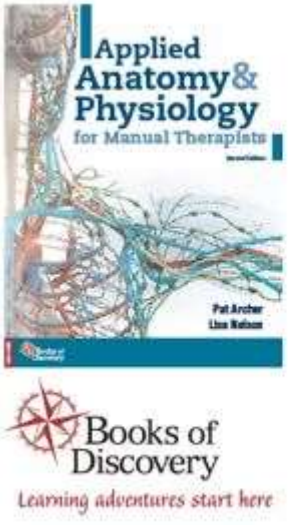

INSTRUCTOR RESOURCE

Applied Anatomy & Physiology for Manual Therapists, 2nd edition

Curriculum

Created for Books of Discovery by Cindy Williams

Detailed Outline and Resources for Lesson Planning

Every teacher's lesson plan is different due to a number of variables including content, class length, personal teaching style, students' needs, available resources, and materials. This ancillary has been created to provide you with a detailed outline of the contents of *Applied Anatomy and Physiology for Manual Therapists* by chapter. Additional resources available to you through the *Applied Anatomy and Physiology for Manual Therapists Review Guide* (hereafter, *Review Guide*) as well as suggestions for presentations, learning exercises, and group activities are listed to help you put together an engaging and effective lesson plan for your class. The most effective lectures involve 10 minutes of content followed by an activity or discussion to instill the terms and concepts.

Chapter 8 — Neuromuscular and Myofascial Connections

Learning Objectives

Upon completion of this chapter, the student will be able to:

1) Discuss the importance of understanding key neuromuscular and myofascial connections in the practice of manual therapy.
2) Describe the 2 neuronal loops utilized by muscle spindles to moderate muscle tension.
3) Explain how manual therapists can use their knowledge of reciprocal inhibition, stretch reflex, and gamma gain to reduce muscle tension.

4) Compare and contrast the theoretical mechanisms involved in development of tender points and trigger points and the implications for manual therapy.
5) Explain the concept of tensegrity as it applies to the human body.
6) Explain the general locations and functions of the fascial layers and planes in the system.
7) Explain the functional importance of myofascial trains and how knowledge of these trains might affect therapeutic choices.
8) Explain the key mechanical properties of fascia and how knowledge of these properties might affect therapeutic choices.
9) Name 4 types of mechanoreceptors found in fascia.
10) Discuss how the presence of mechanoreceptors and smooth muscle cells in fascia might affect therapeutic choices.
11) Describe the neuromuscular and neurofascial mechanisms related to maintaining posture, coordinating movement, and regulating muscle and motor tone.
12) Explain the difference between motor unit recruitment and muscle recruitment.
13) Explain the difference between myofascial trains and kinetic chains.

Key Terms

alpha loop
deep fascia
fascial band
fascial plane
fascial tone
gamma gain
gamma loop
hypertonicity
interstitial myofascial tissue receptors
myofascial train
neurofascial loops
neuromuscular reflex
phasic muscle
piezoelectricity
plasticity
postural muscle
superficial fascia
tender point
tensegrity
thixotropy
trigger point
viscoelasticity

Detailed Outline	Obj	Text pages	PPt slides	RG	Additional Resources and Sample Activities

Introduction
 	
• Introduce topic.
• Provide overview of subtopics to be covered in the lecture.
  ○ Neuromuscular Reflexes
  ○ The Fascial System
  ○ Fascial Plasticity
  ○ Posture, Balance, and Coordinated Movement
• Communicate learning objectives.
• Introduce key terms.
• Explain the purpose of a compartmentalized approach to learning A&P, but that a drawback is forgetting that all parts of the body are connected as an integrated whole.
• This chapter serves as a holistic checkpoint to connect the systems covered so far.
• All manual therapy moves and/or manually manipulates the skin, fascia, and muscle, stimulating sensory receptors that present new information to the brain.
• Exploring the connections between the systems assist the understanding of the physiologic mechanisms of different forms of therapy and explain some of the benefits and effects of techniques.
	1	215–217	1–8	Ex 9	**Note**
					The information covered in this chapter has traditionally been covered as a part of other systems (or not at all). Therefore, you may choose to ask students to read sections of this chapter while studying the muscular or nervous systems in order to fit your course outline. Some of the current information on fascia could be added to the muscular system as well. This chapter also includes a lot of manual therapy connections which may be covered in technique classes within your program instead of in A&P. While this outline has been created to use the chapter as is, please be sure to use the information in a way that works in the context of your program. The Summary of Key Points in the chapter might be a useful tool in helping you organize this information.
					
