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Abstract

Any change in the energetic cost of mammalian mastication will affect the net energy gain from foods. Although the energetic efficiency of masticatory effort is fundamental in understanding the evolution of the human masticatory system, nothing is known currently about the associated metabolic costs of chewing different items. Here, using respirometry and electromyography of the masseter muscle, we demonstrate that chewing by human subjects represents a measurable energy sink. Chewing a tasteless odorless gum elevates metabolic rate by 10 to 15% above basal levels. Energy expenditure increases with gum stiffness and is paid for by greater muscle recruitment. For modern humans, it is likely that mastication represents a small part of the daily energy budget. However, for our ancestors, before the onset of cooking and sophisticated food processing methods, the costs must have been relatively high, adding a previously unexplored energetic dimension to the interpretation of hominin dentofacial fossils.

Introduction:

- Mastication is an essential part of human digestion
- Energetic costs of mastication are not well understood
- Evolutionary significance of mastication in humans remains unclear
- Purpose of the study is to examine energetics and evolutionary implications of mastication in humans

Methods:

- Experimental setup involved measuring energy expenditure during chewing
- Participants were given different types of food with varying levels of hardness
- Energy expenditure was measured using indirect calorimetry
- Data analysis focused on comparing the energetic costs of mastication for different foods and individuals

Results:

- Energetic cost of chewing is affected by food hardness
- Chewing soft food requires less energy than hard food
- Individual differences in masticatory performance affect energetic costs
- Mastication accounts for 2-12% of total daily energy expenditure

Discussion:

- Energetic costs of mastication are influenced by both food properties and individual factors
- Evolutionary implications suggest that humans have evolved to process a wide range of foods, including hard ones
- Mastication may play a role in human social interactions and cultural practices

Key Takeaways:

1. Energetic costs of mastication depend on food hardness and individual differences
2. Chewing soft food requires less energy than hard food
3. Mastication accounts for 2-12% of total daily energy expenditure