

Contents

PART I INTRODUCTION TO GONIOMETRY, 1

Chapter 1 Basic Concepts, 3

Goniometry, 3

Joint Motion, 4

- Arthrokinematics, 4
- Osteokinematics, 5
- Planes and Axes, 5

Range of Motion, 6

- Active Range of Motion, 8
- Passive Range of Motion, 8
- Hypomobility, 9
- Hypermobility, 11
- Factors Affecting Range of Motion, 12

Muscle Length Testing, 13

Chapter 2 Procedures, 19

Positioning, 19

Stabilization, 20

Measurement Instruments, 21

- Universal Goniometer, 21
- EXERCISE 1: Determining the End of the Range of Motion and End-Feel, 22
- Gravity-Dependent Goniometers (Inclinometers), 25
- Electrogoniometers, 26
- Visual Estimation, 26
- EXERCISE 2: The Universal Goniometer, 27

Alignment, 27

- EXERCISE 3: Goniometer Alignment for Elbow Flexion, 30

Recording, 31

- Numerical Tables, 32
- Pictorial Charts, 32
- Sagittal-Frontal-Transverse-Rotation Method, 33
- American Medical Association Guides to Evaluation Method, 34

Procedures, 34

- Explanation Procedure, 35
- Testing Procedure, 35
- EXERCISE 4: Explanation of Goniometric Testing Procedure, 36
- EXERCISE 5: Testing Procedure for Goniometric Evaluation of Elbow Flexion ROM, 36

Chapter 3 Validity and Reliability, 39

Validity, 39

- Face Validity, 39
- Content Validity, 39
- Criterion-Related Validity, 39
- Construct Validity, 40

Reliability, 41

- Summary of Goniometric Reliability Studies, 41
- Statistical Methods of Evaluating Measurement Reliability, 43

- Exercises to Evaluate Reliability, 47
- EXERCISE 6: Intratester Reliability, 48
- EXERCISE 7: Intertester Reliability, 50

PART II UPPER-EXTREMITY TESTING, 55

Chapter 4 The Shoulder, 57

Structure and Function, 57

- Glenohumeral Joint, 57
- Sternoclavicular Joint, 58
- Acromioclavicular Joint, 58
- Scapulothoracic Joint, 59

Range of Motion Testing Procedures, 60

- Landmarks for Testing Procedure, 60
- Flexion, 62
- Extension, 66
- Abduction, 70
- Adduction, 74
- Medial (Internal) Rotation, 74
- Lateral (External) Rotation, 78

Research Findings, 82

- Effects of Age, Gender, and Other Factors, 82
- Functional Range of Motion, 85
- Reliability and Validity, 86

Chapter 5 The Elbow and Forearm, 91

Structure and Function, 91

- Humeroulnar and Humeroradial Joints, 91
- Superior and Inferior Radioulnar Joints, 92

Range of Motion Testing Procedures, 94

- Landmarks for Testing Procedures, 94
- Elbow Flexion, 96
- Elbow Extension, 98
- Forearm Pronation, 98
- Forearm Supination, 100

Muscle Length Testing Procedures, 102

- Biceps Brachii, 102
- Triceps Brachii, 104

Research Findings, 106

- Effects of Age, Gender, and Other Factors, 106

- Functional Range of Motion, 108
- Reliability, 110
- Validity, 112

Chapter 6 The Wrist, 115

Structure and Function, 115

- Radiocarpal and Midcarpal Joints, 115

Range of Motion Testing Procedures, 117

- Landmarks for Testing Procedures, 117
- Flexion, 118
- Extension, 120
- Radial Deviation, 122
- Ulnar Deviation, 124

Muscle Length Testing Procedures, 126

- Flexor Digitorum Profundus and Flexor Digitorum Superficialis Muscle Length, 126
- Extensor Digitorum, Extensor Indicis, and Extensor Digiti Minimi Muscle Length, 130

Research Findings, 134

- Effects of Age, Gender, and Other Factors, 134
- Functional Range of Motion, 137
- Reliability, 139
- Validity, 140

Chapter 7 The Hand, 143

Structure and Function, 143

- Fingers: Metacarpophalangeal Joints, 143
- Fingers: Proximal Interphalangeal and Distal Interphalangeal Joints, 144
- Thumb: Carpometacarpal Joint, 144
- Thumb: Metacarpophalangeal Joint, 145
- Thumb: Interphalangeal Joint, 145

