The Psycholinguistics of Bilingualism

François Grosjean and Ping Li
The Psycholinguistics of Bilingualism
The Psycholinguistics of Bilingualism

François Grosjean and Ping Li
Primary Authors

With contributions from

Ellen Bialystok and Raluca Barac
Annette M.B. de Groot
Rosa M. Manchón
Virginia Yip
Contents

Author Biographies vii

Introduction 1

1 Bilingualism: A Short Introduction 5
François Grosjean
1.1 The Extent of Bilingualism 6
1.2 Describing Bilinguals 7
1.3 The Functions of Languages 11
1.4 Language Mode 14
1.5 Interacting with Bilinguals and Monolinguals 17
1.6 Biculturalism 21

I SPOKEN LANGUAGE PROCESSING 27

2 Speech Perception and Comprehension 29
François Grosjean
2.1 From the Speech Wave to the Mental Representation 30
2.2 Processing Monolingual Speech 33
2.3 Processing Bilingual Speech 39

3 Speech Production 50
François Grosjean
3.1 From Thought to Articulation 51
3.2 Producing Monolingual Speech 52
3.3 Language Production in Bilinguals Is a Dynamic Process 54
3.4 Producing Bilingual Speech 59

II WRITTEN LANGUAGE PROCESSING 71

4 Reading 73
Annette M.B. de Groot
4.1 An Outline of the Reading Process 74
4.2 Word Recognition in Bilinguals 76
4.3 Models of Bilingual Visual Word Recognition 87
4.4 Sentence Processing in Bilinguals 91
Contents

5 Writing  100
Rosa M. Manchón
5.1 The Psycholinguistics of Bilingual Writing: Mapping the Terrain 102
5.2 Bilingual Text Production Activity: Processes and Strategies 105
5.3 The Transfer of Knowledge and Skills in Bilingual Writing 111

III LANGUAGE ACQUISITION  117
6 Simultaneous Language Acquisition  119
Virginia Yip
6.1 Theoretical Issues 121
6.2 Methodological Issues 124
6.3 Early Developmental Stages and Language Differentiation 129
6.4 Cross-linguistic Influence 130
6.5 Code-mixing 133
6.6 Extensions and Applications 137

7 Successive Language Acquisition  145
Ping Li
7.1 Age Effects in Second Language Acquisition 146
7.2 Speech Learning in Successive Language Acquisition 151
7.3 Dynamic Interaction between First Language and Second Language 155

IV COGNITION AND THE BILINGUAL BRAIN  169
8 Bilingual Memory  171
Annette M.B. de Groot
8.1 The Organization of the Bilingual Mental Lexicon 172
8.2 Bilingual Concepts 181
8.3 Bilingual Autobiographical Memory 186

9 Cognitive Effects  192
Ellen Bialystok and Raluca Barac
9.1 Language and Metalinguistic Abilities 193
9.2 Acquisition of Literacy 198
9.3 Developing Executive Control 202
9.4 Advantages of Bilingualism across the Lifespan 206

10 Neurolinguistic and Neurocomputational Models  214
Ping Li
10.1 Neurolinguistic Traditions and Debates 215
10.2 The Cognitive Neuroscience of Bilingualism 220
10.3 Neurolinguistic Computational Modeling 228

Index  239
Primary authors

François Grosjean is Professor Emeritus of Psycholinguistics at Neuchâtel University, Switzerland. His many publications on bilingualism include three books: *Life with Two Languages: An Introduction to Bilingualism* (1982), *Studying Bilinguals* (2008), and *Bilingual: Life and Reality* (2010). The latter was selected as a Choice Outstanding Academic Title. He is a Founding Editor of the journal *Bilingualism: Language and Cognition* and was its first Coordinating Editor.

Ping Li is Professor of Psychology, Linguistics, and Information Sciences and Technology at Pennsylvania State University. His books include *The Handbook of East Asian Psycholinguistics* (Volumes 1–3; General Editor; 2006), and *The Acquisition of Lexical and Grammatical Aspect* (co-authored with Y. Shirai, 2000). He is Editor of the journal *Bilingualism: Language and Cognition*, and Associate Editor of *Frontiers in Language Sciences*.

