Mohamed Kheider University, Biskra/ Section of English

Lecture 4 Introduction to Psycholinguistics by Dr. Chelli

Level: Master one

Lecture Objectives: Language comprehension: speech perception & Word recognition

This lecture helps students to understand the processes involved in speech perception and word recognition

Introduction

Spoken communication is considered as the most important activity that distinguishes humans from animal species. It occurs through the use of sounds while humans' communication is a complex process during which a wide range of ideas, thoughts and emotions are conveyed. Thus, this complex process was the interest of researchers in order to understand how language is perceived. This gave rise to numerous studies about language perception and word recognition.

1. Speech perception and Word recognition

On the one hand, the process involved in understanding speech seems something automatic and easy; however, this requires healthy mental abilities. A lot of scholars contributed to the explanation of this complex process, for example, according to Pardos & Perez (2006, p.201), ' The fundamentals of speech perception surely lie in **psychoacoustics**, an essential reduction of speech perception to sensory resolution and auditory categorization. Treiman et al.(2003, p.6) gave a more detailed definition in which they added that listeners attempt to map the **acoustic signals** onto **a representation in the mental lexicon** beginning as the signal starts to arrive.

On the other hand, word recognition refers to a process of perceptual categorisation whereby input is matched to a known word form in memory' (williams, 2001, p.3). According to Harley (2005), 'speech perception is about how we identify or perceive the sounds of language while word recognition is about a higher level process of recognizing the sounds that make up the words'.

1.1. Speech perception

Research on the perception of speech started during the 1950 focusing on phonetic perception and the nature of the mechanisms to identify and extract individual phonemes from speech signals. Although these continue to be important, the primary focus shifted to understanding how speech capacities are used in segmenting and recognizing words in fluent speech (Jusczyk &Luce, 2001). In order to explain the process involved in speech perception, a number of theories were suggested by researchers in the field.

1.1.1 Theories of speech perception

Theories of speech perception differ with respect to their views of what is perceived and how they are as mentioned below:

The auditory theory : According to it, listeners identify acoustic features matching them to stored acoustic representation.

The active theory : Active theories of speech perception emphasise the role of low-level knowledge in the analysis of speech sign, i.e., articulatory knowledge, knowledge of the vocal tract outputs, and knowledge of the phonetic context. In other words, the hearer acts not only when he produces a linguistic signal, but also when he receives it' (Lobacs, 1984, cited in Handke, 1995). The central assumption of active theories is that the process of speech perception involves some sort of speech production. The reference to speech production can be of a psychological kind, where the listener constantly refers to his articulatory knowlege, or it can be an auditory of any kind where the listener makes use of an auditory model of his own speech production (Handke, 1995).

The motor theory : Liberman et al.(1967, cited in Stazenko, Garcek and Mahon) argued that humans' perception of speech is based on articulatory gestures that are shared by both the speaker and listener and that a listener perceives speech when his or her actual articulatory representations are activated by the speaker's utterances**.**

The top-down theory versus the bottom-up theory: The terms 'bottow-up' and 'top-down' are derived from computer science, where they refer respectively to processes that are data-driven from computer and processes that are knowledge driven (field, 2001, p.40).

Top-down processing suggests that we form our perception starting with a larger object, concept or idea before moving to the details. In other words, we move from the general to specific. It is used to refer to theories of reading and listening which hold that contextual information plays a more important part than perceptual information (field, 2004, p.307).

Bottow-up processing is an approach to the processing of spoken or written language. According to it smaller units of analysis are built into progressively larger ones (field, 2004, p.307). Bottom-up information is processed from the signal assembled into units of ever-increasing size. In listening, the lowest level (i.e., the smallest unit) is the phonetic features. The listeners task might be portrayed as combining groups of features into phonemes, phonemes into syllables, syllables into words, words into clauses and clauses into propositions. At the top, the global meaning of the utterance, into which new information is integrated as it emerges (field, 2001, pp. 40-41).

However, there are conflicting views. Some commentators claim that top-down information is only used for checking bottom-up. Some argue for bottom-up priority, with contextual evidence only invoked once sufficient bottom-up evidence has become available. Other commentators favor a fully interactive model of listening and reading, contending that both sources of evidence are available throughout. They argue that it is more efficient to have all the information available at one time (Field, 2004, p. 307).

Assignment 1: explain bottom-up and top-down processes in reading.

2. Word recognition

Successful communication depends on word recognition. Since word recognition is at the heart of language comprehension process, it has always been a central topic in psycholinguistics (Gaskell, 2007, p. 37).

2.1. Spoken word recognition

There are, broadly speaking, two classes of information that are extracted from the signal and used in lexical access: **Segment information** (i.e. that which distinguishes among speech sounds) and supra-segment information (i.e. that which specifies the prosodic characteristics of words) (Gaskell, 2007, p. 38).

1. Segment information, this pre-lexical level, acts as the interface between auditory and lexical processing. Segmental information specifies which sounds are in an utterance, and hence must be the primary determinant of successful word recognition. Many experiments on this issue have focused on a

more specific aspect of segmental processing: the effect of mismatch between the input and stored lexical knowledge.

