Bassetti, B. and Cook, V. J. (2011) Language and cognition: The second language user In Cook, V. J. and Bassetti, B. (eds.) *Language and bilingual cognition*. Hove, UK: Psychology Press. (pp. 143-190). Prepublication.

LANGUAGE AND COGNITION: THE SECOND LANGUAGE USER

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INTRODUCTION

If differences in linguistic representation lead to differences in cognition among speakers of different languages, what happens to people who know more than one language? Knowing two languages that instantiate two different ways of looking at the world may lead bilinguals to look at the world differently from monolinguals, and may help them see beyond what the first language represents.

Bilingualism has two possible cognitive outcomes. One is that the very knowledge and use of two languages affects cognition, regardless of the languages involved -- the macro level. An example of this may be increased metalinguistic awareness (Bialystok, 2001) or delayed onset of Alzheimer's (Bialystok, Craik, Klein, & Viswanathan, 2004). Another outcome is that the learning of two languages affects cognition because of the characteristics of the languages involved, and how the languages code a given aspect of the world. We may refer to this as the micro level. For instance, suppose a monolingual user of Russian linguistically encodes two different shades of blue where a monolingual user of English has one: In this case a bilingual who speaks both English and Russian may distinguish two colors that monolingual English speakers consider one. An English-Dutch bilingual, however, would not differ from an English monolingual, because these two languages do not have different classifications of blue. While this volume is mostly directed at the micro outcome, the macro outcome (or interactions between the micro and the macro levels) cannot be ruled out.

What is a Bilingual?

A starting point is to consider what bilingualism actually **is**. Intuitively, it is the knowledge of more than one language, as opposed to monolingualism, but a scientific definition seems hard to pin down. A variety of definitions have been proposed, surveyed usefully in Hoffman (1991). Most definitions cluster into two groups. One consists of a maximal assumption where being bilingual means speaking two languages with equal fluency in every situation, as in Bloomfield's (1933) "native-like control of two languages" (p. 56). This probably corresponds best to the everyday concept of bilingualism, namely that a bilingual has a high level of proficiency in both languages. The other definition takes the minimal view that bilingualism refers to any real-life use of more than one language at whatever level; Haugen (1953, p. 7) for instance claims that bilingualism starts at "the point where a speaker can first produce complete meaningful utterances in the other language". These definitions then oppose 'complete' knowledge of two (or more) languages against 'any' ability to use the second language at all; they differ in how much of the second language (L2) they consider it takes to be bilingual. Concealed in the maximal/minimal question is a second issue of 'knowledge' of another language versus 'ability to use' another language. Weinreich, for example, defines bilingualism as "the practice of alternately using two languages" (Weinreich, 1953, p. 1), that is, a straightforward use definition.

Both types of definition have a fatal flaw, as pointed out by Romaine (1989, p. 282): "it is clear that a reasonable account of bilingualism cannot be based on a theory

which assumes monolingual competence as its frame of reference". The maximal definition assumes that the target for a bilingual is the linguistic competence of a monolingual native speaker in both languages; the use definition assumes that a bilingual uses language in the same way as a monolingual native speaker in both languages. But people who know more than one language have different knowledge of both their first and second languages from monolingual native speakers of either (Cook, 2003) and they have uses for language that no monolingual has, such as code-switching and translation: In short a bilingual is **not** two monolinguals in one person (Grosjean, 1998); "For the vast majority of bilinguals, 'bilingual competence' is not measurable in terms of monolingual standards" (Hoffman, 1991, p. 23).

In support of the minimal definition, it seems that even a smattering of knowledge of another language is enough to change from a monolingual's way of thinking. For instance, it took just a few months of English for a group of Hebrew-speaking schoolchildren to change their concept of time flow (see below). It took one hour of Italian a week for one year for a group of English kindergarten children to develop a different concept of 'word' (Yelland, Pollard, & Mercuri, 1993). Experimental studies also found effects of very short (e.g., as little as 15 minutes) second language learning of an artificial language on performance on non-language cognitive tasks (e.g., Boroditsky, 2001). In other words it would be wrong to assume that any cognitive consequences of bilingualism only appear in maximal bilinguals who have acquired and used the language for many years; effects may manifest themselves at a comparatively low level of knowledge and use of the second language after a matter of hours.

The use definition needs to acknowledge the so-called language 'skills' -- listening, speaking, reading and writing; the Language Passport (Council of Europe, 2000) of the Council of Europe for instance asks people to rate themselves on six levels of second language ability under the headings Understanding, Speaking and Writing. Bilingualism may thus vary according to the skill involved. One of the present authors would come out very differently on these scales, being able to follow academic committee meetings in French with no problems but being unable to speak at them except in English; the other author can read entire novels in French but cannot buy a box of chocolates in Brussels. There is a difference between productive and receptive knowledge of a second language; a bilingual may comprehend one of their languages at a different level of proficiency from which they produce it. Someone who is a fluent listener or reader of a language but cannot speak it is indeed a bilingual, just as a monk with a vow of silence is still a native speaker of his or her first language. A particularly interesting case in point is the bimodal bilingualism of the Deaf (Grosjean, 2008): A Deaf signer may be a native user of say British Sign Language and an L2 user of written English, with no use of spoken English. Furthermore, conceptual changes can be instigated not only by knowledge of spoken language, but also by knowledge of written language -- someone who cannot speak two languages but can read two languages is not identical to a monoliterate person.

Another, related, crucial distinction is between academic knowledge or study of a language and the ability to actually use it (also captured by the distinction between natural and instructed bilingualism). For the purposes of bilingual cognition research, someone who learnt Latin in school and understood the intricacies of its tense and aspect system hardly qualifies as a monolingual any more, although this person may

never have spoken a full sentence of Latin. The impact of a second language on thinking needs to be extended to different types of L2 knowledge from the usual implicit knowledge of language, ranging from the scholar who writes entire grammars of languages they cannot speak to the English-speaking child who has been taught the French subjunctive at school.