					Brain Warm-Up: Foreshadowing
					Before beginning the lecture, give students 3 minutes to free-write about the following questions, then spend 3–5 minutes sharing responses as a class:
					• In what ways do you think the nervous, muscular, and fascial systems are connected?
					• Why is movement important for the maintenance of overall health?
					
					Brain Warm-Up: *Review Guide*
					Have students complete Ex 9, pg 110 individually based on memory and recall from pre-class reading. Then pair students up and have them go through each term as they alternate saying the term and chosen definition, correcting answers and filling in blanks together.

Neuromuscular Reflexes
 	
Introduction
• Define and describe neuromuscular reflexes.
  ○ Control and coordinate skeletal muscle contractions.
  ○ Muscles serve as both sense receptor and effector.
 	
Reciprocal Inhibition
• Define the reflex mechanism of reciprocal inhibition and describe how it works.
  ○ Coordinates effort between agonist and antagonists.
  ○ Agonist stimulated for contraction, antagonist inhibited, though not fully.
  ○ Can be applied to reduce acute cramps (Fig 8.1, pg 218), chronic hypertonicity, and muscle spasms.
 	
Stretch Reflex and Gamma Gain
• Define the stretch reflex and describe how it works.
  ○ Muscle spindles sense lengthening or stretching of muscle fibers signaling a reflexive contraction of the muscle.
  ○ Lengthening or stretching is sensed due to two key features:
  ▪ Parallel muscle alignment with extrafusal fibers.
  ▪ Connective tissue attachments between the spindle capsule, endomysium, and perimysium.
  ○ Muscle spindle has two distinct portions; define each. (Fig 8.2, pg 219)
  ▪ Alpha loop
  ▪ Gamma loop
	2–4	217–223	9–19	Ex 2–4	**Activity: *Review Guide***
					Guide students to Ex 2, pg 103 to complete as you cover neuromuscular reflexes.
					
					Discussion: *Manual Therapy Applications*
					Have students read *Manual Therapy Applications*, pg 217. Ask students to break down the term hypertonicity into its word parts for better understanding and recall. Demonstrate and have students practice reciprocal inhibition for reduction of cramps or chronic hypertonicity. (Fig 8.1, pg 218). Then have them explain the concept of reciprocal inhibition to each other to ensure understanding.
					
					Discussion: *Manual Therapy Applications*
					Have students read *Manual Therapy* Applications, pgs 220–221. Demonstrate and have students practice TP and TeP release techniques. Review the pathophysiology, signs, and symptoms of each as you demonstrate.
					
					To add a layer of learning during hands-on classes, ask students to find a TP or TeP in a specific muscle, then ask them to explain the signs, symptoms, and physiological explanation in their own words.
					
					Discussion: *Manual Therapy Applications*
					Have students read *Manual Therapy* Applications, pgs 222–223. Demonstrate and and have students practice active release and/or facilitated stretching techniques. Review the physiological explanation for the techniques as you demonstrate.
					
					To add a layer of learning during hands-on classes, ask students to find a TP or TeP in a specific muscle, then ask them to explain the signs, symptoms, and physiological explanation in their own words.

