# **Detailed Contents**



Preface vii Dedication xv

## UNIT **ONE** Introduction to Motor Skills and Abilities 1

1 The Classification of Motor Skills 2

Application 2
Discussion 3
Skills, Actions, Movements,
and Neuromotor Processes 5
One-Dimension Classification Systems 9
Gentile's Two-Dimensions Taxonomy 14

2 The Measurement of Motor Performance 26

Application 26
Discussion 27
Reaction Time 28

Error Measures 32
Kinematic Measures 37
Kinetics 40
EMG 42
Brain Activity Measures 44
Measuring Coordination 47

3 Motor Abilities 52

Application 52
Discussion 52
Ability and Motor Ability 53

## UNIT **TWO** Introduction to Motor Control 67

4 Neuromotor Basis for Motor Control 68

Application 68
Discussion 69
The Neuron 69
The Central Nervous System 71
The Neural Control of Voluntary Movement 80

5 Motor Control Theories 85

Application 85
Discussion 86
Theory and Professional Practice 87
Motor Control Theory 87
Open-Loop and Closed-Loop Control
Systems 92

Two Theories of Motor Control 94
The Present State of the Control Theory
Issue 108

6 Sensory Components of Motor Control 112

Application 112
Discussion 113

Touch and Motor Control 113

Proprioception and Motor Control 115

Vision and Motor Control 123

Investigating the Role of Vision in

Motor Control 126

The Role of Vision in Motor Control 129

### 7 Performance and Motor Control Characteristics of Functional Skills 139

Application 139
Discussion 140
Speed-Accuracy Skills 140
Prehension 146
Handwriting 150
Bimanual Coordination Skills 152
Catching a Moving Object 154
Striking a Moving Object 157
Locomotion 160

## 8 Action Preparation 173

Application 173

Discussion 174

Action Preparation Requires Time 174

Task and Situation Characteristics Influencing

Preparation 174

Performer Characteristics Influencing

Preparation 183

What Occurs during Preparation? 185

# UNIT **THREE** Attention and Memory 199

## 9 Attention as a Limited Capacity Resource 200

Application 200
Discussion 201
Attention and Multiple-Task Performance 202
The Dual-Task Procedure for Assessing
Attention Demands 208
Focusing Attention 209
Attention and Automaticity 213
Visual Selective Attention 214
Visual Search and Motor Skill
Performance 218
Training Visual Search Strategies 224

Memory Structure 230
Working Memory 231
Long-Term Memory 235
Remembering and Forgetting 238
Assessing Remembering and Forgetting 238
The Causes of Forgetting 241
Movement Characteristics Related to Memory
Performance 244
Strategies that Enhance Memory
Performance 245
Practice-Test Context Effects 250

# 10 Memory Components, Forgetting, and Strategies 229

Application 229 Discussion 230

# UNIT FOUR Introduction to Motor Skill Learning 255

## 11 Defining and Assessing Learning 256

Application 256
Discussion 256
Performance Distinguished from
Learning 257
General Performance Characteristics of Skill
Learning 257
Learning Assessment Techniques 259
Practice Performance May Misrepresent
Learning 269

The Fitts and Posner
Three-Stage Model 274
Gentile's Two-Stage Model 276
Bernstein's Description of the Learning
Process 278
Performer and Performance Changes across
the Stages of Learning 279
A Performer Characteristic that Does Not
Change across the Stages of Learning 291
Expertise 291

#### 12 The Stages of Learning 273

Application 273 Discussion 274

#### 13 Transfer of Learning 298

Application 298
Discussion 299
What Is Transfer of Learning? 299
Why Is Transfer of Learning Important? 300

Why Does Positive Transfer of Learning Occur? 302 Negative Transfer 306 Learning How to Learn as an Example of Transfer 308 Bilateral Transfer 309

# UNIT **FIVE** Instruction and Augmented Feedback 317

381

#### 14 Demonstration and Verbal Instructions 318

Application 318
Discussion 319
Demonstration 319
Verbal Instructions and Cues 330

#### 15 Augmented Feedback 343

Application 343
Discussion 344
The Feedback Family 345
Types of Augmented Feedback 345
The Roles of Augmented Feedback in Skill
Acquisition 347

How Essential Is Augmented Feedback for Skill Acquisition? 348

The Content of Augmented Feedback 350

Types of Knowledge of Performance 357

Timing Issues Related to Augmented Feedback 363

The KR-Delay and Post-KR Intervals 366

Frequency of Presenting Augmented Feedback 370

Techniques that Reduce Augmented Feedback Frequency 372

## UNIT **SIX** Practice Conditions

#### 16 Practice Variability and Specificity 382

Application 382

Discussion 383

The Future Performance Benefit of Practice
Variability 383

Implementing Practice Variability 384

Organizing Variable Practice 387

Accounting for the Contextual
Interference Effect 395

Practice Specificity 398

#### 17 The Amount and Distribution of Practice 405

Application 405
Discussion 406
Overlearning and Learning Motor Skills 407
The Overlearning Strategy Can Lead to Poor
Test Performance 409
Overlearning and Other Practice
Variables 410
The Distribution of Practice 411
Defining Massed and Distributed
Practice 411
The Length and Distribution of Practice
Sessions 411

The Intertrial Interval and Practice
Distribution 416

#### 18 Whole and Part Practice 421

Application 421
Discussion 422
Skill Complexity and Organization 422
Practicing Parts of a Skill 424
An Attention Approach to Involving
Part Practice in Whole Practice 435

#### 19 Mental Practice 439

Application 439
Discussion 440
Two Roles for Mental Practice 440
Mental Practice Aids Skill Acquisition 441
Mental Practice Aids Performance
Preparation 446
Why Is Mental Practice Effective? 447
Mental Practice and Imagery Ability 449

Glossary 453 References 461 Name Index 462 Subject Index 472