It might be impossible ever to provide a satisfactory definition of bilingualism. More importantly for the present volume, it might be undesirable. Different groups of people need different definitions, depending on their purposes. For instance, for educators a use-based definition is more useful, e.g., a bilingual child is one "who regularly needs to understand or use more than one language (e.g., at home and at school)" (Frederickson & Cline, 2002, p. 246). For the purposes of bilingual cognition research, a bilingual is someone who knows more than one language, regardless of ability to produce the languages, and regardless of whether the languages are spoken or written. While language production can be evidence of knowledge, there is no evidence that it is needed for the process of acquiring new concepts. Nor is it is necessary to know the spoken language, as new ideas can be acquired by reading. Furthermore, in this volume, the term *bilingual* includes *multilingual, trilingual* and so on, except where the specific issue of cognition in bilinguals versus multilinguals is discussed below. To avoid prejudging all these issues, some researchers now use the more neutral term *L2 users* rather than *bilinguals* (Cook, 1994), not committing themselves to a multiple-monolingual definition of bilingualism, and the term will be used in this chapter to talk about someone who knows more than one language, whether spoken, written or signed, regardless of the number of languages known, the level of proficiency, how they were learnt, and whether knowledge is productive or receptive.

BILINGUALISM IN THE EARLY DAYS OF LINGUISTIC RELATIVITY

Historically, scientific research into the relationship of language and thought took its inspiration from the principle of 'Linguistic Relativity' proposed by Benjamin Lee Whorf (Whorf, 1940/1956) and Edward Sapir, as mentioned in most contributions to this volume. From its very beginnings, the concept of linguistic relativity was associated with people who knew more than one language, coming out of the strong US nineteenth and early twentieth century tradition of anthropological linguistics, as described in Lucy's contribution to this volume. Edward Sapir (who was Whorf's mentor) was a German Jew who had ended up in the USA and so was a user of more than one language, bilingual in the maximal sense. Whorf himself probably developed his ideas about linguistic relativity as a consequence of studying American Indian languages.

The idea that learning another language changes your world-view was not, of course, new. A century before Whorf, von Humboldt had said:

> To learn a foreign language should therefore be to acquire a new standpoint in the world-view hitherto possessed, in fact to a certain extent this is so, since every language contains the whole conceptual fabric and mode of presentation of a portion of mankind.
>
> (von Humboldt, 1836/1988, p. 60).

Still, he pessimistically went on to add:

> But because we always carry over, more or less, our own world-view, and even our own language-view, this outcome is not purely and completely experienced.
>
> (ibid.)

Sapir and Whorf were more enthusiastic about bilingualism. Sapir wrote:

> Perhaps the best way to get behind our thought processes and to eliminate from them all the accidents or irrelevances due to their linguistic garb is to plunge into a study of exotic modes of expression. At any rate, I know of no better way to kill spurious "entities".
>
> (Sapir, 1924/1985, p. 157)

Whorf also believed that learning other languages could free people from the bias of their language and clarify thinking. To him the stranglehold that language has on thinking could be overcome by becoming aware of it through knowledge of other languages; as Lee puts it, Whorf " believed that awareness achieved by studying the way different languages embody different analyses of experience has the capacity, at least potentially, to free conceptual activity, including reasoning, from monolingual constraints" (Lee, 1996, p. 239). Whorf repeatedly makes the point that a more objective understanding of reality comes from learning how other languages represent reality, styled "multilingual awareness":

> Western culture has made, through language, a provisional analysis of reality and, without correctives, holds resolutely to that analysis as final. The only corrective lies in all those other tongues which by aeons of independent evolution have arrived at different, but equally logical, provisional analyses.
>
> (Whorf, 1941/1956, p. 244)

But he seems to think that this insight is to be achieved through formal study, not naturalistic acquisition. In his 1940 article 'Science and linguistics', Whorf wrote: "The person most nearly free [to describe nature with absolute impartiality] would be a linguist familiar with very many widely different linguistic systems" (Whorf, 1940/1956, p. 214).

Indeed, Whorf appeared to believe that the linguist with an academic knowledge of languages was better equipped to understand how language invisibly affects thinking than the polyglot who can communicate in more than one language:

> These background phenomena [the phenomena of language that are outside the consciousness and control of its speakers] are the province of the grammarian -- or of the linguist, to give him his more modern name as a scientist. … a person who can quickly attain agreement about subject matter with different people speaking a number of different languages … is better termed a polyglot or a multilingual.
>
> (Whorf, 1940/1956), p. 211)

Not that Whorf was always consistent. On the one hand, he believes himself capable of understanding the worldview of Hopi speakers as presented in their language unfettered by his native English. On the other hand, he seems to treat his Hopi informants as monolingual Hopi speakers rather than Hopis who spoke English -- his main informant was living in New York after all -- assuming that they think in uniquely Hopi ways, without appreciating that their knowledge of English may have affected what they are presenting to him. So, for instance, he writes (pp. 103-104) that the "bilingual English-speaking Hopi informant" has two or more fundamental meaning categories in his own language corresponding to just one category in English (inceptive, or 'begin doing', and projective, or 'do with a forward movement').

At any rate, in spite of these caveats, from the early days of linguistic relativity bilingualism was seen as the solution to the problem of language's effects on thought that had just been discovered. Yet, research on bilingual cognition was still far off.

THE DEVELOPMENT OF RESEARCH ON LINGUISTIC RELATIVITY AND BILINGUAL COGNITION

Indeed the possibility that bilingualism affects cognition did not become a research topic for another 60 years after Whorf, although early linguistic relativity research that included bilinguals had showed from the very early days that bilinguals differed from monolinguals. During the 1950s and the 1960s, when linguistic relativity research focused on color perception, a handful of studies indeed looked at bilinguals. Brown and Lenneberg (1954) and Lenneberg and Roberts (1956) showed that when a language does not have separate lexical labels for two colors (e.g., Zuni has one word for 'yellow' and 'orange'), its speakers do not remember these colors as well as speakers of a language with two lexical labels (e.g., English). Ervin (1961) found that learning L2 English changes Navaho speakers' color naming and color prototypes, and that these are affected by language dominance (whether English-dominant or Navaho-dominant). Similar findings were published a few years later (Caskey-Sirmons & Hickerson, 1977). In short, these pioneer studies showed that bilinguals do not share the same color categories as monolinguals.

