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Are Wallabies Left or Right Handed? Both! (Sometimes)

By Jason G. Goldman | January 27, 2012 |

Which limb do you prefer? If you're like most members of our species, you prefer your right hand for most tasks. If you're like a smaller minority of our species, you might prefer your left hand. Very, very few of us are truly ambidextrous. Most of us have at least a minor preference for one hand over the other. So do wallabies.

On the one hand (ha!), this shouldn't be all that surprising. Nervous systems became lateralized quite early in the evolution of vertebrates. For example, there is research showing that fish show a preference for touching the sides of aquariums with one side of their ventral fins or another. And it is not surprising that humans overwhelmingly favor their right hands. When it comes to feeding behaviors, fishes, reptiles, and toads all favor their right eye (and their brain's left hemisphere). The same is true for birds

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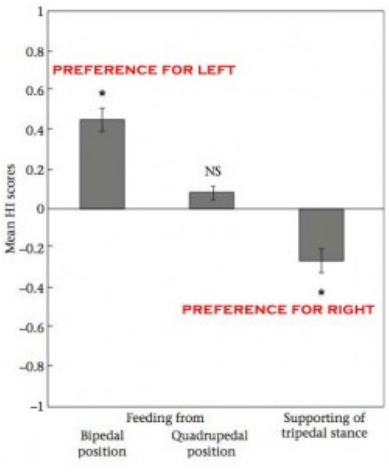
like chickens, pigeons, quails, and stilts. The right-eye preference can be so strong that one bird – New Zealand wry-billed plover – evolved a beak that slopes slightly to the right. And a study of seventy-five whales showed that sixty of them had abrasions on the right side of their jaws, while the other fifteen had only injured the left side of their jaws. As Peter F. MacNeilage, Lesley J. Rogers and Giorgio Vallortigara pointed out in a 2009 article in *Scientific American*, the data indicated that whales tended to use one side of the jaw more than the other for gathering food, "and that 'right-jawedness' is by far the norm."

On the other hand, we have no real reason to automatically assume that wallabies would show a limb preference, just because a diverse handful of other species do. After all, the vast majority of research on limb preference and of behavioral laterality more generally has focused on primates, mainly because researchers' main goal has been to discern the evolutionary origins of brain asymmetry and handedness in humans.

Russian zoologists Andrey Giljov, Karina Karenina, and Yegor Malashichev looked at the literature and realized that an entire group of animals had been almost entirely ignored in the study of laterality: *marsupials*. The thing about marsupials is that they develop very differently from most other mammals, which are called *placentals* (there are also *monotremes*, but they are the subjects of a different blog post). The researchers point out that the brains of marsupials are different from placentals in several important ways, which make them an important comparison group for the study of laterality and brain asymmetry. For one thing, sensory and motor cortices overlap in marsupials; in placentals, those parts of the brain operate more independently. For another, marsupial brains do not contain the corpus callosum, the bundle of cells that connect the two hemispheres.

Their main goal was to determine whether a particular bipedal hopping marsupial, the red-necked wallaby (*Macropus rufogriseus*, see picture above) has a forelimb ("arm") preference. To do so, they observed 27 adult and six juvenile wallabies at five different zoos. All were captive-born.

The data clearly showed that wallabies predictably preferred one arm over the other, just as humans tend to do, when standing on two feet. Twenty of the group (74.1%) were classified as left-handed, two (7.4%) were classified as right-handed, and five (18.5%) showed no clear preference. However, wallabies tended to prefer using their right hands to support themselves in the tripedal position – perhaps freeing up their left hands for feeding. There were no clear preferences for quadrupedal feeding for 95% of the wallabies observed.



Despite significant differences in brain organization, marsupials are just as likely to

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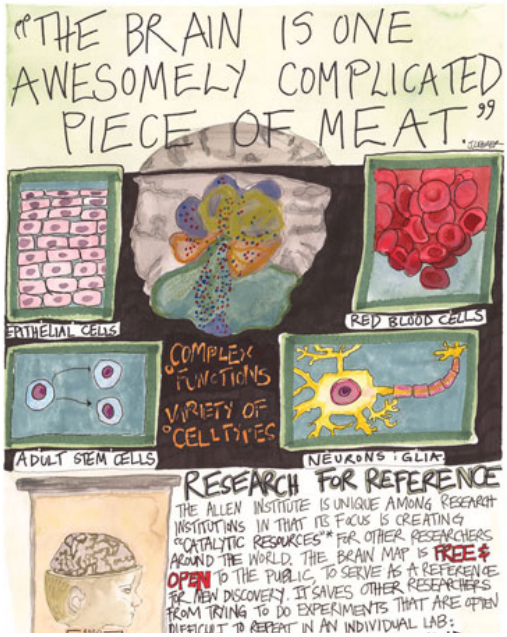

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show some sort of behavioral asymmetry as their placental cousins. These preferences were seen in both the juvenile and mature wallabies: when suckling milk from the mother's pouch, the juveniles more often used their right paws to steady themselves, and used their left paws to pull down mom's pouch. And the left-hand preference wasn't just for feeding. When the wallabies groomed their own snouts, they overwhelmingly used their left hands. Taken together, this suggests that wallabies generally prefer their right arms for body support and their left arms more for manipulating objects or food.

(a) Bipedal feeding, (b) quadrupedal feeding, (c) Supporting body with right limb during tripedal stance, and (d) using one forelimb during milk suckling.

What is perhaps most striking is that the same sorts of preferences have been observed in primate species ranging from orangutans to sifakas – though other primate species, including chimps, bonobos, and gorillas do not tend to show forelimb preferences. Whether or not these sorts of limb preferences evolved before the marsupial-placental split, and thus indicate homology, or after, and thus indicate convergence, is not known.

However, Giljov, Karenina, and Malashichev offer up the following speculation: there could be some kind of relationship between body posture and behavioral asymmetry. They note that among primate species, there is also an increased limb preference when bipedal compared with when standing on all four limbs. In other words, if you create a situation in which an otherwise quadrupedal primate must briefly stand on only two legs in order to retrieve an object or piece of food, they are highly likely to show a limb preference for the reaching behavior. If you've been following along, you've no doubt noticed the same pattern among the red-necked wallabies: for actions completed while bipedal, there was a clear limb preference, but for actions completed while quadrupedal, there was not. What the mechanism is that might account for the effect of bipedality on limb preference – if it exists – is still a mystery.

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Giljov, A., Karenina, K., & Malashichev, Y. (2011). Limb preferences in a marsupial, Macropus rufogriseus: evidence for postural effect *Animal Behaviour* DOI: 10.1016/j.anbehav.2011.11.031

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All photos from: Giljov, Karenina, and Malaschichev (2011).

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