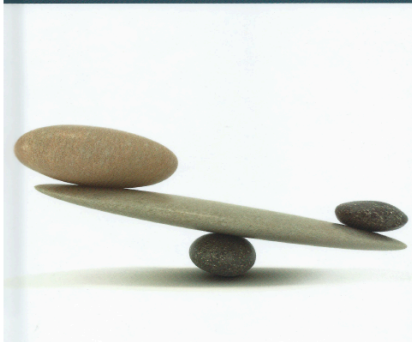


# Language Dominance in Bilinguals

Issues of Measurement  
and Operationalization

Edited by Carmen Silva-Corvalán  
and Jeanine Treffers-Daller



François Grosjean (2016). The Complementarity Principle and its impact on processing, acquisition and dominance.

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## 4 The Complementarity Principle and its impact on processing, acquisition, and dominance

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*François Grosjean*

### 4.1 Introduction

The linguistics, and especially the sociolinguistics, of bilingualism have long been interested in the functions of languages in bilinguals and, in particular, in language choice. More than half a century ago, Weinreich (1953) wrote that many bilinguals are accustomed to discuss some topics in only one of their languages and that if children study certain subjects in a unilingual school, they will have difficulty in discussing their “learned” topics in the other language. A few years later, Mackey (1962) proposed four characteristics that enter into the description of bilingualism, the very first being degree; that is, the extent of a person’s bilingualism. Within this parameter, he gave considerable importance to function, in other words, what bilinguals use their languages for. He divided these into external functions (language use in various situations and domains) and internal functions (the non-communicative uses of language such as counting, praying, dreaming, etc.). Some 20 years later, Dodson (1981) stated that bilinguals have a preferred language and a second language for different areas of experience. It is therefore normal for them to be operating at preferred and second-language levels in one area of experience, while in another area the status of the two languages is reversed.

Early sociolinguistic studies of bilingual communities put heavy emphasis on the functions of languages within these communities. Thus, for example, Hoffman (1971) studied the language use of young Spanish–English bilingual adults in the Puerto-Rican neighborhood of Jersey City, New York. He found that they spoke mainly Spanish to both their parents, although they sometimes spoke English when talking about education and work. They spoke Spanish to their grandparents and to the parents of their girl/boy friends but English with their siblings. Both languages were used with their friends, at school and when they went shopping. They used English only for all official matters outside the home as well as at church (their parents went to the Spanish service but they chose the English one). Finally, at work, everything was done in English. In sum, the two languages were distributed across the domains of life; some domains were covered by one language only, some by the other, and some by both.

Another example takes us to Pomerode in the state of Santa Catarina in Brazil. Heye (1979) tells us that in this small town founded by German immigrants from Pomerania in Germany, both German (more precisely, Pomeranian) and Portuguese are spoken by a majority of the population. In some situations, only Portuguese is used (e.g., with the authorities, in clubs, for sport, and for writing), in others, only German is used (e.g., at church), and in others, both languages are employed (e.g., at work, in stores, at home, and with friends). Here too the languages are distributed across the domains of life.

Although many other examples come to mind of studies that have examined language functions in bilingual communities, special mention should be made of work on diglossia over the years. In these specific bilingual situations, two languages or varieties of a language have such precise and distinct functions that the bilingual speaker has little leeway in deciding which languages to use. However, most bilingual communities do not reach this level of rigidification and bilinguals are usually freer to use one language over the other, or both at the same time.

The borders between the subfields of bilingualism have not been as permeable as one would have liked and hence sociolinguistic studies of language functions and choice have not had the kind of impact they should have had on our thinking about topics such as bilingual language processing, bilingual memory, bilingual language acquisition, and, of course, bilingual fluency and dominance. In this chapter, we will refer to a number of authors who have started to take into account sociolinguistic variables in their reflections on, and research in, these areas of psycholinguistics. We will first define the Complementarity Principle (CP) and explain how pervasive it is in the life of bilinguals. We will then call upon studies that have started to obtain numerical evidence on language use in different domains of life by individual bilinguals. This will be followed by a description of a number of psycholinguistic studies in which the impact of the CP is an important factor. These studies pertain to language perception, language production, memory, and language acquisition. Finally, we will discuss the impact that the Principle must have on our thinking on language dominance, be it in terms of language use, language fluency, or both.