By the 1970s, linguistic relativity had fallen out of favor with researchers, partly because evidence of the universality of color perception was generally accepted (see Berlin & Kay, 1969), but also due to a change in the zeitgeist, as linguists inspired by Chomsky concentrated increasingly on language universals and psychologists had other preoccupations (see Ervin, this volume). Research into linguistic relativity itself became rare and was sometimes vilified. As a consequence, research on bilingual cognition too faded away (with very rare exceptions, such as the study of person cognition in Hoffman, Lau, and Johnson, 1986).

Yet it was also during this time that a fairly strong claim about the effects of bilingual cognition was advanced, in Bloom's study of counterfactual reasoning in Chinese speakers that included Chinese users of L2 English (Bloom, 1981). The English language distinguishes between a counterfactual conditional (a conditional that describes the consequences of events that did not happen, as in *If John had seen Mary, he would have known that she was pregnant* -- i.e., John did not see Mary) and a factual conditional (*If John saw Mary, he knew she was pregnant* -- i.e., we don't know whether John saw Mary). The Chinese language does not distinguish between

these two types of conditionals either lexically or grammatically, and so gives no information as to whether an event happened or not. Bloom created a counterfactual story about what would have happened if a philosopher named Bier had known Chinese, and asked Chinese speakers to answer questions about the story. Chinese monolingual speakers mostly did not interpret the story counterfactually, but those who knew L2 English did so more often. Although the research only used bilinguals as a test-bed for research on monolinguals, it provided clear evidence of effects of bilingualism on cognition. It was also the first study of bilinguals to look at 'grammaticalized concepts', i.e. concepts encoded in morphology and syntax, rather than 'lexicalized concepts', i.e. concepts encoded in words, such as colors -- a distinction that has become highly relevant to current research (Pavlenko, 1999).

Bloom's research happened to be published at a time when linguistic relativity was seen as theoretically and methodologically suspect. Such research was even seen as something to be avoided on ethical grounds, as is evident from the following comment on Bloom's work:

> [A] cross-cultural study of a possible difference in basic cognitive ability that happened to get favorable results for linguistic relativity inevitably leads to the implied degradation of one of the compared cultures. Given the indecisive nature of cross-cultural research, it does not seem to be advisable to conduct cross-cultural studies of linguistic relativity, the most reliable accomplishment of which may be the creation of hostility among different cultures in this already complicated world.
>
> (Takano, 1989, p. 161)

Ironically, it was precisely his finding that Chinese-English bilinguals outperformed monolinguals that might have saved Bloom from taunts of racism. If learning a second language makes this type of reasoning easier, this makes it a **language** problem, not one of race or culture. Many researchers criticized Bloom's work on methodological grounds and failed to obtain the same results (with modified materials -- for example Au, 1983, 1984; Cheng, 1985; Liu, 1985). One could say that this book was dismissed partly because it came out at the wrong time. Only recently have researchers dared to re-open the topic of counterfactuals (Yeh & Gentner, 2005, on monolinguals; Bassetti, 2008, on bilinguals).

There was then a hiatus in research into bilingual cognition, barring the occasional paper or thesis (e.g., Kiyak, 1982). The late 1990s saw the appearance of calls for research specifically on bilingual cognition (Cook, 2002; Green, 1998; Pavlenko, 1999); the term 'conceptual transfer' made its appearance (e.g., Jarvis, 1998); and theses and conference papers started emerging (Chalikia & Vaid, 1999; Han, 1998). In the 2000s came the first workshop devoted to the topic at the European Second Language Association conference (2002), which included presentations by the present authors with colleagues (Bassetti et al., 2002) and by others (Athanasopoulos, 2002). In 2005 two overviews were published (Odlin, 2005; Pavlenko, 2005), and the field has been steadily growing since.

One reason for the increased interest was the rehabilitation of linguistic relativity in the 1990s, documented in most of the papers in this volume, and in such landmark works as Gumperz and Levinson (1996), Niemeier and Dirven (2000), Hunt and

Agnoli (1991), and Lucy (1992a, 1992b, 1997). New theories and methodologies were used to investigate language influences on non-language behavior through cross-linguistic comparison. Some researchers defined themselves as neo-Whorfians, in order to distance themselves from criticisms previously leveled at the Sapir-Whorf hypothesis, particularly from the 'linguistic determinism' attributed to linguistic relativity research by its opponents. Research looked not only at lexicalized concepts, but also at grammaticalized concepts, probably closer to Whorf's original idea than the codability wave of research like Brown and Lenneberg (1954).

The second reason for the rebirth of bilingual cognition research was the rehabilitation of bilingualism itself which, following much research sparked by the landmark study of bilinguals' IQ by Peal and Lambert in 1962, was no longer seen as a deficit, but as an advantage. Research on bilingualism became respectable; in the past decade or so there has been a veritable explosion of conferences, journals, and research focusing on the psychology of bilingualism. Bilingualism research has also started to merge with its sister discipline, second language acquisition research, which had come out of an applied linguistics tradition rather than from psychology.

The crucial difference from earlier days is, however, that now researchers are investigating bilingual cognition for its own sake, rather than as a spin-off to confirm or disconfirm findings from monolinguals. Nowadays there are then two sources of evidence on bilingual cognition. There are studies that are designed on purpose to test the effects of bilingualism on cognition; and there are studies that are interested in cross-linguistic comparisons, where bilinguals are included for one reason or another, such as Romney, Moore and Rusch (1997) for emotion; Hoffman et al. (1986) for person cognition, and Jameson and Alvarado (2003) for color. However important the findings from these latter studies, they had not been specifically designed to investigate bilingualism, and their results are not explained beyond how they do or do not confirm monolinguals' behavior or provide convergent evidence. In fact, there may even be much more bilingual cognition research than we think, as many cross-linguistic studies that purportedly compared speakers of different languages in fact studied bilinguals, although the participants' knowledge of other languages is ignored and not reported as if this were immaterial, including the famous Berlin and Kay study of colors (1969).

