Speechreading

Chapter 8

- Lipreading vs. Speechreading (interchangeably)

- Lipreading: is the *process of recognizing* speech using only <u>visual speech signal</u> and <u>other visual cues</u> (facial expressions)

- Speechreading: is *speech recognition* using both <u>auditory</u> and <u>visual</u> cues. (include the setting of conversation)

Speechreading For Communication

- Even persons with normal hearing *relays* on speechreading.

- A person with HL will depends more on visual signal for speech recognition.

- Converse on the telephone or listening to radio is harder for persons with HL

Characteristics of A Good Lipreading

- Research has revealed that is difficult to predict lipreading performance

- Performance **cannot** be predicted by:

- an individual's intelligence

- educational achievement

- duration of deafness (even with practicing lipreading or speechreading)

- age at hearing-loss onset

- socioeconomic status

- verbal abilities

- cognitive skills (e.g., visual memory and personalities)

- Some variables may be predictive like:

- Women lipread <u>better</u> than men

- Young adults lipread <u>better</u> than elderly adults

- The latencies of recorded electrical potentials (at the cortex) following stimulation of the eye by flash of light may correlates with lipreading performance. (conflicting evidences)

- Shorter latencies is a characteristics of good lipreaders.

Shorter latencies —> more rapid transmission of neural impulses from the eye to the brain.(not affected by personality, experiences, or circumstances).

- Speech and hearing professionals cited more characteristic that relate to lipreading performance including:

- individual ability to capitalize on contextual cues.

- their willingness to guess.

- their mental agility.

- their willingness to revise interpretations of a partially recognized message.

- In children, linguistic and world knowledge can constrain proficiency.

The Difficulty of Lipreading Task
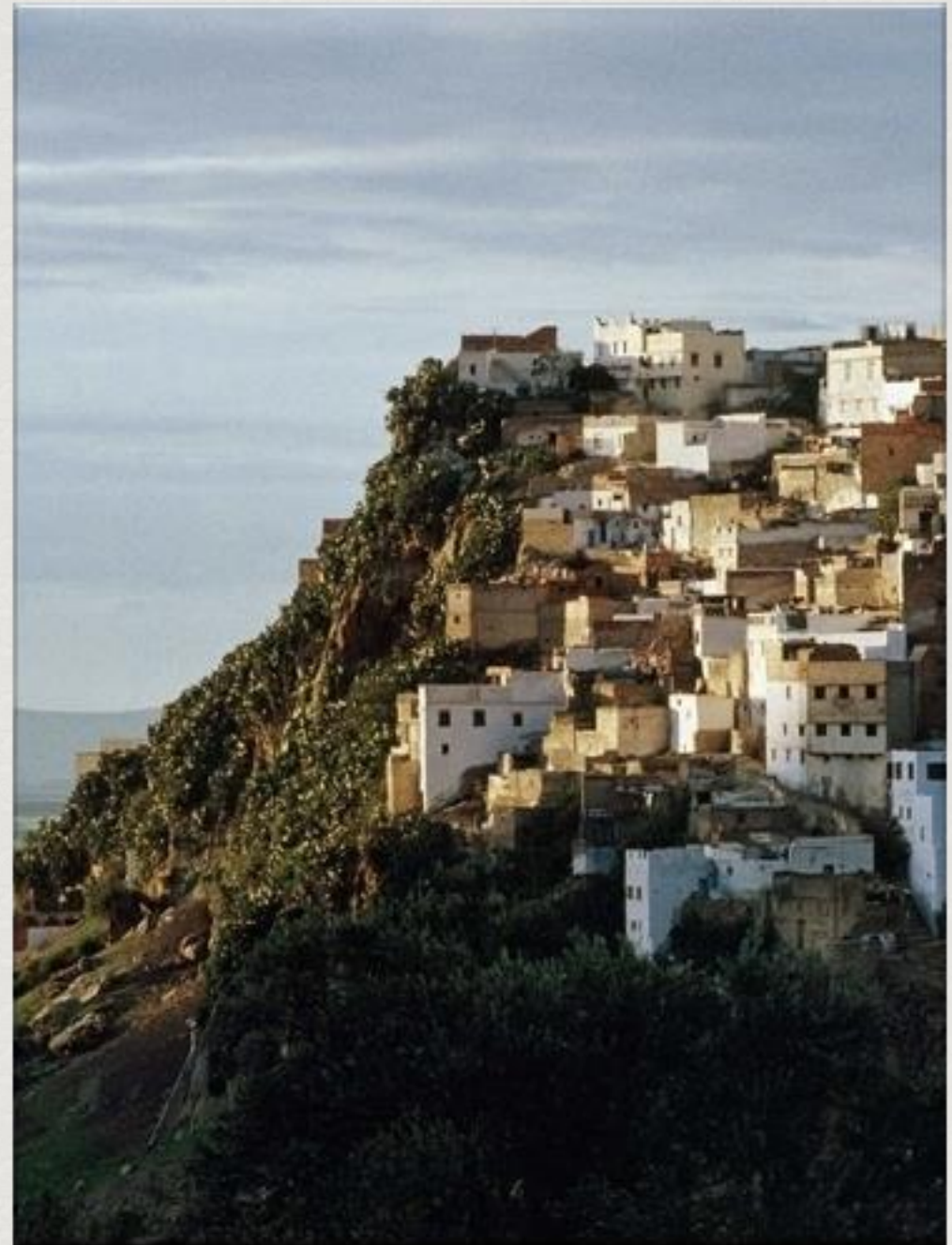
- Talking to you through a closed window (see only) allowed you to recognize less than 20%