Guest authors

Ellen Bialystok is Distinguished Research Professor at York University in Canada. She has published extensively on bilingualism and its cognitive effects across the lifespan. Her books include *Bilingualism in Development* (2001) and *Lifespan Cognition: Mechanisms of Change* (2006) (co-edited with Fergus I.M. Craik). She is a fellow of the Royal Society of Canada and her research has been recognized with numerous awards, including the 2010 Killam Prize in the Social Sciences. Raluca Barac, PhD, is a research manager at the Hospital for Sick Children in Toronto, Canada.

Annette de Groot is Professor of Experimental Psycholinguistics at the University of Amsterdam. She is the author of *Language and Cognition in Bilinguals and Multilinguals: An Introduction* (2011), and with Judith Kroll she edited *Tutorials in*
Rosa Manchón is Professor of Applied Linguistics at the University of Murcia, Spain. Her books include Writing in Foreign Language Contexts: Learning, Teaching, and Research (2007), Learning-to-Write and Writing-to-Learn in an Additional Language (2011), and L2 Writing Development: Multiple Perspectives (2012). Together with Chris Tardy, she edits the Journal of Second Language Writing.

Virginia Yip is Professor and Chairperson of Linguistics and Modern Languages as well as Director of the Childhood Bilingualism Research Centre at The Chinese University of Hong Kong. Her books include Interlanguage and Learnability (1995) and The Bilingual Child: Early Development and Language Contact (co-authored with Stephen Matthews, 2007), which received the Linguistic Society of America’s Leonard Bloomfield Book Award. She has also co-authored a series of books on Cantonese grammar.
Introduction

In the last 25 years, the field of bilingualism has grown tremendously, as can be seen by the presence of numerous introductory books on the topic, the publication of edited and more specialized monographs, the emergence of encyclopedias and new academic journals, not to mention numerous websites and blogs dedicated to the subject.

One of the most dynamic areas of bilingualism research involves the psycholinguistic study of both adults and children. Most books usually concentrate on particular domains such as language processing and representation in adult bilinguals, bilingual child language acquisition, the cognitive aspects of bilingualism, the bilingual brain, and so on. Few books cover all these domains at once. In addition, most are aimed at advanced students and specialists or at those who have a solid background in cognitive psychology, psycholinguistics or applied linguistics.

This book on the psycholinguistics of bilingualism is a general introduction to the field rather than a comprehensive survey. Among its different aims, the first is to present the most important aspects of the area in a clear, informative and pedagogical manner. To do so, the main authors have benefited from the collaboration of guest authors, who are experts in their own fields – Ellen Bialystok and Raluca Barac, Annette de Groot, Rosa Manchón and Virginia Yip. The second aim is to make the issues discussed accessible to non-specialists, most notably undergraduates and masters students with little previous exposure to the field of bilingualism and, sometimes, limited knowledge of psycholinguistics and cognitive psychology. The third aim is to give the various areas of the psycholinguistics of bilingualism equal weight, even though some are investigated more extensively by today’s researchers. For example, written language processing has received much more attention than spoken language processing in recent years even though bilingualism primarily involves spoken languages. The final aim is to introduce readers to the approaches and methodology used in the field, most
Introduction

notably observation, experimentation, verbal and computational modeling, as well as brain imaging.

The book begins with a short introductory chapter on bilingualism and bilinguals (Chapter 1). It presents a number of basic concepts and clarifies some misconceptions. Since bilingual participants in studies bring specific language knowledge and use to the research environment, it is important to understand these phenomena as reflected in the participants themselves so as to be able to make better sense of the data obtained.

The book is then organized into four parts. Part I concerns spoken language processing. Chapter 2 is dedicated to speech perception and comprehension and examines how bilinguals process just one language when no elements of the other language(s) are present. It then considers how bilinguals perceive and comprehend speech that contains code-switches and borrowings. Chapter 3 examines speech production and shows how it is a dynamic process, sometimes language selective and sometimes language independent. In addition it studies the time course of language switching, how it is constrained by syntactic considerations, and its impact on the phonetics of the utterance.

Part II is concerned with written language processing. It contains two chapters, one on reading and one on writing (this latter topic is relatively rare in the literature). Chapter 4, written by Annette de Groot, examines whether visual word recognition in bilinguals is restricted to the contextually appropriate language or whether the other language is also involved. Both experimental studies and models are called upon to provide an answer. It then discusses how bilingual readers resolve syntactic ambiguities and how they process semantic and syntactic anomalies. Chapter 5, authored by Rosa Manchón, considers the processing features of bilingual text production including the strategic role of the stronger language when the less dominant language is being written. It also investigates the interplay between writing expertise and linguistic ability, and discusses the transfer of writing knowledge and skills across languages.

