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Temporomandibular Joint Size Decrease in American Blacks: Evidence from Barbados

ROBERT S. CORRUCINI and JEROME S. HANDLER

Department of Anthropology, Southern Illinois University, Carbondale, Illinois 62901

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Hinton and Carlson (*Am J Phys Anthropol* 50: 325, 1979) have demonstrated a temporal trend of decreasing temporomandibular joint size in Nubian skeletons. Spanning a time range from 3400 B.C. to 1100 A.D., these populations show no evidence of genetic evolution, yet the size of the mandibular fossa of the cranium decreased by 5%. Hinton and Carlson attribute this decrease to gradual reduction of chewing stress, resulting from a change toward softer agriculturally-based dietary substances.

We have similarly analyzed mandibular fossa size in a sample of slave skeletons excavated from a burial ground at Newton sugar plantation on Barbados. The burial population spans the period from about 1660 to 1820. Historical records indicate that it represents a broad mixture of various populations imported from the west African coast and possibly a small number from southeast Africa; records also suggest that, by the mid 1700's, the majority was born in Barbados and that, by the late 1700's and early 1800's, between 10 and 15% showed some European

genetic admixture (Handler & Lange, *Plantation Slavery in Barbados*, 1978:20-29. Thus, the burial ground constitutes a representative, unique, and large sample of the greater New World slave gene pool which was ancestral to modern-day Black Americans. Three of the measurements described by Hinton and Carlson were taken on 27 sufficiently preserved Newton crania (roughly equal sexes) and on samples of 15 males plus 15 females, each of modern St. Louis Blacks and Whites from the Terry Collection (Smithsonian Institution). The fossa measures are: anterior breadth (articular tubercle to temporal spine), posterior breadth (postglenoid process to spine) and lateral antero-posterior length (articular process to postglenoid tubercle). In addition, the geometric mean of these measures provides a correlate of the joint surface area. Descriptive statistics are shown in the Table.

The null hypothesis that slaves and modern Blacks represent random samples from a single parent population for TMJ size can be confidently rejected. Modern Blacks are intermediate between the larger slaves and the smaller Whites, but nearer the latter. In fact, assuming fossa size to be an additive polygenic trait, our results would suggest that more than 78.8% White admixture has occurred in the modern Black gene pool. Since this admixture exceeds the rate of 20%, which is well established on the basis of genetic markers (Saksena, *Am J Phys Anthropol* 41:269, 1974), we assume that non-genetic, environmental factors have played the major role in TMJ size decrease. The most likely explanation is decreased chewing resistance (and growth stimulation) provided by the soft processed diets of modern urban individuals.

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TABLE
MANDIBULAR FOSSA MEASUREMENTS (mm)

Measurement	Newton Slaves Mean (s.d.)	Terry Blacks		Terry Whites	
		Male Mean (s.d.)	Female Mean (s.d.)	Male Mean (s.d.)	Female Mean (s.d.)
Anterior breadth*	24.89 (1.44)	23.92 (1.67)	22.69 (1.94)	22.89 (2.34)	22.62 (0.48)
Antero-posterior length*	18.42 (0.43)	17.45 (1.74)	16.32 (1.95)	16.22 (2.11)	17.25 (1.50)
Posterior breadth	18.54 (1.32)	19.21 (1.83)	17.99 (1.56)	20.02 (1.59)	17.89 (1.82)
Geometric mean*	20.36 (1.19)	19.97 (1.22)	18.76 (1.02)	19.45 (1.17)	19.09 (1.37)

*Newton significantly larger than modern Blacks at $p = .01$.