Sixth Edition

MOTOR LEARNING
Concepts and Applications

Richard A. Magill

MOTOR LEARNING
CONCEPTS AND APPLICATIONS

SIXTH EDITION

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MOTOR LEARNING: CONCEPTS AND APPLICATIONS
SIXTH EDITION

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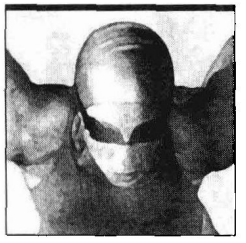
PREFACE



The learning and performance of motor skills is an important part of the everyday lives of people of all ages. Therefore the study of motor learning continues to be an integral part of the preparation of professionals who will assist people as they learn and perform motor skills. It is largely because of this role that this book is now in its sixth edition. It is a privilege to be able to contribute to the preparation of key professionals in this way. The experience of the previous five editions has reinforced my original goal for the book as an introductory text for undergraduates as they prepare for a variety of professional positions, including physical education teachers, coaches, physical therapists, occupational therapists, instructors in the military and industry, dance teachers, and community education personnel. It is within this context that the sixth edition has been developed.

Although the general scope and orientation of this edition remain consistent with those of previous editions, it contains a few changes intended to enhance the quality and use of the book. These improvements have resulted from suggestions of people who use this book in their classes and from recommendations of reviewers of the previous edition.

HIGHLIGHTS OF THE SIXTH EDITION

New Organization

The most notable change is an organizational one. Rather than being organized by chapter, with several concepts within one chapter, this edition presents each concept as a separate chapter. What were previously chapters are now units. It is important to note that this structural change does not eliminate the "concepts approach" that has been so well received in previous editions. The concepts approach continues. Each chapter begins with a concept statement that identifies the primary topic or principle discussed in the chapter. An application section follows that identifies the relevance of the concept to professional practice. Then the discussion focuses on establishing the basis for the concept statement and its application.

A New Chapter on Memory

Second, an updated and expanded chapter on memory (Chapter 10) is an outstanding addition to this text. Based on well-received material presented in earlier editions, this chapter represents a key element of the unit on attention and memory. In addition to featuring the classic memory issues, the chapter highlights the most recent memory-related research.

Key Restructuring

Third, three concepts have been relocated. Two were previously placed at the end of the book in a chapter focusing on abilities; the third was in the chapter on motor control preparation and attention. The concept of the identification of motor abilities, which is now chapter 2, is a part of the initial unit that introduces certain concepts fundamental to the

study of motor learning. The second abilities concept, which addresses the prediction of future performance, is now chapter 13 and is located in the unit that introduces issues specifically related to the concept of learning. Finally, the concept related to the preparation of action is now chapter 7, which has been relocated to unit II, Introduction to Motor Control.

New Research

Other revisions include an extensive updating of research references cited. In many chapters older references have been replaced by more recent research investigations. This updating is reflected in both the reference lists and the chapter discussions. However, care has been taken to ensure that classic research studies and significant older studies are included. Such research references are important in the study of motor learning because they establish a sense of the history of the investigation of an issue and the development of knowledge about it. These discussions are not intended to be exhaustive reviews of the research literature. Instead, they are designed to present students with relevant examples of research that form the basis of the concept being discussed.

More "A Closer Look" boxes have also been included. As before, these pedagogical aids serve as enhancements to the text rather than being essential parts of it. The information presented in these boxes enhances the text by (1) providing more detail about a research study cited in the text, (2) highlighting or summarizing key points made in a discussion of complex issues, or (3) describing specific professional practice applications that relate to the discussion of a concept.

In addition, the number and variety of professional practice applications have been increased. This change was made to further enhance the students' awareness of the relationship between a specific concept and the range of professional practice environments in which they work to help people learn motor skills.

Finally, this edition continues to present the study of motor learning from a behavioral point of view. This perspective does not negate the importance or relevance of a physiological approach. However, it does reflect my view that to attempt to present both orientations adequately in the same text would require a volume that would be considerably larger and more complex than would be appropriate for a one-semester undergraduate introductory course in motor learning.