Part III is dedicated to language acquisition in bilinguals. Chapter 6, written by Virginia Yip, deals with simultaneous language acquisition and discusses such issues as balanced vs. unbalanced development and whether the latter takes place separately for each language or not. It also examines language differentiation in the early stages of acquisition and looks into cross-linguistic influences, code-mixing, as well as trilingual acquisition and language development in children with language disorders. Chapter 7 is concerned with successive language acquisition. It provides a review of the contentious critical period hypothesis and the theoretical perspectives that accompany it. It then examines speech learning and the variables that may influence its success. It ends with an examination of how the two languages influence one another and suggests that even a native language is susceptible to change as proficiency and use increase in the other language.

The final part, Part IV, covers cognition and the bilingual brain. Chapter 8, authored by Annette de Groot, examines bilingual memory and presents various
models of the organization of lexical word forms and their conceptual represen-
tations in the bilingual mental lexicon. It then looks at whether, how, and why
L1 and L2 concepts differ from one another and from those of monolinguals. It
ends with a discussion of bilingual episodic/autobiographical memory and asks
whether one’s memory encodes the language used in a past event, and what this
implies for later retrieval. Chapter 9, written by Ellen Bialystok and Raluca Barac,
is dedicated to the cognitive effects of bilingualism. It begins by describing the
verbal abilities of bilingual children and adults in terms of vocabulary size, meta-
linguistic awareness and learning to read. It continues with an overview of the
nonverbal consequences of being bilingual, primarily changes in executive func-
tion abilities during childhood and adulthood, and what this means for the aging
brain. The last chapter of the book, Chapter 10, investigates neurolinguistic and
neurocomputational models that pertain to bilingualism. It offers an overview
of a number of neurolinguistic traditions and debates, and then examines the
cognitive neuroscience of bilingualism. This is accompanied by a brief guide to
relevant neuroimaging methodologies. The chapter ends by showing how neuro-
linguistic computational modeling complements behavioral and neuroimaging
studies.

A few additional points need to be made. First, all authors in their respective
chapters attempt to present the approaches and methodology used in their
domains by taking illustrative studies or models and describing them in some
detail. Thus readers will normally find an in-depth discussion of a few studies
instead of a comprehensive review of numerous studies. Second, even though
some references are made to monolinguals, in particular with regard to language
processes and representation as well as cognitive effects, the aim is not to compare
monolinguals and bilinguals. This is a delicate issue, especially for those who
espouse a holistic view of bilingualism whereby the bilingual person is not con-
sidered as two separate monolinguals. For the time being, we have decided to leave
this issue aside. Third, the book has been written with pedagogical considerations
in mind. Thus, for instance, each chapter ends with research questions and further
readings.

This book can be used for courses in psycholinguistics, linguistics, cognitive sci-
ences, speech and language pathology, bilingualism, applied linguistics, and first and
second language acquisition. It is ideal for upper level BA and BS courses, first-
and second-year graduate studies, as well as for lay persons who wish to find out
about the psycholinguistics of bilingualism.

We would like to end by thanking our guest authors who very kindly accepted to
take part in this book project and write chapters for the level of reader at which the
book is aimed. They have done a wonderful job in putting this into practice as well
as integrating their chapters into the book as a whole, and for this we are grateful
to them. Our thanks also go to Professor John Field, with whom this book was
discussed at the very outset, to Danielle Descoteaux, Acquisitions Editor at Wiley-
Blackwell, who made the project possible and who has accompanied us in such a
supportive way from the very beginning, as well as to Julia Kirk, Project Editor,
Introduction

Fiona Screen, Copy Editor, and Allison Medoff, Editorial Assistant, for their kind help. Finally, we wish to thank our respective families for their unwavering and loving support. We dedicate this book to them.

François Grosjean and Ping Li
March 2012
The words “bilingual” and “bilingualism” have many different meanings depending on the context they are used in. They can include the knowledge and use of two or more languages, the presentation of information in two languages, the need for two languages, the recognition of two or more languages, and so on. Since this book focuses on the psycholinguistics of bilingual adults and children, we will define bilingualism, and indeed multilingualism, as the use of two or more languages (or dialects) in everyday life.