This new wave of bilingualism-oriented research encompasses not only color but also time, space, motion, emotion, etc, as described below; the present volume includes bilingual cognition research on spatial location (Coventry, Guijarro-Fuentes, & Valdes), temporal representations (Chen & Su), motion (Czechowska & Ewert; Hendriks & Hickmann), color (Athanasopoulos), Theory of Mind (Siegal, Kobayashi Frank, & Hjelmquist), causality (Cunningham, Vaid, & Chen), concepts of animals (Bassetti), and emotions (Besemeres; Knickerbocker & Altarriba) -- as wide a range as cross-linguistic research, and rapidly growing. Furthermore, researchers in various disciplines are nowadays looking at the consequences of bilingual cognition for practical applications, such as marketing to bilinguals and legal trials of bilinguals, as discussed in Part C of this volume.

CAN LEARNING ANOTHER LANGUAGE CHANGE THE WAY PEOPLE THINK?

Not only linguistic relativity researchers, but also laypeople (including policy-makers) seem to think that knowledge of more than one language has positive effects on thinking. The question then is -- how and why does this happen? This section mostly concentrates on sequential bilinguals, i.e. those who learnt an additional language once they had already established one (or more) language system(s) and related conceptual system(s), although the same issues apply to simultaneous bilinguals.

The Layperson's View of Language Learning as an Eye-opener

Among non-specialists there is a widespread view that learning new linguistic representations of the world changes the way people think about it. There has long been a popular view that learning another language 'opens one's mind', or 'widens one's horizons'. Traditionally this was considered an effect of learning Latin and Greek. Both authors of this chapter spent seven years or more learning Latin and one spent five learning Ancient Greek, with the main aim of learning to think better, or 'brain-training' as it was often called. This view has still not been abandoned. The current Mayor of London Boris Johnson (2010) proclaimed recently "Latin and Greek are great intellectual disciplines, forcing young minds to think in a logical and analytical way". In a recent discussion on Italian Facebook about the teaching of Latin and Classical Greek in schools, many Italians wrote that these languages *insegnano a ragionare* ('teach reasoning'), *servono alla logica* ('are useful for logic'), and that studying them *apre la mente* ('opens the mind', Facebook, 2010). It is not clear whether the perceived miracle of increased thinking capability is due to the classical languages themselves or to the intellectually-demanding grammar-translation method traditionally employed to teach them.

A category of laypersons with more clout than Facebook users are policymakers. The European Union is strongly pushing its citizens, especially schoolchildren, to learn other European languages, for a variety of social, economic, and political reasons. At the same time, EU officials seem convinced that knowing two languages improves thinking. The Director General for Education and Culture of the European Commission states that "[t]here is a clear link between multilingualism and creativity because knowledge of languages gives access to other ways of thinking and to other cultures, reinforcing our creative capacities". The European Union Commission for Multilingualism insists that "The ability to communicate in several languages … enhances creativity, breaks cultural stereotypes, encourages thinking 'outside the box', and can help develop innovative products and services" (European Commission on Multilingualism, 2010).

The layperson's view is partly supported by scientific evidence. Bilingual children do better than monolinguals in some tests of both verbal and nonverbal intelligence and in some other linguistic and nonlinguistic tasks, and there is currently a widespread view among psychologists that bilinguals outperform monolinguals in tasks that require cognitive control, i.e. the ability to concentrate on some stimuli while ignoring others (Green, this volume). Knowing or learning another language may indeed have a positive effect on cognition. Whether it 'opens up the mind' or 'broadens horizons' is much more difficult to say, although some papers in this volume indeed report

conceptual changes in this direction (e.g., Athanasopoulos, Bassetti, Chen, among others). The following section discusses whether knowing more than one language can affect cognition.

Does Learning an Additional Language result in Conceptual Changes?

The first possibility is that learning another language does not have any conceptual effects. New linguistic items -- whether lexical labels or grammatical rules -- are learnt, and communication with users of another language is achieved, without any conceptual change. It is possible to learn to communicate in another language without changing one's concepts. If the bilinguals differ from monolinguals, it is then only in how they think about reality in order to encode it for speech, aka 'thinking-for-speaking' (Slobin, 1996), not in how they think.

The other possibility is that L2 learning affects non-linguistic cognition. We saw in Part A of this volume that first language acquisition can lead to the emergence of new concepts, and to changes in existing ones. What about a second language? Research shows that very young children who are taught a new label develop a new concept that does not exist in their linguistic community. Casasola, Bhagwat, and Burke (2006) taught English-speaking 18-month-old infants a made-up word (*toke*) that represents tight fit, as in Korean *kkita*, showing them videos of actions that end with two objects being in contact. This label represents the new concept of 'close contact' which is not represented in English and cuts across the distinctions drawn by English speakers, as it is used regardless of whether the objects are 'in' or 'on' each other. After seeing just a few events, children could when requested put two objects *toke*, showing that they had acquired the concept of 'toke', or being in tight contact.

Can adults also learn new concepts labelled in a second language word? Some experimental evidence comes from research that used artificial language learning tasks. Although in the researchers' intentions artificial language learning studies should shed light on first language acquisition, participants are adults with fully developed language and conceptual systems, unlike children who are at the same time learning language and learning about the world, possibly being guided by language in their conceptualization of the world. Artificial language learning studies then shed light on the effects of second language learning. Results show that adults can learn new concepts through exposure to another language. These concepts are learnt quickly, affect performance on non-language cognitive tasks, and can be learnt from both new words and new grammatical (morphological and syntactical) rules, as well as other language elements such as metaphors. In one study (Boroditsky, Schmidt, & Phillips, 2003), English adults learnt a micro artificial language that divides nouns into two classes, one for nouns for male humans and some objects, the other for nouns for female humans and other objects. Later, participants rated the objects as more similar to male or female humans, and described some objects with more masculine adjectives and other objects with more feminine adjectives, depending on whether their nouns were 'oosative' or 'soupative', a behavior normally observed in native speakers of languages that have such noun classes (see the introduction to Part A).

