

**The College of William and Mary
Department of Kinesiology & Health Sciences**

KINE 322-01 Motor Learning

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Course Description

An introduction to the principles and concepts of learning basic to the acquisition and performance of physical skills. Factors and conditions affecting skill learning will be stressed. Emphasis will be placed on practical applications in instructional setting. Two lectures per/week.

Course Objectives

1. Motor Learning and Control in Perspective
 - A. Understand the relationship between the subfields of motor learning and motor control.
 - B. Describe the relationship between motor learning and motor control and other scientific disciplines.
 - C. Have a cursory understanding of the scientific process.
 - D. Understand the basic principles of scientific experiments.
 - E. Define and characterize the following terms: motor learning, motor control, reciprocal innervation, final common pathway, proprioception, behaviorism, operant conditioning, central intermittency, single channel hypothesis, functionalism, hypothesis, experiment, empirical, induction, theory, postulates, theoretical, deduction, descriptive statistics, inferential statistics, population, sample, randomization, independent variable, dependent variable, control group, experimental group, internal validity, external validity, and ecological validity.
 - F. Explain the information processing approach to the study of motor behavior.

2. Biological Foundations of Motor Learning and Control
 - A. Describe the anatomy and physiology of neurons.
 - B. Understand the methods by which neurons are activated to control force.
 - C. Describe the interaction of the central and peripheral nervous system.
 - D. Describe the interaction of the sympathetic and parasympathetic divisions of the autonomic nervous system.
 - E. Define and characterize the following terms: neuron, dendrite, axon, membrane potential, synapse, afferent, efferent, interneuron, motor neuron, motor unit, motoneuronal pool, recruitment, rate coding, size principles, central nervous system, peripheral nervous system, basal ganglia, cerebral cortex, corpus callosum, Broca's aphasia, Wernick's aphasia, spinal cord, flexor, extensor, feed forward, reticular activating system, autonomic nervous system, sympathetic division, and parasympathetic division.

3. Human Memory
 - A. Identify the classifications of human memory.
 - B. Characterize the factors that determine the depth to which memories are processed.
 - C. Describe the methods of storing, organizing, and processing memories.
 - D. Describe the processes whereby information is retrieved or lost from memory.
 - E. Describe the factors that influence forgetting.
 - F. Define and characterize the following terms: memory, recall test, recognition test, savings test, multiple memory theory, sensory memory, short-term memory, long-term memory, recognition processes, backward masking, rehearsal, working memory, levels of processing theory, encoding,

attention, dichotic listening, recoding, chunking, memory span, semantic memory, episodic memory, free association test, free recall test, schema, retrieval, serial position effect, primacy effect, recency effect, retrieval cues, forgetting, trace decay theory, interference theory, amnesia, active movement, passive movement, anterograde amnesia, retroactive amnesia, proactive inhibition, retroactive inhibition, hippocampus, and flashbulb memories.

4. Information Processing: An overview

- A. Characterize the varied ways in which humans process information.
- B. Describe the types of processing that lead to goal-directed human movement.
- C. Understand how reaction time can be used to estimate information processing demands.
- D. Characterize the factors that influence the speed and efficiency with which information is processed.
- E. Define and characterize the following terms: behaviorism, classical conditioning, operant conditioning, information processing central processes, peripheral processes, exteroceptors, proprioceptors, sensation-perception sensation, perception, response selection, decision, translation, response execution, action plan, serial processing, parallel processing, parallel-distributed processing, cross-talk, reflexes, cognitive stage, associative stage, autonomous stage, movement time, closed loop control, open loop control, open and closed environments, discrete movements, continuous movements, and context dependent behavior.

5. Sensation and Perception

- A. Understand the methods available to measure sensation and perception.
- B. Examine the relationship between the physical properties of sensory stimulation and perceptions of the stimuli.
- C. Understand the diversity of the sensations provided by the many varied sensory receptors.
- D. Understand the roles of sensation and perception play in performance and learning motor skills.
- E. Define and characterize the following terms: sensation, perception, exteroception, proprioception, sensorimotor coordination, psychophysics, absolute threshold, difference threshold, method of adjustment, method of limits, method of constant stimuli, method of signal detection, noise, false alarm, hit, miss, psychophysical functions, Weber's law, just-noticeable difference, prothetic, metathetic, focal vision, ambient vision, pitch, frequency, wave length, cycle, Hertz, amplitude, decibel, cutaneous senses, muscle spindles, and Golgi tendon organs.

6. Response Selection

- A. Understand the role uncertainty plays in the process of determining what response to execute or not to execute.
- B. Understand the degree to which expectancies and/or advance information play in reducing the difficulty of decision making.
- C. Identify factors that affect the degree to which a stimulus nearly automatically elicits a response.
- D. Understand the conditions under which individuals may delay their processing of information.
- E. Define and characterize the following terms: response selection, action plan, decision, translation, event uncertainty, information, Hick's law, bit, temporal uncertainty, perceptual uncertainty, precuing, known probabilities, sequential dependencies, stimulus-response compatibility, and psychological refractory period.