NEW OR EXPANDED TOPICS

Chapter 1: The Classification of Motor Skills

- Revised discussion of skills, actions, and movements
- Skills or actions in relation to goals and required movements
- New presentation of Gentile's taxonomy of motor skills

Chapter 2: Motor Abilities

- Incorporation of motor abilities as introductory material
- Updated discussions about scientific background

Chapter 3: The Measurement of Motor Performance

- Enhanced demonstration of simple, choice, and discrimination reaction time
- Reaction time and movement time in assessing performance problems in decision-making situations (e.g., sport and car driving)

Chapter 4: Motor Control Theories

- Relevance of motor control theory to the practitioner
- Dynamic pattern theory of Kelso
- Comparison of motor program and dynamic pattern theories in relation to relative timing invariance
- Motor program and dynamic pattern theories in relation to spontaneous walk-to-run gait change phenomenon
- Implications of the dynamic pattern view for physical rehabilitation
- Updated discussion of control theory controversy

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Chapter 5: Performance Characteristics of Complex Skills

- Three prominent hypotheses concerning explanations of Fitts' law
- Updated discussion of prehension
- Use of functional objects to enhance reaching performance in physical rehabilitation
- Updated section on bimanual coordination

Chapter 6: Proprioception and Vision

- Updated discussion of role of proprioception in motor control, including section on tendon vibration technique
- Anatomy and function of key proprioceptors involved in providing information to central nervous system
- Functions of *tau* in motor control
- New section on coordination of vision and hand movement in manual aiming
- New section on amount of time needed to make visual feedback-based movement corrections
- Monocular and binocular vision in reaching and grasping, and roles of central and peripheral vision in prehension
- Updated information on visual cues as walking aids in patients with Parkinson's disease
- Revised section on vision and catching

Chapter 7: Action Preparation

- Task and performer characteristics in relation to time required to perform an action
- Demonstration of use of fractionated visual reaction time to understand developmental coordination disorder (DCD)
- Demonstration of how functional demand affects action preparation
- Updated discussion of rhythmicity preparation
- New research throughout chapter

Chapter 8: Attention as a Limited Capacity Resource

- Summary of continuous and probe secondary-task techniques
- Attention and automaticity

Chapter 9: Visual Selective Attention

- How we select visual cues
- Updated research on visual search and action preparation
- Training visual search strategies
- Research study describing a visual search training program to teach anticipation skills in squash

Chapter 10: Memory Components, Forgetting, and Strategies

- Revised and updated chapter
- Most recent memory-related research
- Several new boxes

Chapter 11: Defining and Assessing Learning

- Key distinctions between terms *performance* and *learning*
- Examples of performance situations for closed and open skills that require "adaptability" by the performer
- Assessing learning from coordination dynamics
- New research demonstrating how practice performance can misrepresent learning

Chapter 12: The Stages of Learning

- Study of performer and performance characteristics during initial stage of learning
- Revised discussion of Gentile's stages of learning model
- Concept of "freezing the degrees of freedom"
- Experiment demonstrating changes in conscious attention as a function of practice
- Research findings comparing experts and novices in use of vision in motor skill performance situations involving time stress
- Updated research throughout chapter

Chapter 13: Predicting Performance for Later Learning Stages

- Accounting for poor prediction from early to later stage performance
- Recent work by Ackerman relating his model of abilities and stages of learning model of Fitts and Posner

Chapter 14: Transfer of Learning

- Experiment demonstrating use of virtual reality training before experiencing the real environment
- Transfer-appropriate processing view of why transfer occurs
- Specificity of practice principle related to examples of skill practice situations
- Revised discussion of negative transfer
- Study demonstrating bilateral transfer for mirror writing

Chapter 15: Demonstration and Verbal Instructions

- Updated discussion of demonstration
- Verbal instructions and cues
- Experiment showing influence on learning of where a beginner focuses attention during each practice swing in golf

Chapter 16: The Effect of Augmented Feedback on Skill Learning

- Feedback family to better define terms and to provide examples
- Examples of knowledge of results (KR) and knowledge of performance (KP) for situations related to sport, everyday activities, and physical rehabilitation
- Study concerning relationship between teacher feedback in physical education classes and several different practice and performance characteristics
- Updated research cited in discussion section

Chapter 17: The Content of Augmented Feedback

- Augmented feedback content issues
- Erroneous augmented feedback
- Recent study on basing knowledge of performance on a skill analysis
- Recent research on videotape, movement kinematics, and biofeedback as augmented feedback
- Case study involving use of biofeedback for balance training for a stroke patient

Chapter 18: The Timing of Augmented Feedback

- Research investigations into skill learning and rehabilitation
- Updated research throughout chapter
- Frequency of presenting augmented feedback

Chapter 19: Practice Variability

- Gentile taxonomy characteristics of intertrial variability
- New figure illustrating continuum of amount of contextual interference and its relationship to various practice schedule organization options
- New research on limits of contextual interference effect
- Practical implications of contextual interference effect
- Experiment showing effectiveness of moderate contextual interference practice schedule for basketball