How much L2 learning is needed to have conceptual change? English speakers behave like Greek speakers on a time estimation tasks after learning Greek-style time metaphors for just half an hour (Casasanto, 2008). It appears that very short exposures

indeed are needed to develop new concepts, at least in these studies. This is not the experience of second language learners, who typically undergo a long process with uncertain outcomes. In first language acquisition as well it takes much longer to acquire such linguistic and conceptual categories -- even taking into account the maturational differences between adults and children, it seems unlikely that a more cognitively mature child could acquire noun classes such as 'oosative' and 'soupative' (i.e. grammatical gender) in half an hour. So how is one to explain the cognitive consequences of artificial language learning? Perhaps these tasks provide participants a key to understand how to perform an arguably meaningless tasks -- since it makes no sense to rate the similarity of objects and humans, participants rely on the newly learnt categories of oosative and soupative; alternatively, these are short-lived effects -- participants' performance could be affected by the temporary accessibility of a concept, due to recency or novelty. So these experiments show that new concepts can be learnt from learning a new language, that these concepts affect performance on non-language cognitive tasks, and that they are acquired through exposure to a language, without exposure to culture (which is a confounding variable in many bilingualism studies). But do these conceptual changes happen outside the psycholinguistic laboratory, and do they last in the long term?

In real-life second language learning, there is some evidence that when a second language concept is first introduced it has immediate effects on cognitive tasks, which then become weaker in time. For instance, as seen in chapter one, Hebrew-speaking children represent temporal sequences as going from right to left, in line with the directionality of their writing system, for instance putting a picture of breakfast to the right of a picture of lunch (Tversky, Kugelmass, & Winter, 1991), and naming sets of objects starting from the right and moving towards the left (Kugelmass & Lieblich, 1979). Shortly after they learn to read English, Hebrew children show a change of directionality in their representations of temporal sequences, using both right-to-left and left-to-right directions (Kugelmass & Lieblich, 1979; Tversky et al., 1991); these effects then become weaker as time goes by (Tversky et al., 1991), but they do not disappear. A bilingual does not revert to the conceptual system of a monolingual.

Why does an additional language affect cognition? Codability and habitual thought

Why does another language affect cognition? One issue is the 'codability' of concepts. Some concepts are 'lexicalized' (expressed in an item of vocabulary) or 'grammaticalized' (expressed in a item of syntax or morphology) in one language but not in another. This does not mean that people cannot talk about those concepts in all languages, but in one language the concept label is immediately available as a single lexical item. For instance, in the Alaskan language Dena'ina there are verbs for how trees grow on the mountains, e.g., 'growing on the upper mountain slope', 'growing up the mountain in strips', 'growing up the mountainsides', and 'growing through the pass' (Lord, 1996). Learning Dena'ina as a second language means learning what aspects of tree growth are expressed in that language.

Languages can segment a continuum into different categories, for instance labeling different categories within the color spectrum or degrees of saltiness; speakers of two languages might therefore have to categorize the same experiences (such as two shades of a color or two savoury tastes) as being the same in one language or

belonging to two different categories in the other. For instance, since Italian has a label for 'light blue' (*azzurro*) and English does not, English learners of Italian are exposed to a new concept through a new word. Languages can also create categories that are purely linguistic, for instance a category that includes fire, dangerous things, and women (Lakoff, 1987). Speakers of two languages must learn which animate and inanimate entities belong to the same category in their languages -- categories that cannot be influenced by reality or perception, as is the case with number or color. For instance, English learners of Italian have to learn that 'skirt', 'hen', and 'gun' belong to the same category. The lexical and grammatical categories of a second language correspond to conceptual categories, which L2 learners can acquire.

However, the presence of a label in a language might not be enough if the lexical or grammatical item is not used. Some concepts are often represented in a language, and speaking in that language requires one to use them. Languages can require speakers to encode different aspects of reality, for instance singular and plural, witnessed and unwitnessed events, completed and uncompleted actions, so that speakers of different languages have to notice, remember, and specify how many entities there are, whether actions are completed or not, whether events were personally witnessed or not, or other aspects of the world around them. In this way, the 'habitual thought' of bilinguals differs from that of monolinguals. But, instead of being just thinking for speaking, this ultimately affects how bilinguals also think when they are not producing language.

The related issues of 'codability' and 'habitual thought' can affect non-linguistic cognition. The following section reviews some areas where bilinguals have been shown to 'think' differently from monolinguals as a consequence of knowing two specific languages.

LANGUAGE AND BILINGUAL COGNITION: SOME AREAS OF INVESTIGATION

Research on cognition in bilinguals largely, but not always, follows cross-linguistic research in its topics and emphases. Historically, the first area to be investigated was color, because linguistic relativity researchers working with monolinguals also tested bilinguals. An areas that is currently attracting much attention is the conceptualization of motion events, as we see in this volume, largely due to the popularity of the theories of Talmy and Slobin. Bilingual emotion has also been much researched, in this case perhaps more than among cross-linguistic researchers.

Here is a far from complete list of some aspects of bilingual cognition that have been investigated, giving first the aspect of language involved and then the aspect of cognition relates to. This section includes findings both from studies created to investigate bilingual cognition and from cross-linguistic studies that included bilinguals. It attempts to provide a quick sketch of a few areas of investigation, in the hope of providing food for thought, with no pretence of completeness. Also it mostly limits itself to non-language behavior; while there are many differences in the way time, space, etc. are expressed linguistically by bilinguals and monolinguals, and especially L2 learners compared with native speakers, this is not necessarily evidence of conceptual differences, but might be straight-forward linguistic differences, or thinking-for-speaking. Italian speakers of English might correctly use the English

words *on* and *upon* (both translated as *sopra* in Italian), but this does not mean that they differ from an Italian monolingual in spatial cognition. The fact that a person describes the same action as *run inside* when speaking English and *entrare di corsa* ('go-in running') when speaking Italian does not mean that they conceptualize motion differently when speaking different languages. So conceptual change can only be revealed by analysing L2 users' performance in linguistic and nonlinguistic tasks. Some aspects of linguistic behavior can provide windows on conceptual effects of bilingualism (e.g., code-switching and translation can show that a new concept has been acquired from LX that does not exist in LY, verbal descriptions of events can show which aspects of the event are noticed at least in order to describe the event, etc). On the other hand, looking only at language production and comprehension cannot provide evidence of conceptual effects of bilingualism in the absence of evidence of nonlinguistic performance.