## 4.2 The Complementarity Principle

In Grosjean (1985), I showed the influence that the sociolinguistics of bilingualism has had on my thinking about language knowledge and language use in bilinguals. For example, I wrote the following about assessment tests given to bilinguals: “These tests rarely take into account the bilingual’s *differential needs* for the two languages or the *different social functions* of these languages (what a language is used for, with whom and where)” (p. 469). It is in that

paper that I offered a holistic view of bilingualism for the first time accompanied by the first germs of the CP:

According to the holistic view, the bilingual is a fully competent speaker-hearer; he or she has developed competencies ... to the extent required by his or her needs and those of the environment ... Because the needs and uses of the two languages are usually quite different, the bilingual is rarely equally or completely fluent in the two languages. Levels of fluency in a language will depend on the need for that language and will be extremely domain specific. (p. 471)

More than 10 years later, convinced of the rarity that all facets of life in bilinguals require the same language (people would not be bilingual if that were so) or that they always demand two languages (language A *and* B at work, at home, with friends, etc.), I proposed the CP (Grosjean, 1997), defined as follows: "Bilinguals usually acquire and use their languages for different purposes, in different domains of life, with different people. Different aspects of life require different languages" (p. 165). To visualize the CP, I have used the kind of illustration that can be seen in Figure 4.1. Each quadrilateral represents a domain of life such as work/studies, home, family, shopping, leisure, administrative matters, holidays, clothes, sports, transportation, health, politics, etc. As can be seen, the person depicted, a trilingual in languages a, b and c, uses language a (La) in seven domains of life, Lb in three domains, both La and Lb in five domains, and all three languages (La, Lb and Lc) in just one domain. Some domains, therefore, are specific to one language (ten in all), and others are shared by two or three languages (six in all). Any bilingual can be characterized in this way and will have a pattern that is specific to him or her.

I discussed the impact the CP has on the fluency of bilinguals in their two or more languages (Grosjean, 1997) and proposed that the level of fluency attained in a language (more precisely, in a language skill) will depend on the need for that language and will be domain-specific. If reading and writing skills are not needed in a language, they will not be developed. If a language is spoken with a limited number of people in a reduced number of domains, it may be less fluent and more restricted than a language used extensively. If a language is never used for a particular purpose, it will not develop the linguistic properties needed for that purpose (specialized vocabulary, stylistic variety, some linguistic rules, etc.).

In the 1997 article, I also mentioned a number of phenomena that are better understood if one takes into account the CP. Among them we find the communicative competence of bilinguals that is equal, but different in nature, to that of monolinguals. This competence makes use of one language, of the other, or of the two together (in the form of mixed speech) depending on the situation, the topic, the interlocutor, etc. Thus, as we have just seen, it is normal to find

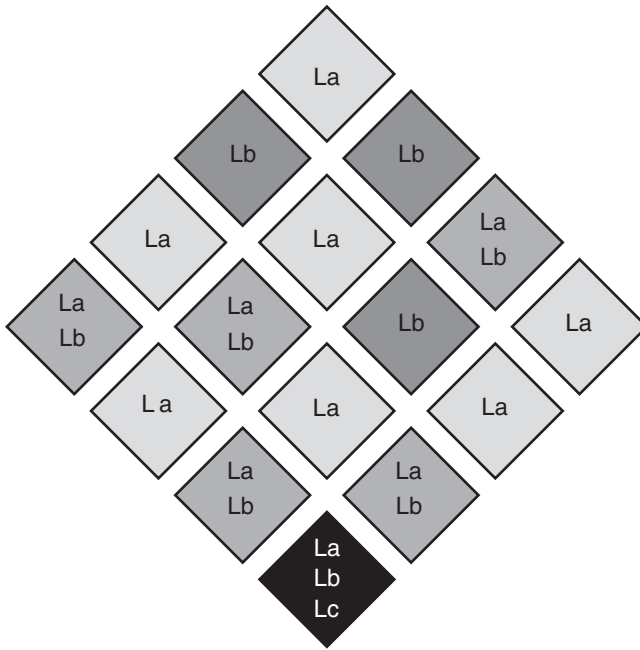


Figure 4.1 An illustration of the Complementarity Principle. The domains covered by languages a, b, and c are represented by the quadrilaterals

bilinguals who can only read and write in one of their languages, who have reduced speaking fluency in a language they only use with a limited number of people, or who can only speak about a particular subject in one of their languages. The CP also explains why regular bilinguals are usually not very good translators or interpreters. They may simply not have the necessary translation equivalents or the stylistic varieties needed in their two languages, not to mention the pragmatic competence required to understand an utterance or produce it in the other language.

Based on this reality, I suggested that the procedure used to evaluate the bilingual's competencies should be redefined. Bilinguals should be studied in terms of their total language repertoire, and the domains of use and the functions of their various languages should be taken into account.

### 4.3 Evidence for the Complementarity Principle

When first proposed, the CP was based largely on observations in sociolinguistic studies, linguistic reasoning and theorizing, and testimonies by bilinguals. What was missing was numerical data that showed that different aspects of

life of individual bilinguals do indeed require different languages. This data is starting to appear and is very promising, as we will see in this section. We will first describe two studies that were undertaken under my supervision. We will then evoke two other studies that have obtained data on the functions of language, one of them as a first step to showing the impact of the CP on various bilingual behaviors.

