the feet and ankles, so it is important to ascertain the condition of the client's toes (Arnot 2003). Look at the big toe of each foot to determine if the first joint of that toe is swollen, has a bunion, or looks as though it points away from the midline rather than straight ahead (see figure 2.5). If the big toe on one or both feet is not straight, this may indicate that the client overpronates. When a person overpronates, the foot collapses and weight is transferred toward the centerline of the body. This transfer of weight across the foot before it can pass over the end of the big toe can cause any of the following: irritation on the inside of the big toe (e.g., a callus), inflammation and additional bone growth on the first joint of the big toe (a bunion), or a shift of the big toe toward the other toes (hallux valgus).

Check the Lesser Toes

The term *lesser toes* refers to all toes but the big toes. Structural imbalances of the feet and ankles and certain types of footwear can cause many abnormalities in the lesser toes. These irregularities are often called hammertoes, claw toes, or mallet toes, and they can be very painful (see figure 2.6) (Arnot 2003). To assess a client for these issues, look at the lesser toes to see if they curl up, form a claw, or look as though they are always flexed. Visual abnormalities of the lesser toes may be an indication that the client overpronates because weight is no longer passing correctly over the forefoot and the ends of the toes.

Go to the online video to watch video 2.2, where Justin demonstrates the visual assessments for overpronation.

Figure 2.5 Example of hallux valgus and a bunion.

Figure 2.6 Example of irregularities of the lesser toes.

HANDS-ON ASSESSMENTS

Once the visual assessments for the feet and ankles are complete, begin the hands-on portion of the assessment process. Tell the client that you will now be manually evaluating his feet and ankles in order to confirm or refute your visual assessment findings. You will be looking for any irregular joint positions in the ankle and excessive tension in the soft tissue structures of the feet and lower legs. Remember to always ask permission before touching a client or performing any hands-on assessments.

Evaluate the Position of the Talus Bone

The talus bone, which is located in the ankle just below the lower leg bones, helps dissipate some of the side-to-side stresses in the foot and ankle during weight-bearing activities. Evaluating the position of the talus bone will help confirm whether a client overpronates and to what extent (Muscolino 2009).

To assess the position of the talus bone, ask the client to stand facing you with both feet straight and pointed forward. Kneel down and place the thumb and index finger of your right hand on either side of the client's left ankle just below the anklebones (malleolus). You will feel a dimple or indentation on both sides of the ankle. On the inside of the ankle, the dimple is just below and behind the large tendon of the tibialis anterior, the muscle that pulls the foot toward the shin. On the outside of the ankle, the dimple is just below and behind the tendon of the extensor digitorum longus, the muscle that lifts the lesser toes toward the shin (Gray 1995).

When you first begin practicing this assessment, you will find it easier to locate these dimples by asking clients to roll the weight on the foot to the outside (i.e., to supinate) and to pull the foot and the big toe upward using the muscles in the front of the shin.

This will help expose the tendon on the inside of the ankle and highlight the dimpled area where you will place your thumb (see figure 2.7*a*). Once you have located this position, ask your client to pronate (i.e., roll the weight on the foot to the inside) and pull the lesser toes upward using the muscles in the shin. This will help expose the tendons of the lesser toes on the outside of the ankle and will highlight the dimpled area where you will place your index finger (see figure 2.7*b*) (Price and Bratcher 2010).

Position your thumb and forefinger and press firmly in the center of the dimples on the inside and outside of the ankle (see figure 2.8). Then ask the client to roll the ankle from side to side in order to raise and lower the arch of the foot (supinate and pronate). As the client rolls the ankle inward, you will feel pressure under your thumb on the inside of the ankle. This is the talus bone pushing into your thumb. As she rolls the ankle outward, you will feel pressure under your forefinger. This is the talus bone moving the other way. Coach your clients to slowly roll the ankle in and out, and stop them in the position when the pressure under your thumb and forefinger feels even.

When you feel even pressure under your thumb and forefinger, instruct your client to hold the foot and ankle in that position. This is the neutral position for the talus bone and the correct position for the foot and ankle in an upright standing position (Magee and Sueki 2011). If the person you are assessing habitually overpronates, then a neutral foot and ankle position will likely feel awkward, as though the weight were all on the outside of the foot. Reassure these clients that it is normal to feel that way because their feet and ankles are used to collapsing under the weight of the body rather than supporting and transferring it correctly.

Now switch hands and use your left thumb and forefinger to assess the position of the talus bone on the client's right foot.

Go to the online video to watch video 2.3, where Justin demonstrates the hands-on assessment for overpronation.