Sensory Perception and Categorization

Compared with color, other aspects of sensory perception in bilinguals have received less attention. Still, there is research on senses other than vision, such as the perception and categorization of (non-linguistic) sound, and concepts of taste.

Color terms and color perception and categorization

The traditional area for linguistic relativity research has been color, as described above and in Ervin-Tripp and Athanasopoulos (both this volume). Early cross-linguistic researchers found that bilinguals' color categories differed from those of monolingual speakers of their L1 in shifting towards the categories of their second language (which in this research meant exclusively English) and were in-between the L1 and L2 categories. For instance there was a shift in the description of focal yellow (more or less, the best example of 'yellow') in Navaho-English bilinguals (Ervin, 1961). Other shifts were found in color concepts in speakers of various first languages who knew L2 English, leading for example to changes in the concept of 'green' in Korean-English bilinguals (Caskey-Sirmons & Hickerson, 1977). More recent cross-linguistic research that included bilinguals confirmed that their color categories are in-between those of monolingual speakers of their two languages. For instance, color naming behavior in Vietnamese-English bilinguals falls in-between the naming behaviors of Vietnamese and English monolinguals. Vietnamese does not have a label for 'orange'; monolingual Vietnamese name 'orange' as 'dark yellow' or 'red'; bilinguals tested in L1 Vietnamese, however, use a new color name to name this color category which they learnt from L2 English (Jameson & Alvarado, 2002, 2003). Several results confirm that bilinguals perform in-between monolingual speakers of their two languages in linguistic and non-linguistic tasks. For instance, Russian-English bilinguals consider dark and light blue as more similar than do Russian monolinguals (Andrews, 1994), as do Greek-English bilinguals with higher English proficiency compared with bilinguals with lower proficiency (Athanasopoulos, 2009, this volume).

Linguistic tone, pitch patterns in languages, and musical tone perception

The concentration on color by researchers does not mean that other aspects of sensorial perception and classification than vision are unaffected by bilingualism.

With regard to hearing, language seems to link to pitch perception. Some studies related language and pitch perception by looking at the perception of the *tritone paradox*, a pattern of two musical tones separated by a half-octave (tritone) interval created so that their pitch class is clear but their octave placement is not (e.g., one note is clearly a C, but it could be in the middle octave or in the octaves above or below) -- this is perceived as ascending or descending depending on the pitch range of the hearer's first language. A late 1990s study found differences in the perception of tritones between English/Spanish bilinguals and English monolinguals, attributed to differences between the pitch patterns of the two languages (Chalikia & Vaid, 1999; see also Chalikia, Norberg, and Paterakis (2000) on Greek-English bilinguals).

Researchers have also looked at the ability to perceive and produce musical tones in bilinguals who speak a 'tone language' (in a tone language -- such as Chinese and some dialects of Norwegian -- the same syllable has different meaning according to its pitch contour, e.g., in Chinese /ba/ pronounced with level tone means 'eight', but with descending tone it means 'dad'). In another tritone perception study, Deutsch (2004) linked differences between Vietnamese-English bilinguals and English monolinguals to Vietnamese being a tone language; knowledge of English did not seem to affect performance, as English- and Vietnamese-dominant bilinguals both differed from English monolinguals but not from each other, which Deutsch attributed to a critical period. Mang (2006) also showed that Cantonese-speaking children are more in tune when they sing an English-language song than English-speaking children. The cause may be that Cantonese is tone-based; speakers of tone languages might have absolute pitch more often than speakers of other languages (Deutsch, Henthorn, & Dolson, 2004). While it appears that the factor affecting bilinguals' musical tone perception is their first language rather than their bilingualism, Chalikia and Vaid (1999) claimed that bilinguals differed from monolinguals regardless of which of the two languages was their chronological L1, i.e. a later learnt L2 could also affect pitch perception.

Taste terms and taste concepts

Taste concepts have also been investigated. As there are primary colors, so there are basic tastes, but while in western languages these are 'sweet', 'salty', 'bitter', and 'sour', the Chinese and Japanese languages also label another taste concept called *umami* in Japanese (and more recently also in English). This combines attributes of savoriness and meaty taste as found in for instance in soy sauce, parmesan cheese, and Marmite. Cross-linguistic studies found differences in the perception of 'umami' (O'Mahony & Ishii, 1986). One study showed that English speakers can learn the Japanese concept of 'umami' (then unknown to Americans) by exposure to linguistic definition and actual (Japanese) food samples, and that learning this new lexical item affects their food categorization (Ishii & O'Mahony, 1989).

Time, Space, and Motion Events

Perhaps the most widely studied areas in bilingual cognition are motion events as the papers in this volume demonstrate, for example in relation to verbs and adjuncts (Czechowska & Ewert; Hendriks & Hickmann). In this volume, Coventry, Guijarro-Fuentes, and Valdés look at spatial prepositions and concepts of location in space in English-Spanish bilinguals and find that "sensitivity to functional relations occurs

earlier than sensitivity to fine-grained geometric relations" (p. 000). Temporal representations have also been studied, in relation to time metaphors and to verb morphology (in this volume, see Chen and Su).

