

# A new theory to explain how spinal neuronal circuits control locomotion

October 13 2022, by Bob Yirka

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A team of researchers at the University of Copenhagen working with a colleague from the Max Delbrück Center for Molecular Medicine in Berlin has developed a new theory to explain how spinal neuronal

circuits control locomotion in turtles. The study is published in *Nature*. Martha Bagnall with Washington University in St. Louis, has published a News & Views piece in the same journal issue, outlining prior research efforts aimed at learning how nerves in the spine control locomotion in animals and the work by the researchers on this new effort.

Prior research has suggested that nerves in the spine are arranged in [small groups](#) that are responsible for inciting muscle movement—some of the groups were believed to be responsible for flexor motor control while others are responsible for extensor motor control. The thinking has been that control is passed back and forth between the two groups, allowing for actions such as walking. In this new effort, the researchers challenged this model.

To better understand how the nerves in the spine are used by the body to control [locomotion](#), the researchers attached electrodes to the spines of several test turtles to record [neural activity](#) as the subjects reacted to tickling. Tickling was used to urge the turtles to simulate walking as they were held in place.

In studying the recordings, the researchers found that neural activity was not passed back and forth between groups responsible for flexor and extensor control. Instead, they found that the neurons in the spine responsible for [motor control](#) were arranged in random fashion and were activated at different times. They also found that neuronal activity occurred in circular activity patterns. Such patterns have been seen before, the researchers note, in the part of the primate brain that controls arm movements. They have been named rotational dynamics.

The researchers used their findings to create a new model of spinal neuron circuit locomotion control. Their model shows neurons that are randomly located and connected but in a way that allows for circular neuronal control of rhythmic muscle movement such as that used in

walking.

**More information:** Henrik Lindén et al, Movement is governed by rotational neural dynamics in spinal motor networks, *Nature* (2022).

[DOI: 10.1038/s41586-022-05293-w](https://doi.org/10.1038/s41586-022-05293-w)

Martha W. Bagnall, Neurons that control walking go round in circles, *Nature* (2022). [DOI: 10.1038/d41586-022-02238-1](https://doi.org/10.1038/d41586-022-02238-1)

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Citation: A new theory to explain how spinal neuronal circuits control locomotion (2022, October 13) retrieved 2 May 2024 from <https://medicalxpress.com/news/2022-10-theory-spinal-neuronal-circuits-locomotion.html>

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