2. Supra-segment information specifies the position of segments in the prosodic hierarchy is also used in word recognition. This type of information includes word-internal properties (the syllabification of segments within the words), and also properties referring to increasingly larger domains- the prosodic word, the phonological phrase and the intonational phrase(Gaskell, 2007, p. 40).

2.2. Printed word recognition

Several word cognition models have been suggested by previous studies to show how the process of recognizing printed words occurs. 'What all models have in common is the recognition that reading involves the processing of orthographic, phonological, semantic, and morphological information' (Frost, 2005, p.272.

2.2.1. Models of skilled reading

Two major theories should be considered in the context of modelling skilled reading (Frost, 2005, p.275): the **dual-route theory** and the **single-route** strong phonological theory.

According to the dual-route theory, reading aloud can be either through the lexical route or the non-lexical route as show in the diagram below:

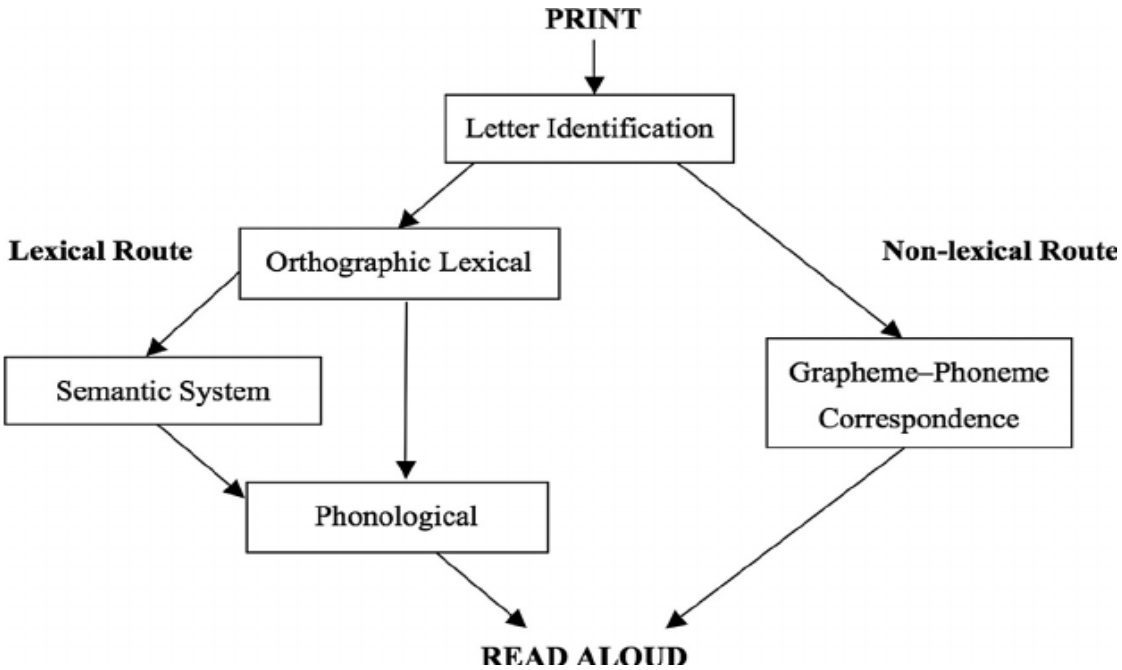

Figure 1: the dual- route cascaded (DCR) model of reading (Clotheart, 2001)

Reading via the lexical route involves looking up a word in a mental lexicon containing knowledge about its spellings and pronunciations of letter strings that are real words (and so are present in the lexicon) (Coltheart, 2005, p.9). The non lexical route makes no reference to this lexicon, but instead involves making use of rules relating segments of orthography to segments of phonology (Coltheart, 2005, p.9). Colheart (1978, cited in Coltheart, 2005, p.9) used the term grapheme to refer to any letter or letter sequence that represents a single phoneme, so that 'th' and igh are two graphemes of the two phonemes of the two phoneme word thigh.

Example of the lexical route: The visual feature of the printed word **'shelf'** are recognised a familiar word which activates the orthographic representation of shelf in the orthograpic lexicon, in turn activates the

word's name in the phonological lexicon before activating the word's meaning in the semantic lexicon. The sub-lexical phonological representation (speech sounds /sh/; /e/, /l/ , /f/ are then activated and produced as the spoken word shelf (how do children learn and what goes wrong with some children).

According to the **single-route phonological theory,** the reading of a single word involves a mechanism which maps the orthographic input onto a sub-lexical phonological code via which the lexicon is accessed.

The dual-route theory has generated various models in the last three decades, which differ in their architectural assumptions. One of the most important is **the dual-route cascaded (DRC**) model of **Coltheart, 2000; Coltheart et al., 2001** who implemented the two routes in a model of reading with the lexical route comprising a stored lexicon containing phonological information for all the words known to the hearer, and the second sub-lexical routes which applies graphemes-phoneme correspondence rules to convert serially the orthographic input into phonemes. Though the two routes operate simultaneously and in parallel, for word reading, the lexical route is configured to process written input faster than the sub-lexical route.

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- *How do chidren learn to read and what goes wrong for some children. www.understandingminds.com.au/blog/dyslexia-gold-coast-3*

Further reading*: Seva, N. (2009). Stressing what is important: Orthographic cues and lexical stress assignment. In Journal of Neurolinguistics, vol 22, 3, 237-249*