**S1 Text. Diaphyseal Strength/Articular Size as a Proxy for Relative Muscular Strength.**

In contrast to long bone diaphyseal cross-sectional geometry, which is developmentally plastic [1-4], long bone articular size is less directly affected by changes in mechanical loading during life [5-7]. This is clearly shown, for example, in studies of human upper limb bilateral asymmetry, in which diaphyseal cross-sectional dimensions track differences in limb use [8, 9], while articular dimensions do not [9, 10]. The same general morphological patterning has been shown recently in a nonhuman primate [11], although without accompanying behavioral data.

Many developmental studies of humans have demonstrated strong effects of muscular growth on long bone diaphyseal cross-sectional size or strength (adjusted for body size) [12]. In a previous study, growth velocities in long bone strength were found to be tightly correlated with changes in mechanical loadings, both gravitational and muscular (gravitational loadings were approximated by body mass $∙$ bone length, and muscular loadings by estimated cross-sectional muscle area) [13]. Gravitational effects predominated in the lower limb, while muscular effects were more significant in the upper limb, particularly among males. Articular properties were not included in that study, in part because it is difficult to measure articular size radiographically in younger juveniles. However, articular breadths are available for the older individuals in the study [14]. We focus here on the upper limb because it more clearly demonstrates the effects of muscular loadings while reducing the confounding effects of body mass variation. Individuals at 17 years of age - the oldest age group with complete data for all 20 subjects in the study - were analyzed. Linear regressions of log-transformed data were carried out for humeral diaphyseal strength and forearm muscle area against humeral head superoinferior breadth, and residuals calculated (see [13] for measurement details; arm muscle breadths were not available, but forearm and arm muscle areas are highly correlated in children [15].)

As shown in S1 Figure, there is a significant positive relationship between residual diaphyseal strength and residual muscle area, relative to joint size (r = .74, p < .001). The relationship is still significant within sex (r = .64-.67, p < .05, n = 10, both sexes). If residuals are calculated using body mass instead of articular breadth as the "size" variable, results are similar (r = .70, p = .001). Thus, in this sample diaphyseal strength relative to articular size reflects, to a large extent, relative muscle size. Note that while muscle size is used here as a proxy for muscle strength, it is quite possible that between evolutionarily divergent groups differences in muscle strength (and thus bone loadings) could result from other physiological mechanisms that do not involve muscle mass variation (see main text and S2 Text).

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