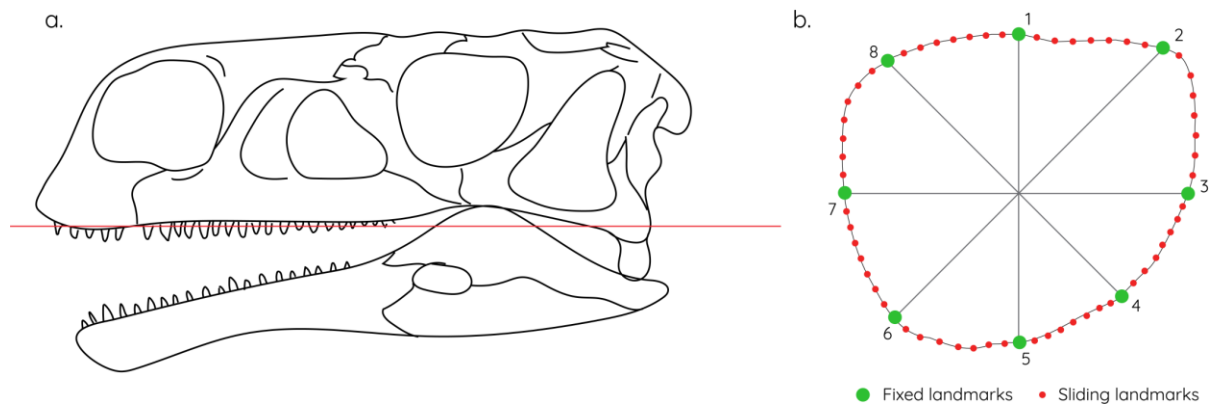
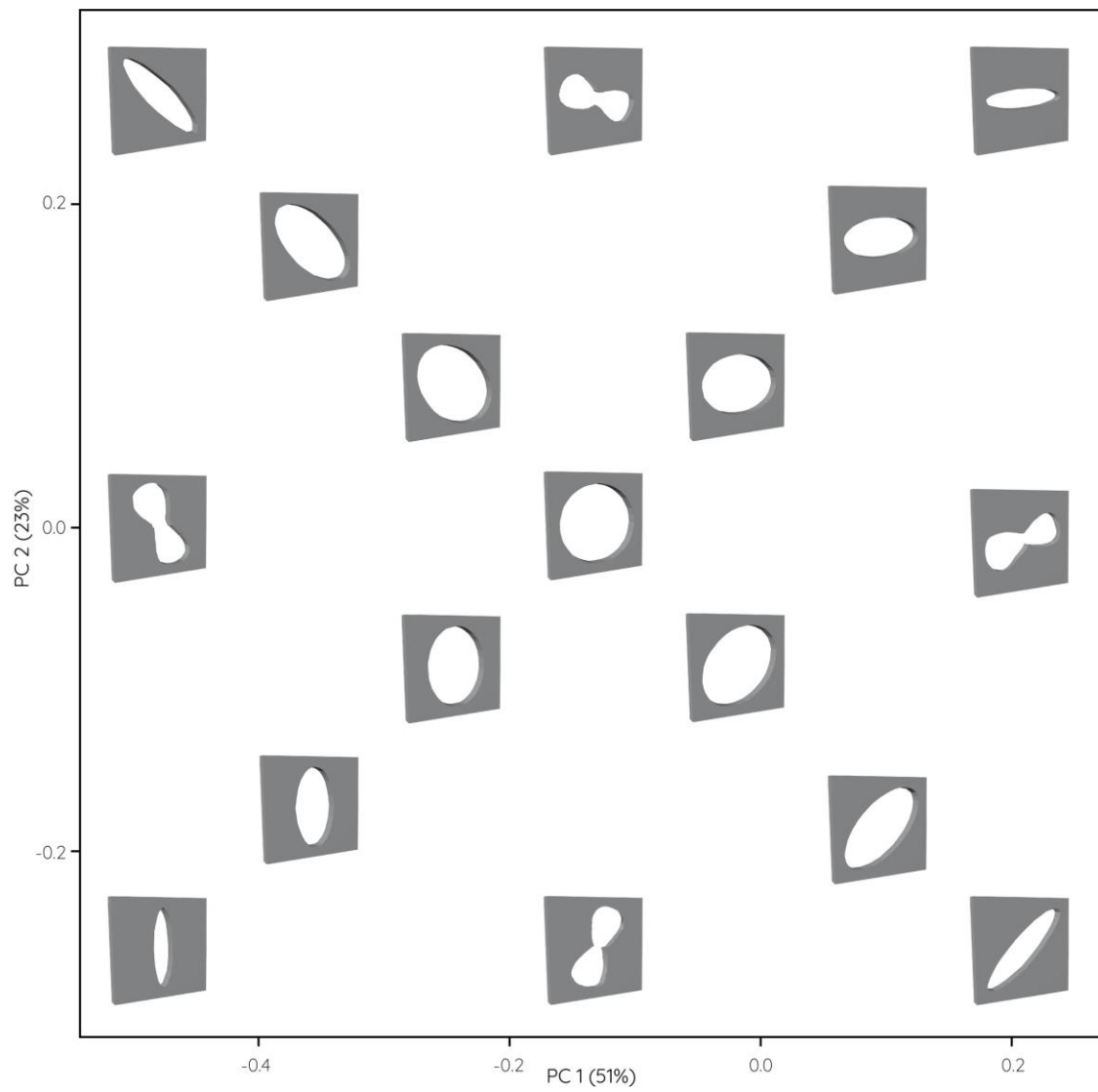
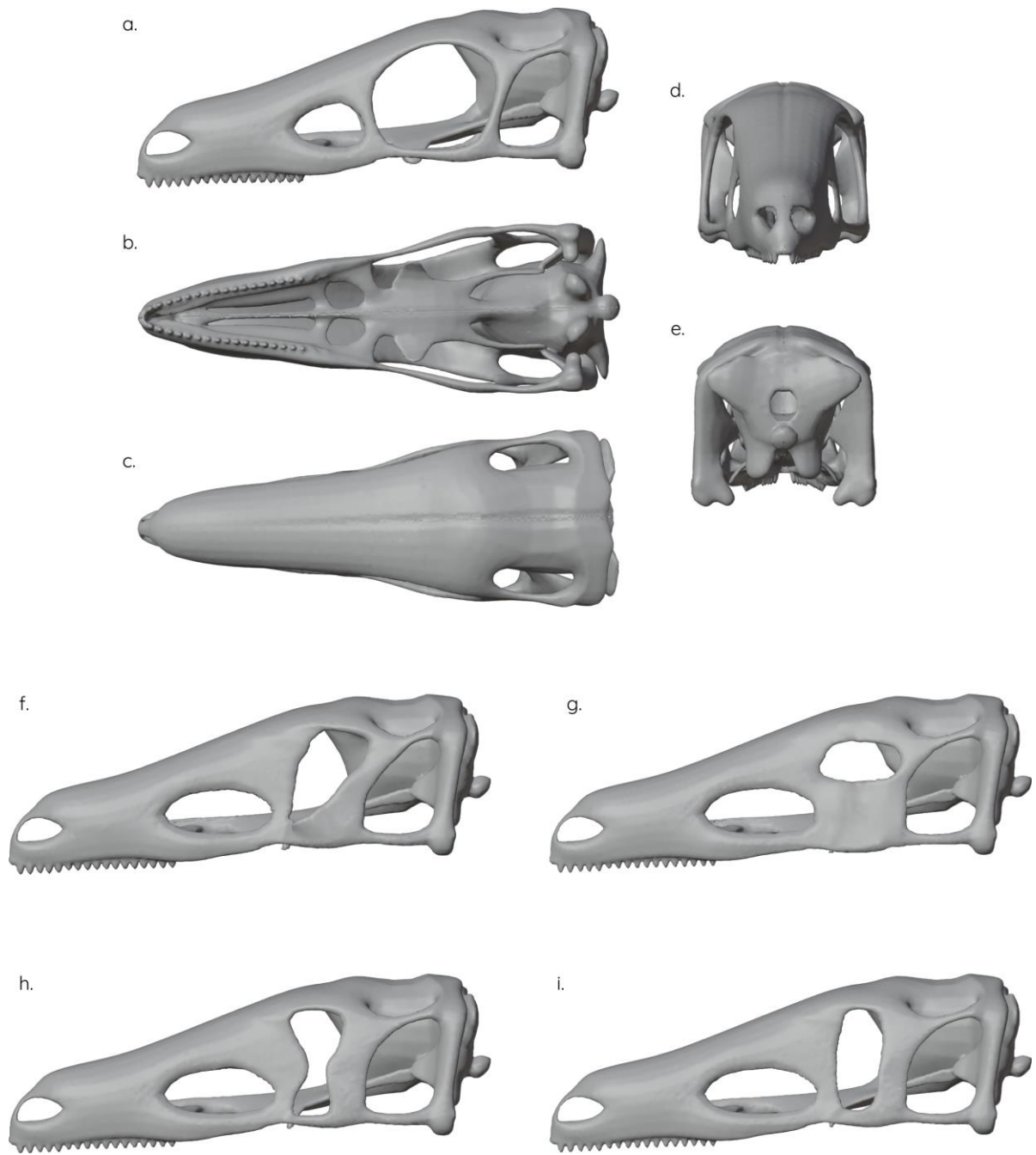




