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Flexor γ-motor patterns during locomotion

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Recent studies (Taylor *et al.* 2000 a & b) have provided detailed information regarding the γ-motor activity directed to the medial gastrocnemius (MG) muscle during decerebrate locomotion in cats. Static γ firing was smoothly modulated in relation to the step cycle in two distinct patterns. The pattern in some units closely resembled the shortening movement of MG, but with phase advance. The remainder showed a modest increase in frequency during muscle lengthening. Dynamic γ units started firing abruptly at the onset of MG shortening and ceased shortly after the beginning of lengthening. We have now made similar recordings from γ axons supplying the ankle flexor, tibialis anterior (TA).

The methods have been described in detail previously (Taylor *et al.* 2000*a,b*). All surgery was carried out under anaesthesia with halothane in 50 % nitrous oxide/ 50 % oxygen until after pre-collicular decerebration. Animals were killed with an overdose of pentobarbitone at the end of the experiment. One hindlimb was denervated but for MG and TA and secured to restrict movement to rotation at the ankle. A small filament of TA nerve was cut and γ axons isolated from the central end and characterised by conduction velocity. Their identification as static or dynamic depended on observing the relation between their firing frequencies and the response of TA spindle afferents to ramp stretches during variation occurring spontaneously, during stroking the skin or during electrical stimulation at sites in the brainstem. Observations are based on recordings from 27 cats.

All the static γ-axons studied showed smoothly modulated firing patterns closely resembling and increasing in phase with the shortening movements of TA. Spindle afferent recordings were made during the active movements and subsequently with the movements repeated passively after suppressing γ firing with IV pentobarbitone. The difference between these records was found to parallel closely the static γ firing pattern during the shortening phase. During lengthening in active movements there was an additional burst of firing in spindle primary afferents. Recordings from dynamic γ units showed bursts of firing starting at the onset of shortening and continuing into the beginning of lengthening. This could account for the heightened dynamic sensitivity of spindles during the early lengthening phase. These results are similar to those for the MG recordings except that in the latter (a) the static γ discharge was phase advanced relative to the shortening profile and (b) two static patterns were observed, rather than the one found for TA.

Taylor A *et al.* (2000*a*). *J Physiol* **522**, 515–532.

Taylor A *et al.* (2000*b*). *J Physiol* **529**, 825–836.

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All procedures accord with current UK legislation