The Effects of Food Processing on Masticatory Performance and Its Implications for Hominid Cranio-dental Evolution

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Katherine Duncan, Daniel E. Lieberman

Abstract:
A steady decrease in relative dental and facial size occurred during the evolution of the genus Homo. It is often hypothesized that this reduction was made possible by, or was an adaptation for chewing food that was cooked or otherwise processed. This study therefore tested experimentally the extent to which cooking and pounding influence masticatory performance capabilities. Fourteen subjects where asked to chew standardized samples of root vegetables and meat that were raw, roasted, or pounded (meat only). Masseter and temporalis EMG data were collected and calibrated to masticatory force using a force transducer. Comminution (fragmentation) performance was assessed using particle-size analysis of unswallowed boluses. Results from preliminary experiments indicate that processing affects masticatory performance differently depending on the food and the way it was processed. Roasting increases the amount of force recruited by the adductors when chewing meat (compared to raw and pounded samples), but tends to decrease force production when masticating root vegetables (p 5 0.07). Roasting also affects the degree to which meat, but not vegetables, is broken-down in the oral cavity. The number of chews that a subject takes to swallow does not change as a result of processing yet meat is fragmented to a much greater extent when roasted. These results suggest that processing techniques do affect masticatory performance. The difference in food-type response to these techniques, however, highlights the complex nature of the relationship between diet and masticatory force production and cautions against a single causal explanation for reductions in hominid cranio-dental size.