During climbing, body-to-substrate distance was 25% lower compared with quadrupedalism (45±2 v 61±1 cm). Climbing entailed maximum forelimb protraction at touch down that was slightly higher than quadrupedalism (27–41° v 26–31°). Over a stride, elbow and knee joints were 35–40° more flexed during climbing than quadrupedalism. During quadrupedalism, the knee and elbow maintained relatively constant joint angles (elbow: ~150°; knee: ~160°) during their respective stance phases. During climbing the elbow flexed dramatically over stance phase (by 30–70°). Peak flexion coincided with minimum body-to-substrate distance. The knee slightly extended (by ~20°) during stance phase. Our results show that chimpanzees do use more protracted forelimbs during climbing, but this effect was smaller than anticipated. Chimpanzees also reduce body-to-substrate distance during climbing, but contrary to some model predictions, this is accomplished via elbow flexion.

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Structural Variability in Long Bones as a Marker for Sex Specific Daily Activities

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Differences in cross-sectional long bones can be used to understand the habitual activities of human groups. Understanding the structural variability of long bones between the sexes can lead to a useful interpretation of activity. This study examines the variability in femoral and humeral structure to extrapolate daily activities of 112 individuals from 4 Chinese sites dated from 3000-1650 BP. This sample consists of populations with differing subsistence strategies. Body mass is estimated using a sex specific femoral head body estimation equation presented by Ruff et. al. Total cross-sectional area (TA), cortical area (CA), I_{max}, I_{min}, and polar moment of area (J) are calculated for humerus and femur samples. TA, CA, I_{max}, and I_{min} are standardized via length of the respective long bone. Differences between the sexes in TA, CA, I_{max}, and I_{min} of both the humerus and the femur are assessed between 4 sites. Across sites, males are found to have higher I_{max}, I_{min}, and TA when standardized for femur length compared to females. Humeral TA, I_{max}, and I_{min} are found to be higher in females across sites when standardized for length of the humerus. This points towards a significant difference in daily activities between males and females in this sample, with males conducting much more lower limb dominant activities while females partook in activities that were demanding on the upper limb. The use of structural variability in long bones as a method of assessing daily habits can shed light on the cultural norms of past human groups.

How enamel thickness, mineral concentration and mechanical properties influence tooth wear and fractures in catarrhine molar crowns

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Variation in the structure, mineral concentration and mechanical properties of enamel across tooth crowns has been studied in both clinical and evolutionary contexts. How this variation is associated with dental tissue loss remains relatively unexplored. In this study, tooth wear and fracture patterns were compared with mechanical properties (nanoindentation of buccal-lingual sections; 13 catarrhine, one platyrrhine), mineral concentration (MC; Micro-CT scans of whole crowns; 16 catarrhines) and enamel thickness (Micro-CT scans; same 16 catarrhines). All specimens are from museum collections, with a mix of first (n=9), second (n=20) and third (n=1) molars. Mean values for different crown locations were calculated. Thickly enamelled buccal cusps (i.e., 'functional' cusps) have significantly lower hardness ($p < 0.001$) and elastic modulus ($p = 0.031$) than their non-functional counterparts (e.g., lingual hardness mean: 4.79 GPa; buccal hardness: 4.55 GPa). Cusps consistently have higher MC and mechanical properties values than lateral positions (e.g., cuspal MC mean: 2.31 g/cm³; lateral MC mean: 2.25 g/cm³). Lateral mesial enamel has significantly lower MC and thickness values than other locations. Non-functional cusps have higher prevalence of fracture and hardness than functional cusps, potentially as an evolutionary response. Cusps are subjected to longer and/or more extreme forces during mastication than lateral enamel, meaning that stronger enamel may help protect cusps against failure. Lateral mesial enamel is 'weaker' potentially due to increasing forces moving distally, and typically shows more substantial wear than distal positions. In sum, enamel structural/compositional data may allow additional insights into primate molar wear/fracture patterns and evolution.

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Effects of daily step counts and rest bouts on bone material and structural properties in the femur of three West African primates

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Bone is responsive to both load frequency and duration of rest periods in daily activity. This study examines femoral bone density of three sympatric primates (*Piliocolobus badius*, *Cercopithecus diana*, *Cercocebus atys*) in light of locomotor effort in the Ivory Coast's Taï Forest. *Pi. badius* takes fewer steps per day than *C. diana*, and both take significantly fewer than *C. atys*. *Pi. badius* rests the most during the day, and for long periods, while *C. diana* rests the least. Since the combination of walk cycles and rest periods differs among species, these data may offer insight into which variables most strongly influence bone quality.

For three individuals of each species, we examined bone density and structural rigidity at four slices from femoral micro-CT scans (25%, 45%, 55%, 75% proximodistal). An ANOVA indicates that the overall density differed significantly among species ($P<0.01$), with *C. atys* having lowest density and *Pi. badius* the greatest. The cortical to total subpericosteal area ratio was also different among species ($P<0.001$), with *Pi. badius* having a much higher ratio than *C. atys* or *C. diana*.

The differences in daily step counts among species align well with both the overall density and the higher cortical area ratio, paradoxically suggesting that fewer steps lead to denser, thicker bone. However, the closer association between *C. diana*-*C. atys* for both variables suggests that bone morphology is not a simple function of step counts. The longer and more frequent rest periods for *Pi. badius* may explain why they diverge so significantly.

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Modeling airflow during the nasal cycle in 3D: Implications for variation in human nasal form and function

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