RUNNING DOES NOT PROTECT AGAINST AGE-RELATED GAIT ADAPTATIONS

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INTRODUCTION

Age effects on human gait have been shown in many studies. DeVita and Hortobagyi [1] argued that a redistribution of joint moments is a most characteristic aspect of age-related gait changes. Elderly were found to increase hip joint extensor torques to compensate for reduced plantar flexion torques. It has been argued that reduced muscle force underlies these age-associated gait adaptations. Physical activity is known to improve muscle function. Combining these observations brings us to the hypothesis that physical active can be applied to prevent gait related retardation of gait function. If anything, running induced adaptations might be most suited to counterbalance the effect of ageing on gait stability.

METHODS

Four groups of subjects were included: young-active, young-inactive, elderly-active and elderly-inactive. All physical active subjects were selected from a group of runners. The inactive participants had not exercised more than once a week for more than one year. Moreover admission to either of the activity groups was based on a physical activity questionnaire.

The subjects were asked to walk over a 12m level walkway, both at a self-selected speed and at a test speed of 1.5m/s. For each trial 2D segmental positions in the sagital plane from video images (50Hz) of reflective markers and vertical and horizontal ground reaction forces (Kistler type 9281A) were obtained. Inertial properties of the lower limb segments were based on a regression model, using subjects' measures. Inverse dynamic analysis was applied to calculate net joint torque moments of the ankle, knee and hip joint. Only when GRF_z exceeded 300N, the point of application of the GRF-vector was determined accurately. Consequently only joint torques between 10 and 90% of the stance phase are presented. Peak values of joint torques and powers were statistically analyzed.

RESULTS AND DISCUSSION

Spatio-temporal characteristics in both the self-selected and the test speed differed between ages not between activity groups. Under both condition elderly walked slower and with shorter step lengths. This resembles previous studies.

Also for joint torques differences between groups occurred as an effect of age not of activity level. In the ankle joint torque elderly displayed a gradual increase from low plantar flexion torques at heel contact to large plantar flexion torques at toe off (Figure1a). Young subjects were characterized by a rapid initial increased, followed by a plateau phase at midstance and a subsequent final rise of plantar flexion moment. Maximal plantar flexion torques were significantly larger in young subjects (152Nm *vs* 132Nm). Elderly had reduced knee extensor torques (Figure 1b) and increased hip extensor torques (Figure 1c) at the initial part of the stance phase. These age-related changes match exactly those presented earlier [1]. No changes in joint torque due to differences in activity were found.

For the same population also function of knee joint extensor and flexor muscle has been reported [2]. An age-associated reduction of knee flexor function was found within the joint angle range used during running and walking. In that study also no effects of activity could be found.

CONCLUSIONS

Based on this study and the previous study evaluating muscle function in the same population [2] it can be concluded that running does not protect against age-associated muscle wasting. Moreover, it is once again suggested that gait changes result from reduced muscle function.

REFERENCES

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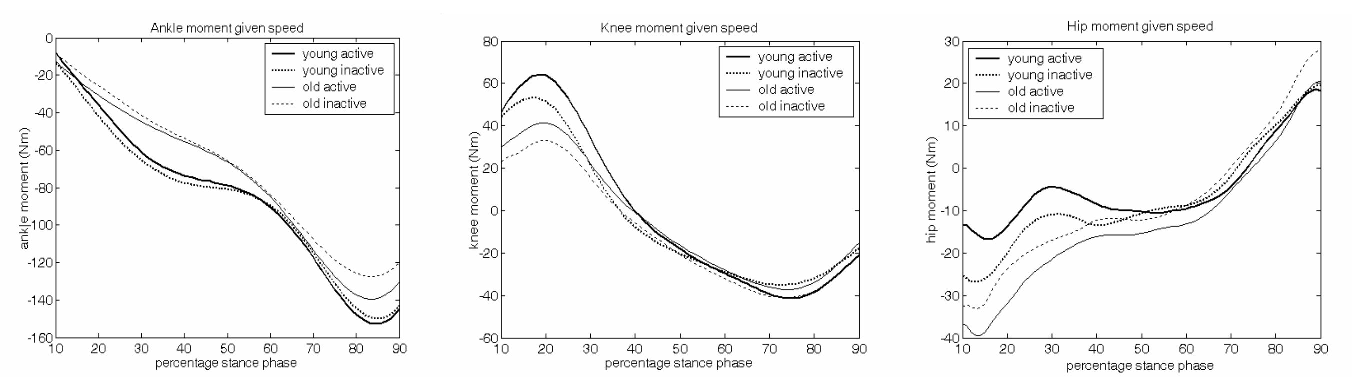

Figure 1a-c: Ankle (left panel), knee (middle) and hip joint torque (right) as function of percentage of the stance phase. Positive torques represent respectively, dorsal flexion, knee joint extension and hip joint anteflexion..