

# EXPERIMENTAL PHONETICS

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### Voice Onset Time(VOT) measurements for Hindi Speakers

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## Overview

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## Motivation

- To study Voice onset time measurements for Hindi speakers
- To compare VOT measurements of Hindi speakers with English speakers
- To study the effect of the following on VOT:
  - Place of articulation
  - Difference in VOT measurements due to gender

## VOT, and Types

- VOT is the time difference between the initiation of the stop burst and the onset of voicing
- VOT is measured in milliseconds
- 3 types of VOT :
  - Negative VOT: where onset vocal fold vibration precedes the plosive release
  - Zero VOT: where onset fold vibration coincides with the plosive release
  - Positive VOT: where there is a delay in the onset of vocal fold vibration after plosive release
- In English, the stop consonants phonemes are: [ /p/, /b/, /t/, /d/, /k/, /g/ ]
- Multiple factors affect VOT such as place of articulation, following vowels, the voice of voiceless sounds, gender, rate of speech, and, age of the speaker.

## Introduction

- Hindi is an Indic language derived from Sanskrit and written in Devanagari script.
- 250 million people speak it as their first language
- There are 20 consonants in Hindi
- Stop consonants are called plosives produced by a momentary blockage in airflow

## Method

- Hypothesis:
- There will be no significant difference between the means of VOT for vowels
- There will be no significant difference among different voiced stop sounds concerning the same vowel for the three places of articulation
- There will be no significant difference between mean if the VOT of voiced stop sounds for male and female

## Experiments

### Dataset

- 10 subjects, 2 male and 2 females with an age range of 18 to 26 years
- Mean age = 21.7
- No history of neurological, vascular, or motor abnormalities
- Should be a native Hindi Speaker

### Other Details:

- Boat Bass 225 Microphone is used
- DELL Vostro 3568 laptop for recording and analysis
- PRAAT is used for further study

## Experiments

### Procedure

- Subjects sit comfortably in a quiet room
- The recording is done using a microphone placed at a distance of 5 cm from the mouth of speaker
- During recording, they were required to read words at a normal speed
- The sampling rate of recording was 44.1 KHz
- Nine syllables were used (/ba/, /bi/, /bu/, /da/, /di/, /du/, /ga/, /gi/, /gu/)



### Results(Expectation)

- The mean VOT of /ba/, /da/, and /ga/ were statistically compared and yielded no significant difference with an F value of 0.228 and p-value of 0.75
- The mean VOT of /bi/, /di/, and /gi/ were statistically compared and yielded no significant difference with an F value of 0.115 and p-value of 0.89
- The mean VOT of /bu/, /du/, and /gu/ were statistically compared and yielded no significant difference with an F value of 0.331 and p-value of 0.732
- Therefore the result shows no significance change or variation in the place of articulation
- The mean VOT of /ba/ in males and females is 0.099s and 0.110s
- When VOT for the/ba/ syllable was done among males and females, it shows that there is no significant gender difference( $p=0.196$ )

### **Conclusion(Expectation)**

- The result confirms that vowel has a significant effect due to the place of articulation
- It also suggests that place of articulation is associated with the largest VOT following in descending order by alveolar and labial place of articulation
- It also suggests that there is no difference in VOT concerning gender