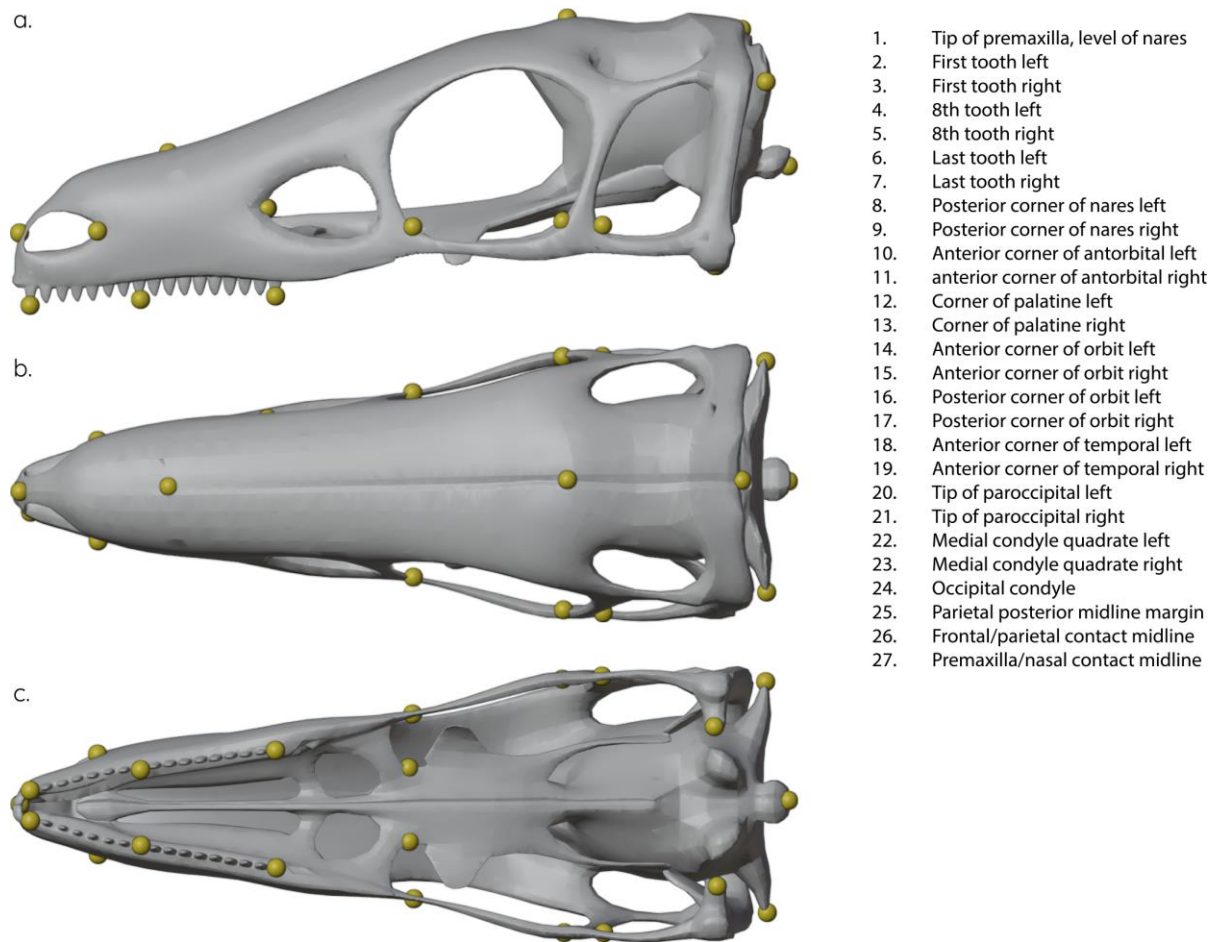
Supplementary figure. 1 | Digitisation of orbit morphology. (a) Skull aligned with maxillary tooth row parallel to horizontal plane. (b) Selection of eight fixed and 56 semi-landmarks.



