

## Correlation between climatic factors and proportions of consonant to vowel ratios in languages

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**Abstract:** climate and terrain through evolution have developed variations in both human anatomy and kinesiology. Maddieson and Coupé in “Human spoken language diversity and the acoustic adaptation hypothesis” (2015) have advanced that variations in these environmental factors manifests in differences in sonorities and consonant distributions among languages.

The reason for such variations can, in fact, be shown to be tied to articulatory mechanics. The influence on **tongue behavior** by cold and warm environments has never been studied but this function can be readily observed. Cold and warmth differently affect vertical (dorsal vs. ventral) tongue biasing and thus influence consonantal or vocalic richness in a language. Maddieson and Coupé's hypothesis is thus physiologically supported. Five apparent kinesiological connections between climate, body behaviors and phonetics can be described in the following.

(Flow chart on p 4.)

### 1. Body and tongue responses to thermal environment

**a.** Temperature conditions bring automatic bodily responses. Response to cold generates nasal respiration, frontally contracts, curls the body, tenses the face, closes the mouth and ventrally abducts appendages. Significantly, relating to phonetics, cold also causes palatal approximation by the tongue. This is correlated to narrowing the nasal passages. Although no previous reports can be cited, this process is as clear to personal self observation as the above listed external responses.

The bodily effect to warmth is the opposite, the body and limbs dorsally expand, breathing is oral and the tongue approximates the mouth floor. Mouth opening when overheated occurs in humans, dogs, cows, lizards, etc. *Fig.1.*

**b.** For any given articulatory task a muscular framework is preset in preparation.

E.g., in speech the presetting of a syllabic frame precedes the articulation of its sequence of phonemes.

Since the tongue is the primary agent of articulation, its positional biases, that is, its framework presettings due to temperature would influence phonetic behavior; cold, with a presetting for palatal (tectal) occlusions would tend to favor consonants, while warmth, causing tongue depression and oral tract enlargement would be biased for vowels.

**c.** As further outlined below, the correlations between colder versus warmer climates and vertical tongue approximations can be shown to **support** the hypothesis that languages of colder or warmer environments would be biased, respectively, for consonants or vowels.

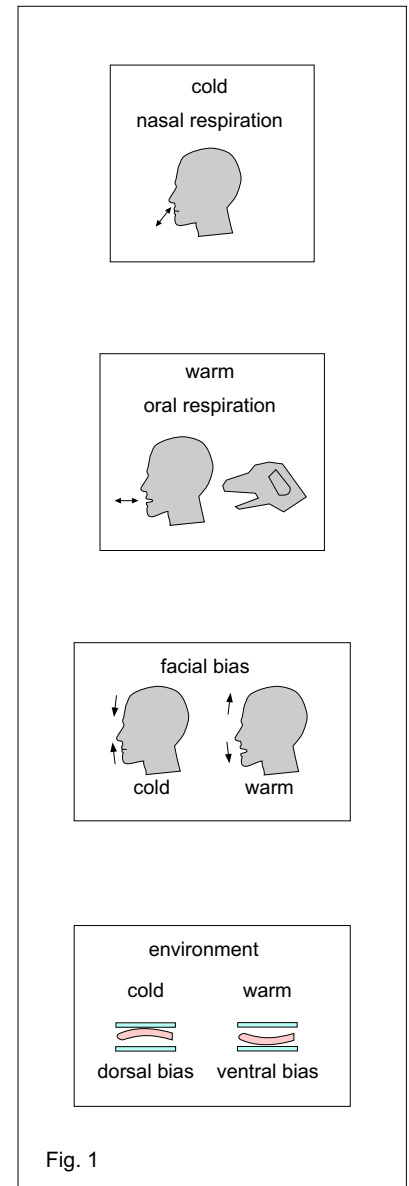


Fig. 1

## 2. Target approximations by the tongue in respiration and biases for /h/ and /m/

**a.** Exactly the same scheme of vertical tongue approximations occurs in respiration, where the lingual action is part of air flow control, in both oral and nasal respiration. That is, inspiration bias raises the tongue and expiration depresses it. *Fig. 2.*

**b.** Simple observation shows that inspiration exhibits preparation for the articulation of /h/ significantly more than for other phonemes; the sound articulable in during inspiration is /h/. On the other hand, in expiration an articulatory presetting arises for /m/. *Fig. 2.* This indicates that vertical tongue bias is a functional tool of oral mechanics in both respiration and sound formation.

