Static measures of range of motion (ROM) are used extensively to determine flexibility. These measures are often used to determine if flexibility training is indicated or not since it is thought that these measures reflect functional performance. The purpose of this study was to determine if static flexibility measures predict ROM during running. This was part of a larger project where the main purpose was to look at the influence of flexibility training on running economy, kinematic characteristics and stiffness.

Methods: 17 subjects divided into a training group (TRA, n = 8) and a control group (CON, n = 9) were tested before (PRE) and after (POST) the implementation of a flexibility training program which lasted 6 weeks. All static measures were obtained by one experienced physical therapist using a hand-held goniometer. The measures included ankle dorsiflexion and hip extension (Thomas test). Running kinematics were recorded using an 8 camera Qualisys motion analysis system with body markers during treadmill running at an intensity of 60, 70, 80% of VO2-max. Data were exported and analyzed in Matlab. The minimum and maximum angles during running were determined in the sagittal plane for the ankle and hip.

Results: The mean correlation PRE and POST in the CON group for static and dynamic measures was \( r = 0.81 \) indicating good repeatability of measurements. Static ROM measures of ankle dorsiflexion and hip extension were not associated with maximum values obtained during a running stride from the kinematic analysis. However the static measures had inconsistent levels of significance with the total ROM in the sagittal plane for the same joints. Static hip extension measure in the PRE group was significantly related to total sagittal plane ROM of the hip (\( r = 0.54, p < 0.05 \)) at 80% of VO2-max. The static hip extension measure was associated with total ROM in the ankle for all intensities in the PRE and POST group (\( r = 0.48 – 0.63, p < 0.05 \)).

Discussion: ROM restrictions relative to the demands of running are thought to affect kinematic characteristics. Hip extension was obtained using the Thomas test which is supposed to be sensitive to hip flexor mobility, and might therefore not reflect other factors limiting this motion. Ankle dorsiflexion has been found to be greater active assisted than passively. In this study we obtained this measure passively. What is interesting to note is that these static measures at the end of ROM are more strongly associated with the total ROM rather than the corresponding maximum values. Hip extension and ankle dorsiflexion can interrelate during a running stride since one can influence the other in determining total stride length. This is evident since hip extension correlates well with total ankle ROM at all intensities PRE and POST.

Conclusion: Static range of ROM are not associated with maximum active ROM, however static measures of hip extension are significantly correlated with total ankle ROM during running.

**Keywords:** Running, Flexibility/Range of Motion, Biomechanics