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Behavior of hindbrain neurons during the transition from rest to evoked locomotion in a newt.

Bar-Gad I, Kagan I, Shik ML

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Trains of electrical stimuli were delivered to the mesencephalic 'locomotor region' in the rough skin newt. The current (3-12 mcA) and the interstimulus interval (100 to 200 ms) were adjusted so that locomotion arose in approximately 10 s, or so that the train remained subthreshold for initiation of locomotion. Impulses of single neurons in the hindbrain were recorded during the transition period from rest to locomotion. Time-locked synaptic responses were bi- or unimodal with typical latencies close to 18, 23 or 28 ms, and weak irregular mode near 13 ms. Impulses that were not locked to the stimuli arose in some silent neurons, and the rate of firing of neurons with background discharge was sometimes enhanced. Composite responses consisted of both time-locked component and impulses distributed throughout the interstimulus interval. The data suggest that short-lived, wave-like propagation of the input volley ceases or is transformed into asynchronous activity after three or four translations. The latter variant could occur if the train reached the threshold for initiation of locomotion. The asynchronous activity persisted throughout interstimulus interval and could coexist with time-locked impulses. Some neurons generated only a few impulses, while others remained active from beginning to end of the train. These active neurons could either spike at a steady rate, or decrement or augment their rate of firing during the train. The time course of their activity was related to the initial rate of firing. The augmenting type of firing in a subset of neurons may arise due to the interaction of neurons with unstable, steady state and decrementing activity.