THE INFLUENCE OF DIFFERENT TESTING CONDITIONS ON EMG-ACTIVITY AND KINEMATICS OF THE LOWER EXTREMITY IN RUNNING

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INTRODUCTION: Different testing conditions such as treadmill running or over ground running on laboratory tracks with different path lengths can be used to investigate running mechanics. Data gained in treadmill running or short laboratory track running is only transferable to longer distance over ground running if the testing condition does not influence the analyzed parameters. Although there is already information about the changes in kinematics concerning this matter there is just little information about the possible changes in EMG-activity (Nigg et al., 1995, Wank et al., 1998). Therefore the purpose of this study was to investigate if (a) EMG- and kinematic data recorded in running on a treadmill and running over a long and short laboratory track show intra-condition variability (b) there are differences between the conditions in analyzed parameters.

METHOD: Twelve volunteers were tested running (3.0m/s) on a treadmill (TM), a 10m laboratory track (LT) and during continuous over ground running (CR). Surface EMG was recorded (3000Hz) with unaltered electrode placement of 9 muscles of the lower extremity. Kinematical data of knee and ankle joint were recorded by a highspeed-camera (125Hz) in the sagittal plane and a custom designed rear-foot goniometer in the frontal plane. Anatomical reference points (trochanter major, lateral knee joint space, malleolus lateralis, calcaneus, metatarsophalangeal joint II) for the sagittal plane were digitized to process information of the joint angles. For each testing condition 3 sets of data were recorded to test intra-condition variability. Selected EMG-variables were computed based on a wavelet analysis of the signals.

RESULTS / DISCUSSION: Analysis of the first data suggests that intra-condition variability is smaller than inter-condition variability. Figure 1 displays the EMG-pattern of one subject for the three testing conditions. A higher amplitude and different timing of EMG-peak could be found particularly for LT during the stance phase. The muscular response, however, to the changes in running conditions is not systematical and seems to be individual for the analyzed subjects. Due to the individuality of responses to changes in testing conditions found in this study the comparison of averaged data gained from the whole group of tested subjects could result in masking these individual responses. Ongoing analysis of EMG and kinematics should lead to a better understanding of the influence of running testing condition on the chosen parameters.

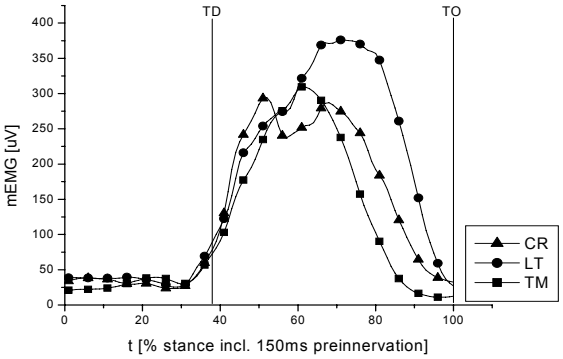

Figure 1: Averaged (9 trials) and processed EMG curves of m. soleus of one subject during running (3.0m/s) under the three different conditions CR, LT and TM. TD indicates touch down and TO indicates toe off.

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