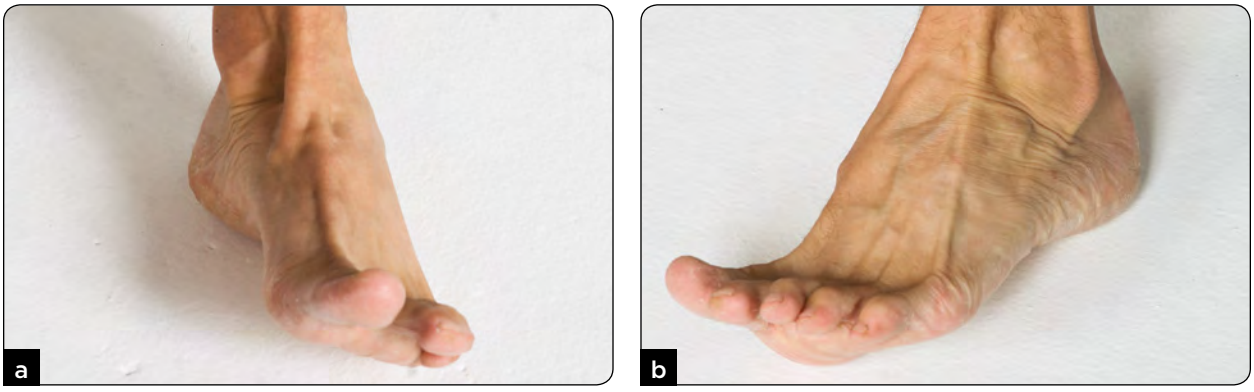

Figure 2.7 *(a)* Dimple on medial side of ankle. *(b)* Dimple on lateral side of ankle.

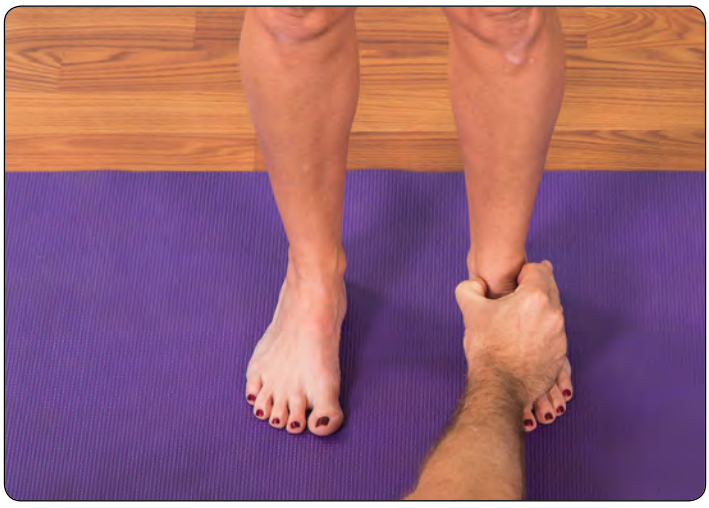

Figure 2.8 Assessing the position of the talus bone.

Once the assessment is done, teach clients visually and kinesthetically how to find the neutral position so they can see and feel what it is like to stand with their feet and ankles in alignment. Teaching them to evaluate themselves enables them to achieve this position on their own. They might even communicate the technique to a friend, colleague, or family member, which could result in another person seeking your help to design a corrective exercise program.

Evaluate the Condition of the Calf Muscles

Musculoskeletal imbalances in the feet and ankles will adversely affect the calf muscles (Kendall, McCreary and Provance 2005). As the foot overpronates, the heel rolls inward, pulling on the Achilles tendon and on the gastrocnemius and soleus, the calf muscles on the back of the lower leg that attach to the heel via that tendon. This excessive pulling causes these muscles to become sore and to lose their flexibility. If these muscles cannot lengthen effectively, then the foot and ankle will not be able to dorsiflex well. This lack of dorsiflexion can compress the structures at the front of the ankle and cause inflammation and irritation of the Achilles tendon (Barnes 1999).

Ask the client to lie down on the floor on her back with her knees bent. Kneel beside the client with one leg forward and lift the lower part of one of the client's legs. Rest the client's foot on your knee and use your thumb and forefinger to squeeze the belly of the client's calf muscle (see figure 2.9). You are looking for the presence of trigger points, nodules, or excessive muscle tension. If you are unsure whether what you are feeling is a tight or tender spot, ask the client to tell you what she is feeling when you squeeze the calf. Repeat the assessment on the other leg. Make a note of any findings, including tenderness, on the CAD.

Evaluate the Condition of the Plantar Fascia

The plantar fascia is a broad, dense, fairly rigid connective tissue that runs the length of the underside of the foot. Forces from the body above and ground reaction forces from below put enormous stress on the plantar surface of the foot during weight-bearing activities such as walking and running (Hyde and Gegenbach 2007). Musculoskeletal imbalances, such as overpronation and lack of dorsiflexion, increase stresses on the plantar fascia. Over time, these can cause the tissue to become overstressed, dysfunctional, and painful (Snell 2008).

