Postural and Movement Assessments, & Corrective Strategies

Topics include:

- The importance of stability and mobility
- Postural distortions
- Assessments
    - Movement
    - Overweight/Obesity
- Assessment/Solutions tables

As you read this chapter, keep in mind, the cause of some postural deviations and movement dysfunctions is correctable, such as dysfunction caused by repetitive motions or mobility/stability imbalances. Other dysfunctions such as structural anomalies or injuries caused by trauma or disease are not correctable.

Stability and Mobility

The first goal of any training program is to ensure activities of daily living can be performed. Five foundational movements, or a combination of the foundational movements, are primarily used to perform most activities: squatting, single leg movements such as lunges and walking, pushing, pulling, and rotating (Cook, Burton, & Hoogenboom, 2006; Galati, 2015). These movements require a level of stability and mobility. Overactive muscles will often result in limited mobility, while underactive muscles often result in poor stability. Kinetic stability is when posture or a joint remains unchanged or returns to proper alignment, even when resistance is applied (American College of Sports Medicine [ACSM], 2018; Comana & McGrath, 2015; Galati, 2015). Stability is achieved by a coordinated effort of muscle activation that creates stiffness around a joint. Mobility is articulation, and balance is the ability to maintain the center of gravity, statically or dynamically, over the base of support (Comana & McGrath, 2015; Galati, 2015). Remembering stability requires little range of motion compared to mobility, and starts with the ground, will help to understand which joints provide stability and which provide mobility. Muscular imbalance occurs when mobility joints are used for stability, and stability joints are used for mobility. Figure 4.1 details the primary function of each joint or skeletal segment, and Figure 4.2 displays how altered kinematics and dysfunction in one area leads to compensatory movements in another.

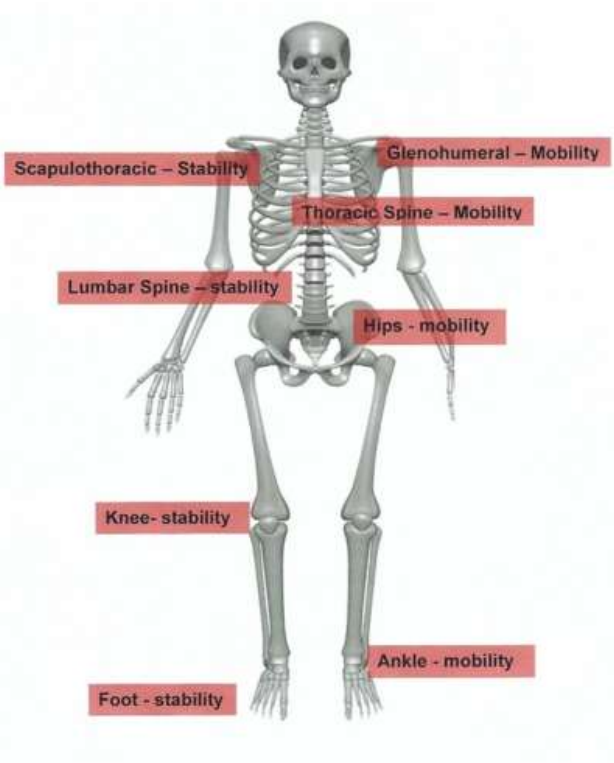

Figure 4.1 Stability and mobility. This figure details the primary function of each joint or skeletal segment.

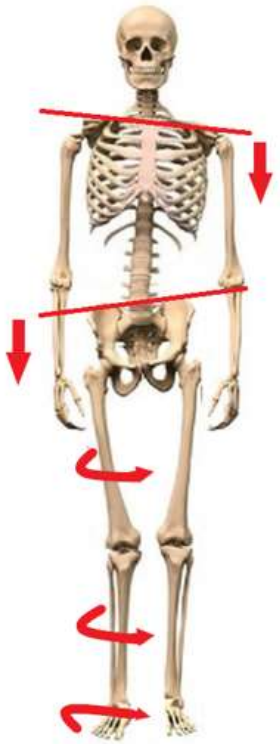

Figure 4.2. Altered kinematics. This figure displays how 4 degrees of dysfunction in one segment can affect the segments above and/or below.

