

FOOT AND ANKLE JOINT KINEMATICS IN RHEUMATOID ARTHRITIS CANNOT ONLY BE EXPLAINED BY ALTERATION IN WALKING SPEED

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INTRODUCTION

Rheumatoid arthritis (RA) manifests itself in the feet and ankles of RA patients. Besides the kinematic differences between healthy and impaired subjects, the temporal factors such as walking speed and double stance phase are different: Walking speed is slower and stride length is smaller, while stance phase, including double stance phase, is longer for subjects with foot and ankle impairments^{1,2}. Besides the disease process, these temporal factors may influence foot and ankle kinematics which makes it difficult to deduce the effects of the disease process on foot and ankle kinematics. The aim of this study was to analyse the effect of walking speed on foot and ankle joint kinematics of RA subjects.

METHODOLOGY

Gait recordings of 21 RA and 14 age-matched healthy subjects were performed. The RA group included subjects with average disease duration of 9 years (SD 7y) and moderate to severe disease activity and progression. The RA subjects walked at their own comfortable walking speed. The healthy subjects walked at 100% (Vc), 75% (V75) and 50% (V50) of their comfortable walking speed. Temporal-spatial factors were calculated. Foot and ankle joint kinematics were determined from marker-recordings (Figure 1) by using the method developed by Simon³. Differences between the stance phase kinematics of the two groups caused by the factors walking speed and the RA disease process were analysed using a multi-level linear model (SPSS Inc, Chicago, USA).



Figure 1 - Foot and leg markers

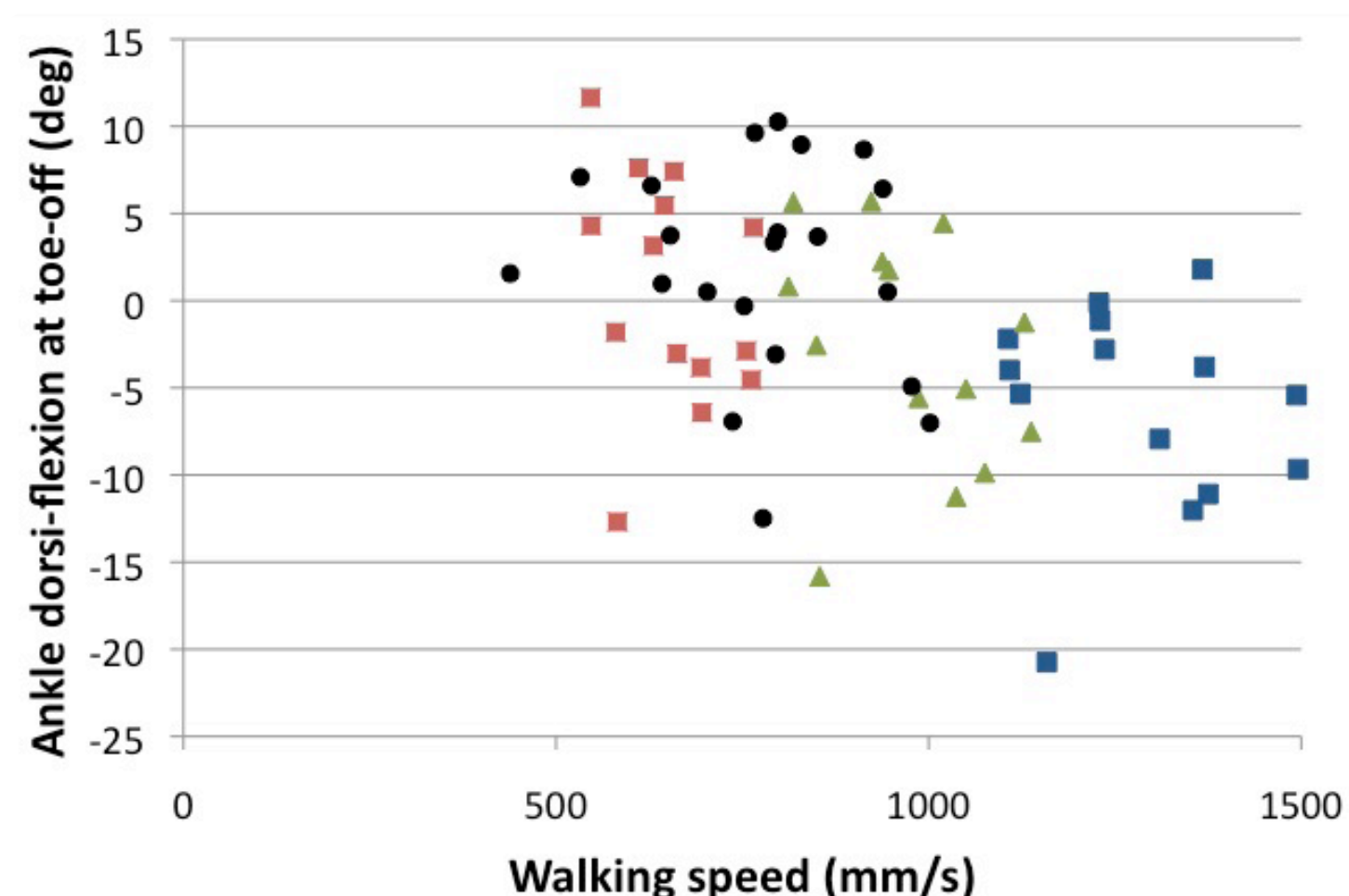


Figure 2: Ankle dorsi-flexion at toe-off of healthy (Vc, V75, V50) and RA subjects (RA)