Verbs and conceptualization of motion events

Since Talmy (1985, 2005) conceptualized motion events as consisting of figure, ground, path, and motion, much research has looked at learners' conceptualization of motion events. In satellite-framed languages such as English and Polish, typically verbs express manner of motion, and path is expressed in a satellite such as a preposition (e.g., *run inside*); verb-framed languages such as French and (mostly) Italian express path in verbs and manner in satellites (e.g., *entrare di corsa*; *entrare* = 'go in'; *di corsa* = 'running'). Descriptions of motion events in L2 learners are affected by their first language (Jarvis & Odlin, 2000), and even when their speech production is close to native speakers their gestures reveal thinking patterns typical of their L1 (Kellerman & van Hoof, 2003). On the other hand, the L2 also affects the conceptualization of motion events: Japanese-English bilinguals encode manner in L1 Japanese speech more often than Japanese monolinguals, although this is limited to linguistic output, as their gestures do not represent manner more than monolinguals (Brown & Gullberg, 2008); L2 descriptions of motion events are affected by L1 in choice of manner and path verbs in both early (before age 5) and late (after age 12) sequential bilinguals (Hohenstein, Eisenberg, & Naigles, 2006; but see Pavlenko, 2010). In this volume, Czechowska and Ewert look at differences between the degree of satellite-framedness in English and Polish, showing "conceptual shift towards the L2 in the least proficient bilinguals and restructuring of the conceptual domain in the two most proficient groups" (p. 000). Covering the same area, Hendriks and Hickmann (this volume) found that "English learners of French have clear difficulties expressing the same level of density [path and manner] in their second language as they would in their source language" (p. 000), and in order to convey the information they deem necessary they "flout some of the target language rules" (p. 000).

Results are varied, and much more research has appeared than can be reviewed here (e.g., Brown & Gullberg, 2010; Cadierno, 2008; Cadierno & Robinson, 2009; Navarro & Nicoladis, 2005; Slobin, 2003; etc. For reviews, see Czechowska and Ewert, and Hendriks and Hickmann, this volume); in general much research has found effects of both languages in conceptualization and expression of motion in L2 learners and users.

Other differences between bilinguals' and monolinguals' conceptualizations of motion events are related to knowledge of one language that has a perfectivity marker (perfective/imperfective morphology marking whether an action is completed or not, e.g., *he is eating an apple*) and one that does not (*he has eaten an apple*); again knowing two languages affects the conceptualization of motion events, for instance the amount of attention paid to endpoints (e.g., the monastery in *walking towards a monastery*, see among others Bylund, 2009; Flecken, to appear; Schmiedtová, Carroll, & von Stutterheim, 2007).

Verb inflections, metaphors and temporal representations

Researchers also examined the relationship between tense and aspect and representations of events. In as yet unpublished conference presentations, Boroditsky and colleagues have reported that bilinguals notice differences between completed and uncompleted actions more often than monolingual speakers of their L1 if verbs convey this information in their second language but not in their first language. For instance, Indonesian-English bilinguals are more affected by the tense of action (whether completed, undergoing, or going to happen) than Indonesian monolinguals in rating the similarity of pictures of actions and in remembering which picture they had seen before (Boroditsky, Ham, & Ramscar, 2002; see also similar findings from Russian-English bilinguals in Boroditsky and Trusova (2003); the Indonesian bilinguals also perform differently depending on the language of the instructions (Boroditsky et al., 2002). Chen and Su (this volume) investigated temporal awareness and found "Chinese-English bilinguals with a high level of English proficiency perceive the future and the past phases of an action event, as encoded in a picture, more readily than bilinguals with a low level of proficiency" (p. 000).
Research has also looked at the relationship between time metaphors and the representation of the directionality of time. One study (Boroditsky, 2001) correlated Chinese-English bilinguals' age of onset of acquisition (reported age when they started learning English) with their preference for thinking about time vertically, attributed to the debatable idea that English uses horizontal spatial metaphors, Chinese vertical ones (as in *shang ge yue*, lit. 'above-month', 'last month'). Earlier bilinguals consequently represent time directionality as horizontal more than later bilinguals; with increased exposure to English, L2 users move towards English speakers, whose true/false responses to statements such as "March comes earlier than April" were faster after a horizontal prime (e.g., a picture of two worms one to the left of the other), whereas Chinese speakers' answers were faster after a vertical prime (e.g., a picture of two balls one above the other). Nevertheless, a subsequent study found no differences between bilinguals and monolinguals (Tse & Altarriba, 2008); and two studies failed to replicate Boroditsky's monolingual results with Chinese speakers (Chen, 2007; January & Kako, 2006).

Finally, some research linked the directionality of writing (left-to-right, right-to-left or top-to-bottom) with mental representations of time. Children who learn an L2 with different writing directionality change their representations of time directionality: While English children put a picture of lunch on the left of a picture of dinner and Arab children do the opposite, Arab children learning English do both; bilinguals also name sets of objects starting both from the left and the right (Kugelmass & Lieblich, 1979; Tversky et al., 1991. Writing directionality also affects the directionality of face scanning, Vaid, 1995; and of the illusory rotation of objects, Morikawa & McBeath, 1992; Vaid, forthcoming).

Concepts and Categorization of Entities

Bilingualism can affect concepts and categorization of entities such as artifacts, animals, natural kinds, and abstract entities, e.g., 'clock', 'tiger', 'moon', and 'freedom'.

Object nouns and object categorization

Different languages assign objects to different categories. L2 users of English differ from English monolinguals in object naming and object typicality judgments, due to the linguistic categorization in their first languages, for instance considering a 'dish' what English speakers consider a 'bowl' (Malt & Sloman, 2003). There are also effects of language knowledge and exposure: The less experienced learners (in terms of length of stay, length of study, and proficiency self-rating) differed more from L2 native speakers in naming and typicality ratings of housewares (e.g., concepts of 'chair' and 'stool'; Graham & Belnap, 1986; Jarvis, 2000). Vice versa, L2 nouns also affect bilinguals' naming and typicality ratings of 'bottles' and 'dishes' in their two languages, showing convergence of L1 and L2 (Ameel, Malt, Storms, & Van Assche, 2009; Ameel, Storms, Malt, & Sloman, 2005; Pavlenko & Malt, in press). It appears that categorization of objects is affected by bilingualism, as reflected in naming tasks.