Postural Distortions

Muscular imbalances result in impaired movement patterns and postural dysfunction. Proper posture requires the muscles and joints work minimally to maintain a state of musculoskeletal alignment and balance, and is indicated when a plumb line passes slightly in front of the ankle bone (lateral just in front of the center of the knee joint, through the greater trochanter, and then through the lumbar vertebrae and the center of the shoulder joint and ear as seen in Figure 4.3 (Norris, 2011).

Figure 4.3. A plumbline can be used to determine proper static posture.

Static posture deviation manifests in four ways (not including scoliosis or lateral curvature of the spine) (Comana & McGrath, 2015: Norris, 2011).

1. Lordosis is indicated by an increased anterior curve.
2. Kyphosis is indicated by an increased posterior thoracic curve.
3. Flat back is indicated by a decreased lumbar curve.
4. Swayback is indicated by a decreased lumbar curve and an increased posterior thoracic curve.

In addition to the postural deviations already mentioned, Janda (1996) recognized patterns of overactive and underactive relationships that he termed proximal and distal crossed syndrome. This classification may be more useful to medical professionals, but the deviations are commonly encountered by fitness professionals and can often be corrected, so each has been renamed and explained by various fitness organizations. Proximal crossed syndrome has been relabeled *upper crossed* or *upper extremity syndrome*, and distal crossed syndrome

has been relabeled *lower crossed syndrome* or *lumbo-pelvic-hip syndrome*. Upper crossed syndrome is characterized by a forward head and rounded shoulders. Lower crossed syndrome is characterized by increased lumbar lordosis and an anterior pelvic tilt. Another, although more recent postural deviation classification, is lower extremity, or pronation distortion syndrome. Pronation distortion syndrome is characterized by excessive foot pronation and knee flexion with internal rotation. Table 4.1 details common injuries associated with each distortion, as well as overactive and underactive muscles; Table 4.2 provides corrective strategies for postural distortions.

Table 4.1

Common postural distortions

Distortion	Common Injuries	Overactive	Under Active
Lower Extremity Pronation Distortion Syndrome	Plantar Fasciitis Posterior Tibialis Tendonitis (Shin Splints) Anterior Knee Pain Low Back Pain	Peroneal Gastrocnemius Soleus IT Band Hamstrings Adductors Iliopsoas	Posterior Tibialis Anterior Tibialis Vastus Medialis Gluteus Medius Gluteus Maximus
Upper Extremity Syndrome or Upper Crossed Syndrome	Rotator Cuff Impingement Shoulder Instability Biceps Tendonitis Thoracic Outlet Syndrome Headaches	Pectoralis Major Pectoralis Minor Levator Scap Teres Major Upper Trap Anterior Deltoid Subscapularis Lats Sternocleidomastoid Rectus Capitus Scalenes	Rhomboids Lower Trap Serratus Anterior Posterior Delt Teres Minor Infraspinatus Longus Coli/Capitus
Lumbo-Pelvic-Hip Syndrome or Lower Crossed Syndrome	Hamstring Strain • Anterior Knee Pain • Low Back Pain	Iliopsoas Rectus Femoris TFL Short Adductors Erector Spinae Gastrocnemius Soleus	Gluteus Maximus Hamstrings Gluteus Medius Transverse Abs Multifidus Internal Obliques Anterior and Posterior Tibialis

