Introducing Psycholinguistics

How humans produce and understand language is clearly introduced in this textbook for students with only a basic knowledge of linguistics. With a logical, flexible structure *Introducing Psycholinguistics* steps through the central topics of production and comprehension of language and the interaction between them.

- Students will gain an understanding of the processes and representations involved in language use, aided by a comprehensive glossary, concepts defined in the margins and online flashcards that allow students to check their understanding of all the key terms and concepts of the subject.

- Examples and exercises throughout each topic reinforce understanding and encourage students to consider what language users might carry around in their heads as part of their linguistic knowledge, and how this stored knowledge relates to the structures and rules proposed by theoretical linguistics.

- Students will gain hands-on experience of experimental methods, with online demonstrations of techniques. This supports the theory within the book, reinforces a student’s grasp of the concepts and allows the student to apply their understanding to the analysis of data.

**Paul Warren** is an Associate Professor in the School of Linguistics and Applied Language Studies at Victoria University of Wellington.
Cambridge Introductions to Language and Linguistics

This new textbook series provides students and their teachers with accessible introductions to the major subjects encountered within the study of language and linguistics. Assuming no prior knowledge of the subject, each book is written and designed for ease of use in the classroom or seminar, and is ideal for adoption on a modular course as the core recommended textbook. Each book offers the ideal introductory material for each subject, presenting students with an overview of the main topics encountered in their course, and features a glossary of useful terms, chapter previews and summaries, suggestions for further reading, and helpful exercises. Each book is accompanied by a supporting website.

Books published in the series
- Introducing Phonology David Odden
- Introducing Speech and Language Processing John Coleman
- Introducing Phonetic Science Michael Ashby and John Maidment
- Introducing Second Language Acquisition Muriel Saville-Troike
- Introducing English Linguistics Charles F. Meyer
- Introducing Morphology Rochelle Lieber
- Introducing Semantics Nick Riemer

Forthcoming:
- Introducing Language Typology Edith Moravcsik
Introducing Psycholinguistics

PAUL WARREN
Victoria University of Wellington
# Contents

| Figures | ix |
| Tables | xi |
| Preface | xiii |

## 1 Introduction
1.1 Introduction 2
1.2 What is psycholinguistics? 4
1.3 Who does psycholinguistics? 6
1.4 How do psycholinguists do psycholinguistics? 6
  Summary 10
  Exercises 11
  Further reading 12

## 2 Planning utterances
2.1 Introduction 14
2.2 A sketch of the production process 15
2.3 Conceptualisation and planning 17
2.4 Cycles of planning 20
2.5 Formulation 23
2.6 Sentence complexity 27
2.7 Syntax and speech 29
  Summary 34
  Exercises 34
  Further reading 35

## 3 Finding words
3.1 Introduction 38
3.2 Pausing and predictability 40
3.3 Speech errors and lexical selection 41
3.4 Getting the order wrong 48
3.5 Association norms 49
  Summary 50
  Exercises 51
  Further reading 52

## 4 Building words
4.1 Introduction 54
4.2 Tip-of-the-tongue 55
4.3 Speech errors and morphological structure 56
4.4 Speech errors and phonological encoding 62
4.5 Tongue twisters 67
  Summary 68
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>5.1 Introduction</td>
<td>72</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>5.2 Self-monitoring</td>
<td>72</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>5.3 Induced errors</td>
<td>73</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>5.4 Repair</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>5.5 Editor theories</td>
<td>79</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>5.6 Speakers helping listeners</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>Summary</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>Exercises</td>
<td>82</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and repair</td>
<td>Further reading</td>
<td>83</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>6.1 Introduction</td>
<td>86</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>6.2 Gestures as content</td>
<td>86</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>6.3 Gesturing for discourse management</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>6.4 Gestures for emphasis</td>
<td>91</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>6.5 Gestures, conceptualisation and lexicalisation</td>
<td>92</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>6.6 Who do we gesture for?</td>
<td>94</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>Summary</td>
<td>96</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>Exercises</td>
<td>96</td>
</tr>
<tr>
<td>6</td>
<td>The use of gesture</td>
<td>Further reading</td>
<td>97</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>7.1 Introduction</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>7.2 Basic issues in perception for language</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>7.3 Basic issues in speech perception</td>
<td>105</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>7.4 Basic issues in visual perception for language</td>
<td>109</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>7.5 Influence of the linguistic system on perception</td>
<td>113</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>Summary</td>
<td>115</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>Exercises</td>
<td>116</td>
</tr>
<tr>
<td>7</td>
<td>Perception for language</td>
<td>Further reading</td>
<td>117</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.1 Introduction</td>
<td>120</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.2 What are words?</td>
<td>120</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.3 Pre-lexical analysis</td>
<td>121</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.4 Contact and activation</td>
<td>126</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.5 Selection</td>
<td>128</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.6 Lexical access</td>
<td>130</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.7 Recognition and context effects</td>
<td>130</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.8 Frequency, competition and neighbourhoods</td>
<td>132</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>8.9 Recognising morphologically complex forms</td>
<td>135</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>Summary</td>
<td>137</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>Exercises</td>
<td>138</td>
</tr>
<tr>
<td>8</td>
<td>Spoken word recognition</td>
<td>Further reading</td>
<td>138</td>
</tr>
</tbody>
</table>
9 Visual word recognition
  9.1 Introduction 140
  9.2 Factors affecting visual word recognition 140
  9.3 Models of visual word recognition 144
  9.4 Routes to read by 147
  9.5 Dyslexia 152
    Summary 155
    Exercises 156
    Further reading 156