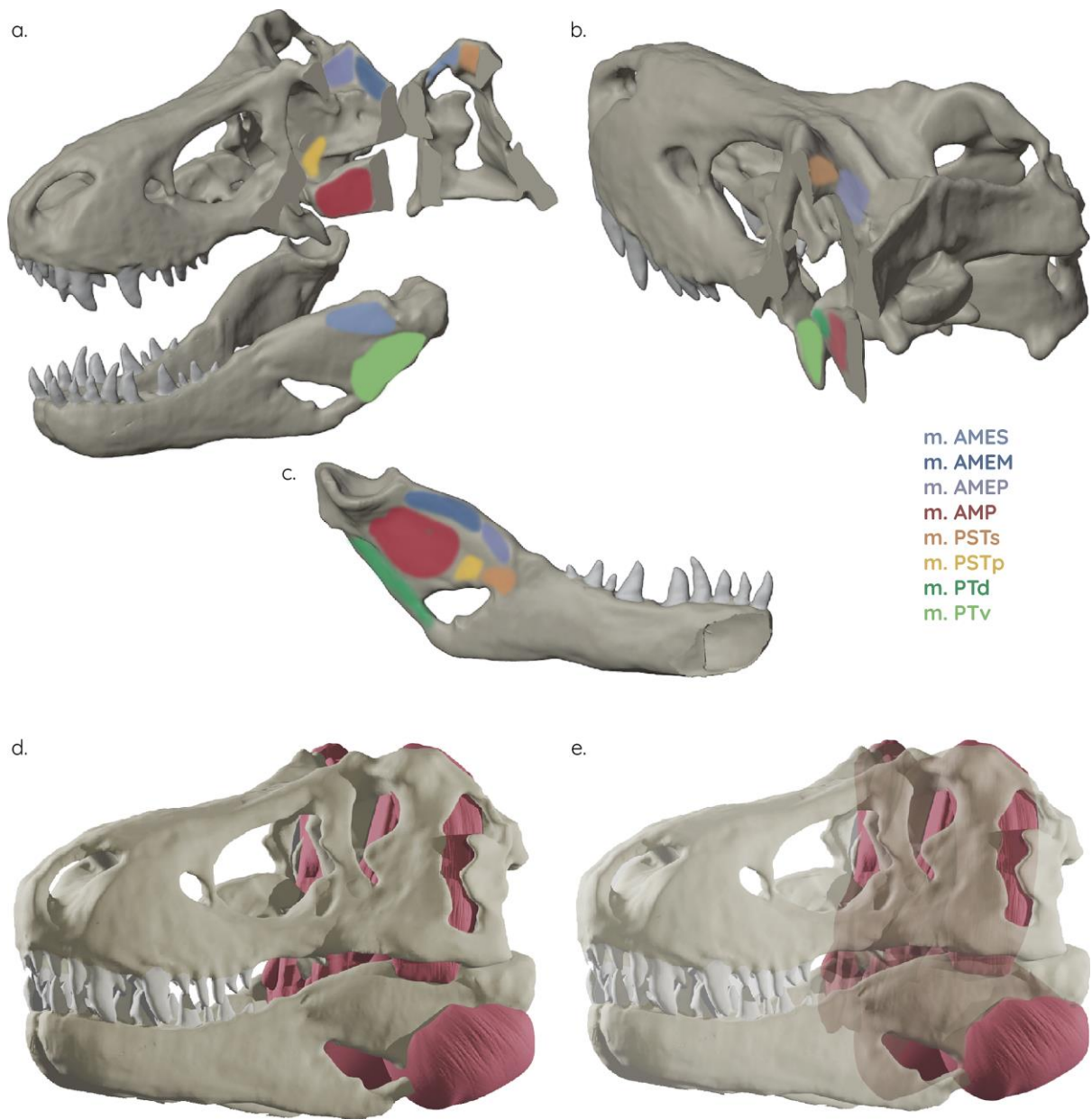
Supplementary figure. 2 | Theoretical flat-plate models. Position of models based on landmark-based shape quantification.



