Investigating intra-skeletal variation in cortical bone strength parameters of the radius and tibia in non-osteoporotic males

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The goal of this study is to investigate intra-skeletal variation in measures of cortical bone strength in the radius and tibia in non-osteoporotic males. The range of variation in bone quality for individuals deemed "skeletally healthy" through traditional methods needs to be explored. Left and right radii and tibiae were excised from 30 male cadavers ranging in age from 33 to 79 years (64.13 ± 11.31) and with DXA lumbar spine T-scores qualifying them as non-osteoporotic(>-2.5). Quantitative clinical CT was performed on *ex vivo* elements to calculate volumetric bone mineral density (vBMD) at 30% radius and 38% tibia sites. Total area (Tt.Ar), cortical area (Ct.Ar), section modulus for both the anterior (Z_{ant}) and posterior (Z_{post}) cortices and robusticity (Tt.Ar/bone length) were quantified. Paired samples t-tests indicate significant differences in Tt.Ar ($p<0.01$), Ct.Ar ($p<0.005$), robusticity ($p<0.01$), SSI_{ant} ($p<0.05$) and SSI_{post} ($p<0.01$) between left and right elements, as well as significantly higher SSI_{post} in the tibia and SSI_{ant} in the radius. However, there were no significant differences in vBMD between right and left sides for the radius ($p>0.05$) or tibia ($p>0.05$). Side differences in variables related to bone strength could be the result of functional adaptation due to laterality or side preference. Intraskeletal comparisons indicate significant correlations for SSI_{ant} ($r=0.484$; $p<0.0001$) and SSI_{post} ($r=0.568$; $p<0.0001$). This is a non-destructive method of capturing intra-individual variation in cortical bone strength parameters and suggests differential response to mechanical loading. Considering these differences within individuals has implications for assessing skeletal health within past and present populations.

The "other" drug: Implementing bird grasshoppers as a treatment for anemia

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In a recent publication, the Food and Agriculture Organization of the United Nations (FAO) states that "entomophagy can be promoted for three reasons: health benefits, environmental benefits, and the improvement of our livelihoods involving economic and social factors." Their main argument is that insects are a vast resource for human diets, especially when the population is projected to increase. While the potential of insects as a food source is important, one area that is perilously overlooked is their medicinal potential. This poster examines the efficiency of bird grasshoppers as a substitute for anemia treatments, as practiced by many rural communities in Mexico. Here the genus *Schistocerca* was examined for Vitamin B6, or more specifically pyridoxine, and iron content, two common supplements used to treat anemia. The recommended dietary allowance (RDA) for iron is from 7-27 mg/day varying with age and sex, and the iron content of *Schistocerca* falls well into that range at 8.38 mg/100g dry weight. While other sources of iron and pyridoxine such as beef, poultry, and even over-the-counter supplements provide sufficient content, these resources are costly. Utilizing bird grasshoppers for medicinal purposes is a low cost aide for developing countries with no access to such supplements. Identifying this, along with other benefits, helps to relinquish the stigma associated with edible insects as well as facilitate more widespread use of this underutilized resource.

Homo naledi's frontal lobe: Modern in form, ancestral in size

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There is no greater difference in frontal lobe morphology between apes and *Homo sapiens* than in the inferior frontal gyrus. The degree to which this evolutionary change is due to increase in brain size versus brain reorganization has long been in dispute. Here we show the *Homo naledi* DH3 fossil skull fragment, recently discovered in the Dinaledi chamber of the Rising Star cave system, South Africa, provides an endocast with an unusual degree of detailed cortical morphology that is essential to answering this question. In the ancestral morphology seen in apes and *Australopithecus*, the fronto-orbital sulcus forms the anterior boundary of the orbital cap, whereas the homologous sulcus in modern *Homo* has moved posteriorly and been draped over by the formation of the frontal opercula associated with Broca's language area in humans. Despite an overall brain size similar to those of apes and australopithecines, *H. naledi* exhibits the modern condition of the orbital cap, bound anteriorly by an extended inferior frontal sulcus. In addition, a clear vertical ramus of the lateral fissure and its horizontal branch permits easy identification of a modern configuration of the frontal opercula. DH3 thus shows a modern *Homo*-like frontal brain organization despite its small size, which separates it from endocasts of *A. africanus, A. afarensis, A. sediba,* and *H. floresiensis*.

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The effect of temperature and population history on the shape of the distal and proximal epiphyses of the tibia

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Skeletal size and shape are strongly affected by natural selection, with climate one of the most significant factors. Nevertheless, skeletal variation is also influenced by neutral processes, although these remain relatively unexplored for long bone variation. Here, we apply geometric morphometric methods to analyze the effect of temperature and population history on the shape of the proximal and distal epiphyses of the human tibia in hunter-gatherer populations around the globe. Population history is assessed using an isolation by distance model, where geographical distances between pairs of populations are used as proxies for neutral genetic differences. The results show no significant differences for tibial shape between males and females and only minor allometric effects in the distal epiphysis. Significant differences among populations for both the proximal and distal epiphyses were observed. Mantel tests indicate that these differences in the distal epiphysis are probably triggered by adaptation to different temperature regimes, whereas the proximal epiphysis is largely unaffected by these. The results also indicate some neutral effects of population history on the shape of the distal tibia, although this is not as significant an influence as selective pressures. Although further research is warranted to determine the role of lifestyle and activity, this preliminary study suggests that the shape of the proximal and distal epiphyses of the tibia evolved following different processes.

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