#### 4.3.1 *The Gasser study*

In her study on English–German bilinguals, Gasser (2000) addressed a number of questions. The first ones concerned whether there was some empirical evidence for the CP. More precisely, how are the languages of bilinguals distributed as a function of topic and activity, and is the CP an adequate way of characterizing this? Gasser also wanted to find out whether the CP had an effect on language mixing (this topic will be addressed in the next section). Twenty first-generation English–German bilinguals in Basle, Switzerland, took part in her study. They had all grown up speaking English and had moved to Switzerland as adults. At the time of the study, they averaged 22 years of bilingualism, that is, they had used both languages on a regular basis during that time (German and Swiss German will be counted as one language in what follows, even though they were separated in the questionnaire the bilinguals filled in).

The questionnaire contained questions pertaining to the participants' biography (who they were, where they had lived, etc.), their language history, how they rated their oral comprehension and production of both English and German, with whom they spoke which language, etc. The two parts that interest us the most concerned the distribution of the bilinguals' languages across topics and activities. The instructions given for the former were as follows (see Appendix A, p. 3, in Gasser, 2000):

Please indicate which languages you use for various **topics**. First give the frequency with which you talk about each of the topics indicated below (circle one of the letters: D = daily, W = a few times a week, M = a few times a month, Y = a few times a year, N = Never) and then indicate by means of a percentage the extent to which each language is involved. For example, if you talk about politics a few times a week, please circle "W," and if you do it mainly in English, much less in German and almost never in Swiss German, indicate this by means of three percentages (e.g. 70%, 25% and 5%). Of course, the numbers must add up to 100%. At times, we ask you to give specific topics when they are related to domains that only you know about (e.g. domain of study, specificities of a job, etc.).

The topics listed were: work/studies (in general), work/studies (specific topics indicated by each participant), immediate family (with whom you live), distant family (or ancestors), house-related matters (cooking, cleaning, etc.),

shopping, leisure (in general), leisure (specific activities indicated by each participant), administrative matters, holidays/trips, evening out, clothes, sports (in general), specific sports (indicated by each participant), transportation, health, education, politics, religion, love and affection, others (specified by each participant).

The instructions for the part on activities were very similar (the participants were asked to express the frequency of use and the importance of each language in the same way). The activities listed were as follows: writing (at work), writing mail (letters, email), note-taking, attending local circles/clubs, speaking colloquially, counting, calculating, expressing one's feelings, singing alone, praying, swearing, speaking to oneself, other (specified by each participant).

The results Gasser obtained were inserted into two tables for each bilingual, one for the topics and one for the activities. It is here that answers given for Swiss German and German were regrouped under one heading, "German." Table 4.1 presents the results for topics for Bilingual 14, a participant who we thought might distribute topics relatively well across domains. It should be noted that the frequency information (daily, weekly, monthly, etc.) has been omitted here and that topics that attain 100% in a language are not repeated with a 0% in the other language.

Table 4.1 *The distribution of languages according to topics for Bilingual 14 in Gasser's study and the importance of each language expressed as a percentage*

Percentage	English	German
81–100	Family (immediate) 100% Home 100% Love 100% Family (distant) 100%	Leisure 100% Shopping 100% Administration 100% Education 90% Health 90% Sports 90% Transportation 90% Religion 90%
61–80	Holidays 80% Evening out 70%	Politics 80% Clothes 80%
40–60	Work 60%	Work 40%
20–39	Politics 20% Clothes 20%	Holidays 20% Evening out 30%
0–19	Education 10% Health 10% Sports 10% Transportation 10% Religion 10%	

The organization into five percentage classes allows one to see the topics that are often talked about in a language (top two rows) or, inversely, not talked about much, or at all, in that same language (bottom two rows). The topics that fall in the 40–60 percent range are talked about equally in each language. Clearly, as can be seen in the table, the topics are distributed across languages; some are talked about in only one language (e.g., family (immediate and distant), home and love in English alone, and leisure, shopping, administration in German alone). Others are mainly talked about in one language (those with 90 and 80 percent) and some are shared equally between languages (there is only one topic in this particular example, work). Clearly, the CP is upheld here since different aspects of life require different languages (group results, discussed later, confirm this observation). This, of course, goes against the idea that bilinguals have translation equivalents for a large subset of their vocabulary as stated, among others, by Kroll, Bobb, and Wodniecka (2006). They do for topics in the middle ranges but, most likely, not for those talked about in only one language.

If we examine the activities grid for the same bilingual (see Table 4.2), we find percentages that are even higher. Seven activities are in the 90–100 percent range in just one language (English) as one would expect for late English–German bilinguals who started doing these activities in their first language. It has long been known that many well-learned behaviors such as these are extreme cases of the CP (see Grosjean, 2010). It is interesting to note that swearing, nevertheless, takes place to the same extent in the two languages!

In order to assess the degree to which the CP is reflected in the results obtained, we developed a Complementarity Index (CI) that ranges from 0% (all topics or activities are covered equally by the two languages) to 100% (topics or activities are language specific; none are covered by both languages). Fifty percent means that basically half the topics or activities are covered by the two languages and half by just one language, to varying degrees of course. To calculate the CI, the numbers of topics (or activities) are counted in the 61–100% sections in the tables, for both languages. The total is then divided by the total number of topics (or activities) and the result is multiplied by 100. For example, for the topics of Bilingual 14 (Table 4.1), the number in the 61–100% range is 16, the total number of topics is 17, and hence the CI is 94.12%. For this participant, therefore, the CP applies very well.

