

Aspiration : How is it Perceived ?

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The field of speech perception is still a mystery. As the area is explored further, more is the confusion and part is the solution. This study was carried out to gain insight into the perceptual cues of aspiration in Hindi. Four experiments were conducted in this regard :

Experiment - I: Noise duration during aspiration as a cue to aspiration.

Experiment - II: Duration of silence or VOT as a cue to aspiration.

Experiment - III: Duration + noise as a cue to aspiration.

Experiment - IV : Transition of the following vowel as a cue to aspiration.

For the above purpose eight meaningful Hindi words were taken with the plosives of interest (k, kh, t, th, p, ph) in the initial position. The words were produced by an 18 year old normal adult male and they were digitized using a computer. The stimuli were then synthesized by manipulating the desired cue for each experiment. Thus, Experiment - I had stimuli which were synthesized by reducing the duration of noise in 10 msec, steps on all the aspirated plosives (kh, th, ph). Experiment - II had synthetic stimuli whose phonemes were manipulated with a view of increasing the VOT of the unaspirated phoneme in 10 msec, step to that of the aspirated phoneme. Experiment - III consisted of synthetic stimuli whose plosives were manipulated in terms of reduction of noise + duration in steps of 10 msec. from the following vowel. Experiment - IV consisted of synthetic stimuli, where the transition to the following vowel of the aspirated phoneme was replaced by that of the unaspirated. Totally 210 synthetic stimuli were prepared.

All these stimuli were audio recorded in a metallic cassette with an interstimulus interval of two seconds. These stimuli were presented to 30 normal adult subjects (15 males and 15 females) whose mother tongue was Hindi. They were given a forced choice percept, response sheet and were asked to identify their response, which could have been either aspirated or unaspirated. They were specifically asked to concentrate on the initial phoneme of the word.

The responses were tabulated and the percent responses and graphs were plotted. Analysis of these n responses was done in terms of cross over points, upper limit of perception, lower limit of perception and boundary width. The aspiration duration cross over point was measured as that duration wherein, an intersection between the aspiration curve function and an aspiration curve function took place. The lower limit of the aspiration boundary was measured as that duration below which 75% of subjects perceived only unaspirated category. The upper limit of the aspiration boundary was measured as that duration above which 75% of subjects perceived only aspirated category. The width of the aspiration boundary was measured by subtracting the upper limit from lower limit.

The results revealed that among the four cues that were experimented the combination, noise + duration served as the most important cue of aspiration. However, in the absence of noise, the duration did take over to cue aspiration. But noise alone or transition alone did not serve as a cue for aspiration. However, in Experiment - III other than the forced choice percept few subjects gave other responses as /kh/, /p/, /t/, instead of either /t/ and /th/.

Thus, in Hindi aspiration is cued by presence of noise + duration. In the absence of noise, duration alone could also cue the aspiration of the phoneme.

The cues of murmur/aspiration as in the murmured plosives are worth investigating as murmured plosives have different acoustic properties than the aspirated.