Study Guide for Test 3
Motor Control

These chapters come from Magill’s (2010), Motor Learning and Control: Concepts and Application (9th) edition textbook. Additional materials regarding these key concepts for each chapter can be found in my powerpoint presentations.

1. The classification of Motor Skills (Chapter 1)

Terms: Define

Motor skills Actions Movements Gross motor skill
Open skill Closed skill discrete motor skill fine motor skill
Serial motor skill taxonomy environmental context
Continuous skill regulatory conditions intertrial variability

Principles: Describe and explain

Describe and discuss the three one-dimension classification systems.

Describe the two dimensions used to classify skills in Gentile taxonomy of motor skills and the classification characteristic included within each dimension.

Discuss the ways one can use Gentile’s taxonomy in physical rehabilitation (PTs & ATs), physical education, exercise science, and/or sport coaching.

2. The measurement of motor performance (Chapter 2)

Terms: Define

Performance outcome measures Performance production measures
Reaction time Movement time
Response time Simple RT
Choice RT Discrimination RT
Premotor component Motor component
Fractionated RT EMG
Absolute Error (AE) Constant error (CE)
Variable error (VE) Radial (RE)
Root-mean-square error Kinematic measures
Kinetics EEG
Positron emission topography Functional magnetic resonance imaging
Magneticencephalography Transcranial magnetic stimulation
Relative phase

Principles: Describe and explain
Discuss the differences between performance outcome and production measures and identify several examples of each.

Describe the different types of reaction time and provide an example of each type that relates to physical rehabilitation, physical education, exercise science, and/or sport coaching.

Describe and discuss the different one-dimension error and what each error score means.

Describe and identify the different types of kinematic measures and provide an example of each type that relates to your future profession.

Describe and identify the different types of kinetic measures and provide an example of each type that relates to your future profession.

Describe the three techniques commonly used to measure brain activity during performance of a motor skill?

What information about a movement can be obtained by using EMG?

Describe the two techniques that can be used to tell us something about the coordination characteristics of two limbs or two limb segments?

3. Neuromotor Basis for Motor Control (Chapter 4)

Terms: Define

<table>
<thead>
<tr>
<th>Axon</th>
<th>Sensory neuron</th>
<th>Motor neuron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebral cortex</td>
<td>sensory cortex</td>
<td>Primary motor cortex</td>
</tr>
<tr>
<td>Premotor area</td>
<td>SMA</td>
<td>Basal ganglia</td>
</tr>
<tr>
<td>Cerebrum</td>
<td>cerebellum</td>
<td>ascending track</td>
</tr>
<tr>
<td>Descending track</td>
<td>motor unit</td>
<td></td>
</tr>
</tbody>
</table>

Principles: Describe and explain

Describe the general structure of a neuron and the function of each component

Describe the process of neural transmission?

Describe synaptic transmission?

What are the three sections of the brain and what each section of the brain primary function?

Describe the location of the cerebellum and discuss its role in motor control.

What are the four lobes of the cerebral cortex and the function of each lobe?

What is purpose of limbic and association cortex?
Describe the transportation of sensory information to the brain?

Describe the transportation of movement information from the brain to the muscles?

3. Motor Control Theories (Chapter 5)

Terms: Define

<table>
<thead>
<tr>
<th>Coordination</th>
<th>degrees of freedom</th>
<th>open-loop control</th>
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<tbody>
<tr>
<td>closed loop control</td>
<td>feedback</td>
<td>motor program</td>
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<tr>
<td>invariant features</td>
<td>parameters</td>
<td>relative time</td>
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<tr>
<td>schema</td>
<td>dynamic pattern theory</td>
<td>stability</td>
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<tr>
<td>attractors</td>
<td>order parameters</td>
<td>control parameters</td>
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<tr>
<td>self-organization</td>
<td>coordinative structures</td>
<td>Perceptual action coupling</td>
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</table>

Principles: Explain and describe

Describe the degrees of freedom problem in relation to performing motor skills.

What are the two flaws found in early motor programs? How does Schema Theory solve these two problems?

What is a schema? How do the recall and recognition schema work together?