For the 20 participants in Gasser's study, the mean CI is 79.45% with a range that extends from 29.41% to 100%. If one only examines the results of participants who have at least two topics in the 61–100% range in each language, thus moving away from very dominant bilinguals, the mean percentage remains just as high: 78.38%. As for activities, the mean CI is 81.24% with a range that goes from 36.36% to 100%. Once again, this mean is very similar to that of bilinguals who have at least two activities in the 61–100% range in each language: 81.85%. If we combine the above results (topics and activities)



Table 4.2 *The distribution of languages according to activities for Bilingual 14 in Gasser's study and the importance of each language expressed as a percentage*

Percentage	English	German
81–100	Note-taking 100% Expressing feelings 100% Praying 100% Calculating 95% Counting 95% Writing at work 90% Writing mail 90%	
61–80		Speaking colloquially 80% Attending clubs 80%
40–60	Swearing 50%	Swearing 50%
20–39	Speaking colloquially 20% Attending clubs 20%	
0–19		Writing at work 10% Writing mail 10% Calculating 5% Counting 5%

and work out a grand mean, it comes to 80.35% (it is 79.24% when at least two topics or activities figure in the 61–100% range in each language).

Clearly in this group of English–German bilinguals, many topics or activities are language specific; that is, they are covered mainly (or totally) by one language. To illustrate this further, we simply counted the items that fell in the 81–100% range for a particular language. As concerns topics, English was clearly preferred when talking about love, family (both immediate and distant) and spending an evening out. German came out top when discussing shopping, transportation, administration, health, and sports. As for activities, almost all were covered by English (e.g., calculating, counting, note-taking, writing at work, praying, singing alone, etc.). There is one exception where German was preferred just slightly – attending clubs. In sum, as the CP states, different aspects of life and different activities require different languages.

#### 4.3.2 *Other studies*

A year after Gasser's study, Jaccard and Cividin (2001) undertook a replication of her research with a different group of bilinguals in order to see if similar results could be obtained. Theirs were second-generation Italian–French bilinguals who lived in the French-speaking part of Switzerland (Yverdon and

Table 4.3 *The distribution of languages according to topics for Bilingual 8 in Jaccard and Cividin's study and the importance of each language expressed as a percentage*

Percentage	French	Italian
81–100	Education 85%	Family (distant) 100% Religion (95%) Family (immediate) 90%
61–80	Work 80% Politics 80% Evening out 70% Shopping 70% Love 65%	
40–60	Home 50% Transportation 50% Leisure 50% Sports 50% Holidays 40% Health 40% Administration 40%	Holidays 60% Health 60% Administration 60% Home 50% Transportation 50% Leisure 50% Sports 50%
20–39		Love 35% Evening out 30% Shopping 30% Politics 20% Work 20%
0–19	Family (immediate) 10% Religion 5%	Education 15%

Bienne). They had acquired their two languages as children, first Italian and then French, and were younger (between 18 and 35 years old) than the Basle group. The questionnaire was an exact replica of the one used in Basle except that it was in French.

The results Jaccard and Cividin obtained were similar to those reported by Gasser. Table 4.3 presents the results for topics for their Bilingual 8. If we compare this bilingual with Gasser's Bilingual 14 (see Table 4.1), we note that there are fewer topics in the very top category (81–100%) and more in the middle category (40–60%). This might be due to the fact that the participants in Jaccard and Cividin's study became bilingual as children and had a tendency not to have as many single-language topics. This said, many topics are still in the 61–80% range, which shows that the CP is still at work here.

The mean CI for topics obtained by Jaccard and Cividin was 60.58% with a range that extended from 12.5% to 100%. As for the activities, the mean CI was 73.46% with a range extending from 40% to 100%. The grand mean, combining

topics and activities, was 67.02%. Thus, even though these percentages are lower than the ones found in Basle (grand means of 67.02% vs. 80.35%, respectively; a statistically significant difference,  $F(1, 38) = 8.21$ ,  $p < .01$ ), more than half of the topics and activities are covered, to varying degrees, by just one language in the Swiss French study. This, of course, is exactly what the CP would predict.

Two other studies, one done in Italy and the other in the United States, bring additional evidence that the CP is a fair characterization of language functions in bilinguals. Chiaro (2009), in a study that examined humorous talk in bilingual couples, asked 59 bilinguals representing a number of different language pairs to state which languages they spoke in various domains and activities. There were 39 female and 20 male participants with a mean age of 37 years old. She too found that a number of activities received very high single-language percentages (in this case, the respondents' mother tongue): 74% for counting, 88% for doing sums and calculating, 81% in prayer and worship, and 73% for talking to oneself. Other domains were shared between the two languages such as work, arguing, food, etc.