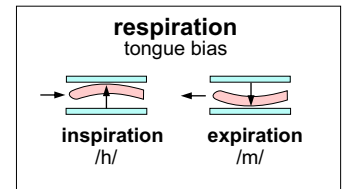


Fig. 2

## 3. Respiratory presettings correlated with /h/ and /m/ in speech

**a.** The vertical settings of the tongue in respiration are absolutely tied to its phonetic presettings in speech because respiration is a fundamental component of speech, and so respiratory presettings possibly have an impact on phonetic production. Indeed, in actual speech generating /h/ and /m/ shows that for these phonemes the same dorsal and ventral forces as in respiration are the prime movers. *Fig. 3.*

**b.** Although full articulation of either phoneme consists of synergic and antagonist forces, including the powerful input of the jaw, the identity of the prime mover of /h/ and /m/ production becomes evident when the temporary framework tension of either phoneme attenuates to a whisper, or better tonic level at the end of articulation. The prime mover, being the action initiator remains the only significant force. This fact is especially evident if one articulates /h/ or /m/ with mouth closed and without a vowel.

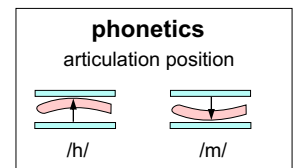


Fig. 3

## 4. The vowel quadrilateral matrix and /h/ and /m/ articulations

**a.** The 3x3 cell matrix in classifying vowel positions can be adapted to consonants. Covering it here only as it applies to /h/ and /m/, the procedure can be observed as follows. Just as vowels, /h/ or /m/ can be articulated fronted, backed, raised, etc., in a 3x3 cell matrix. However, consonants being obstructive, the matrix is not nearly as open to movements as with vowels. *Fig. 4.*

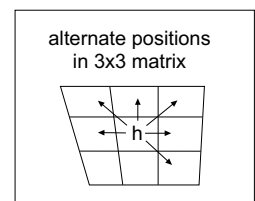


Fig. 4

**b.** When articulated in a neutral articulatory framework of English, with the neutral vowel /ə/ at its mid-center, /h/ can be most easily placed in the high front and central cells of the matrix, while /m/ optimally settles in the low back and central cells.

A conclusion can be made at this point. It can be inferred that if a language is consonant rich it would have a lingual dorsal presetting and therefore would also have a bias for the frequency of /h/. For a sonorous language an /m/ bias and its frequency would be applicable. The contrast would also be relatable to colder versus warmer climates. Further studies are needed to examine this hypothesis, but paragraph 5. below presents possible confirmation. *Fig. 5.*

**c.** Temperate climate languages will show mixtures of tongue presettings, and would be more complicated in this regard.

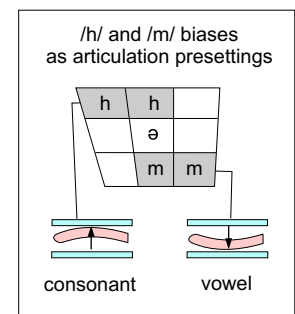


Fig. 5

## 5. Some correlations between /h/ and /m/ lingual presettings and the frequencies of these phonemes in languages associated with northern versus southern climates

a. A cursory examination of language teaching books and courses with basic vocabularies present the following /h/ to /m/ ratios of word initials:

Northern languages: Anglo-Saxon 1.57 to 1; Irish 1.75 to 1; Icelandic 4 to 1; Southern languages: Sanskrit 1 to 4; Arabic 1 to 3.6; Telugu 1 to 23.

b. Greetings might be the most spontaneously produced words or phrases and looking at these we can see the prevalence of /h/ in initials of words of greeting in Northwestern Europe. All have readily borrowed the English "hello" and even "hi", whereas African, Arabic and Romance tongues have not adopted these, and have no greetings with initial /h/. It is notable that the Romance languages, excepting Rumanian, totally lack /h/. In Rumanian such examination yielding a 1 to 2.66 ratio for /h/ and /m/ may indicate such underlying Romance characteristic.

## 6. Other somatic associations with /h/ and /m/ presettings

There are other instances of connection between body behavior and articulatory presettings. Whether or not for a cold climate speaker the tongue bias generates /h/ presetting, interestingly, regardless of language, so does standing on tiptoes, whereas in warmer regions the /m/ presetting brings a preference for flat footed action. This fact appears to reflect that the Northwestern European region typically employs tiptoe footwork in dance, cf. classical ballet or Irish dance. At the same time dancers in southern regions feature balancing on the sole and heel. *Fig. 6.*

Note: French, although a Romance language, belongs with the tip-toe group, most likely because the language is to a significant extent spoken by a population of historically Germanic origins.

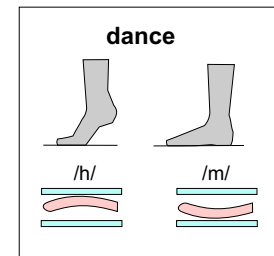


Fig. 6

Ballet



Indian



Irish



Arab



Italian



## FLOW CHART

