Introduction

According to Perry (2002), a normal gait cycle consists of seven stages (Figures 1-7). According to Perry (2002), a normal gait cycle should consist of 60% of the movement in the support, or stance, phase and 40% in the swing phase. There are several variables to consider that might alter a normal gait cycle such as walking velocity and neuromusculoskeletal deficiencies.

There are several types of joints in the body: hinge, ball and socket, saddle, gliding, and pivot. Each joint plays a different but important role in the body. The hinge is the most common type of joint, and the knee is a prime example of the hinge joint. According to Seel, Raisch, and Schauer (2014), the knee is not perfectly constrained to rotate around a single axis. Abduction and adduction and knee rotation internally or externally may exceed a joint change of up to 10° (Seel et al., 2014). However, this information is rarely included in publications but should be considered when evaluating the angles of the knee during walking.

The purpose is to determine how knee angles change during specific phases of the walking gait compared to research. The subject is a young, healthy, moderately active adult, so it is hypothesized that the subject’s knee angle change during each stage will fall within the range of a healthy adult’s walking gait.

Load Response

According to Perry (2002), a normal knee flexion angle during the loading response is 15°. During the loading response, the subject exhibited a knee flexion angle of 8.4°. This difference is significant enough to be considered a discrepancy. A major goal during this initial portion of the gait analysis is to ensure that the weight is shifted in order for stability to occur and to enable the body to propel forward in the sagittal plane to begin the next stance (Perry, 2002). The subject had a knee flexion angle of 6.5° during this stage, which falls within the range of a normal gait. During this the tibia is stabilized on the foot, so the body weight is shifted forward in the sagittal plane. The ankle and foot are important during this stage in relation to making sure the body’s center of gravity is shifted forward. The major muscles involved in this stage are: sartorius, iliacus, and tibialis anterior (Streifeneder, 2018).

Mid Stance

The subject’s knee angle during the mid-stance position was 4.5°. As limb support is initiated, knee flexion may increase slightly and may reach 18°. The subject’s knee angle change only slightly increased. This may be due to the subject having a strong gastrocnemius and soleus, which are both vital muscles during the mid-stance stage (Brunner & Rutz, 2013). The major muscles that are activated during this stance are the gastrocnemius and the soleus (Streifeneder, 2018). The subject had a knee flexion angle of 2.5°. This is a 32.7° change of the knee can be caused by weakness of the quadriceps. Knee stability may be inhibited if the hamstrings and single joint hip extensors insufficiently exchange their intensities, which may lead to discrepancies of knee angle changes (Perry, 2010). Additionally, lateral stability may be hindered if the hip abductors are not adequately activated. Single-leg limb support may be limited if the soleus and gastrocnemius do not increase their intensity as the walking gait progresses.

Terminal Stance

The phases of the gait cycle that include discrepancies are the load response, pre swing and mid swing. Inadequate angles change of the knee may be caused by weakness of the quadriceps. Knee stability may be inhibited if the hamstrings and single joint hip extensors insufficiently exchange their intensities, which may lead to discrepancies of knee angle changes (Perry, 2010). Additionally, lateral stability may be hindered if the hip abductors are not adequately activated. Single-leg limb support may be limited if the soleus and gastrocnemius do not increase their intensity as the walking gait progresses.

Conclusion

During most stages of the gait cycle, the subject exhibited normal knee angle changes. However, during a few of the stages the subject’s knee angle changes do not match the norms. The subject has no known musculoskeletal issues or balance problems, but the analysis shows that there might be a slight musculoskeletal or balance issue. The client should focus on strengthening the leg muscles and complete balance improving exercises.

References