In the other study, Carroll and Luna (2011), prior to undertaking a lexical decision task, asked their Spanish–English bilingual participants in Boston, USA, all highly proficient in their two languages, to rate their language use on a 7-point scale (with “never” on one end and “always” on the other). They did this for three different domains: home, family and friends, and work. For home, Spanish was the dominant answer (5.93 vs. 4.03 for English, a statistically significant difference at the .001 level); for family and friends, Spanish again came out on top, 5.87 vs. 3.67, a significant difference at the .001 level; and for work, English was the dominant answer (6.30 vs. 3.17, another significant difference at the .001 level).

In sum, in four different studies, with four different groups of bilinguals, empirical evidence was found for the CP. Languages are indeed distributed differently across domains of life and activities. Different aspects of life do seem to require different languages.

#### **4.4 The impact of the Complementarity Principle**

Since the CP is so prevalent in the life of bilinguals, one would expect it to have an impact on the psycholinguistics of bilingualism, most notably on language perception, language production, memory, and language acquisition. Although the available studies are still few, they all point towards the importance of the CP as an important factor.

##### *4.4.1 Language perception*

In the domain of language perception, Carroll and Luna (2011) investigated how the accessibility of words depends on how they are used by the bilingual

in everyday life. They argued that words will be more accessible when the language in which they are coded is the language that is typically used to discuss a particular content area; that is, the domain being discussed. Having shown that certain topics are discussed more readily in a particular language in their Spanish–English bilinguals (see the preceding section), they conducted a visual word recognition task in both English and Spanish (Study 1 in their paper containing three studies). One group did a lexical decision task on English words that matched the English-language content area (work) and they did the same task on Spanish words that matched the Spanish-language content area (friends and family). The other group did the same lexical decision task but this time on English words that did not match the English-language content area (that is, on English words pertaining to friends and family) and on Spanish words that did not match the Spanish-language content area (that is, on Spanish words pertaining to work).

The results obtained showed how important the CP is during language processing. When words were shown in Spanish and they belonged to the Spanish-language content area (family and friends, therefore), they were recognized faster than the same words shown in English. The mean for Spanish was 637.78 ms and the mean for English was 695.38 ms, a significant difference at the .05 level. And when words were shown in English and they belonged to the English-language content area (work), they too were recognized faster than the same words shown in Spanish (643.61 ms and 825.37 ms respectively, a significant difference at the .001 level).

Since the authors had controlled for both word frequency and length (two important variables in word recognition), they concluded that words in the language used in the words' content areas (work for English, friends and family for Spanish) are more accessible than words in the other language. Since this is exactly what the CP would predict, it can only be hoped that future studies in visual or auditory word recognition will take into account this variable. It would also be interesting to go back to published data and see if, after the fact, the results obtained cannot be better explained if one takes into account the CP.

Carroll and Luna (2011) were interested in researching the language used in advertisements targeting bilingual individuals and hence they presented the results of two other studies bearing on this issue. In Study 2, they found that when an ad that is shown in a particular language and the ad's content belongs to the domain most associated with that language, then evaluations are higher than when there is a mismatch between the language of presentation and the content of the ad. They theorized that this occurs because knowledge relevant to the ad content is more accessible in the language typically used in that content area.

In Study 3, the authors showed that if bilingual consumers become aware of the existence of language-specific domains, that is, how some languages

are used in certain content areas with greater frequency than others – the very essence of the CP – their awareness of the process offsets fluency effects. The resulting evaluations are influenced by elaboration on language schemas. This explains why their bilinguals scored Spanish ads lower than English ads in this third study. They did not associate positive feelings with Spanish, at least in the context of marketing communications. The authors end their paper by stating that each bilingual community has language norms that dictate the proper use of each language for particular content areas. The language of an ad should match the language typically used in the content area the ad refers to.

#### 4.4.2 *Language production*

In the area of language production, a very old study by Cooper (1971), for which we have little information, showed that Spanish–English bilinguals had very different word-naming scores depending on whether the domain proposed was family, neighborhood, school, or religion. This was explained by the fact that some of these domains were usually covered by Spanish, others by English, and still others by both. What is interesting is that the bilinguals would have been considered as balanced when the authors looked at the results of some domains but as dominant when they examined the results of other domains. (We will come back to this later.) Almost 40 years later, Ivanova and Costa (2008) attempted to explain the different behaviors of bilinguals who are dominant in their first language and of bilinguals who have switched their dominance (they are dominant in their second language). They argued that the latter may use their two languages in different social and linguistic contexts in the sense that some L1 and L2 items for these bilinguals were complementary rather than overlapping. According to them, these bilinguals may not have been sure of the translation equivalents of the corresponding items in the other language or, at least, they had more problems retrieving them. This is a CP explanation that is intriguing and that needs further research.

