



Wheelie. An accident of physics dictates that this long-nosed dragon runs on its hind legs about 40% of the time.

Credit: Simon Pynt

How Is a Lizard Like a Motorcycle?

By Elsa Youngsteadt
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When they're on the run, some lizards take to their hind legs, dashing about like miniature dinosaurs. But their bipedal gait is largely accidental, according to a new study. The findings refute earlier proposals that getting off all fours might help lizards go farther and faster.

No one knows why some lizards run bipedally. In the mid-1900s, zoologist Richard Snyder of the University of Washington, Seattle, proposed that lizards could run faster and more efficiently on two legs than on four, but he was unable to thoroughly test the theory. In 2003, biomechanist Peter Aerts of the University of Antwerp in Belgium suggested that bipedal running might not be adaptive but rather that it occurs as a side effect of a different adaptation: a rearward shift in the center of mass that makes a fast-moving object better able to execute sharp turns. His model indicated that a lizard would start to run on two legs when it reached a certain rate of acceleration—the same way a powerboat rears out of the water and a motorcycle pops a wheelie.

Comparative physiologist Christofer Clemente of the University of Cambridge in the U.K. and colleagues tested both possibilities in real lizards. The team snared 16 species of Australian dragon lizards from the family Agamidae, insect-eaters that range from hand-sized to nearly a meter long. They plunked each reptile down on a treadmill and measured the percentage of its strides that were two-legged and four-legged. For four species, the team also recorded the lizards' speeds and accelerations.

After correcting for the lizards' overall size, the researchers found that bipedality did not improve endurance--in fact, the more bipedal the lizards were, the shorter their sprints. Nor did the lizards run faster on two legs than on four. The acceleration that brought the four species up on their hind legs did, however, generally jibe with the predictions from Aerts's model. Indeed, for some lizards, bipedality looked accidental, Clemente says. Even after an animal's front legs lifted off the ground, they would continue to move as if they were on the ground.

Although Aerts's model was correct in its general predictions about which lizards would go bipedal first, the numbers were a little off. Three of the four species got off the ground before they reached the predicted acceleration, apparently by using their tails and forearms to shift the center of gravity farther back, the team reports today in the *Journal of Experimental Biology*. Clemente thinks these lizards might have co-opted accidental bipedality for some advantage. But if not to improve speed or endurance, why do it? Perhaps two legs are less likely than four to get tangled up in vegetation, Clemente hypothesizes.

Physiologist Thomas Roberts of Brown University describes the new results as a cautionary tale. "There's been a dangerous history," he says, of looking at an animal and "making up a story" about how its various features must be beneficial. "This nice, comprehensive study," he says, quashes just such a made-up story. In fact, Aerts says, the work is among the first to do so experimentally--and he's excited to hear that his model was on the right track.