This chapter has several aims. The first is to introduce readers to basic concepts concerning bilingualism and bilinguals so as to help them understand more specialized chapters later in the book. Readers bring with them knowledge of language and cognition but they may know less about bilingualism. Hopefully this chapter will help fill this gap. The second aim is to describe what it is that bilingual participants bring to the studies they take part in. In everyday life, they are “regular bilinguals” with specific language knowledge and language use which they bring to this research as participants. Some of the aspects that will be mentioned are studied specifically or manipulated directly by psycholinguists whilst others simply accompany bilingual participants into the research environment. We need to understand these phenomena so as to be able to make sense of the data that are obtained.

A third aim, which is not restricted to this chapter alone, will be to clarify some misconceptions that surround bilingualism and bilinguals, such as that bilinguals have equal and perfect knowledge of their two or more languages, that they have no accent in any of their languages, that they acquired their languages in childhood, that they are all competent translators, and so on. When it comes to children, we hear that bilingualism will delay their language acquisition, that children will invariably mix their languages, and that being bilingual will have negative effects on their development (see Grosjean, 2010, for a discussion of many of these misconceptions). Some of these will be dispelled in this chapter and others in later chapters.
We will begin with a description of the extent of bilingualism and the reasons that underlie it. Next, we will describe bilinguals in terms of language use and language fluency, and show how these factors can change over time; we will call this the wax and wane of languages. This will be followed by a discussion of the functions of languages, which will revolve around what is now known as the Complementarity Principle. We will then describe what happens when bilinguals are interacting with other bilinguals who share their languages and how this is different from when they are addressing monolinguals; we will do this by means of the language mode concept. We will end with a discussion of biculturalism in bilinguals and the impact it has on bilingual language knowledge and language processing.

### 1.1 The Extent of Bilingualism

Researchers on bilingualism have repeated over the years that half of the world’s population, if not more, is bilingual. Unfortunately, there are no clear data for the whole world but it is clear that bilingualism is found in all age groups, in all levels of society, and in most countries. For example, a European Commission report (2006) showed that some 56% of the inhabitants of 25 European countries speak a second language well enough to have a conversation in it. They may not all lead their lives with two or more languages but the percentage gives an idea of how extensive bilingualism can be. In North America, some 35% of the population of Canada is bilingual. The percentage is smaller in the United States (around 18–20%) but this still amounts to some 55 million inhabitants. The proportion of bilinguals is much higher in other parts of the world such as Asia and Africa where it is normal to know and use several languages in one’s everyday life.

How can we explain the extent of bilingualism? First, there are many more languages (some 7000 according to Gordon, 2005) than there are countries (193 in 2011). Some countries house numerous languages and this leads to language contact between the inhabitants, and hence bilingualism. For example, there are 516 languages in Nigeria, 427 in India, 200 in Brazil, and so on. Most such countries have one or two languages of communication (lingua francas) which people use along with their more local language, hence the presence of bi- or multilingualism. A second reason, which goes back to the origins of mankind, is that people have always traveled for trade, commerce, business, employment, religion, politics, conflicts, and so on. The populations of many countries today are the result of immigration – examples are the United States, Canada, Australia, and many South American nations. Other countries, which witnessed the emigration of its populations some while back, are now seeing the influx of new immigrants. In the majority of cases, migrants acquire the language of the host country and hence become bilingual; there are also many cases where the original inhabitants adopt the new language, such as with American Indians in North America.

Another important reason for the extent of bilingualism is education and culture. Many students pursue their studies in a region or country with a different language...
to their own and hence become bilingual. Other events such as intermarriage or professional opportunities – diplomacy, business, foreign journalism, language teaching, and so on – lead to the development of language contact. The phenomenon is far more frequent than one imagines at first and it is only natural, therefore, that the language sciences have given bilingual studies much more room in recent years.

1.2 Describing Bilinguals

In this part, we will first examine two important defining factors of bilingualism – language fluency and language use – and we will then observe how the languages of bilinguals can wax and wane over time.

1.2.1 Language fluency and language use

A common misconception is that bilinguals master two languages fluently. Some will then add that bilinguals do not have an accent in either language and others will propose that they must have learned their languages in childhood. In a sense, bilinguals are seen as two monolinguals in one person. In fact, the majority of bilinguals do not have equal fluency in their languages, many have an accent in at least one of their languages, and many acquired their other language(s) when they were adolescents or adults. As we will see, bilinguals use their languages for different purposes, in different domains of life, to accomplish different things. Their level of fluency in a language depends on their need for that language. Hence many bilinguals are more fluent in a given language, and some cannot read or write one of their languages.