Still in the domain of language production, but in an interview situation, both Gasser (2000) and Jaccard and Cividin (2001) wanted to see what would happen if their bilinguals talked about a topic in the “wrong” language. If they talked about it while in a bilingual mode situation, would they mix their languages more, that is, code-switch and borrow, than when using the “right” language? In what follows, we will refer to a topic as “strong” if it was characterized by a high importance percentage in the language in question (see the previous section) and as “weak” if it received a low importance percentage. For 10 of her 20 bilinguals, Gasser worked out for each bilingual, and each of their two languages, the strong and the weak topics. Thus, for example, she found for Bilingual 14 (see Table 4.1) the following topics in each category:

- Strong English topics: home, family (distant)
- Weak English topics: leisure, shopping
- Strong German topics: sports, education
- Weak German topics: holidays, evening out

For each bilingual, questions were prepared for the strong/weak English part of the interview, and other questions for the strong/weak German part. The questions took into account the culture linked to each language, a British or American culture for English, and the Swiss German culture for German. These questions served as a starting point for a semi-guided interview that took place in a quiet room, very often in the bilinguals' homes. It lasted in all about 30 to 40 minutes. The bilinguals were told that they should feel free to talk about any aspect related to the question, the only restriction being that they were to stay in the base language set at the beginning of each section. They could code-switch if they wanted to, however, as the experimenter knew both languages. She showed this in the warm-up conversation before the start of the interviews.

The variable examined during the data analysis stage was the amount of language mixing that took place; that is, any instance of the language not being spoken at that time such as code-switches and borrowings. (Established borrowings, calques and loanshifts were not counted as instances of mixing.) There were two different dependent measures. The first was the number of mixed syllables per minute. Gasser counted the number of mixed language syllables in each of the four conditions for each bilingual. When two topics were used in the same condition, the results were added up and a mean obtained. Gasser also measured the total time spent speaking, which allowed her to obtain the number of syllables per minute. For example, Bilingual 5 in the strong English condition talked about work and produced six mixed syllables for a total of 594 seconds of speaking time. Thus, the number of mixed syllables per minute was  $6 / 594 * 60 = 0.61$ .

The other dependent measure that took into account the speaker's speech rate was the percentage of mixed syllables per condition. First Gasser obtained an estimate of the speaker's speech rate by taking three 30-second segments and transcribing everything that was said in them. She then divided the number of syllables uttered in each section by 30 to obtain the speech rate; that is, the number of syllables articulated per second. She did this for the two other segments and obtained the mean of the three. The next step was to multiply the time spent talking in a particular condition by its mean rate to obtain an estimate of the total number of syllables uttered. Finally, she divided the number of mixed language syllables by the estimate of the total number of syllables and converted this to a percentage. For each dependent measure, the English and German results for each condition (i.e., for the strong condition and then

for the weak condition) were combined to obtain two global means for each participant.

Whatever the dependent measure used, the results were very similar and clearly showed that the CP is a factor in bilingual speech production. For the number of mixed syllables per minute, the strong language condition global mean was 1.06 syllables per minute and for the weak language condition it was 2.32 syllables per minute. This difference was significant at the .05 level. For the other dependent measure, the percentage of mixed syllables, the means were 0.55% and 1.4% for the strong and weak language conditions respectively, also significant at the .05 level.

Jaccard and Cividin (2001) used exactly the same approach with their Italian–French second-generation bilinguals in the French-speaking part of Switzerland. Their results were even more marked in that the amount of mixed language increased more than fourfold when bilinguals went from a strong topic in a language to a weak topic. For the number of mixed syllables per minute, the means were 0.73 syllables per minute and 3.55 syllables per minute for the strong and weak topics respectively, and for the percentage of mixed syllables the means were 0.36 % vs. 1.86%, respectively. In each case the differences were significant at the .01 level.

Thus, in both studies, bilinguals showed a significant difference in their language mixing depending on whether they talked about a strong language topic or a weak language topic. If, for example, they had to talk about a topic in the “wrong language” (a weak language topic), they brought in their other language to help themselves out since they were in a bilingual language mode. This happened much less when they were speaking about a topic in the “right” language (a strong language topic). Thus both studies found evidence for the CP and both showed the very real impact it has on language behavior.

#### 4.4.3 *Memory*

It would seem that memory is also influenced by the CP, at least indirectly. Marian and Neisser (2000) found that bilinguals remember things better when the language that is used for recall matches the language used at the time of the event in a particular domain. In the introduction to their study, they mention two anecdotes. The first was offered by Aneta Pavlenko who, when asked in Russian for her apartment number in the United States, erroneously provided the number of her old apartment in her native country, which she knew in Russian. The other anecdote concerned Elizabeth Spelke, who related that a bilingual child had learned a French song while on vacation in France but could not recall the song on his return to the United States. However, when he was once again in a French-speaking environment, he remembered the song without any effort.

In their study, Marian and Neisser interviewed a number of Russian–English bilinguals, both in English and in Russian. They gave them English prompt words in the English part of the study, and Russian translation equivalents in the Russian part. The English prompt words included items such as “summer,” “neighbors,” “birthday,” “cat,” and “doctor.” The bilinguals were asked to describe an event from their own life that the prompt word brought to mind. The researchers also asked the participants, after the interview, to indicate the language in which they had been spoken to, or they had spoken, or they had been surrounded by, at the time that each recalled event took place. If the event prompted by the word “cat,” for example, took place in Russian, the researchers called this a Russian memory; if it took place in English, then it was an English memory.

