Treadmill training with an incline reduces ankle joint stiffness and improves active range of movement during gait in adults with cerebral palsy.

**OBJECTIVES**

There is at present little evidence of effective therapeutic measures against contractures in adults with cerebral palsy (CP). Here, we investigated if 30 minutes of daily treadmill training with an incline for 6 weeks would reduce ankle joint stiffness and improve active range of movement in adults with CP.

**METHODS**

The study was designed as a randomized controlled clinical trial including 32 adults with CP (GMFCS 1-3) aged 38.1 SD 12 years. The training group (n=16) performed uphill treadmill training at home daily for 30 min for six weeks in addition to their usual activities. The control group continued their usual activities. Passive and reflex mediated stiffness and range of motion (ROM) of the ankle joint, kinematic and functional measures of gait were obtained before and after the intervention/control period. Intervention subjects trained 31.4 SD 10.1 days for 29.0 SD 2.3 min (total) 15.2 hours.

**RESULTS**

Passive ankle joint stiffness was significantly reduced in the training group as compared to the control group (F=5.1; p=0.031). Reflex mediated stiffness was unchanged. Clinical tests of spasticity were similarly unchanged. Significant interactions between group and time were found for both maximal gait speed (F=42.8, p<0.001), amplitude of toe lift prior to heel strike (F=5.3, p=0.03) and ankle angle at heel strike (F=12.5; p<0.001). No interaction effect was found for functional gait parameters (6 min walk test, 10 meter, Timed Up and Go, Timed Up and Down Stairs).

**DISCUSSION**

We suggest that facilitation of the central drive to the ankle dorsiflexors during uphill walking is responsible for the improvements in gait parameters in this study. Daily exercise and repeated neural activation of the muscles around the ankle joint that cause muscle changes could lead to changes in muscle stiffness. If so, this would suggest that any intensive exercise involving active movement of a joint may help to reduce the stiffness of the joint. It is of importance to clarify such issues in order to find the most optimal therapeutic intervention.

**CONCLUSIONS**

Daily treadmill training with an incline for 6 weeks may effectively reduce ankle joint stiffness and cause increased active range of movement during gait in adults with CP. We propose that intensive gait training may be beneficial in preventing and reducing contractures and help to maintain functional gait ability in adults with CP.