- There are five variables that compound the difficulty of the lipreading tasks:

- Visibility of sounds

- Rapidity of speech

- Coarticulation and stress effects

- Talker effects

- Visemes and homophones. e.g., 'rose' (the flower) and 'rose' (past tense of rise); 'lie' (to tell an untruth) and 'lie' (to lie down); 'bear' (the animal) and 'bear' (to put up with)

Talker	Message	Environment	Speechreader
Facial expressions	Length	Viewing angle	Lipreading skill
Diction	Syntactic complexity	Distance	Residual hearing
Body language	Frequency of word usage	Lighting	Use of appropriate amplification
Speech rate	Shared homophenes	Background noise	
Speech intensity	Context	Room acoustics	Stress profile
Familiarity to the speechreader		Distractions	Attentiveness
Accent			Fatigue
Facial characteristics			Motivation to understand
Speech prosody (intonation, stress, and rhythm)			Language skills
Objects in or over mouth			

Visibility of Sounds

- 60% of speech sounds are not visible on the mouth (cannot be seen)

- Words that are more visible on the face —> begin with consonants that are made with:

- Bilabial closure (/p, b, m, w/)

- The lower teeth pressing the upper lip (/f, v/)

- The tongue tip contacting the upper teeth (/th/)

- Consonants with limited visibility include:

- Sounds that are *produced within the mouth* (/ k, g, t, n/)

- Some features of phonemes are not visible (voice vs. voiceless)

- Vowels are considered not to be highly visible

- Vowels tend to be acoustically salient to individuals with HL. why?

- Vowels are intense

- Change slowly over time in their frequency composition

- Are long in duration

Rapidity of Speech

- Talker may speak anywhere from 150- 250 words/mins. or 4-7 syllables/sec. (excluding time spent pausing)

- Talker may produce an average of 15 phonemes/sec.<—> human eye capable of registering only about 9 or 10 discrete mouth movements in this time interval —> *lipreader* has a <u>little time</u> to ponder the identity of a word (may not every word)

Coarticulation and Stress Effects

- Sounds looking different depending on its phonetic & linguistic context.

- e.g., boot (lip begin to *round* in anticipation of the following /u/) vs. beet (lip begin to *spread* in anticipation of the following /i/)

- Stress can affect the appearance of a word

- How are ya?

- How are you?

Talker Effects

- The same sound may look different when spoken by two different people.

- e.g., different degree of mouth opening while saying a vowel

Visemes and Homophenes

- Visemes are groups of speech sounds that look alike on the face/lips (/p, b, m/), (/f, v/)

- Sounds belong to visemes groups and many words are homophonous increases lipreading/ speechreading difficulty

- Homophenes are words that look the same on the mouth

- grade and yes vs. boom and doom

- 40%-60% of english words are homophenous

- grammatical sentence cues and other linguistic and situational cues can decrease the confusion about word identity.