To get around the problem of fluency as a defining criterion (how fluent does one have to be in one’s languages to be bilingual?), many researchers, starting with Weinreich (1968) and Mackey (2000), have put the stress on language use as the defining factor. This explains the definition given at the beginning of this chapter: bilingualism is the use of two or more languages (or dialects) in everyday life. Note that this definition includes dialects, and encompasses two or more languages (covering trilingualism, quadrilingualism, etc.). This definition accounts for many more speakers of languages than one based on fluency alone – especially if balanced fluency in the two languages is required – and hence is more realistic.

This said, it is important to also take into account the level of fluency in the bilinguals’ different languages (and language skills), whatever that level may be. To do so, the grid approach that this author has developed can be helpful. Figure 1.1 presents the bilingualism of a person (MC) at two moments in time: at age 26 and at age 36. Language use is presented along the vertical axis of each grid (Never used to Daily use) and language fluency along the horizontal axis (Low fluency to High fluency).
We see in the top grid that MC’s most used and most fluent language at age 26 was La (English). His other language, Lb (French), was used on a regular basis although slightly less frequently than La; he was also slightly less fluent in it. MC also had some knowledge of a third language he learned at school (Lc; German) but he never used it. Hence, MC was bilingual in English and French, with a slight dominance in English, and had some knowledge of another language. This is frequent in bilinguals who, in addition to the languages they use on a regular basis, know one or two other languages which they employ more rarely. (It should be noted that we use the symbols La, Lb, and Lc for MC’s three languages. This is because we are not...
interested here in pointing out which was his first language [L1], his second language [L2], and his third language [L3]. Both types of symbols will be used in this book.

Of course, this first description of the language status of a bilingual is very general as it does not take into account the domains (situations) in which the languages are used (see Section 1.3) or the modalities of a language (the oral, written or signed modalities). To make the description more complete, this kind of grid can be duplicated and used, for instance, for each of the bilingual’s four language skills: speaking, listening, reading, writing. This allows one to delve more deeply into the bilingual’s language configuration, as is normally done with a language questionnaire (see, for example, the questionnaire in Li, Sepanski, & Zhao, 2006). One often finds that the proficiency bilinguals have in the four skills is not the same for their different languages: some may have very good oral comprehension of a language but may not speak it very well; others may know how to read and write one of their languages but not the other, and so on.

The grid approach presented here can also encourage us to examine the relationship between the bilingual’s languages: some languages can be quite close (e.g., Spanish and Italian) and some quite distant (e.g., English and Chinese). It is a well-known fact that closely related languages will influence one another more than will distant languages.

1.2.2 The wax and wane of languages

If we go back to Figure 1.1 and examine the bottom grid, we see MC’s present bilingual configuration (at age 36), that is, 10 years after that of the top grid. We note a striking change: La (English) and Lb (French) are still the best known languages but each one is used slightly less frequently now. Lc (German), however, which was a dormant language acquired in school, has moved up in the grid (it is now used daily) and it has also moved to the right (MC is more fluent in it). The reason is that MC moved to Germany during the 10-year interval and German has become his everyday language, used more frequently than La or Lb. This exemplifies the importance of knowing the language history of bilinguals: which languages are acquired, when and how; what the pattern of fluency and use is over the years; whether some languages go through periods of restructuring under the influence of another, stronger, language, or even become dormant and are slowly forgotten in later years.

Figure 1.2 merges two grids into one and presents the case of a 30-year-old bilingual (EP) who, between the ages of 20 and 30, not only changed his language configuration (as had MC) but, in addition, acquired two new languages. The languages present at age 20 (La: French; Lb: English; Lc: German) are underlined. If they changed position in the 10-year interval this is shown by an arrow going from the original position to the new position. The new languages (Ld: Spanish; Le: Swiss German) are marked (N).
What we observe is that La and Lb have stayed in the same position over the 10-year interval, but Lc is now being used daily and is more fluent. In addition, two new languages have been acquired: Ld (Spanish), which is now known quite well but is not used much, and Le (Swiss German), which is used almost daily but not yet known well. A 1-year stay in another country and then movement within a country (in this case, Switzerland) accounts for these changes.

