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See You Later Alligator: Forelimb and Wrist of Alligators Walking the Treadmill

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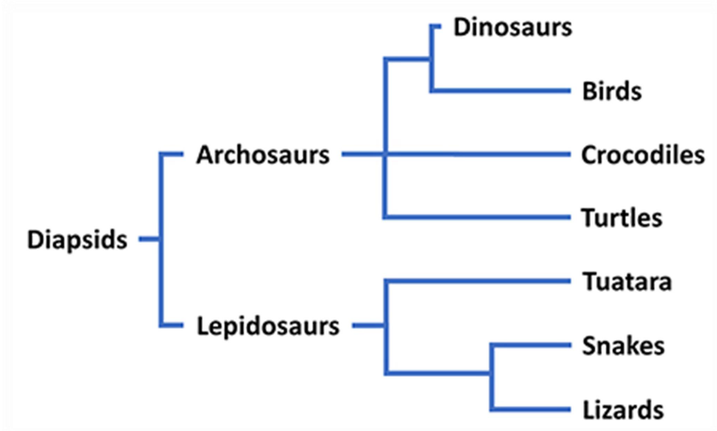
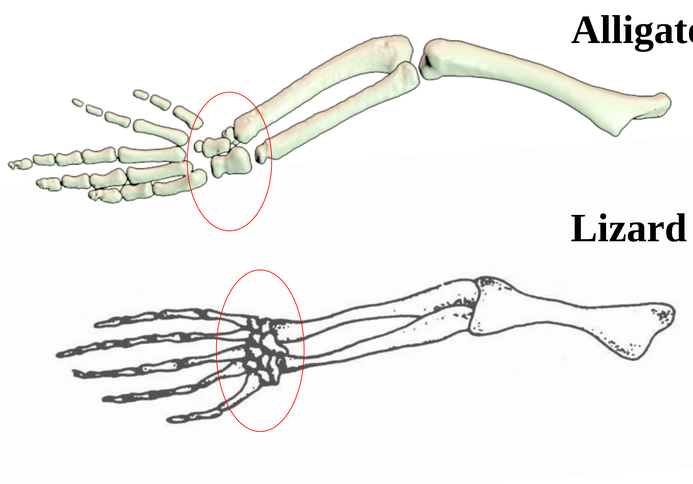
Introduction

Crocodilians have a unique locomotor repertoire compared to other reptiles, as they switch between a low/walk belly crawl through high-walk or semi erect postures. In this study we combined the use of XROMM (biplanar X-ray video) and digital bone models, to measure how the alligator skeleton moves during high walks on a treadmill. Here, we describe how bones of the forearm, wrist, and hand coordinate during alligator strides. We find that the elbow is more than just a simple hinge: the forearm bones slide relative to one another, and the elongated carpals are involved in a unique type of wrist motion.

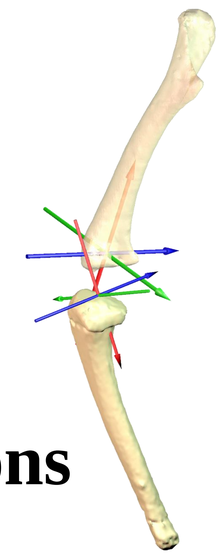


Methods

We used XROMM which combines Xray video and skeletal models from CT scans to reconstruct 3d skeletal motion of the elbow, radioulnar joints, and wrist during high walks. We used Maya animation software to construct a joint coordinate system and measure distal limb joints' motion in that system.

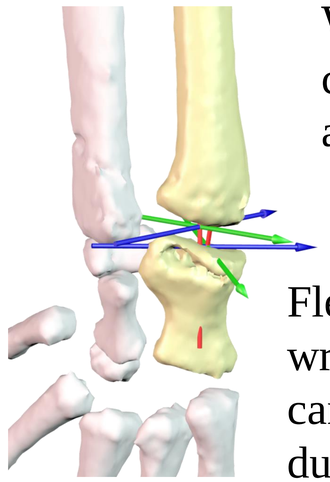


Questions



How close to a perfect hinge is the elbow?

How do the forearm bones move relative to each other?



What role do the elongate carpals play in flexion and extension?

Conclusions

The elbow abducts/adducts and has long axis rotation in addition to flexion/extension

The radius and ulna move relative to each other, with piston-like movement

Flexion/extension at the wrist alternates between the carpometacarpal joints during stance and the radiocarpal joints during swing

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