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Does the constrained lever model describe an optimality criterion in crocodilian jaw mechanics?

The constrained lever model (CLM) describes the theoretical relationship between bite force, the position of the jaw adductor resultant, and jaw joint loading during unilateral biting. According to the CLM, the resultant muscle vector usually lies within a "triangle of support" formed by the bite point and two jaw joints, in order to prevent loading the working side jaw joint in tension. During biting at caudally placed bite points the jaw muscle resultant vector lies outside the triangle of support if balancing side muscle activity—and, hence, overall bite force—is not reduced to shift the resultant vector towards the bite point and into the triangle of support. Thus, the CLM is a hypothesis about optimization of the feeding system: it suggests that maximum bite force is compromised to avoid tensile loading in the jaw joint. Originally developed for mammals, we provide the first empirical evidence regarding the applicability of this model to a non-mammalian vertebrate, *Alligator mississippiensis*. Strain data from locations dorsal and ventral to the jaw joint and EMG data from jaw adductors were recorded during unilateral biting on a bite force transducer at different locations along the tooth row. On the working side, maximum principal strain (ϵ_1) dorsal and ventral to the joint is aligned with the joint, indicating that it is loaded in tension. On the balancing side, minimum principle strain (ϵ_2) is aligned with the joint, indicating compressive loading. Peak maximum principle strain magnitudes ($4900\mu\epsilon$) far exceed those recorded adjacent to the mammalian jaw joint in other studies. Explanations for this finding include that the crocodilian jaw joint is specialized to resist tension associated with "twist-feeding" behavior or the utility of the CLM is restricted to mammals.