Importance of Residual Hearing

- A little hearing can be helpful.

- Experiment of Rosen et al. (1981)

nonsense syllables with varying medial consonants (/apa/, /ama/, /ada/, /asa/). a laryngograph placed on throat (reflect VF vibration), the output used to develop an auditory signal that reflected the changes in the talker's voice pitch.

when subject (with normal H) saw but did not hear —> identified 44% of the cons. correctly, but when saw the talker speak and heard the changes in fundamental frequency, their performance improved to 72% cons. correct.

- Many people with profound HL are dependent on hearing aids. Even though they receive minimal auditory info., their ability to speechread is enhanced greatly by the amplified signal.

Factors That Affect The Speechreading Process
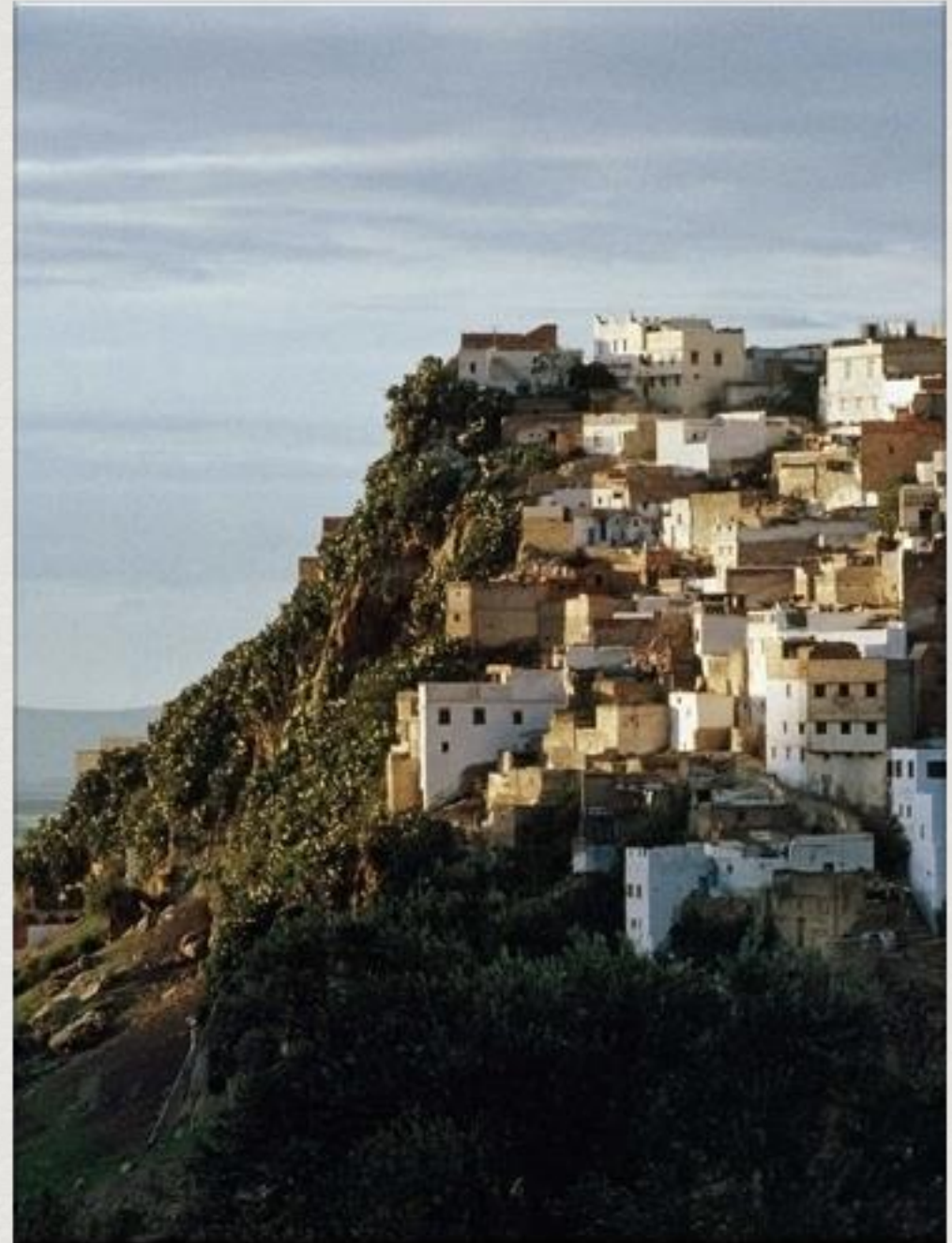
The Talker

