The irrelevance of the lowered larynx in modern Man for the development of speech

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In speculation about the evolutionary development of speech much significance has been attached to the lowered larynx in humans. The lowered larynx, the argument runs, creates a pharyngeal cavity that is separate from the buccal cavity (the oral cavity bounded on the sides by the cheeks) and that this two-cavity configuration permits the production of more distinct vowels which, it is assumed, is essential or at least advantageous to speech communication. I offer the following arguments against this proposal:

1. Although the larynx is low in adult male humans (vis-à-vis the larynx position in closely related primate species, such as the chimpanzee), it is less low by a considerable amount in adult female humans. Normally in cases of dimorphism, the age group or sex that has more of a given "marked" feature supposedly serving a certain function should be better adapted for that function. For example, among sea lions severe limitation of resources leads to marked size dimorphism in males; the larger males, it has been documented, are better adapted to successfully compete for food, territory, and mates. But are human males with their lowered larynx better adapted for speech than females? No; it is just the opposite. In cases where males and females have equal access to education and health resources, females invariably outperform males on verbal tests. Similarly, males are more prone to speech disorders stemming from neurological conditions such as delayed acquisition of speech, stuttering, and autism by a ratio (in comparison to females) of 4 or 5 to 1.

2. Typically when there is sexual and age-related dimorphism, as is the case with the degree of larynx lowering in humans, the onset of a distinct development of the dimorphic feature is timed to that phase in the individual's life when the feature is needed. For example, some birds develop a so-called "egg tooth" shortly before hatching. This facilitates breaking the shell at the appropriate time. After hatching, this egg tooth gradually disappears. In human males the disproportionate lowering of the larynx (vis-à-vis females) occurs at puberty, long *after* the onset of speech. It is unlikely, then, that it is related to speech function.

3. The hypothesis that the larynx lowering is an adaptation to speech would have to treat as wholly coincidental the fact that there is another remarkable anatomical dimorphic development in adult males vocal apparatus that parallels the descent of the larynx, namely, the enlargement (elongation and increased mass) of the vocal cords. Equally, it would treat as coincidental yet another dimorphic development in males at puberty: the growth of facial hair. However, I present below a hypothesis that integrates all these dimorphic secondary sexual features.

4. Other species – that obviously do not have speech – also show sex- and age-determined enhancements of the vocal apparatus. These range from cranes to howler monkeys to elephant seals. For example, whooping cranes have tracheas that are about as long as the

birds themselves. The "extra" length of the trachea is achieved by part of the trachea being coiled up inside the sternum (not unlike the convolutions of a French horn). This enhancement of the resonating tube of their vocal apparatus is assumed to contribute to the loud and far-carrying vocalizations that they are known for.

The function of the lowered larynx in humans, especially males, is probably to enhance threat displays rather than speech itself. Threat displays involve both visual and acoustic components. A cross-species analysis of agonistic vocalization in birds and mammals reveals what is called the 'frequency code': vocalizations in threats tend to have low fundamental frequency (F_0), whereas non-threat (submissive or affinitive) vocalizations have high F_0. Ohala (1984, 1994) suggested that the same code applies not only to the F_0 but also to the resonances shaping the vocalization, too. Predominantly low resonances should correlate with threat and high resonances with non-threat. Functionally this comes about since the natural frequencies of a sound producer are inversely related to its size. Low frequencies are associated with a larger – and thus more dangerous – vocalizer. This explains the temporal coincidence of the larynx lowering, vocal cord enlargement, and the growth of facial hair in male humans during puberty. (Facial hair, i.e., beards, in males presumably functions as a visual, implastic, component in threat displays: it makes the bearded one seem larger since his head subtends a larger angle in the visual field of the viewer.) With sexual maturity, males, by virtue of the common sex role they must assume, need to compete for resources. This would account for why males have these anatomical features enhancing threat displays more than females.

Whether the lower larynx, as an adaptation for threat displays, occurred before, during, or after the evolution of speech and language is uncertain. My point is that it is independent of and thus irrelevant to the evolution of speech.

References

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