

Cambridge Introductions to Language and Linguistics

comprehension

brain

sentence

processing

Introducing

Psycholinguistics

Paul Warren

representation

word

production

Contents

Introducing Psycholinguistics

PAUL WARREN

Victoria University of Wellington



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Preface

This book introduces key issues in the production and comprehension of spoken and written language. Its focus is on how adult native speakers carry out the everyday but complex tasks involved in generating an utterance from an idea or in deriving a meaning from a sentence.

Using data from observation, from experiments, and more recently from brain imaging, the field of psycholinguistics has contributed significantly to our understanding of the uniquely human ability to communicate through language. *Introducing Psycholinguistics* summarises key findings from the field, such as the fascinating study of spontaneous speech errors and misperceptions, and carefully controlled experimental investigations of the details of how we produce and understand language.

Introducing Psycholinguistics is written by a linguist primarily for students of linguistics. The book therefore assumes no prior familiarity with psychology. Although readers would find a basic understanding of linguistic concepts helpful, explanations of key linguistic terminology are provided. As a consequence, this text is also a useful introduction for students of psychology with an interest in language processing.

The book is arranged in two main clusters of chapters. Chapters 2 to 5 cover aspects of language production, starting with the speaker's (or writer's) intention, moving through the stages of sentence planning and word selection to the construction of words. The final chapter in this first cluster considers the monitoring and repair that speakers carry out of their own speech output. Chapters 7 to 12 deal with language perception and comprehension, starting with the perceptual skills relevant for language processing, before looking at word recognition, syntactic and other aspects of sentence analysis, as well as discourse processing. A bridge

between these two clusters of chapters is provided by Chapter 6, which discusses how the study of gesture can inform us about both production and comprehension. Chapter 13 brings together issues from earlier chapters, linking the study of the production and comprehension of spoken and written language in a discussion of how it all fits together.

The structure of the book allows some flexibility in how it can be used in the teaching of psycholinguistics. That is, in addition to the existing sequencing of chapters, the book could be used to support a course that starts by looking at issues in language perception and comprehension (using Chapters 7 to 12), before considering language production (Chapters 2 to 5). The choice of ordering may hinge on other aspects of a course, such as assessment, and on what material needs to be covered before assignment topics can be tackled.

Note that this book does not give extensive coverage to (first or second) language acquisition or to language breakdown. Instead, it focuses on normal adult language processing. What we know about normal language processing is of course informed by our knowledge of how infants become adult users of language and also by what we understand of impaired language use. But these are vast subject areas in their own right.

The chapters have a common structure. Each chapter opens with a preview summarising what the reader should expect to learn. This is followed by a list of key terms that will be introduced in the chapter. These and further key terms are also highlighted in bold blue text when they first occur. The most important key terms are explained in the glossary at the end of this book, and all key terms are explained in the fuller glossary on the accompanying website. The main text for each chapter consists of a short introduction and a

number of sections covering the subject matter of the chapter. A short summary then reviews the main points, and is followed by a set of exercises to reinforce the reader's learning, as well as a section indicating where to look for relevant further reading.

The chapters include many illustrative examples and figures, as well as sidebars that convey more detail than is in the main text. Sidebars with blue shading introduce technical terms or matters of notation, while those shaded in grey provide additional background information of interest.

The online glossary on the website for *Introducing Psycholinguistics* (www.cambridge.org/paulwarren) provides definitions and examples for the key terms, and also includes functions that allow users to test their own understanding of the entries. The website also includes audio and video files illustrating ideas introduced in the text, solutions to some of the

exercises, and examples of some of the main experimental techniques used in psycholinguistics, as well as links to other useful resources. When the following symbols appear in the margin they indicate that at the time of publication links were available on the website to resources relevant to the material under discussion. Other resources will be added over time.



General web resource



Sound file



Video or image file



Demonstration



Solutions to problems

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1 Introduction

PREVIEW

KEY TERMS

mental lexicon

process

psycholinguistics

representation

This chapter provides an overview both of the field of psycholinguistics and of the book itself. By the end of the chapter you should have a better understanding of, amongst other things, the appeal, significance and subject matter of psycholinguistics.