7. Response execution

- A. Understand the role of feedback in the execution of movement.
- B. Contrast closed and open loop control.
- C. Understand the advantages and disadvantages of closed and open loop control.
- D. Understand the role that mechanical and reflexive factors play in the control of movement.
- E. Identify factors that bias the control of movement.

- F. Define and characterize the following terms: response execution, closed-loop control, open-loop control, motor program, hierarchical control, reciprocal inhibition, crossed-extensor reflex, central pattern, generator, alpha-gamma coactivation, synergy, after-contraction effect, tonic neck reflex, and tonic neck response.
8. Theoretical Perspectives on Motor Control
- Understand the historical context in which motor learning and control theories were proposed.
 - Understand the evidence for and against the principles proposed in recent motor learning and control theories.
 - Identify experimental evidence in support of or inconsistent with the principles proposed in recent motor learning and control theories.
 - Define and characterize the following terms: memory trace, perceptual trace, schema theory, schema, generalizable motor program, recall schema, recognition schema, initial conditions, response specifications, sensory consequences, response outcome, invariant features, parametrize, variant features, parameter, mass-spring hypothesis, and coordinative structures.
9. Speed-Accuracy Principles
- Understand the concepts of a speed accuracy trade-off and index of difficulty.
 - Identify the similarities and differences between Fitts' law and impulse variability theory.
 - Identify different types of anticipation.
 - Understand the impact of timing and spatial errors on tasks like hitting a baseball.
 - Define and characterize the following terms: speed-accuracy trade-off, Fitts' law index of difficulty, impulse variability theory, effective target width (W_e), speed-accuracy paradox, anticipation, timing, receptor anticipation, perceptual anticipation, and effector anticipation.
10. Information Feedback
- Understand the diversity of information sources available to performers.
 - Clarify the distinction between performance and learning.
 - Understand the roles information feedback plays in the performance and learning of motor skills.
 - Identify the ways in which knowledge of results can be manipulated to facilitate performance and/or retention.
 - Understand the roles knowledge of performance plays in the performance and learning of motor skills.
 - Define characterize the following terms: Knowledge of results (KR), knowledge of performance (KP), intrinsic feedback, extrinsic feedback, learning, performance variable, Law of Effect, guidance hypothesis, absolute frequency, relative frequency, learning variable, fading schedule, reverse fading, bandwidth of KR, maladaptive short-term corrections, KR delay interval, post KR delay interval, interresponse interval, summary KR, precision of KR, qualitative KR, and quantitative KR.
11. Practice Scheduling and Composition
- Clarify the distinction between retention and transfer.
 - Identify ways to manipulate practice schedules in order to enhance retention and/or transfer.
 - Identify the conditions under which the presence of other facilitates (or inhibits) performance and learning.
 - Understand the process through which group membership and concern with social evaluation affect self-identity.
 - Understand the basis from which groups derive power to influence members.
 - Define and characterize the following terms: practice schedule, practice composition, retention, transfer, transfer paradigm, practice distribution, massed practice, distributed practice, contextual interference, elaboration perspective, reconstruction hypothesis, specificity hypothesis, variability of practice hypothesis, part-whole practice, mental practice, and observational practice.

12. Human Performance in a Social Context

- A. Understand the impact of social variables on arousal, motivation and performance.
- B. Understand the different ways in which models affect performance and learning.
- C. Identify the conditions under which the presence or others facilitates (or inhibits) performance and learning.
- D. Understand the process through which group membership and concern with social evaluation affect self-identity.
- E. Understand the basis from which groups derive power to influence members.
- F. Define and characterize the following terms: social influence, arousal, competition, social comparison, goal setting, level of aspiration, group polarization, social learning theory, coercion, social facilitation, social inhibition, social loafing, sucker effect, free rider effect, and home-court advantage.

Text

Schmidt and Lee. (1999) (3rd edition). Motor control and learning. Champaign, IL. Human Kinetics.

Evaluation

Four examinations will be scheduled during the semester. The first three tests will be given during the semester and will follow an objective format. The fourth exam will be administered during exam week. This exam will be cumulative in nature and will follow an objective format.

Grading

The following will be used to determine grades in this course:

Exam I	20%
Exam II	30%
Exam III	10%
Exam IV	<u>40%</u>
Total	100%

Grades will be determined as follows:

A	93 – 100%	4.00
A-	90 – 92%	3.67
B+	87 – 89%	3.33
B	83 – 86%	3.00
B-	80 – 82%	2.67
C+	77 – 79%	2.33
C	73 – 76%	2.00
C-	70 – 72%	1.67
D+	67 – 69%	1.33
D-	62 – 66%	0.67
F	<60%	0.00