Marian and Neisser found that their bilingual participants accessed more Russian memories when interviewed in Russian than when interviewed in English, and more English memories when interviewed in English than when interviewed in Russian. They concluded that bilinguals are more likely to retrieve memories that occurred in a particular language if that same language is also used in the retrieval setting. They called this language-dependent recall. In sum, the CP also seems to manifest itself, at least indirectly, in the recall of events that took place in the bilingual’s different languages – which, as we have seen, are usually linked to different domains.

#### 4.4.4 *Language acquisition*

A topic that has interested researchers over the years concerns whether bilingual children have similar vocabularies to their monolingual peers. In addition, do they have as many words? Pearson and Fernández (1994) examined the vocabulary development of English–Spanish bilingual children, aged between 8 and 30 months, and found that the rate and pace of development of the bilinguals’ lexical knowledge were similar to those of monolingual children. In addition, the total vocabulary count of these children (taking into account both languages) was not different to that of the monolinguals, but their single-language vocabularies were somewhat smaller.

Almost 20 years later, Poulin-Dubois, Bialystok, Blaye, Polonia, and Yott (2013) confirmed and extended this line of research. They compared the lexical development of two-year-old monolingual and bilingual infants. One of the tasks used was similar to the Pearson and Fernández task, which was based on a vocabulary checklist that parents fill in and that measures a child’s expressive vocabulary. They too found that the total vocabulary size obtained for the monolinguals and the bilinguals was not statistically different. As for the vocabulary size in the children’s first language, it was once again smaller in the bilinguals than in the monolinguals.



Poulin-Dubois et al. (2013) explained the fact that bilingual children have a smaller vocabulary in just one language in the following way: they are exposed to their languages in different environments and hence they may encounter specific items in a context where only one language is used. This decreases the number of words acquired in each language. This explanation is identical to what the CP states; that is, that 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.

In fact, three years before, Bialystok, Luk, Peets, and Yang (2010) had found evidence for this proposal. They had tested the English receptive vocabulary of a very large number of monolingual and bilingual children, between the ages of 3 and 10 years, whose school language was English. They too had found that monolingual children outperformed bilingual children when tested in just one language. To try to understand this finding, they took the step of examining the results by domain: the school domain (with words like “writing,” “rectangle,” “astronaut,” etc.) and the home domain (with words like “squash” and “camper,” for example).

The results they obtained confirmed the impact of the CP. The difference that had been found between monolinguals and bilinguals was maintained in the home domain. This is normal as the bilingual children used their other language at home and hence did not know English home words as well. However, in the school domain, a domain where English is used by both groups, the monolingual and bilingual children showed similar results. The authors concluded that bilingual children are not disadvantaged in academic uses of English.

In sum, as with adults, the vocabulary of bilingual children will be in a given language for certain domains, in the other language for other domains, and in both languages for some shared domains. Concerning shared domains, already in the 1990s, Pearson, Fernández, and Oller (1995) had found that 30.8 percent of words in bilingual children were doublets or translation equivalents (i.e., a particular concept had a label in both languages), and more recently Poulin-Dubois et al. (2013) have reported a very similar percentage (37.4 percent). We are thus far away from what Gollan, Montoya, Cera, and Sandoval (2008: 788) state, that “[b]ilinguals know roughly twice as many words as monolinguals (assuming bilinguals know a word in each language for most lexicalized concepts),” and, a bit later in the same article, “for any given concept, they know two words (translations) that fit their intended meaning very well, whereas monolinguals typically know just one” (p. 788). Of course, the authors were talking about bilingual adults, but even they, as we have seen throughout this chapter, simply do not fit this two-monolinguals-in-one-person point of view.

The studies on bilingual acquisition in children make perfect sense and reflect the fact that different aspects of life, whether in children or adults, often

require different languages. Increasingly, as we have seen throughout this section, empirical evidence is being found for the impact of the CP in the linguistics and the psycholinguistics of bilingualism.

#### 4.5 Language dominance and the Complementarity Principle

As is apparent in this book, language dominance is a complex concept that needs to include several factors. In this last section, we will argue that the CP should be one of them.

It is recognized in the field of bilingualism that many bilinguals are dominant in a language, as opposed to “balanced.” However, dominance is particularly difficult to define: is it based on fluency? On fluency and use? On the ability to also read and write in a language? On when the languages were acquired? On other factors? Many specialists such as Flege, MacKay, and Piske (2002) put the emphasis on fluency – objective fluency (as it is evaluated by the researchers) and subjective fluency (as it is reported by the bilinguals themselves). Among the more objective assessment tools used, one finds language evaluation measures by outside judges (including pronunciation evaluation), as well as different behavioral tasks that measure such things as the time needed to carry out a command, to name a picture or a number, to read a text, etc. These instruments also often contain translation tasks. From the various measures obtained, specialists give their subjects a dominance rating: the person is dominant in language A or dominant in language B or balanced in both languages. However, these various approaches have been criticized for reducing the complexity of the bilingual’s language behavior to a number of simple laboratory tasks.