To assess the condition of the plantar fascia, ask the client to lie down on the floor on her back with her knees bent. Kneel beside the client with one leg forward and lift the lower part of one of the client's legs. Rest the client's foot on your knee and press your thumbs or fingers into the arches and sole of each of her feet from the heel to the toes (see figure 2.10). Note any tenderness or painful areas, and record them on the CAD. If you are not sure whether you are feeling a tight or tender spot, ask for the client's feedback. The sorest spot for most people will usually be just forward of the heel at the highest part of the arch or just behind the first joint of the big toe (Hobrough 2016).

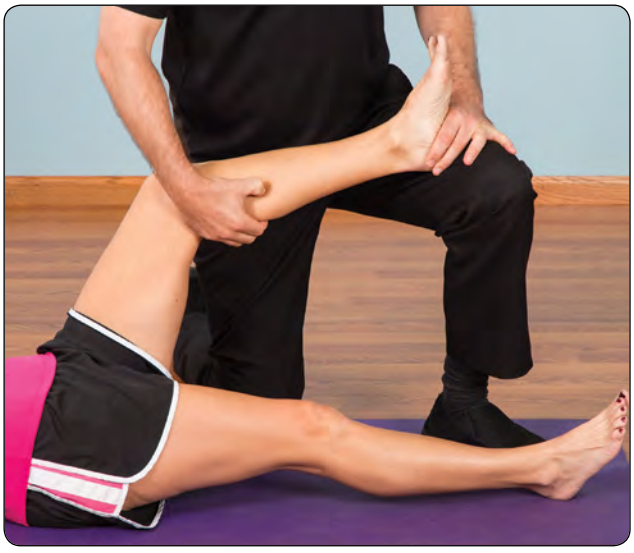

Figure 2.9 Assessing the calf muscle.

Figure 2.10 Assessing the plantar fascia.

By the end of the foot and ankle assessment, you will have been able to help your clients understand any musculoskeletal imbalances in these areas as well as explain how those imbalances affect their knees. While the assessments you have just completed can reveal specific issues in the feet and ankles, they also begin to demonstrate the interconnectedness of all of the body's parts. This is important because it helps clients to understand that the site of their pain or dysfunction is not always the source of their problem. Therefore, before progressing to the verbal, visual, and hands-on assessments for the knees, briefly sum up your findings about the client's feet and ankles. Make sure you have completed the CAD for this body area, and briefly describe how the feet and ankles relate to the knees (see How the Feet and Ankles Relate to the Knees). Communicating this information to your clients will also help you to move seamlessly into the next part of the assessment process.

HOW THE FEET AND ANKLES RELATE TO THE KNEES

The feet and ankles form the foundation of the human body. As with any structure, the integrity of the foundation affects everything above it, and the weight above has a direct impact on the foundation. Therefore, the condition of the feet and ankles will influence the performance of all weight-bearing activities, such as standing, bending, reaching, squatting, walking, running, and lunging (Schamberger 2002).

When the foot overpronates, it causes the lower leg to roll inward and the heel bone to collapse toward the midline of the body. This collapsing inward of the foot, ankle, and lower leg results in a lack of dorsiflexion—that is, the foot, ankle, and lower leg do not come forward over the foot correctly. Simply put, if the foot and ankle collapse in too much, they cannot come forward enough. Since the soleus and gastrocnemius muscles are attached to the heel bone, this collapsing of the foot and ankle affects the function of these muscles and further limits dorsiflexion (Lowe 2009).

Figure 2.11 Valgus knee position.

The internal movement of the lower leg caused by overpronation also affects the position of the knee, since the bottom of the knee joint sits directly atop the tibia and fibula. Overpronation causes a valgus knee position, that is, an inward displacement of the knee (see figure 2.11) (Johnson and Pedowitz 2007). Excessive inward movement or displacement of the knee joint can result in tracking problems in which the kneecap does not glide smoothly over the femoral groove as it should (Johnson and Pedowitz 2007).

Lack of dorsiflexion in the ankle also directly affects the function of the knee when it is both bending (flexing) and straightening (extending). For example, many weight-bearing activities like squatting and lunging require the ankle to bend forward at the same time the knee is bending (figure 2.12).

Other weight-bearing activities like walking and running require the ankle to bend forward while the knee is straightening (figure 2.13). However, if the foot and ankle complex lacks dorsiflexion, the knee joint must compensate for this lack of movement in the ankle, and pain and injury can result (Cook 2010).