

3D Joint Kinetics Data Processing and Analysis – Thomas Young

The following leg muscles will be addressed in their hyphenated form: rectus femoris (RF), biceps femoris (BF), medial gastrocnemius (MG), and tibialis anterior (TA). There is a co-activation (co-contraction) of muscles helping the ankle joint during both walking and running which are the MG and TA. There is also a co-activation of the muscles (co-contraction) helping the knee during both walking and running which are the RF and BF. The muscle activation of the start of the stance phase for the ankle and the knee while walking includes RF, BF, and TA. The RF and TA are less activated around 25% of the stance phase while the BF becomes less activated at the midstance. The MG becomes activated around the 25% zone of the stance phase and continues to gain activation until the 75% mark where the MG comes back down to 0 (neutral) at the end of the stance phase.

The muscle activation of the start of the stance phase for the ankle and the knee while running includes RF, BF, and TA. The RF and TA both start a little primed for movement and then shoot up with high activation around the 25% mark, stay at a high level with a peak at the midstance, and then come down at the 75% mark, close to not being activated. The BF starts a little primed as well, but steadily increases in activation from 25% stance to 75% of the stance phase. This peak at the 75% mark then gradually comes down to end the stance phase. The MG gradually increases in activation from the start of the stance phase to the 75% mark with a peak. Then from 75% to the end of the stance phase steadily comes down, but does not become deactivated.

The ankle sagittal-plane moment for walking has a slight dorsiflexion for the first 25% of the stance phase and all the way to the end of the stance phase. During midstance, the ankle is in a dorsiflexed angular position but the moment is plantarflexion moment. The ankle sagittal-plane moment for running is similar, but has a slightly different trend. The ankle joint starts out in a slight dorsiflexed position and then becomes plantarflexed with its max at the midstance. From midstance the ankle comes back from being plantarflexed to zero at the end of the stance phase. The knee sagittal-plane moment for walking starts in a flexed position and then becomes extended with a peak at the 25% mark. The knee joint then returns to zero at the midstance and becomes slightly flexed at the 75% mark. The knee then becomes slightly extended and returns to a near neutral position. The knee sagittal-plane moment for running starts in a slightly flexed position, but becomes very extended with a peak around the midstance. From the midstance there is a slight decrease in the extensor moment until the knee returns to zero around the 75% mark. From 75%, the knee becomes slightly flexed before returning close to zero at the end of the stance phase.