Table 4.2

Corrective strategies for postural distortions

Distortion	Compensation	Overactive	Under Active	Example Exercises
Lower Extremity-Pronation Distortion Syndrome Injuries: • Plantar Fasciitis • Posterior Tibialis Tendonitis (Shin Splints) • Anterior Knee Pain • Low Back Pain	• Excessive Foot Pronation • Knee Flexion/Internal Rotation	Peroneal Gastrocnemius Soleus IT Band Hamstrings Adductors Iliopsoas	Posterior Tibialis Anterior Tibialis Vastus Medialis Gluteus Medius Gluteus Maximus	Strengthen: Dorsiflex w/band Mini squat-heel touch Ball Squat w/ Abduction S/L Bridge Kick Backs Stretch: Plantar Flex-Invert SMR Calf Calf Stretch SMR IT Band Sit and reach Lunge and Reach
Upper Extremity-Upper Cross Syndrome Common Injuries: • Rotator Cuff Impingement • Shoulder Instability • Biceps Tendonitis • Thoracic Outlet Syndrome • Headaches	• Rounded Shoulders • Forward Head	Pectoralis Major Pectoralis Minor Levator Scapula Teres Major Upper Trap Anterior Deltoid Subscapularis Latissimus Dorsi Sternocleidomastoid Rectus Capitus Scalenes	Rhomboids Lower Trap Serratus Anterior Posterior Deltoids Teres Minor Infraspinatus Longus Coli/Capitus	Strengthen: 3-way rotator cuff Cobra Low Row Chin Tuck Stretch: Doorway Stretch Neck stretch Lat stretch O/B Kneeling Lat stretch
Lumbo-Pelvic-Hip-Lower Cross Syndrome Common Injuries: • Hamstring Strain • Anterior Knee Pain • Low Back Pain	Increased Lumbar Lordosis	Iliopsoas Rectus Femoris Tensor fasciae latae Short Adductors Erector Spinae Gastrocnemius Soleus	Gluteus Maximus Hamstrings Gluteus Medius Transverse Abs Multifidus Internal Obliques Anterior and Posterior Tibialis	Strengthen: S/L Bridge Ball Squat w/Abduction Bracing Cobra O/B Dorsiflex w/band Crunch w/twist Stretch: SMR TFL SMR Calf TFL Stretch Calf Stretch Lunge Stretch w/internal twist S/L Butterfly

Assessments

The overhead squat assessment

The overhead squat assessment (OHS) is a good starting point for screening a client's stability and mobility (Clifton, Grooms, & Onate, 2015; Hirth, 2007). It is not as comprehensive as the Functional Movement Screen (FMS) (Clifton, et al., 2015), but takes considerably less time to complete and provides enough information so any obvious movement dysfunction can be addressed. Additionally, the FMS was developed to determine the functional ability of athletes undergoing rehabilitation, and as such was not originally intended for clients suffering from one or more chronic disease, who may be unable to complete the seven movements of the FMS. Regardless, the OHS is only a basis for program design, and as you get to know your client, other concerns may arise that were unnoticed in the original assessment and may need to be addressed. To perform an OHS assessment, a client should stand with feet hip width apart, toes forward, and arms raised above the head. A medical fitness specialist (MFS) will view a number of squats from the front, back, and side. A client should perform the overhead squat as many times as needed so any movement imbalance can be recorded. Table 4.3 details what should be observed, and correction strategies (National Academy of Sports Medicine, n.d.)

Table 4.3

Overhead squat assessment chart

View	Checkpoint	Compensation	Possible injuries	Overactive	Under active
Anterior	Feet	Turns Out	Plantar Fasciitis Posterior Tibialis Tendonitis-shin splints Patellar Tendonitis-jumpers knee	Soleus Lat. Gastrocnemius Bicep Femoris Tensor Fascia Latae (TFL)	Med. Gastrocnemius Med. Hamstring Gluteus Med/Max Gracilis Sartorius Popliteus
	Knees	Move Inward	Anterior, medial, and lateral knee pain IT Band tendonitis	Adductor Complex Bicep Femoris (short head) TFL Lat. Gastrocnemius Vastus Lateralis	Med. Hamstring Med. Gastrocnemius Gluteus Med/Max Vastus Medialis (VMO)