Chapter 20: Practice Distribution

- Updated research on intertrial interval and practice distribution
- Implications of massed and distributed practice for scheduling practice or rehabilitation session
- Relation of practice distribution and contextual interference to different skill learning contexts

Chapter 21: The Amount of Practice

- Overlearning strategy and procedural skills
- Overlearning strategy and poor test performance
- Updated research throughout chapter

Chapter 22: Whole and Part Practice

- Fractionization as a part practice strategy for bimanual coordination skills
- Various whole and part practice conditions that facilitate learning of bimanual coordination skills

- New idea for simplification of practice strategy
- Research study on music accompaniment to help patients with Parkinson's disease improve their walking pace

Chapter 23: Mental Practice

- Updated research throughout chapter
- Mental practice aids performance preparation
- Examples of use of imagery in a variety of sports

SUCCESSFUL FEATURES

Motor Learning: Concepts and Applications offers the following helpful features to enhance student learning.

Definition Boxes
Key terms are displayed in the text in boldface type and are defined in corresponding boxes for easy reference. Other important terms in the text appear in italics for emphasis.

Applications
Each chapter begins with an Applications section that explains the chapter concept in practical terms. It helps students understand the relevance of the concept to professional practice.

Discussion
This section explains how the chapter concept will be presented. It gives students the rationale for this presentation, making the concept easier to understand at the outset.

Summary
Each chapter concludes with a summary that presents the main ideas and their significance. The student can then return to a topic in the chapter for clarification or study.

Related Readings
Because some students want to know more about a particular topic, the readings list at the end of each chapter offers carefully selected journal articles and books for exploration.

Study Questions
A set of questions appears at the end of each chapter to allow students to review and analyze the chapter content.

ANCILLARIES

Instructor's Manual and Test Bank
This printed manual contains suggested teaching outlines that correspond with the text. The Test Bank section includes 550 questions: essay, multiple-choice, and fill-in-the-blank.

Laboratory Manual
This online manual is available to students and instructors with a passcard. It includes new laboratory activities on topics such as encoding specificity, preselection effect, and verbal labels and recall.

Computerized Test Bank
Test questions from the printed Test Bank are available on our computerized testing and grading program, MicroTest III, for Windows or Macintosh.

Online Learning Center
The Online Learning Center provides instructors with downloads of helpful ancillaries, such as a PowerPoint presentation (see below) that corresponds with each chapter of *Motor Learning Concepts and Applications.* For students, the Online Learning Center offers self-scoring quizzes, career opportunities, FAQs, and access to web links and updated material.

McGRAW-HILL PAGEOUT: THE COURSE WEBSITE DEVELOPMENT CENTER

PageOut is a program that allows instructors to develop websites for their courses easily. The site includes:

- A course home page
- An instructor home page
- A syllabus (the syllabus is interactive and customizable, allows quizzing and

addition of instructor notes, and can be linked to the Online Learning Center)
- Web links
- Online discussion areas (multiple discussion areas per class)
- Online grade book
- An area to list links to students' web pages
- More than 16 design templates from which to choose

This program is available to registered adopters of *Motor Learning: Concepts and Applications.* To become a registered user, contact your local sales representative. If you would like assistance in using the PageOut program, McGraw-Hill technology experts will create a website for qualified adopters in 30 minutes or less. This program is exciting for those who use *Motor Learning: Concepts and Applications* because the Online Learning Center content can be imported into your web page.

Health and Human Performance Supersite
McGraw-Hill's Health and Human Performance Supersite offers a wide variety of information for both instructors and students—from the latest health topics in the media to career opportunities in the field. Visit this website at: www.mhhe.com/catalogs/sem/hhp.

A sample of what you will find at this supersite includes:

This Just In. Look here for the latest information on "hot" health topics in the news. Read the monthly featured article to find out more about topics that everyone is talking about. Search the archive for a wide selection of resources on health-related topics.

Faculty Support. Find the best resources and services available to teach your course. Click here to find online supplements such as Online Learning Centers and PowerPoint presentations. Other offerings include assessment activities and PowerWeb.

Student Success Center. This is the place for students to find everything from study tips and online study materials to text updates on health information, which often changes daily. They can also look here for scholarship information and career opportunities.

Author Arena. Find out more about our authors—some of the most highly respected educators and pioneers in the field of health and human performance. Check on upcoming professional conventions so you can mark your calendar. Explore the possibility of using your ideas and writing skills to develop new courses and ancillaries.

