**INTRODUCTION**

We have constructed a model of the mammalian locomotor CPG that reproduces realistic cycle and phase durations as well as deletions of motoneuron activity during fictive locomotion.

Can this model also reproduce afferent-evoked perturbations of the fictive locomotor pattern?

**Approach:**
1. Incorporate sensory feedback into the Rybak et al CPG model
2. Simulate and reproduce the effects of trains of peripheral nerve stimuli on patterns of motoneuron activation and the step cycle
3. Offer plausible mechanisms for the sensory control of locomotion

**METHODS**

**The Model**

Both the RG and PF layers can oscillate. Normally PF activity is controlled by the RG or “block” network

**Transition to locomotion: reflex reversal**

- Locomotor drive (tonic excitation) inhibits Ia-E (via In) and removes non-reciprocal inhibition.
- Iab-E is disinhibited and can produce disynaptic excitation during locomotion.

**Modelling afferent input:**
- synaptic connections were weighted
  - group I: flexor: a rectangular pulse with fixed amplitude
  - group II: flexor: activation required to exceed a set threshold and group II afferent activation always included group I recruitment like increasing stimulus intensity in animal experiments
  - add sensory input adjusting synaptic input weighting until the simulation corresponds to ENG records obtained with cycle-triggered nerve stimulation in MLR-evoked fictive locomotion in decerebrate cats

**CPG Added:**

- monosynaptic (Ia) excitation and disynaptic (Ia+Ib) non-reciprocal inhibition of extensors

**ABBREVIATIONS**

- AB = anterior brachial
- EDL = extensor digitorum longus
- Fx-I = flexor (extensor) / flexor
- G0 = extensor / flexor
- In = interneuronal
- Ia-Ib = group I / group II
- LG = lateral gastrocnemius
- MG = medial gastrocnemius
- MN = monosynaptic (Ia) extensor / flexor
- MG = monosynaptic (Ia+Ib) non-reciprocal inhibition
- 5T = main extensor / flexor

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**CONCLUSIONS**

1. The 2-layer CPG reproduces realistic cycle durations, deletions and sensory reflex perturbations
2. Extensor group I actions can be evoked at the RG and PF levels
3. Flexor group II excites the extensor half-centre rhythm generator and flexor group I excites the flexor half-centre pattern formation network. The balance of the number of afferents and synaptic strength of these actions accounts for the differential effects of 5T nerve in the cat.
4. Changes in the synaptic strength of group II input by spontaneous or controlled changes in presynaptic transmitter release result in variable reflex actions.