Supplementary figure. 3 | Hypothetical skull models with different orbit shapes. Base skull model in (a) lateral, (b) ventral, (c) dorsal, (d) anterior, and (e) posterior view. Models with (f) wedge-shaped, (g) dorsoventrally compressed, (h) keyhole-shaped, and (i) elliptical orbit shape.



Supplementary figure. 4 | Placement of landmarks for deformation models. Skull model in (a) lateral, (b) dorsal, and (c) ventral view.



Supplementary figure. 5 | Reconstructed jaw adductor musculature of *Tyrannosaurus rex*. Muscle attachment sites mapped onto the skull in (a) oblique lateral, and (b) oblique dorsal view, and onto the (c) mandible in medial view. Three-dimensional reconstructions with the skull rendered (d) solid and (e) transparent. Abbreviations: m. AMEM, m. adductor mandibulae externus medialis; m. AMEP, m. adductor mandibulae externus profundus; m. AMES, m. adductor mandibulae externus superficialis; m. AMP, m. adductor mandibulae posterior; m. PSTp, m. pseudotemporalis profundus; m. PSTs, m. pseudotemporalis superficialis; m. PTd, m. pterygoideus dorsalis; m. PTV, m. pterygoideus ventralis.

Muscle	m. AMES	m. AMEM	m. AMEP	m. AMP	m. PSTs	m. PSTp	m. PTd	m. PTv
Force [N]	2809	2262	1620	2365	475	469	2018	5835
Total [N]	17853							

Supplementary table. 1 | Jaw adductor muscle forces for *Tyrannosaurus rex* as used in the biomechanical analyses. Muscle force values for single side only.