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I want to acknowledge the contributions of several colleagues and friends who were kind enough to give of their time to provide me with valuable suggestions and needed information. Their comments assisted me in a variety of ways as I prepared this sixth edition. Among these, Kellie Hall, Mark Fischman, and Tim Lee deserve special recognition and thanks. In addition, I appreciate the efforts of the reviewers selected by the editors at McGraw-Hill to critique the previous edition and provide suggestions about what to keep, delete, and change in this new edition. The editorial and production staff at McGraw-Hill also deserve many thanks for their able assistance, direction, and support. At Louisiana State University, Amelia Lee, my department chair, has been a wonderful source of support and encouragement throughout the process of developing this revised edition. Finally, I would be remiss if I did not thank the many undergraduate and graduate students who have been in my motor learning classes throughout the years. Although they take the class to learn something about motor learning, I find that each group of students teaches me something about motor learning that influences my own

understanding of the role it should play in professional preparation.

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To My Mother, Audrey, and Sister, Judy

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BRIEF CONTENTS

PREFACE ix
DEDICATION xvi

UNIT I INTRODUCTION TO MOTOR SKILLS AND ABILITIES 1
1 The Classification of Motor Skills 2
2 Motor Abilities 15
3 The Measurement of Motor Performance 22

UNIT II INTRODUCTION TO MOTOR CONTROL 39
4 Motor Control Theories 40
5 Performance Characteristics of Complex Skills 62
6 Proprioception and Vision 75
7 Action Preparation 97

UNIT III ATTENTION AND MEMORY 115
8 Attention as a Limited Capacity Resource 116
9 Visual Selective Attention 128
10 Memory Components, Forgetting, and Strategies 141

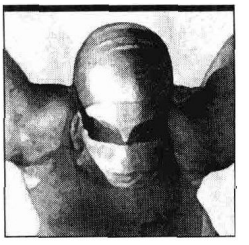
UNIT IV INTRODUCTION TO MOTOR SKILL LEARNING 167
11 Defining and Assessing Learning 168
12 The Stages of Learning 183
13 Predicting Performance for Later Learning Stages 198
14 Transfer of Learning 204

UNIT V INSTRUCTION AND AUGMENTED FEEDBACK 217
15 Demonstration and Verbal Instructions 218
16 The Effect of Augmented Feedback on Skill Learning 235
17 The Content of Augmented Feedback 246
18 The Timing of Augmented Feedback 264

UNIT VI PRACTICE CONDITIONS 283
19 Practice Variability 284
20 Practice Distribution 297
21 The Amount of Practice 304
22 Whole and Part Practice 310
23 Mental Practice 320

REFERENCES 331
GLOSSARY 349
NAME INDEX 357
SUBJECT INDEX 361

CONTENTS



PREFACE ix

DEDICATION xvi

UNIT I INTRODUCTION TO MOTOR SKILLS AND ABILITIES 1

1 The Classification of Motor Skills, 2

Application, 2

Discussion, 2

Skills, Actions, and Movements, 3

One-Dimension Classification Systems, 5

Gentile's Two-Dimensions Taxonomy, 8

2 Motor Abilities, 15

Application, 15

Discussion, 15

Abilities as Individual Difference Variables, 16

Identifying Motor Abilities, 17

Relating Motor Abilities to Motor Skill Performance, 19

3 The Measurement of Motor Performance, 22

Application, 22

Discussion, 22

Reaction Time, 23

Error Measures, 26

Kinematic Measures, 30

Kinetics, 33

EMG Measures, 33

Measuring Coordination, 35

UNIT II INTRODUCTION TO MOTOR CONTROL 39

4 Motor Control Theories, 40

Application, 40

Discussion, 40

Theory and Professional Practice, 41

Coordination, 42

The Degrees of Freedom Problem, 44

Open-Loop and Closed-Loop Control Systems, 45

Theories of Motor Control, 47

Motor Program–Based Theory, 47

Dynamic Pattern Theory, 52

The Present State of the Control Theory Issue, 58

5 Performance Characteristics of Complex Skills, 62

Application, 62

Discussion, 62

Speed-Accuracy Skills, 62

Prehension, 64

Handwriting, 67

Bimanual Coordination Skills, 68

Gait, 71

6 Proprioception and Vision, 75

Application, 75

Discussion, 75

Proprioception and Motor Control, 75

Vision and Motor Control, 81

Vision Predominates Our Sensory-Perceptual Systems, 81
Vision and Manual Aiming, 81
Vision and Prehension, 84
Vision and Handwriting, 86
Vision and Locomotion, 87
Vision and Jumping from Heights, 89
Vision and Catching, 90
Vision and Striking a Moving Object, 94

7 Action Preparation, 97
Application, 97
Discussion, 97
Action Preparation Requires Time, 98
Task and Situation Characteristics Influencing Preparation, 98
Performer Characteristics Influencing Preparation, 104
What Occurs during Preparation? 107