On the self-report side, bilinguals are given language background questionnaires that include, among other things, self-rating scales for language fluency and language use for the two or more languages. The four basic skills in each language are also involved (speaking, listening, reading, and writing), as are other factors such as the age of onset of bilingualism. For example, in the recent Bilingual Dominance Scale proposed by Dunn and Fox Tree (2009), there are 12 questions that, when scored, lead to a composite score indicating dominance. Four questions pertain to the onset of bilingualism (when the languages were learned and when the respondent started feeling comfortable speaking each language), one question concerns accent, one pertains to fluency, one to the country/region the bilingual lives in, and five questions deal with language use. The latter concern which language is predominately used at home, which language is used for math, the number of years of schooling the bilingual had in each language (covered by two questions), and finally there is a question that is an adaptation of the infamous question originally used by Cutler, Mehler, Norris, and Segui

(1992). In that question, bilinguals were asked to indicate which language they would choose to keep if they developed a serious disease and their life could only be saved by a brain operation that would have the unfortunate side-effect of removing one of their languages. (My reaction to this question appears in Grosjean, 1998.) Here, in the Bilingual Dominance Scale, bilinguals are asked which language they would choose to use for the rest of their life if only one language was possible. A simple glimpse at Figure 4.1 in this chapter shows how difficult it is to give an answer to this question for many bilinguals.

If we only concentrate on language use, questionnaires such as this one may produce a global measure of dominance and may confirm, for example, that the bilingual depicted in Figure 4.1 is globally dominant in La, which covers many more domains (13 domains counting shared domains) than Lb (9 domains counting shared domains). But the problem with global dominance is that it does not take into account how the languages are distributed over the domains. Even though the bilingual in Figure 4.1 is globally dominant in La, we see that there are three domains in which she uses Lb exclusively. With adequate assessment tools, it would probably be fairly easy to show that this bilingual is dominant in Lb in these domains.

Things are even more complex when one examines the distribution of languages according to topics (see the example given in Table 4.1) or according to activities (see Table 4.2). Clearly, there are some domains of life, and some activities, where the bilingual in question is dominant in English, others where she is dominant in German, and still others where she is balanced.

I wrote to Alexandra Dunn and Jean Fox Tree when their paper came out to discuss this issue with them. I accepted that bilinguals may be globally dominant in one language or the other, or, more rarely, be balanced. However, I also felt strongly that languages are used in different domains of life, and that this can have an impact on dominance. According to the CP, different aspects of life require different languages. What this means is that dominance may be domain-specific. For some domains, a bilingual will be dominant in one language, for others, in the other language, and for some others still, balanced. If this is correct, then one will have to develop a means of expanding a dominance scale to take this into account. On this precise issue, the two authors replied (personal communication) that they still thought that dominance can be described in a more general way, as they attempted to do with their scale, but they did agree that dominance can also be described as domain-specific.

Clearly, a domain-specific approach to dominance is crucial to obtain a better description of the bilingual but also to help understand the data that is obtained in linguistic and psycholinguistic studies. It is only because of the pioneering work of the psycholinguists mentioned in the previous section that

one is starting to understand some of the experimental results obtained that otherwise would have remained unclear.

Another important component of dominance is fluency, and even though the CP puts emphasis on use, it has an indirect effect on fluency. If a language is spoken in a reduced number of domains and with a limited number of people, then it will not be developed as much as a language used in more domains and with more people. It is precisely because the need and use of the languages are usually quite different that bilinguals do not develop equal and total fluency in all their languages. This is also true for certain skills such as reading and writing. Many bilinguals do not need to read and write in some of their languages and hence have not developed these skills. Even if they do have reading and writing skills in their two or more languages, the levels of competence are probably different because the needs for these skills are not the same in each language.

If a domain is not covered by a language, bilinguals will simply not have the domain-specific vocabulary, the stylistic variety, even sometimes the discursive and pragmatic rules needed for that domain. When such elements are missing, and they are needed at a particular moment, the result can be quite frustrating. For example, in a conversation, one will tend to fumble in the language that is new to that domain. When the right word or expression does not come to mind, one is tempted to call upon the other language(s) one knows. This is sometimes possible when speaking with other bilinguals who share the same languages but when speaking with monolinguals, this solution is inappropriate. One may continue to struggle but may finally resort to bringing in some of the words from the other language(s) all the same by adapting them and explaining them. One may persevere for a while but then the conversation is often shortened.

In whatever way the CP is taken into account in measures of dominance in the years to come, one should keep in mind that dominance can change in a bilingual's lifetime and that 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 people's first language or "mother tongue" is automatically their dominant language. People's personal language history may show quite different bilingual configurations at different moments in time.

Clearly, measures of dominance will become more and more sophisticated and will take into account the many underlying phenomena that characterize a person's bilingualism. The CP should be one of them.

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