As illustrated by EP (above), a bilingual’s language history can be quite complex due to life events that reduce or increase the importance of a language (e.g., meeting a companion, losing a family member with whom one spoke a language exclusively, moving to another language region or country, and so on). The process is dynamic and leads to a change in a person’s language configuration and hence language processing. Thus, a bilingual’s languages have moments of stability (the language pattern is relatively stable) and moments of change where one language suddenly acquires new importance and another language may remain stable or have less of a role to play. If one assesses a person’s languages (and language skills) or one undertakes a psycholinguistic study, one must keep in mind the transition periods which can last several years. During these periods, the level of communication attained by the bilingual may not be optimal while the languages reorganize themselves. But when stability is attained, the bilingual will usually regain the level of communication achieved before the change, even if the language configuration is now very different.

Although the examples given above do not exemplify it, language forgetting (called “language loss” or “language attrition”) can also take place during a bilingual’s lifespan. It is a frequent phenomenon, as frequent as language learning, but it has received far less attention (see, for example, Schmid, Köpke, Keijzer, &
Weilemar, 2004). During language forgetting, the domains of use of the language are greatly reduced, or sometimes even disappear, and signs of loss appear over time: language production is filled with word finding problems and hesitations; the person’s accent is influenced by the other, stronger, language(s), as is the syntax; the speaker calls on the other language(s) more and more for a word or a phrase, and so on. In addition, bilinguals become very unsure of themselves when they have to use the language and often state that they do not know it any more. Oral comprehension suffers too but less so than production.

In sum, the bilingual’s languages will wax and wane over the years and the different stages will have an impact on psycholinguistic processes. Thus, starting with the early years, the age at which a language is acquired, how it is acquired (for example, in a natural setting or more formally such as in school, or a combination of the two), and the amount of use it is given over the years all play a role on how well the language is known, how it is processed, and even on the way the brain stores and deals with it. And, when, with the passing of time, languages are restructured, or even fade away, psycholinguistic and cognitive operations will also be influenced by this.

In the following sections we examine other important characteristics of bilinguals that the student of psycholinguistics should know about.

1.3 The Functions of Languages

Were one to ask a bilingual which languages she uses in different domains of life (e.g., with parents, siblings, relatives, friends, at work, for sport, when going out, when reading a newspaper, when writing reports, etc.), one might obtain the kind of pattern that is shown in Figure 1.3.

Figure 1.3: The domains covered by a bilingual’s three languages (La, Lb, and Lc).
The domains are represented by circles and can be covered by one language (see the circles marked with La or Lb only), two languages (see the two circles marked La & Lb) or even, in this case, three languages (one such circle here). The pattern shown is a visual representation of the Complementarity Principle (Grosjean, 1997), which can be stated as follows:

Bilinguals usually acquire and use their languages for different purposes, in different domains of life, with different people. Different aspects of life often require different languages.

Thus, in the example above, which only presents a subset of domains, we find that the bilingual in question covers six domains with La only, three domains with Lb, two domains with La and Lb, and one domain with La, Lb, and Lc. A pattern of this type can be drawn up for any bilingual. Rare are the bilinguals who cover all their domains of life with all their languages. If that were the case, there would be little reason to be bilingual as one language would suffice. It should be noted that diglossia is a form of societal bilingualism where two languages or two varieties of a language have very precise domains of use. Thus the principle stated above is rigidified in diglossia – very few (if any) domains are covered by two or more languages.