1.1 Introduction

Although there is little agreement on how many words an adult native speaker of English might know, let us take a conservative estimate of 20,000 (based on Nation, 2006, but see Section 8.2), and let us also assume that *splundle* is not one of them. Imagine such a native speaker searching through their 20,000-word mental lexicon, as we call the dictionary in our heads. Let's assume that they do so at a seemingly impressive rate of 100 words per second (which incidentally is 20 times faster than a good reading pace of 300 words per minute). At this rate, if they searched exhaustively through their mental lexicon, it would still take over 3 minutes to confirm that *splundle* is not there. Yet if you ask someone if they know the word *splundle*, they will be able to tell you more or less instantly that they do not. Clearly something is wrong with the assumptions we have just made about how rapidly we can look up words in our mental lexicon, or about the way in which we search through it, or both.

Ask someone to tell you what they had for breakfast, and then ask them to explain the workings of their coffee machine, and you are likely to find that their speech is much more hesitant in the second task than in the first, with more errors and restarts as well as pauses and *uhms* and *ahs*. The differences here reveal something about the nature of planning involved in different speaking tasks. The locations of the hesitations might also tell you which kinds of words and/or sentence structures the speaker finds more difficult to find or to put together.

Have a conversation with someone while they are carrying out a difficult task like driving a car, and you will find that both their language production and their language comprehension is less fluent than at other times (Becic *et al.*, 2010).

If you listen out for speech errors, or slips of the tongue, you are much more likely to hear an error where the beginning sounds of two words have been swapped over, as in 'tip of the slongue', than one where the beginning of one word and the end of another have been exchanged, as in 'slit of the pongue'.

When you see a sign like that in Figure 1.1, or one that says 'Please go slowly round the bend', you might well chuckle, but your experience of misreading the sign shows that there are certain preferred patterns of analysing the structure and meaning of sentences in English.

Consider what is wrong with the following interaction between speakers A and B, in which <SILENCE> indicates noticeably long periods of silence, and CAPITALS indicates the part of the word that receives word stress:

- A. Could you tell me the time of the next train to Palmerston North and how much a single fare costs?
 B. <SILENCE>
 A. Hello?
 B. <SILENCE> Invisible tables sleeeeeeep violently



Figure 1.1
Thank goodness our
young ones are not
breaking the speed limit.

- A. When does the next train go to Palmerston North and what is a single ticket?
- B. <SILENCE> PALMERston North trains from platform 3 leave. A single ticket licences a one-way journey.

There are of course a number of odd features here – there is meaningless and irrelevant content, there are long silences with odd patterns of pausing, there are infelicities of vocabulary and structure ('A single ticket licences a one-way journey', 'Palmerston North trains from platform 3 leave'), there is strange stress placement ('PALMERston') and another odd pronunciation ('sleeeeeeep'). Looking at 'odd' speech like this (the example is fabricated but the principle remains valid) sheds some light on what we need to do in order to speak. That is, speakers usually aim to produce utterances that have appropriate meaningful content, that use appropriate lexical items and grammatical structures, and that have appropriate pronunciation, intonation and phrasing. Speakers aim to do this fluently and in real time, and rarely have opportunity to rehearse. They also have to relate what they say to the context, including to previous speech in a conversation.

Speakers are generally very good at doing this. For example, one experiment was explicitly designed to elicit subject-verb agreement errors like (1.1), where the subject is plural (*efforts*) but is followed by a singular verb (*is*). The reason for the error is that the most recent noun before the verb is singular (*language*). In the experiment, fewer than 5% of the stimuli designed to produce agreement errors like this actually did so (Bock & Miller, 1991).

- (1.1) Efforts to make English the official language is gaining strength throughout the US.

In spontaneous speech, it has been found that sound errors (e.g. saying 'par cark' for 'car park') occur only about 1.5 times per 10,000 words, and word errors (where the wrong word is chosen or words change positions in a sentence) occur only about 2.5 times per 10,000 words (Deese, 1984). Clearly we are generally pretty good at what we do when we produce and understand language.

1.2 What is psycholinguistics?

The rather disparate observations in the preceding section illustrate just a few of the areas of interest in psycholinguistics. Psycholinguistics can be defined as the study of the mental representations and processes involved in language use, including the production, comprehension and storage of spoken and written language. A number of issues arise from this definition. Some are to do with *representations*, such as:

- How are words stored in the mental lexicon, i.e. the dictionary in our heads? Is the mental lexicon like a dictionary, or more like a thesaurus? For instance, is *cat* listed near the similar sounding word *catch* or near the meaning-related word *dog*? Or neither? Or both?
- Do we have phoneme-sized chunks of language in our heads? That is, as part of recognising the word *cat* do we also recognise the component sounds /k/, /æ/ and /t/?
- Do literate people have letter-sized chunks filling equivalent roles for the processing of written language?
- How is the meaning of a sentence represented in our memory?
- Is *government* a single word or *govern* + *ment*?
- Is the plural form *cats* represented in the lexicon, or just the singular *cat*?