		Move Outward		Piriformis Bicep Femoris TFL Gluteus Medius/ Minimus	Adductors Complex Med. Hamstring Gluteus Max
Lateral	LPHC	Excessive Forward Lean	Hamstring, quad, and groin strain Low back pain	Soleus Gastroc Hip Flexor Complex Abs	Anterior Tibialis Gluteus Max Erector Spinae
		Low Back Arches		Hip Flexor Complex Erector Spinae Latissimus Dorsi	Gluteus Maximus Hamstring Core Stabilizers (transverse abs, multifidus, transversospinalis, internal oblique, diaphragm, pelvic floor muscles)
		Low Back Rounds		Hamstrings Adductor Magnus Rectus Abdominis External Obliques	Gluteus Maximus Erector Spinae Lats/Psoas Intrinsic Core Stabilizers
	Upper Body	Arms Fall Forward	Headaches Biceps Tendonitis Shoulder Injuries	Latissimus Dorsi Pectoralis Major/Minor Coracobrachialis Teres Major	Mid/Low Traps Rhomboids Posterior Deltoid Rotator Cuff
Posterior	Feet	Flatten	Plantar Fascitis Posterior Tibialis Tendonitis-Shin Splints Patellar Tendonitis-Jumpers Knee	Peroneal Complex (peroneus tertius, peroneus longus, peroneus brevis) Bicep Femoris TFL Lat. Gastrocnemius	Anterior/Posterior Tibialis Med. Gastrocnemius Gluteus Med Med. Hamstrings
		Heels Rise		Soleus	Anterior Tibialis
	LPHC	Asymmetrical Weight Shifting	Hamstring, Quad, Groin Strain Low Back Pain SI joint pain	Adductor Complex, TFL (on side of shift) Piriformis, Bicep Femoris (short head) Gluteus Medius (opposite of shift)	Gluteus Med-on side of shift Adductor Complex-on opposite side of shift

Overweight and obesity

In addition to movement and posture assessments, there are also a number of commonly used tools to assess obesity. Anthropometric measurements such as body fat percentage, body-mass index (BMI), and waist-to-hip ratios assess the size, shape, and composition of the human body. Body fat percentage can be measured in a number of ways inclding skin fold measurements, bioelectrical impedance, and hydrostatic weighing. Table 4.4 details body fat classifications (Kravitz, 2015).

Table 4.4

Body fat classifications

Classification	Males %	Females %
Essential fat	2-5	10-13
Athletes	6-13	14-20
Fitness	14-17	21-24
Average	18-24	25-31
Obese	>25	>32

The most prevalent anthropometric measurement for health risk is BMI that is used to categorize individuals from underweight to obese. BMI is a calculation of height and weight.

- [Body weight in pounds / (height in inches x height in inches)] x 703
- [Body weight in kg / (height in meters x height in meters)]

Underweight = <18.5

Normal Weight = 18.5-24.9

Overweight = 25.0-29.9

Obese = >30

The BMI scale has come under scrutiny as it does not differentiate between fat-free mass and fat mass. However, waist circumference can be used as an indicator for visceral fat, and a valid predictor of health risk (Janssen, Katzmarzyk, & Ross, 2004). Therefore, waist circumference measurements used as a separate indicator for health risk, and used in conjunction with BMI, can differentiate between healthy and unhealthy mass. For men, a waist

of ≥ 40 inches (102cm), and for women a waist of ≥ 35 inches (89cm) are the thresholds for obesity related health risks.

Another measurement gaining popularity to assess cardiovascular risk is hip-to-waist ratio because it is more discriminate of lean vs. fat mass (Elsayed, et al., 2008). Measure at the smallest part of the waist, and the largest part of the hips and divide the waist the by hip measurement.

Table 4.5 details thresholds for waist-to-hip ratios.

Table 4.5

Hip to waist ratio

Gender	Excellent	Good	Average	Poor
Male	<0.85	0.85-0.89	0.90-0.95	>0.95
Female	<0.75	0.75-0.79	0.80-0.86	>0.86

Kravitz, 2015

Discussion and application

1. Describe the mechanical dysfunction(s) associated with knee adduction and the movements needed to correct it. How can this be explained so a client will understand what is involved?
2. What imbalances exist for a client displaying kyphosis (upper-cross syndrome)? What exercises can be performed to alleviate the postural dysfunction? What cues can be suggested for a client to practice throughout the day?

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