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100 Lakeside Ave East • Cleveland, OH44114

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## ABSTRACTS

account for some statistical interdependencies inherent to relational network data. Here we use 21 years of behavioral data from Gombe from 23 adult males with known mothers, 10 of whom also had known fathers assigned via genetic sampling, to investigate the effect of kinship on cooperation. Employing additive and multiplicative effects (AME) models, a Bayesian random effects regression framework for relational data, we found that, as well as maternal brothers, both father-son and paternal brother dyads associated and groomed preferentially, and groomed more equitably, than unrelated dyads, even after accounting for individual age and rank, dyadic age and rank similarity, and individual grooming and association tendencies. Paternal and maternal kinship effects were of a similar magnitude. These results suggest that the ability to recognize paternal kin may be widespread in chimpanzees, and that kin selection likely plays a larger role in cooperation among male chimpanzees than previously thought.

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### Phylogeny of Extant Colobines Using Morphological Data

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We conducted a cladistic analysis of extant colobines using morphological data, as the last such analysis was published twenty years ago by Jablonski (1998). The sample included all commonly recognized extant African and Asian genera including *Colobus* (n=51), *Procolobus* (n=9), *Ptilocolobus* (n=58), *Simias* (n=20), *Nasalis* (n=21), *Rhinopithecus* (n=11), *Pygathrix* (n=9), *Presbytis* (n=110), *Trachypithecus* (n=60), *Semnopithecus* (n=11) and *Kasi* (n=13) treated as a separate OTUs. *Macaca* (n=199), often considered the most morphologically primitive papionin, was the outgroup. We included all of the characters that could readily be applied to colobines from Gilbert's (2013) cladistic analysis of papionins, including 52 quantitative dental, 33 quantitative cranial, and 67 qualitative characters. Quantitative characters were scored with gap weighted coding. We tested all characters for allometry, and affected characters were treated as described by Gilbert (2013). Three analyses were conducted: males only, females only, and sexes pooled. Matrices were assembled with Mesquite and analyzed in TNT using parsimony. The pooled sex analysis recovered a single most parsimonious tree with a monophyletic Presbytina, but Colobina was paraphyletic. The Asian colobines included an odd-nosed clade, but the langurs were paraphyletic. *Kasi* was sister to *Trachypithecus*. Sex-specific results were similar,

except in the male analysis *Ptilocolobus* was basal to the odd-nosed clade within Presbytina; and in the female analysis *Colobus* was basal to the odd-nosed clade within Presbytina. The position of *Kasi* in the sex specific analyses was unstable, but always among the other langurs. Future research involves increasing outgroup diversity to include more cercopithecines and incorporating fossils.

### Investigating fossil hominin climbing behaviors: Novel applications of existing technology

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The retention of climbing-adapted features in the upper limb of some species of fossil hominins have historically been interpreted to indicate the continued relevance of arboreal climbing in the human lineage. Recent paleoenvironmental reconstructions for two major hominin-bearing landscapes in Africa have found that fossil hominins were preferentially utilizing landscapes featuring a mosaic of habitats in close geographical proximity, including dry, uplifted flanks with rocky cliffs. Many extant species of primate use rocky and cliff habitats as sleeping, foraging, and refuge sites. This raises the question: could the retention of climbing-advantageous morphologies in fossil hominins relate to behaviors other than tree climbing, such as rock climbing?

Five healthy, experienced rock climbers were recruited to perform two rock climbing and two suspensory grips on a custom rig. Kinematic analysis (Qualisys Motion Capture Systems, Gothenburg, Sweden) was used to quantify differences between suspensory and rock climbing grips in terms of joint angles, or grip shape. Pilot data was analyzed using principal components analysis and canonical variate analysis to assess variation within the samples. Results indicate significant differences between angular joint configurations according to grip type ( $p < 0.007$ ). The only paired grip comparison with-outsignificant effects was the Hook-Power grip comparison.

The pilot study justifies a more detailed exploration of force distribution and kinematics between rock climbing and arboreal climbing/suspensory grips. We also present a novel approach to instrumenting complex vertical substrates using 3D printing technology to accurately collect kinetic data during non-arboreal climbing behaviors in modern humans.

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### Exploring age-related variations during talar growth

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Age estimation is a fundamental aspect in juvenile osteological studies and, as such, there are many methods that rely on ontogenetic-related changes to bone morphology. The talus, being a small and compact bone, is generally well preserved in archaeological contexts, but little is known about its morphological trajectory during growth. To better understand this we apply a (semi)landmark-based approach to an ontogenetic sample of 26 modern human juvenile tali (known age/sex = 12; unknown age/sex = 14), grouped by 5 age categories ranging from 0 to 15 years.

A template of 11 landmarks and 205 semilandmarks were applied to 26 microCT-based digital models of the juvenile tali. These were superimposed by Generalized Procrustes Analysis with the semilandmarks freely sliding against recursive updates of the Procrustes consensus. Finally, individuals of unknown age/sex were projected into the form-space determined from a Principal Component Analysis of the known sample.

Our results show that most of the morphometric variation is explained by PC1 (89.1%), which is highly correlated with size and accounts for ontogenetic allometry. Negative scores (i.e., youngest) are related to a small and globular morphology. The positive scores (i.e., oldest) account for an elongation of the talar body, which is mainly related to the development of the neck and growth of the lateral malleolar facet.