THE EFFECTS OF MOVEMENT AFTER LANDING ON MUSCLE PRE-ACTIVATION BEFORE TOUCH DOWN.

Takahara Terumasa, Iida Tomoyuki, Seki Kazutoshi, Ishida Yasuo, Onodera Sho
(Graduate school of Kawasaki University of Medical Welfare, Japan)

Landing is one of the common physical movements of life, like descending stairs, jumping and running. Many previous studies of drop jumping and hopping reported that muscle pre-activation (PA) of the leg appeared before the touch down in the landing phase. In movements like drop jumping or hopping, the muscle contraction before the passive muscle stretch stores much elastic energy in the element of the muscle-tendon complex. For this reason, previous studies explained that PA makes the element of preparation for touch down and also effectively makes a contribution to the next jump. However, some studies reported that PA appeared even without the next jump. For this reason, PA before touch down might be a preparation for a shock absorption at the landing. Past studies examined the effects of falling height and the influence of visual information on PA. However, few reports examined the appearance of PA depending upon the assigned movement after touch down. Therefore, the purpose of this study was to investigate the effect of assigned movement after touch down on PA. Seven healthy males volunteered to participate in this experiment. The subjects jumped from a platform onto a landing surface. They performed 10 normal landings (L-condition) and 10 drop jumps that consisted of the first landing condition (FL-condition) and the second landing condition (SL-condition) from a platform 0.3m high. In the L-condition, subjects were absorbing the impact and then regaining the standing position. In the drop jump, subjects jumped as soon as they landed. The electromyographic (EMG) activities of the m. gastrocnemius, m. soleus and tibialis anterior of the right leg were recorded. The EMG signals were recorded using bipolar surface electrodes fixed with a constant interelectrode distance of 20 mm. Joint angles were measured at the ankle using an electrogoniometer. The ground reaction force and time of touch down were calculated using the force platform. After the full-wave rectification of an EMG wave, the integral EMG (iEMG) value of 100ms calculated before landings in the L-condition, FL-condition and SL-condition. As for the values of iEMG in MG, a significant difference was not observed in all conditions. The values of iEMG in SOL and TA in the FL-condition shows a high tendency when compared with that of the L-condition. The values of iEMG in SOL and TA in the SL-condition shows a low tendency when compared with that of the L-condition. In addition, the values of iEMG in SOL and TA showed significant differences between the FL-condition and SL-condition. Moreover, little PA in the SL-condition was observed in SOL and TA. Because significant differences were not observed in each condition, it was considered that PA in MG was the most important at the time of touch down. Little PA being observed in SOL and TA suggested that the recruitment of motor units were regulated depending on assigned movement after touch down.

Keywords: Electromyography, Motor Control