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# An Investigation of Robusticity in Modern Human Crania: Implications for *Homo erectus*

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Homo erectus is frequently differentiated from other taxa on the basis of cranial size, shape and the robusticity of cranial superstructures. However, the influence of size, and especially shape, on the expression of robusticity is not well understood.

We collected data from 140 recent human crania representing seven regional populations with varying levels of 'robusticity.' For each cranium, craniofacial shape was quantified by several three-dimensional (3-D) landmarks, and robusticity was assessed using the non-metric characters of Lahr (1996). Canonical correlation analysis of the Procrustes-aligned landmark shape data with the discrete robusticity traits demonstrates that (1) size is not the most important correlate of robusticity; (2) high robusticity scores for varying subsets of traits are correlated with different cranial shapes; (3) cranial shape influences the relative robusticity of many structures simultaneously; and, (4) two groups can be differentiated within each regional sample—one more robust and one more gracile. In contrast to prior studies, we find that size differences alone do not account for most variation in cranial robusticity. Rather, regional samples exhibit unique patterns of robusticity, suggesting that the idea of 'robusticity,' if it is to be useful, must be assessed in more detail than is usual. This detailed characterization is complicated by the lack of independence among robusticity traits as indicated by the correlation of multiple discrete robusticity measures with each canonical variable. The robust and gracile subdivisions within populations correspond to our independent sex assessment, confirming the utility of these traits in sex determination at the population level. However, overlap between groups argues against using these traits to identify sex in isolated specimens without knowledge of intrapopulational variation. These data on the sex-related expression of robusticity could be used to independently assess sex for fossil populations with multiple individuals, like the *H. erectus* fossils from Dmanisi or Ngandong.

Lahr, M. 1996. *The Evolution of Modern Human Diversity*. Cambridge: Cambridge University Press.

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