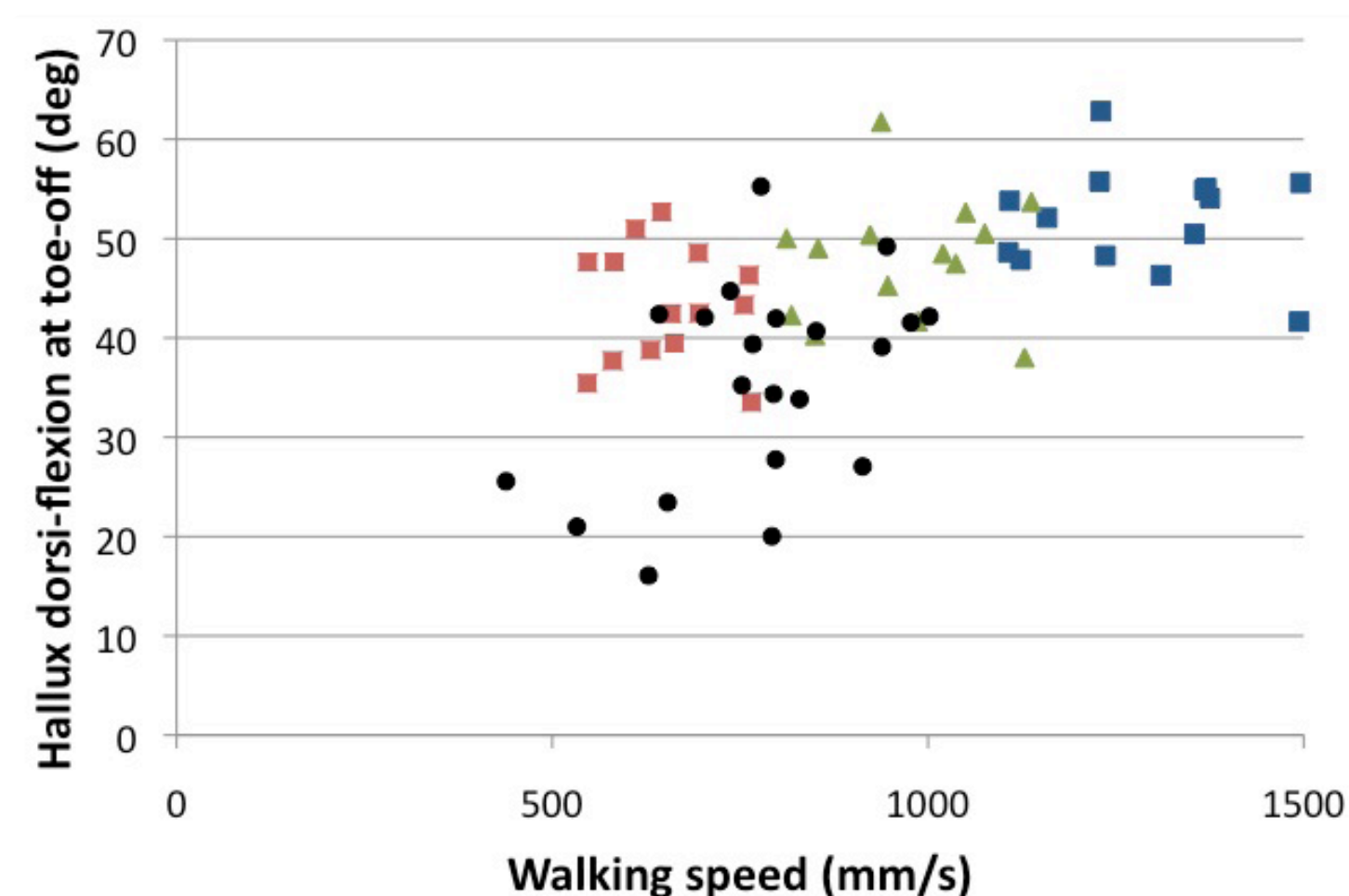


Figure 3: Maximum hallux dorsi-flexion at toe-off of healthy and RA subjects

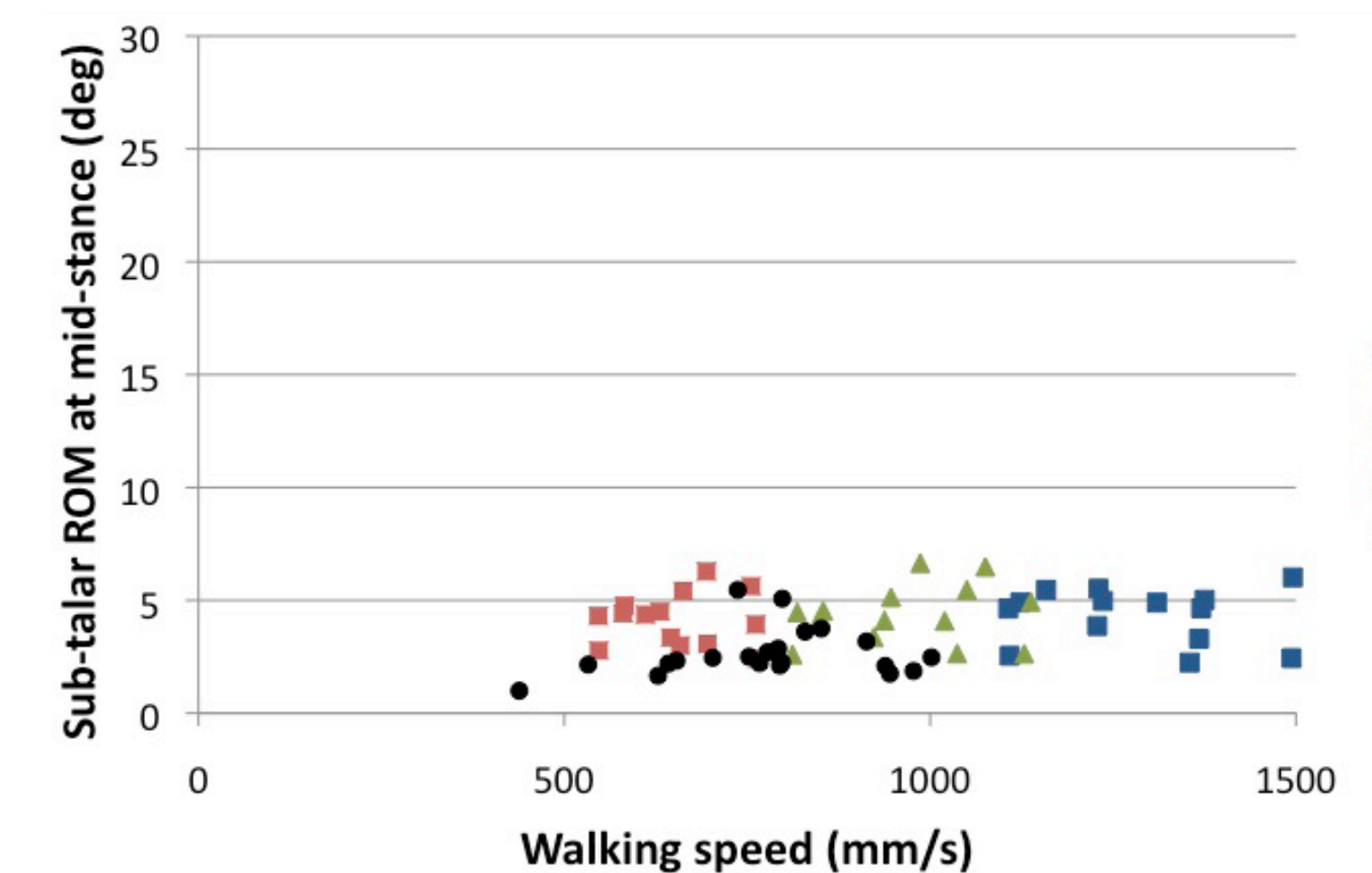


Figure 4: Sub-talar eversion range of motion mid-stance of healthy and RA subjects

RESULTS

The RA subjects walked at an average speed of 780 mm/s and the healthy subjects walked at an average of 1280, 970 and 650 mm/s for the three walking speed sessions, respectively. The ankle joint dorsi-flexion (Figure 2), medial arch motion and hallux abduction were statistically significantly influenced by walking speed alone. Hallux flexion (Figure 3), navicular bone motion, midfoot supination and leg rotation were influenced by both walking speed and the disease process. Sub-talar eversion was solely influenced by the disease process (Figure 4). For those joints that were influenced by walking speed alone, the RA joint kinematics were comparable to those of the healthy subjects walking at lower speeds. For those joints that were influenced by the disease process, abnormal RA joint kinematics were observed compared to healthy subjects walking at lower speeds.

CONCLUSIONS

Walking speed alone cannot explain all differences in the foot and ankle kinematics between RA and healthy subjects. On the other hand, not all observed differences in RA joint kinematics are pathological compared to healthy subjects. Future studies should focus on determining the causes of abnormal hallux flexion at toe-off and reduced midfoot and sub-talar eversion during mid-stance in RA subjects.

REFERENCES

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