What is the relationship between parameters and schema?

What are the two flaws found in early motor programs? How does dynamic pattern theory solve these two problems?

What is self organization?

What is the difference between control parameter and a constraint?

Compare and contrast Schema Theory and Dynamic System Theory in explaining how one controls the degrees of freedom problem in voluntary coordinated movement performance.

4. Sensory Components of Motor Control (Chapter 6)

Terms: Define

<table>
<thead>
<tr>
<th>Proprioception</th>
<th>muscle spindles</th>
<th>Golgi-tendon organs</th>
<th>joint receptors</th>
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</thead>
<tbody>
<tr>
<td>deafferentation</td>
<td>cornea</td>
<td>pupil</td>
<td>iris</td>
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<td>lens</td>
<td>retina</td>
<td>rods</td>
<td>cones</td>
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<tr>
<td>optic nerve</td>
<td>optic chiasm</td>
<td>visual field</td>
<td>central vision</td>
</tr>
<tr>
<td>peripheral vision</td>
<td>optical flow</td>
<td>TAU</td>
<td></td>
</tr>
</tbody>
</table>

Principles: Describe and explain

Discuss what functions touch plays in performing voluntary movements.
Define proprioception and the roles of proprioception in motor control.

Identify and describe how one investigates the roles of proprioception in motor control.

Discuss the neural basis of proprioception involving muscle spindles, golgi-tendon organs, and joint receptors.

Discuss the neuro physiology of vision control involving dorsal and ventral brain pathways, prefrontal cortex, premotor cortex, and motor cortex.

Describe the visual motor control process in production of voluntary movement.

Discuss the role of the visual pathways in controlling movement.

Describe the three techniques used to study the role of vision in motor control.

Identify and describe the roles of monocular, binocular vision, central and peripheral vision in motor control.

Discuss the issue of how much time is needed to make vision based movement corrections?

Define optical variable tau and it relationship to motor skill performance.

5. *Performance & Motor Control of Functional Skills (Chapter 7)*

*Terms: Define*

Aiming tasks  speed-accuracy trade off  Fitt’s law  Index of difficulty
Prehension  Motor equivalence  bimanual coordination

*Principles: Describe and explain*

Describe Fitt’s law and explain how it relates to the speed-accuracy trade-off phenomenon.

Describe how Fitt’s law relates to motor skill performance.

Describe the role of vision information in controlling and performing speed accuracy tasks?

Describe the role of vision information in controlling and performing prehension?

Describe the role of vision information in controlling and performing handwriting?

Describe the differences between symmetric and asymmetric bimanual coordination and why asymmetrical bimanual skills are difficult to perform as compared to symmetric bimanual skills?

Describe the rhythmic relationship associated with walking and running.
Discuss the role of maintaining head stability during locomotion.

Discuss the characteristics associated with gait transition that occur from a walk into a run, vice versa.

Describe how vision influences locomotion when attempting to contact an object, such as in long jumping.

Describe how the visual system contributes to avoid contacting an object?

Identify the three stages of catching and describe the role of vision plays at each stage in catching a moving object.

Discuss how it is possible for a person to catch a ball without seeing his or her hands make the catch.

Discuss the role of vision in the skill of hitting a baseball or softball and the implications of this role for teaching a person this skill?

6. Action preparation

Terms: Define

Hicks law    cost-benefit trade off    stoop effect    S-R compatibility
Foreperiod    psychological refractory period

Principles: Describe and discuss

Discuss how reaction time can be an index of preparation required to produce a motor skill performance.

Explain Hick’s Law and discuss the how the law relates to performing motor and sport skills in a choice reaction time situation.

Discuss the benefits and cost of being precued prior to performing a motor or sport skill?

Describe why S-R compatibility affects one reaction time.

Describe foreperiod manipulation affects on one’s reaction time.

Discuss how the degree of movement accuracy and complexity affects one’s reaction time?

Discuss how practice can affect one’s reaction time?

Describe the psychological refractory period and how it relates to one performing a motor or sport skill?
Describe and discuss performer characteristics that influence one action preparation.

Discuss what should occur when preparing to performance a motor or sport skill?