Range of Motion Testing Procedures:

Fingers, 147

- Landmarks for Testing Procedures, 147
- Metacarpophalangeal Flexion, 148
- Metacarpophalangeal Extension, 150
- Metacarpophalangeal Abduction, 153
- Metacarpophalangeal Adduction, 155
- Proximal Interphalangeal Flexion, 155
- Proximal Interphalangeal Extension, 157

- Distal Interphalangeal Flexion, 158
- Distal Interphalangeal Extension, 160
- Composite Flexion of MCP, PIP, and DIP Joints, 161

Range of Motion Testing Procedures:

Thumb, 162

- Landmarks for Testing Procedures, 162
- Carpometacarpal Flexion, 164
- Carpometacarpal Extension, 167
- Carpometacarpal Abduction, 170
- Carpometacarpal Adduction, 172
- Carpometacarpal Opposition, 172
- Metacarpophalangeal Flexion, 176
- Metacarpophalangeal Extension, 178
- Interphalangeal Flexion, 179
- Interphalangeal Extension, 181

Muscle Length Testing Procedures:

Fingers, 182

- Lumbricals, Palmar Interossei, and Dorsal Interossei, 182

Research Findings, 186

- Effects of Age, Gender, and Other Factors, 186
- Functional Range of Motion, 189
- Reliability, 190
- Validity, 191

PART III LOWER-EXTREMITY TESTING, 195

Chapter 8 The Hip, 197

Structure and Function, 197

- Iliofemoral Joint, 197

Range of Motion Testing Procedures, 198

- Landmarks for Testing Procedures, 198
- Flexion, 200
- Extension, 202
- Abduction, 204
- Adduction, 206
- Medial (Internal) Rotation, 208
- Lateral (External) Rotation, 210

Muscle Length Testing Procedures, 212

- Hip Flexors: Thomas Test, 212
- The Hamstrings: Semitendinosus, Semimembranosus, and Biceps Femoris: Straight Leg Raising Test, 218
- Tensor Fascia Lata and Iliotibial Band: Ober Test, 224
- Tensor Fascia Lata and Iliotibial Band: Modified Ober Test, 228

Research Findings, 229

- Effects of Age, Gender, and Other Factors, 229
- Functional Range of Motion, 234
- Reliability and Validity, 235

Chapter 9 The Knee, 241

Structure and Function, 241

- Tibiofemoral and Patellofemoral Joints, 241

Range of Motion Testing Procedures, 243

- Landmarks for Testing Procedures, 243
- Flexion, 244
- Extension, 246

Muscle Length Testing Procedures, 246

- Rectus Femoris: Ely Test, 246
- Hamstring Muscles: Semitendinosus, Semimembranosus, and Biceps Femoris: Distal Hamstring Length Test or Popliteal Angle Test, 250

Research Findings, 254

- Effects of Age, Gender, and Other Factors, 254
- Functional Range of Motion, 256
- Reliability and Validity, 258

Chapter 10 The Ankle and Foot, 263

Structure and Function, 263

- Proximal and Distal Tibiofibular Joints, 263
- Talocrural Joint, 263
- Subtalar Joint, 263
- Transverse Tarsal (Midtarsal) Joint, 265
- Tarsometatarsal Joints, 266

Metatarsophalangeal Joints, 267

Interphalangeal Joints, 268

Range of Motion Testing Procedures, 269

Landmarks for Testing Procedures:

Talocrural Joint, 269

Dorsiflexion: Talocrural Joint, 270

Plantarflexion: Talocrural Joint, 273

Landmarks for Testing Procedures: Tarsal Joints, 275

Inversion: Tarsal Joints, 276

Eversion: Tarsal Joints, 278

Landmarks for Testing Procedures: Subtalar Joint (Rearfoot), 281

Inversion: Subtalar Joint (Rearfoot), 282

Eversion: Subtalar Joint (Rearfoot), 284

Inversion: Transverse Tarsal Joint, 286

Eversion: Transverse Tarsal Joint, 288

Landmarks for Testing Procedures:

Metatarsophalangeal Joint, 290

Flexion: Metatarsophalangeal Joint, 292

Extension: Metatarsophalangeal Joint, 294

Abduction: Metatarsophalangeal Joint, 296

Adduction: Metatarsophalangeal Joint, 298

Flexion: Interphalangeal Joint of the First Toe and Proximal Interphalangeal Joints of the Four Lesser Toes, 298

Extension: Interphalangeal Joint of the First Toe and Proximal Interphalangeal Joints of the Four Lesser Toes, 299

Flexion: Distal Interphalangeal Joints of the Four Lesser Toes, 299

Extension: Distal Interphalangeal Joints of the Four Lesser Toes, 299

Muscle Length Testing Procedures, 300

Gastrocnemius, 300

Gastrocnemius Length Testing Position: Standing, 303

Research Findings, 304

Effects of Age, Gender, and Other Factors, 304

Functional Range of Motion, 309

Reliability and Validity, 311

PART IV TESTING OF THE SPINE AND TEMPOROMANDIBULAR JOINT, 317

Chapter 11 The Cervical Spine, 319

Structure and Function, 319

Atlanto-Occipital and Atlantoaxial Joints, 319

Intervertebral and Zygapophyseal Joints, 321

Range of Motion Testing Procedures, 323

Landmarks for Testing Procedures, 323

Cervical Flexion: Universal Goniometer, 326

Cervical Flexion: Tape Measure, 328

Cervical Flexion: Double Inclinometers, 329

Cervical Flexion: Cervical Range of Motion (CROM) Device, 330

Cervical Extension: Universal Goniometer, 331

Cervical Extension: Tape Measure, 333

Cervical Extension: Double Inclinometers, 334

Cervical Extension: CROM Device, 335

Cervical Lateral Flexion: Universal Goniometer, 336

Cervical Lateral Flexion: Tape Measure, 338

Cervical Lateral Flexion: Double Inclinometers, 339

Cervical Lateral Flexion: CROM Device, 340

Cervical Rotation: Universal Goniometer, 341

Cervical Rotation: Tape Measure, 343

Cervical Rotation: Inclinator, 343

Cervical Rotation: CROM Device, 345

Research Findings, 346

Effects of Age, Gender, and Other Factors on Cervical Range of Motion Measurements, 346

Functional Range of Motion, 352

Reliability and Validity, 353

Summary, 361

Chapter 12 The Thoracic and Lumbar Spine, 365

Structure and Function, 365

Thoracic Spine, 365

Lumbar Spine, 366

Range of Motion Testing Procedures, 368

Landmarks for Testing Procedures, 368

Thoracolumbar Flexion, 369

Tape Measure, 370

Fingertip-to-Floor, 371

Double Inclinometers, 372

Thoracolumbar Extension, 373

Tape Measure, 374

Double Inclinometers, 375

Thoracolumbar Lateral Flexion, 376

Universal Goniometer, 377

Fingertip-to-Floor, 378

Fingertip-to-Thigh, 379

Double Inclinometers, 381

Thoracolumbar Rotation, 382

Universal Goniometer, 382

Double Inclinometers, 384

Lumbar Flexion, 385

Modified–Modified Schober Test or

Simplified Skin Distraction Test, 385

Modified Schober Test, 387

Double Inclinometers, 387

Lumbar Extension, 388

Simplified Skin Attraction

Test/Modified–Modified Schober Test, 388

Modified Schober Test, 388

Double Inclinometers, 390

Lumbar Lateral Flexion, 391

Double Inclinometers, 392

Research Findings, 393

Effects of Age, Gender, and Other
Factors, 393

Functional Range of Motion, 397

Reliability and Validity, 398

Summary, 405

Chapter 13 The Temporomandibular Joint, 409

Structure and Function, 409

Temporomandibular Joint, 409

Range of Motion Testing Procedures, 412

Landmarks for Testing Procedures, 412

Depression of the Mandible (Mouth
Opening), 412

Overbite, 416

Protrusion of the Mandible, 417

Lateral Excursion of the Mandible, 418

Research Findings, 420

Effects of Age, Gender, and Other
Factors, 420

Reliability and Validity, 422

APPENDIX A Normative Range of Motion Values, 425

APPENDIX B Joint Measurements by Body Position, 431

APPENDIX C Numerical Recording Forms, 433

INDEX, 439