Neuromuscular Reflexes continued
 	
• Define and describe gamma gain (gamma loading).
  ○ Mediated via the gamma loop. (Fig 8.2, pg 219)
  ○ Increased tension of intrafusal fibers heightens muscle spindle to the rate of lengthening. (Fig 8.3, pg 219)
  ○ When muscle is shortened for a long period of time, gamma gain causes the spindles to become very sensitive so that <u>any</u> lengthening of the muscle stimulates the stretch reflex.
  ○ Describe how gamma gain contributes to the formation of TePs and contrast with the pathophysiology of TPs. (Fig 8.5, pg 222 and Table 8.1, pg 220)
  ○ Link pathophysiology of TPs and TePs to manual therapy techniques. (Fig 8.4, pg 221 and 8.6, pg 223)
 	
Inverse Stretch Reflex
• Define and describe inverse stretch reflex.
  ○ GTOs sense increased tension and respond by inhibiting contraction, opposing the stretch reflex.
  ○ Highest concentration of GTOs in tends and musculotendinous junctions.
  ○ Prevents tearing when under excessive tension.
  ○ Active release and facilitated stretching techniques use increased tension of active contraction to stimulate GTOs and thus inhibit muscle tension.
					Discussion: *What Do You Think?*
					Break students into pairs or groups and give them 5 minutes to contemplate these questions (*What Do You Think?* 8.1, pg 223). Then, discuss as a class.
					• Why is it important to use isometric contraction when applying reciprocal inhibition to reduce acute muscle cramps?
					• Does the alpha or gamma motor neuron innervate the motor unit? Explain.
					• If there is no increase in stretch after employing contract-relax, what other tissues or physiologic factors might be limiting muscle length?
					
					Activity: *Review Guide*
					Guide students to Ex 3, pgs 104–105 to color and label as you explain the different neuromuscular reflexes. They can complete the fill-in portion of this same exercise individually or in pairs as an in-class review activity at the end of this section of content.
					
					Activity: *Review Guide*
					Give students 2–3 minutes to complete Ex 4, pg 106 as quick in-class review of the information on TPs and TePs and assessment of their ability to differentiate the two.

Fascial System
 	
Introduction
• Describe how all connective tissue elements form a unified fascial system and, when viewed as an integrated whole, can be appreciated for their complexity and role in the body.
• Define fascial system while explaining that research is quickly evolving our understanding of this system.
• List functions of the fascial system.
  ○ Organizes growth and development of the embryo.
  ○ Supports spatial relationships between vessels, nerve, and organs.
  ○ Protects body from infection.
  ○ Heals wounds.
  ○ Allows movement.
• Define and describe the concept of tensegrity.
 	
Layers
• Identify and describe the fascial layers:
  ○ Pannicular fascia = Superficial fascia
  ○ Axial fascia
  ○ Meningeal fascia } Deep fascia
  ○ Visceral fascia
 	
Fascial Patterns
• Define and describe myofascial trains and how they are used in manual therapy. (Fig 8.8, pg 225 and 8.9, pg 227 and *Manual Therapy Applications*, pg 226)
  ○ Lateral line
  ○ Spiral line
  ○ Superficial and deep front arm lines
  ○ Superficial and deep back arm lines
  ○ Superficial back line
  ○ Superficial front line
	5–8	223–231	20–34	Ex 5 and 6	**Activity: *Review Guide***
					Give students 3–5 minutes to complete Ex 5, pg 106 after defining and describing the concept of tensegrity. Share answers as a group.
					
					Activity: *Review Guide*
					Guide students to Ex 6, pgs 107 and 108 to use as a note-taking method as you cover the fascial layers and planes. Provide colored pencils for students to color-code each component.
					
					Discussion: *Manual Therapy Applications*
					Have students read *Manual Therapy* Applications, pg 224. Ask students to pair up and describe what happens to nerves, blood vessels, and lymph vessel when changes occur in fascial density, such as might occur with injury. Also have them explain in their own words why these changes might occur, and why this supports the value of stretching, broadening, and loosening fascia.
					
					Discussion: *What Do You Think?*
					Break students into pairs or groups and give them 5 minutes to contemplate these questions (*What Do You Think?* 8.2, pg 231). Then, discuss as a class.
					• What kinds of musculoskeletal dysfunctions can you think of that might be linked through the superficial front line?
					• A client with a history of two C-sections and a fractured clavicle complains of chronic neck pain and tension headaches. Using the construct of myofascial trains and planes, what connections can you make between their history and current complaints of pain?
					• In the above scenario, what are the possible therapeutic implications?