

Two knees or not two knees: The curious case of the ostrich's double kneecap

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Ostriches are the only animals in the world to have a double-kneecap, but its purpose remains an evolutionary mystery. PhD student, Ms Sophie Regnault, from the Royal Veterinary College, UK says "understanding more about different kneecap configurations in different animals could help to inform prosthesis design, surgical interventions, and even robots with better joints."

"In ostriches, the upper kneecap looks similar to the single kneecap in most other species, but the lower kneecap resembles a fixed bony process, like the point of your elbow," says Ms Regnault. "As far as we know, this double kneecap is unique to ostriches, with no evidence found even in extinct giant birds."

From Ms Regnault's results, it appears that the ostrich's double-kneecap counter-intuitively decreases the mechanical advantage of the knee extensor muscles, while in other species including humans, it has more mixed effects: increasing mechanical advantage at some knee joint angles and decreasing it at others.

The effect that this double-kneecap has on the running performance of ostriches is hard to identify, but Ms Regnault and her team have a few ideas: "We speculate that this might mean ostriches are able to extend their knees relatively faster than they would with one kneecap."

Using a combination of CT scans and fluroscopy known as 'X-ray reconstruction of moving morphology' (XROMM) on a real ostrich leg,

Ms Regnault and her team built a 3D model of the ostrich's leg bones and kneecaps: "We then moved the ostrich's leg, allowing us to animate the CT bone models to show how the patellae are actually moving in 3D."

While this research has so far highlighted one aspect of how the sesamoid bones function, their true purpose remains a mystery. "We are still not sure why [ostriches](#) might have evolved this second kneecap," says Ms Regnault. "It might help to protect the tendon of these heavy fast-running birds, but there are other potential roles that we haven't yet explored".

Provided by Society for Experimental Biology

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