The Complementarity Principle refers to what has been known for many years as the functions of languages (see Mackey, 2000, for example) and it explains a number of interesting phenomena in the linguistics and psycholinguistics of bilingualism. The first concerns a bilingual’s level of fluency and use of a language. Although the fluency/use grid presented earlier is different from the language domain pattern shown here, there is a close link between the two. When a language is used in a very restricted number of domains, then there is every chance that it will be used less frequently and that it will have a lower fluency (bottom left-hand area of the grid in Figures 1.1 and 1.2). The reverse is also true: the more domains a language is used in, the greater the frequency of use and hence, usually, the greater the fluency (top right-hand area of the grid in Figures 1.1 and 1.2). In addition, if a domain is not covered by a language (e.g., a person never talks about work in a given language), then there is every chance that the bilingual will not have the vocabulary, the variety of language, or the style of language needed for that specific domain. (This is true despite the fact that some people still believe that for any given concept, all bilinguals know two words, one in each language, and hence that they have roughly twice as many words as monolinguals). All bilinguals have been in a situation where they have had to talk about a particular topic in the “wrong” language. They don’t know or can’t find the right words or expressions, they hesitate a lot, and, if the situation allows it, they resort to the other language to help them out (Grosjean, 2008, describes a number of studies that show this clearly). Well-learned behaviors such as counting, praying, giving phone numbers, and so on, are extreme cases of language specificity and can create problems when conducted in the wrong language.
The Complementarity Principle can also explain the phenomenon of language dominance, in part at least. If we examine Figure 1.3 again, we see that the bilingual in question is dominant in La. Not only is it the sole language of six domains but it also covers another three domains, two with Lb and one with Lb and Lc, for a total of nine domains. The other languages cover fewer domains: Lb, by itself or with other languages, covers six domains and Lc just one domain (along with La and Lb). Thus one could say that the bilingual in question is dominant in La. Care should be taken, though, when using only a global measure of dominance such as counting domains of use. This is because for some domains the “non dominant” language can be the sole language and it is, de facto, the dominant language for that particular domain. In what is a rather old study now, Cooper (1971) showed that Spanish-English bilinguals had very different word naming scores depending on the domain referred to (family, neighborhood, school, religion, etc.). In some, they showed balance (they did as well in Spanish as in English) whereas in others they showed dominance in one language. Close to 40 years later, some aspects of the results of word naming studies in psycholinguistics, among other experimental studies, may be explained by the Complementarity Principle (a point also made by Ivanova & Costa, 2008).

At this point, it is important to note that language dominance in a bilingual (measured in terms of overall use of a language, overall fluency, domains covered by a language, or a combination of all of these) can change over time. Thus, a person’s first language may not always be his or her dominant language. Grosjean (2010) describes a person whose dominance has changed four times over a stretch of some 50 years, with two periods, both some 10 years long, where the second language was the person’s dominant language. One should be careful, therefore, not to assume that a person’s first language or “mother tongue” is automatically their dominant language. Personal language history may show quite different bilingual configurations at different moments in time.

Two additional impacts of the Complementarity Principle should be mentioned. The first concerns translation. Even though bilinguals are thought to be natural translators (yet one more myth that surrounds bilingualism), they often have difficulties translating when the domains are specialized. This makes a lot of sense since their two or more languages do not cover all domains of life. Hence, bilinguals often find themselves doing less well than second language learners who have systematically learned the translation equivalents of words and expressions in their second language. Of course, bilinguals are no less bilingual for this; they are simply reflecting the fact that their languages are distributed across different domains. The second impact concerns memory of events. Marian and Neisser (2000) showed in an experimental study that events are better recalled if the language used to recall them is the language in which the event took place (see Chapter 8 for a description of the study). They called this “language-dependent” recall. They illustrated it with a real-life example reported by Aneta Pavlenko, a multilingual researcher in this field. When she was asked, in Russian, for the number of her apartment in the United States, she gave the
number of her former apartment in her native European country, which she knew in Russian!

In sum, the Complementarity Principle is an important part of a bilingual’s life. It is present at all times and it can explain many aspects of a bilingual’s language knowledge and language processing.

1.4 Language Mode

When interacting with an interlocutor but also when using language in other situations (e.g., writing to someone, reading a book, doing a language task in a laboratory, etc.), bilinguals have to ask themselves two questions, most of the time subconsciously: Which language should be used? and Should the other language be brought in? Figure 1.4 takes up these questions and shows the consequences they have on the bilingual’s languages and processing mechanisms.

In the figure, which, to simplify things, covers just two languages (though the same applies to three or more languages), we see that the bilingual has to choose between language a (La) and language b (Lb). Both are inactive, or deactivated, at first, and this is represented with squares filled with light diagonal lines. To the first question, “Which language should be used?”, the bilingual in our example answers

![Diagram](Figure 1.4)

Figure 1.4: The two questions bilinguals have to ask themselves, often subconsciously, when communicating with others.
Bilingualism: A Short Introduction

with La. It becomes activated and the square changes over to black, representing full activation. This first operation is called “language choice” and the language chosen is termed the “base language.”

