

We Can Thank Agriculture and Soft Food for the 'F' Sound, Claims Provocative New Study

George Dvorsky

Humans couldn't always easily produce "f" and "v" sounds, according to a surprising new study. The reason we can now enjoy words like "flavor" and "effervescent," say the researchers, has to do with changes to the ancestral human diet and the introduction of soft foods—a development that altered the way we bite, and by consequence, the way we talk.

Human speech involves all sorts of wacky noises, from the ubiquitous "m" and "a" sounds found in virtually all languages to the rare click consonants expressed in some South African dialects. Anthropologists and linguists have traditionally assumed that the inventory of all possible speech sounds used by humans has remained unchanged since our species emerged some 300,000 years ago, but new research published today in *Science* is challenging this long-held assumption.

An interdisciplinary research team led by Damian Blasi from the University of Zurich is claiming that "f" and "v" sounds were only recently introduced into the human lexicon, emerging as a side effect of the agricultural revolution. These sounds, which are now present in the vast majority of all human languages, are what linguists call labiodental consonants—sounds produced by pressing our upper teeth to our lower lip.

Here's the story, as presented in the new study: Around 8,000 years ago, as humans transitioned from predominantly meat-eating lifestyles to agriculture, the foods our ancestors ate became softer, which had a pronounced effect on the human bite. Instead of the edge-on-edge bite exhibited by hunter-gatherers, who had to tear into tough meat, agricultural humans retained the juvenile overbite that usually disappears by adulthood. With the upper teeth

slightly in front of the lower teeth, it became much easier to make labiodental sounds. Gradually, and quite by accident, these sounds were integrated into words, which eventually spread across time and space, most notably within the last 2,500 years.

At least, that's the theory—though the new paper presents some compelling evidence to back the claim.

The paper is intriguing because it suggests human sounds used in language have been more dynamic in history than conventionally assumed, and that certain aspects of language can be traced to relatively recent changes in human biology.

Adult skulls showing edge-to-edge bite (A and B), and an adult skull showing a slight overbite (C).Image: D. E. Blasi et al., 2019/Science

The roots of this study go back to 1985, when American linguist Charles Hockett showed that words with labiodental sounds were overwhelmingly absent in the languages of hunter-gatherer societies—an observation he attributed to the edge-on-edge bite configuration owing to the absence of soft agricultural foods. Hockett's contemporaries didn't buy this argument, but now, nearly 35 years later, Blasi and his colleagues have rekindled this idea.

At a press conference held Tuesday, Blasi said the new study is the culmination of five years of work, with input from experts from anthropology, phonetics, and historical linguistics. The team, which included researchers from the Max Planck Institute, the University of Lyon, and Nanyang Technological University Singapore, devised new methodologies specific to the research, including the development of novel datasets and models to simulate human biomechanics.

Critics of Hockett's hypothesis argued that wear-and-tear can't fully explain changes to a person's bite configuration, and that edge-to-edge bites didn't start to fade away until long after the introduction of agriculture. Writing in the new study, however, the authors conceded that Hockett, who died in 2000, may have been onto something, saying “recent anthropological

evidence has demonstrated that tooth wear... is indeed the principal mechanism of post-adolescent bite change, and that despite considerable variation, there has been an overall decrease of edge-to-edge bite since the Neolithic.”

Indeed, the foods introduced by agriculture—items like porridge, soups, and gruels, and dairy products such as cheese, milk, and yogurt—led to dramatically softer diets. Importantly, and as the authors pointed out in the study, it was the absence of tough, harsh foods, and not the presence of soft foods, that contributed to the changes in bite configuration—a physiological process known as attritional occlusion.

A key point of the new research is that an overbite makes it easier to enunciate labiodentals. This ease-of-effort, the authors argued, eventually led to the emergence and spread of words with “f” and “v” sounds. Biomechanical computer models used in the study appeared to affirm this conjecture, demonstrating that 29 percent less energy is needed to produce labiodentals with an overbite compared to an edge-to-edge bite. Speaking at the press conference, the authors said the advent of labiodental sounds was not the result of a “deterministic” process, that is, it wasn’t inevitable. The adoption of a softer diet simply increased the probability of this happening.

“Producing labiodental sounds does not come at the cost of making other sounds,” Balthasar Bickel, a linguist at the University of Zurich and a co-author of the study, said at the press conference. “The thousands and thousands of trials”—i.e. the inadvertent introduction of labiodentals in speech—“over many generations has left a statistical imprint,” he said—the imprint being the current prevalence of words with labiodentals.

The authors also took a deep dive into the world’s languages, finding that, “on average, hunter-gatherer societies have only about 27 percent the number of labiodentals exhibited by food-producing societies,” as noted in the study. Borrowing from evolutionary biology, the researchers also performed a phylogenetic analysis, but instead of tracking physical changes to species, they tracked changes to Indo-European languages over time. The analysis showed that labiodental sounds spread quickly into other languages.

“In Europe, our data suggests that the use of labiodentals has increased dramatically only in the last couple of millennia, correlated with the rise of food processing technology such as industrial milling,” Steven Moran, a linguist at the University of Zurich and a co-author of the new study, said in a press statement.

“This study will come as a surprise to many experts in language and language change—it certainly surprised me.”

Importantly, the authors did not consider changes in brain development or changes to nutrition that may have influenced this process. As Blasi noted at the press conference, “We make no claims whatsoever about the brain—we were purely testing biomechanical factors.”

“This study will come as a surprise to many experts in language and language change—it certainly surprised me,” Tecumseh Fitch, an expert on bioacoustics and language evolution and a professor of cognitive biology at the University of Vienna, told Gizmodo. “The study is an interdisciplinary tour-de-force, combining methods from biomechanics, bioacoustics, comparative and historical linguistics to breathe new life into an old hypothesis: that changes in mouth structure brought on by dietary changes shaped historical change in language.”

Fitch said the authors relied on “various assumptions and reconstructions” of unknown factors—especially bite structures of current and ancient populations, but ultimately he believes they presented “a very plausible case that will open the door to future detailed research.” To which he added: “It’s probably the most convincing study yet showing how biological constraints on language change could themselves change over time due to cultural changes.”

Ian Maddieson, a linguist at the University of New Mexico, said “this paper is a welcome addition to the discussion of the extent to which language-external factors impinge on the phonetic design of human languages.” Nonetheless, he had some reservations about the new research.

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In particular, Maddieson was concerned about how the authors categorized and counted certain labiodentals, saying there's a lack of consensus regarding the interpretation of data used in the study, and that some of the labiodental sounds may have been over-counted.

Indeed, given the novelty of the study and its rather surprising conclusion, it would be a good idea for other researchers to dive in and explore this possibility further. Regardless, this paper has revitalized a hypothesis first proposed some 35 years ago, with the authors showing it's a topic worthy of consideration.

So the next time you cathartically shout out the "f" word, be sure to offer thanks to your pioneering farming ancestors.