- Talker can increase or decrease the *speechreading* task <u>difficulty</u>.

- *Behaviors*, *familiarity*, and *gender*

- Such **behaviors** make a talker difficult to speechread:

- Shouting
- Mumbling
- Turning away
- Speaking rapidly
- Covering the mouth
- Smiling while talking
- Chews gum
- Wears dark glasses

- **Familiarity** effect on speechreading

- Someone who is familiar (family member) vs. someone who is unfamiliar (stranger) why? *accustomed* to mouth movement and speech pattern

- Thin lips are easier to speechread than thick

- Immobile lips are harder to speechread

- Foreign accent increases difficulty.

- Talker **gender** influence the difficulty of the task.

- Females are lipread easier than males

- Female speech is easier to recognize when presented (in a vision-only condition).

- Female speech is not necessarily easier to recognize when presented (in an audition-plus-vision condition)? higher F0 for females **vs** lower F0 for males.

- For male talker's consider facial hair (mustache, beard)

The Message

- The message presented by talker including the structure and the component is affecting the recognition.

- **Structure**: depending on: length, syntactic complexity, frequency of use, similarity to other words, and linguistic context.

- **Frequency of use** is a measure indicating how often a particular word occurs during everyday conversation.

- **Neighborhood**: Lexically easy-to-recognize words have few *lexical neighbors* vs. Lexically difficult-to-recognize words have many *lexical neighbors*

 * *Lexical neighbors* are words that are phonemically (or visually) similar.

- **Context**: words that are specified by context are easier to recognized.

e.g., words in contexts make more sense and grammatical sentence structure helps too.

The Environment and Communication Situation

- **Viewing angle** (full-face vs. in profile/turned at an angle)

- In a group setting, the speechreader must locate the talker first.

- **Distance** from the talker (especially, how far to view the talker's mouth movement?) "e.g., front raw in the class with favourable seating vs the second raw"

- 3-6 feet is a good distance for speechreading.

Room condition

- A poorly lit talker with a shadow on the face due to standing in front of a light source.

- Who stands before a bright window with no overhead light.

- Light shining in the eyes of the speechreader

- Room reverberation

- Assistive devices availability

- Interfering objects (support beam)

- Visual distractions

- Room noise

- **Background noise** affect <u>listening</u> as well as <u>speechreading</u>.

- noisy environment —> can mask speech —> decrease **speechreading** enhancement effect afforded by residual hearing **+** distract the speechreader from the speech recognition task.

- Visible movement or looking through a window can be distracting.

The Speechreader

- The better the lipreading skills + the greater amount of residual hearing —-> the <u>better</u> the speechreading.

- The nature of the HL affect performance

- CHL vs. SNHL (poorer S discrimination —> poorer SR)

- The use of appropriate amplification + use of eye glasses (cataracts)

- **Emotional and physical stress**

- Level of stress, fatigue, and attentiveness can affect performance.

Oral Interpreters

- An **oral interpreter** is someone who sits in clear view of a hard-of-hearing person and silently repeats a talker's message as it spoken (1-2 words)

- A talker's mood and and intent is conveyed too.

- Code of ethics is adhered:

- No interpreted information is shared
- No changing of meaning for the interpreted message
- No opinions or personal commentary is allowed to added.

- Could be used in: meetings, lectures, churches/ mosques, and courts of law

- Interpreter can alleviate comm. difficulty when speaking turns shift rapidly

(e.g., group situations) *<u>as speech and hearing professional could be asked to play this role</u>.