Now comes the second question: “Should the other language be brought in?” If the answer is “no” (imagine that the bilingual is speaking to someone who only knows one of her languages), then the other language remains inactive and only one language will be used. This is called the monolingual mode (represented in the bottom left area of the diagram). Examples of a monolingual mode are reading a book in a particular language, listening to a radio program which only uses one language, speaking to a monolingual adult or child, and so on. In this mode, the bilingual will usually only use one language and deactivate the other (see Section 1.5.2). If the answer to the second question is “yes” (for example, the bilingual is speaking to bilingual friends who share her languages), then the other language is activated, but less so than the base language (compare the two squares on the right), in case the bilingual needs it during the interaction. Here, the bilingual is in a bilingual mode and can bring in elements of the other language (see Section 1.5.1) or even change base language completely. Other examples of a bilingual mode are listening to a conversation between bilinguals where two languages are used interchangeably, doing an experimental study which requires, overtly or covertly, the use of two languages, interpreting from one language to another, and so on.

So far we have accounted for the two endpoints of a continuum – the language mode continuum – which ranges from a monolingual mode to a bilingual mode (see the bottom area of the figure). In fact, in their everyday lives, bilinguals find themselves at various points along the continuum. For example, bilinguals can be in an intermediary language mode – in other words, between the two endpoints. This is the case when they are speaking to a bilingual who shares their languages but who prefers to stick to one language, or when they are speaking about something which really demands the other language (see the discussion of the Complementarity Principle in Section 1.3) but which cannot be used. This may happen, for example, when a French-English bilingual has to speak about a typically American event such as Thanksgiving in French instead of in English.

Language mode can be defined as the state of activation of the bilingual’s languages and language processing mechanisms at a given point in time (see Grosjean, 2008, for an extensive review of the concept). Several points can be made about it. First, bilinguals may differ from one another as to how much they move along the language mode continuum. Some, who live in bilingual communities where the two languages are used together extensively, may rarely find themselves at the monolingual end of the continuum. Others, who are surrounded by monolinguals during their everyday activities, may never move to the bilingual endpoint and bring in the other language in their interactions. It is fair to say, though, that many bilinguals navigate along the continuum depending on the person they are speaking to, the situation they are in, the topic of discourse, and so on.

A second point is that movement along the continuum can take place at any time and in any place, and can be very rapid. Thus, one person may start at the bilingual
end but realize as the conversation is taking place that his interlocutor, even though she is bilingual, does not seem to accept that he slips into the other language for a word, phrase, or sentence. He will then deactivate the other, unwanted language, and hence move to the monolingual end of the continuum. Similarly, a bilingual may start interacting monolingually with someone but then realize, as the conversation continues, that the person shares the same two languages. This will induce some movement along the continuum in case the bilingual needs the other language in the interaction, even if only to signal, with a few words, that they share the fact of being bilingual. The same is true of a participant in an experiment who suddenly hears or sees a word from the other language; she will immediately activate that language and hence move toward the bilingual end of the continuum (see Chapter 2).

A third point concerns the bilingual mode. Since the other language is also active, but less so than the base language, it can be brought in for a few words, as indicated above, or it can quite simply take over the role of base language (something that simply can’t happen in a monolingual mode unless the interlocutor changes, of course). When the base language does change, the activation pattern shown in Figure 1.4 also changes; Lb becomes the most active language and La is less active. Note also that there are cases where both languages can be fully active in a bilingual mode. Two instances come to mind: the first is when a bilingual is listening to two people, each one speaking a different language; the second is when someone is interpreting from one language to another. Here, the person needs both languages, the source language – the language being heard – and the target language – the language being produced (Grosjean, 2008).

A fourth point pertains to the language that is not being used in the monolingual mode. Researchers such as Green (1998) propose that it is inhibited whereas others prefer the notion of deactivation. There are two reasons to lean toward the latter. First, the bilingual language system has to be able to change base languages rapidly; a language that is deactivated will be “on line” more rapidly than if it is inhibited. Second, there is some slippage in the monolingual mode in that the other language can slip through in the form of dynamic interferences (see Section 1.5). This can be explained more readily with the notion of deactivation than with inhibition.

A final point that needs to be mentioned concerns processing. Until very recently, most psycholinguists have claimed that perceptual processing is nonselective, that is, all the bilingual’s languages are involved in the processes that take place during the acts of listening to or reading just one language. In terms of language mode, it has been argued that listeners and readers, even though in a monolingual mode, call on their two or more languages to do the task asked of them (see Chapter 2). The same has been said of language production in bilinguals (see Chapter 3). The problem with this view, discussed in Grosjean (1998), is that the only way to study whether processing is nonselective is to put the participants in a truly monolingual mode. (No one would counter the claim that processing is indeed nonselective when bilinguals are hearing or reading two languages in a bilingual mode; processing couldn’t take place otherwise). Putting a bilingual in a monolingual mode is