Predicting Knee Luxation Force for Various Gallinaceous Bird Species Using Musculoskeletal Measurements of the Leg

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The knee joint strength of 43 turkeys, 44 chickens, and 37 guinea fowl was studied by recording various musculoskeletal measurements of the leg, as well as the force required to luxate the knee (FLK). The results were plotted and least-squares regression lines and associated R^2 values were calculated; F statistics were calculated to determine significance of the regression relationships. The slopes of all regression lines were positive, indicating that knee joint strength increases with body size for all musculoskeletal measurements for all species; many of these relationships were significant (a = 0.05). Post-dissection femur length for guinea fowl was shown to be a significantly better predictor of knee joint strength than pre-dissection femur length and had the highest R^2 value of any musculoskeletal measurement at the individual species level (R^2 = 0.567, p < 0.001). Of all the standardized measurements recorded, the lower leg maximum circumference (LMC) was fairly consistent among the 3 species, thus the data for LMC were pooled. The resulting positive linear relationship for the pooled data was highly significant (R^2 = 0.716, p < 0.001) indicating that there is a musculoskeletal measurement (i.e., LMC) that is a statistically significant inter-specific predictor of knee joint strength across all species of gallinaceous birds studied. Further research could be conducted to determine if this relationship holds true for other species of gallinaceous birds. A similar model of knee joint strength based on musculoskeletal measurements of the leg, if developed for humans, could serve as a predictive, early warning system to identify individuals at risk for sports-related knee injuries.

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