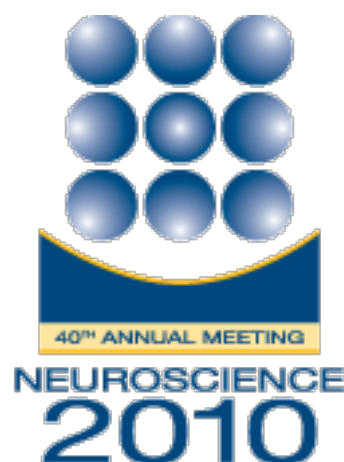




Presentation Abstract

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Title: Muscular responses evoked by mechanically dorsoflexion of the ankle during running in man

Location: Halls B-H

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Abstract: The task dependency of the human stretch reflex has already been studied in activities such as walking and pedaling in comparison to sitting (Grey et al 2002), but never during running. Grey *et al.* (2002) have shown that the medium component of the stretch reflex is modulated to provide increased control for the postural demands in walking. As the control of posture is even more crucial in running, we investigated the muscular stretch reflex evoked during running via dorsoflexion perturbations generated with a wearable stretching device.

Perturbations were delivered to 7 healthy subjects while running at 2.8 m.s⁻¹ on a treadmill. A new wearable device (<1kg), inspired by that of Andersen and Sinkjær (1995), was designed to deliver a well-defined angular perturbation to the right ankle. This apparatus consisted of 2 carbon fiber shells, custom-made for each subject, which held the foot and the lower leg. The shells were linked by a hinged joint pivoting at the centre of rotation of the ankle and only allowing dorso-plantar movements. A servomotor capable of flexing the ankle at up to 600 deg s⁻¹ and at a maximal torque of 300 N m was connected by two Bowden cables to a clutch mounted at the hinge joint. When disengaged the clutch allowed free movement of the ankle joint. The clutch engaged the servomotor at any predetermined moment of the stride. Perturbations were delivered at 5 equivalent epochs preceding the right foot contact. During the experiments, the right ankle angle was measured with an optical encoder incorporated in the device (1kHz sampling). EMG activity of the *Soleus* (Sol), *Gastrocnemius medialis* (GM), *Gastrocnemius lateralis* (GL) and *Tibialis anterior* (TA) of the right leg were recorded by means of surface electrodes.

The EMG activity relative to a control step was measured 40 to 140 ms after the perturbation.

Our results show that we were able to apply a similar dorsoflexion (9.0 ± 3.5 deg, 206 ± 66 deg.s⁻¹, n=441) of the right ankle at any moment during the step. The subjects were able to cope with the perturbations without problem. The muscular reflex response (40-140 ms) evoked on the Sol-GM-GL muscles were modulated during the cycle: responses were almost inexistent when the perturbation was applied less than 50 ms before the right foot contact (when the muscles were active) but were visible when the perturbation was applied earlier (more than 250 ms before the right foot contact, when these muscles were silent).

These preliminary results confirm the modulation of the stretch reflex in running, even if the role of such modulation (the intensity of the EMG activity evoked reaching at the maximum 30%) has still to be discussed.

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Keyword(s): LOCOMOTION

REFLEX

MODULATION

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