UNIT III ATTENTION AND MEMORY 115

8 Attention as a Limited Capacity Resource, 116
Application, 116
Discussion, 116
Attention as a Human Performance Limitation, 117
Attention Theories, 118
Procedures for Assessing Attention Demands, 122
Focusing Attention, 123
Attention and Automaticity, 125

9 Visual Selective Attention, 128
Application, 128
Discussion, 128
Procedures for Investigating Visual Search in Motor Skills, 129
How We Select Visual Cues, 131
Visual Search and Action Preparation, 133
Training Visual Search Strategies, 138

10 Memory Components, Forgetting, and Strategies, 141
Application, 141
Discussion, 142
Some Introductory Issues, 142
Memory Structure, 143
Working Memory, 144
Long-Term Memory, 147
Remembering and Forgetting, 150
Assessing Remembering and Forgetting, 151
The Causes of Forgetting, 153
Movement Characteristics Related to Memory Performance, 156
Strategies That Enhance Memory Performance, 157
Practice-Test Context Effects, 162

UNIT IV INTRODUCTION TO MOTOR SKILL LEARNING 167

11 Defining and Assessing Learning, 168
Application, 168
Discussion, 168
Performance Distinguished from Learning, 168
General Performance Characteristics of Skill Learning, 169
Assessing Learning by Observing Practice Performance, 170
Assessing Learning by Retention Tests, 174
Assessing Learning by Transfer Tests, 176
Assessing Learning from Coordination Dynamics, 177
Practice Performance May Misrepresent Learning, 179

12 The Stages of Learning, 183
Application, 183
Discussion, 184
The Fitts and Posner Three-Stage Model, 184
Gentile's Two-Stage Model, 185
Performer and Performance Changes across the Stages of Learning, 188
Expertise, 194

13 Predicting Performance for Later Learning Stages, 198
Application, 198
Discussion, 198
Relating Initial and Later Achievement, 199

14 Transfer of Learning, 204
Application, 204

Discussion, 204
What Is Transfer of Learning? 205
Why Is Transfer of Learning Important? 205
Why Does Positive Transfer of Learning Occur? 207
Negative Transfer, 210
Bilateral Transfer, 212

UNIT V INSTRUCTION AND AUGMENTED FEEDBACK 217

15 Demonstration and Verbal Instructions, 218
Application, 218
Discussion, 218
Demonstration, 219
Verbal Instructions and Cues, 226

16 The Effect of Augmented Feedback on Skill Learning, 235
Application, 235
Discussion, 235
The Feedback Family, 235
Types of Augmented Feedback, 236
The Roles of Augmented Feedback in Skill Acquisition, 238
How Essential Is Augmented Feedback for Skill Acquisition? 239

17 The Content of Augmented Feedback, 246
Application, 246
Discussion, 246
Augmented Feedback Directs Attention, 246
Augmented Feedback Content Issues, 247
Different Types of Knowledge of Performance, 255

18 The Timing of Augmented Feedback, 264
Application, 264
Discussion, 264
Concurrent versus Terminal Augmented Feedback, 265
The KR-Delay and Post-KR Intervals, 267
Frequency of Presenting Augmented Feedback, 273
Techniques That Reduce Augmented Feedback Frequency, 276

UNIT VI PRACTICE CONDITIONS 283

19 Practice Variability, 284
Application, 284
Discussion, 284
The Future Performance Benefit of Practice Variability, 285
Implementing Practice Variability, 285
Organizing Variable Practice, 288
Accounting for the Contextual Interference Effect, 293

20 Practice Distribution, 297
Application, 297
Discussion, 297
Defining Massed and Distributed Practice, 298
The Length and Distribution of Practice Sessions, 298
The Intertrial Interval and Practice Distribution, 300

21 The Amount of Practice, 304
Application, 304
Discussion, 304
Overlearning and Learning Motor Skills, 305
The Overlearning Strategy Can Lead to Poor Test Performance, 307
Overlearning and Other Practice Variables, 307

22 Whole and Part Practice, 310
Application, 310
Discussion, 310
Skill Complexity and Organization, 311
Practicing Parts of a Skill, 312
An Attention Approach to Involving Part Practice in Whole Practice, 317

23 Mental Practice, 320
Application, 320
Discussion, 320
Two Roles for Mental Practice, 321
Mental Practice Aids Skill Acquisition, 321

Mental Practice Aids Performance Preparation, 325
Why Is Mental Practice Effective? 326
Mental Practice and Imagery Ability, 327

REFERENCES 331
GLOSSARY 349
NAME INDEX 357
SUBJECT INDEX 361

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