10 Syntactic sentence processing
  10.1 Introduction 158
  10.2 Complexity and sentence processing 158
  10.3 The clausal hypothesis 160
  10.4 Explicit syntactic markers 163
  10.5 Strategies for syntactic processing 164
  10.6 Garden paths and the sausage machine 165
  10.7 Syntactic category ambiguity 170
  10.8 Cross-linguistic evidence for processing strategies 171
    Summary 174
    Exercises 174
    Further reading 175

11 Interpreting sentences
  11.1 Introduction 178
  11.2 Meaning and sentence processing 178
  11.3 Syntax first 180
  11.4 Presuppositions, plausibility and parsing 182
  11.5 Lexical preferences 184
  11.6 Prosody and parsing 189
  11.7 Constraint-based accounts 192
  11.8 Hybrid accounts 194
  11.9 Good-enough processing 195
    Summary 196
    Exercises 197
    Further reading 198

12 Making connections
  12.1 Introduction 200
  12.2 Mental model building 200
  12.3 Inferences 202
  12.4 Anaphora 203
  12.5 Given and new 206
  12.6 Fillers and gaps 208
    Summary 214
    Exercises 215
    Further reading 216
CONTENTS

13 Architecture of the language processing system 217
  13.1 Introduction 218
  13.2 Modularity within language processing 218
  13.3 The relationship of production and comprehension 223
  13.4 The relationship of visual and spoken language 226
  13.5 Language and other processing systems 228
  13.6 Language and the brain 231
    Summary 233
    Exercises 233
    Further reading 234

Glossary 235
References 255
Index 269
Figures

Figure 1.1  Thank goodness our young ones are not breaking the speed limit.
Figure 1.2  An outline sketch of language use.
Figure 1.3  Schematic representation of differences in brain activity during different tasks.
Figure 2.1  Processes and knowledge types involved in language production.
Figure 2.2  Left hemisphere brain areas involved in syntactic encoding and conceptual planning.
Figure 2.3  The cat hunted the mouse.
Figure 2.4  Speech waveform and text annotation of ‘… space and …’
Figure 2.5  Example of hesitant and fluent phases of speech.
Figure 2.6  The components of the formulation process.
Figure 3.1  A two-stage model of lexicalisation.
Figure 3.2  Left hemisphere brain areas involved in aspects of word production.
Figure 3.3  Activation flow to an associate lemma in substitution errors.
Figure 3.4  Activation flow to a phonetically similar form in malapropisms.
Figure 4.1  A wug, as used in the wug test. Reproduced with the kind permission of Jean Berko Gleason.
Figure 5.1  An example of a node network as used in experiments collecting repair data.
Figure 5.2  The anatomy of a repair.
Figure 5.3  Spectrogram for the utterance Pete is keen to lead the team.
Figure 7.2  Spectrogram for the utterance Pete is keen to lead the team.
Figure 7.3  Four /i/ sounds from the utterance in Figure 7.2.
Figure 7.4  Compensation for coarticulation.
Figure 7.5  Eye movements during silent reading.
Figure 7.6  Smooth and categorical response functions.
Figure 8.1  Changing activation levels of word entries as more of a word is heard.
Figure 8.2  Modification of Figure 8.1 to account for frequency differences between words.
Figure 9.1  Representation of logogens as containers.
Figure 9.2  Forster’s bin or search model of word recognition.
Figure 9.3  Partial sketch of an Interactive Activation model of word recognition.
Figure 9.4  The grapheme–phoneme route in reading.
Figure 9.5  Lexical access through whole-word pronunciation.
Figure 9.6  A dual-route model of reading.
Figures

Figure 9.7  Whole form vs letter-by-letter word identification.
Figure 9.8  A sketch of reading aloud, based on dual-route models.
Figure 13.1  Two possible views of the relationship between the production and comprehension of spoken words.
Figure 13.2  A model of three repetition routes for getting from spoken input to spoken output.
Figure 13.3  Possible architecture of the lexical system for both spoken and visual input and output processing.
Figure 13.4  Single referent condition.
Figure 13.5  Double referent condition.
Figure 13.6  Timing of activation of left hemisphere brain areas during word production.
Figure 13.7  Two configurations of four objects.
Tables

Table 1.1 Approximate timing of components involved in picture naming.
Table 3.1 Types of word errors.
Table 3.2 Most popular association responses to a selection of target words.
Table 3.3 Association responses given to two target words.
Table 4.1 Types of sound errors.
Table 5.1 Examples of different kinds of editing expressions and their suggested functions.
Table 6.1 Examples of symbolic gestures.
Table 8.1 Consonant and vowel phonemes of New Zealand English.
Table 9.1 Some word types based on regularity and consistency of the relationship of spelling and pronunciation of the word body.
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