Other questions concern the *processes* that might operate on those representations:

- How do we recognise words so effortlessly?
- Do we analyse the speech signal phoneme-by-phoneme or do we identify complete syllables or even larger units?
- Do we recognise *government* as a complete form or do we have to construct it from *govern* + *ment*?
- If *cats* is not represented in the lexicon, does that mean that we use a rule to get the plural form of *cat*, and how does this work for irregular plurals like *children*?
- When we speak, how do we convert an idea into an utterance?
- As listeners, how do we get from hearing an utterance to developing our own representation of the idea(s) being expressed by that utterance?
- What stages do we have to go through during the construction of utterances? For example, do we first generate a sentence structure and only then populate it with words from our mental lexicon, or do we first choose words and then build a structure around those words?
- Do the processes involved in language production and comprehension influence one another, and if so in what ways?

The outline sketch of language use in Figure 1.2 gives an overview of areas of interest in psycholinguistics as well as providing the basic structure of this book, which has chapters on language production (roughly following the progression shown in the second column) and on comprehension

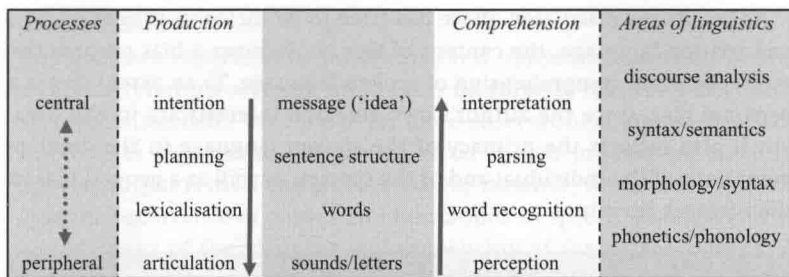


Figure 1.2
An outline sketch of
language use.

(fourth column). Psycholinguistics clearly has links to other areas of linguistic study, and some of these are shown in the final column.

From the language producer's (speaker's, writer's) perspective, the production of a message takes us from an underlying intention, through stages of planning sentence structures and selecting words, to the articulation of that intention as a sequence of sounds or letters, as shown by the arrow.

From the comprehender's (listener's, reader's) viewpoint, the goal is to perceive or recognise elements such as letters and sounds in the input, to recognise words and to work out the connections between these words in sentence structures, in order to arrive at a message-level interpretation. The arrow in the 'comprehension' column shows such a 'bottom-up' flow of information from the input to an interpretation. This is a simplification, though, as there is evidence for 'top-down' information flow too, e.g. when a listener starts to gain an understanding of the sentence they are hearing this can influence the efficiency with which they recognise subsequent words in the sentence. Most psycholinguists today support the idea of interactive processing in both production and comprehension, with information flowing in both directions (bottom-up and top-down) as well as between elements at the same level (so recognising one word has an effect on the likelihood of recognising similar words).

It is reasonable to claim that the main focal areas of psycholinguistics have tended to be *sentences* and *words*. So production studies have focused on the generation of sentence structure and on syntactic planning, as well as on word finding and word building. Similarly, much of the study of comprehension has dealt with word recognition and sentence parsing (working out the syntactic structure of sentences). The study of these processes has in turn involved consideration of the representation of words and of grammar.

In effect there are many more 'fields' than this, dealing with many subprocesses, such as the perception of letters and of speech sounds, the processing of different kinds of word endings, and so on. In addition, these fields are not always clearly distinct, neither in terms of research nor in terms of the ways in which the processor operates. For instance does our choice of words influence our choice of sentence structure, does sentence-level interpretation influence phonetic perception, does the spoken form of a word affect our silent reading of it, and so on?

Bottom-up:
processing based
on information
flow from lower
levels of
processing to
higher levels, e.g.
from the sensory
input (the speech
signal) to the
lexicon (words).

Top-down:
processing guided
by information
flow from higher
levels (e.g.
sentence
interpretation) to
lower levels (e.g.
words).

Interactive:
processing that
involves a
combination of
bottom-up and
top-down flow of
information, as
well as links
between elements
at the same level.