Grammatical number and the classification of objects and substances

In English objects are generally referred to with count nouns that can be plural and can be preceded by a numeral (e.g., *two books*), while substances are referred to with mass nouns that do not take plurals and can be preceded by a classifier (e.g., *two glasses of water* but not **two waters*); in Japanese both objects and substances are referred to in the same way (with either bare noun or numeral-classifier-noun, e.g., *futatsu no hon*, 'two-classifier book', and *nihai no mizu*, 'two-classifier water'). In one study (Cook, Bassetti, Kasai, Sasaki, & Takahashi, 2006), Japanese-English bilinguals with longer stays in an English-speaking country differed in their classification of entities that were borderline between objects and substances from bilinguals with shorter stays, attributable ultimately to the differences between English and Japanese article systems. Other studies have also found a preference for shape-based classification in Japanese high-proficiency users of L2 English compared with those with lower proficiency (Athanasopoulos, 2007; Athanasopoulos & Kasai, 2008). Effects of bilingualism were also found on the similarity rating of pictures that contained the same number of objects or the same amount of substances (Athanasopoulos, 2006): English monolinguals rate pictures with the same number of objects as more similar than pictures with the same amount of substances, whereas Japanese-English bilinguals pay equal attention to similarity in the number of objects and in the amount of substances if they are less proficient in English, and behave more like English monolinguals if they are more proficient.

Finally, Kuo and Sera (2009) looked at the effects of classifiers on the categorization of objects. Participants matched pictured objects (mostly complex objects, i.e. having a complex shape and a function) with objects that had either the same function, or the same shape and the same classifier (e.g., a broom could be matched with either a hoover, i.e. same function, or a fork, i.e. same shape and classifier). While overall participants classified mostly by function, which is a universal preference in the classification of complex objects. Yet, Chinese-English bilinguals were more similar to English monolinguals than Chinese speakers who were not living in an English-speaking country, but they also relied on shape/classifier for classification more often than English monolinguals; the bilinguals again performed in-between monolingual speakers of their two languages.

Grammatical gender and concepts and classification of entities

In some languages all nouns belong to agreement classes called 'genders'. In many Indo-European languages the genders are masculine, feminine, and in some cases neuter. While some of these nouns refer to biologically male or female referents (e.g., 'uncle'), most do not (e.g., 'tiger' is masculine in German *Der Tiger* and feminine in Italian *la tigre*). Cross-linguistic research found that speakers of such languages think of referents as being more or less masculine or feminine depending on their grammatical gender, so that German speakers consider an apple more masculine than Spanish speakers (Boroditsky et al., 2003).

English is a natural gender language in which gender goes with biological sex, as reflected in choice of pronouns. When native speakers of a grammatical gender language learn a natural gender language, their L1 grammatical gender assignment still affects their performance in various tasks, such as describing entities with adjectives -- German speakers describe bridges in English as 'elegant' and Spanish speakers describe them as 'robust', in line with the grammatical gender of the noun 'bridge' in the two languages. These bilinguals also learn English names for objects more easily when the name is consistent with the grammatical gender of the noun in their L1 (e.g., *Patrick* versus *Patricia* for an apple). Studies with learning of micro-artificial languages also show that when English speakers learn an artificial language where one category of nouns is used for male humans and some objects, and the other is used for female humans and other objects, performance in object-human similarity judgment tasks is affected by the object's gender in the artificial language (Boroditsky et al., 2003).

On the other hand, when bilinguals know two grammatical gender languages, the effects of grammatical gender are reduced or disappear. Phillips and Boroditsky (2003) found that bilinguals with German and Spanish rated the similarity of various objects to male or female humans. The effects of each language's grammatical gender correlated with the bilingual's fluency in that language. In Bassetti (2007), Italian native-speaking children chose a male or female voice for a series of objects as they would be talking in a cartoon. Italian children chose female voices for objects that were grammatically feminine in Italian, but Italian-German bilingual children were not affected by grammatical gender. Bassetti (this volume) found that Italian-German bilinguals perform in-between Italian and German monolinguals in rating animals on a semantic differential task that measures masculinity-femininity when these animals are grammatically masculine in one of their languages and feminine in the other. From these studies, it appears that knowledge of two languages that assign opposite gender to the same entity eliminates the effects of grammatical gender, at least for those entities. On the other hand, there is some evidence that learning a second language with grammatical gender can introduce a grammatical gender bias in native speakers of a language with natural gender. English-speaking child learners of Spanish choose male or female voices for objects depending on the objects' grammatical gender in L2 Spanish, and this effect correlates with L2 proficiency (Kurinski & Sera, to appear).

Reasoning

Some effects of bilingualism have been found in reasoning, for instance in mathematical reasoning, counterfactual reasoning, and causal reasoning. Bilingual children also generally develop theory of mind earlier than monolinguals (see Siegal et al., this volume), although this seems a generic macro effect of bilingualism rather than a consequence of knowing two specific languages.

Mathematical terminology, mathematical concepts and mathematical reasoning

Research on mathematical reasoning has found differences in mathematical cognition tasks between bilinguals and monolinguals due to their language combinations. Some Chinese mathematical terms are more transparent than their English equivalents, e.g., the English *diagonal* in Chinese is *dui jiao xian*, 'line-opposed-to-angle', and *equilateral triangle* is *deng bian san jiao xing*, 'equal-side three-corner-figure'. English-Chinese bilingual high-school students understand such mathematical concepts better than English monolinguals, as shown in tasks such as identifying the picture of an equilateral triangle; their performance correlates with proficiency in Chinese (Han & Ginsburg, 2001).

Conditionals and counterfactual reasoning

The controversies about counterfactual reasoning were discussed earlier. From the bilingualism perspective, Bloom (1981) demonstrated that Chinese speakers who know English reason more like English speakers than Chinese monolinguals on tasks involving comprehension of a complex counterfactual story. A recent study reported in a conference presentation (Bassetti, 2008) confirms and extends Bloom's findings, showing that preference for counterfactual interpretations of stories in Chinese-English bilinguals correlates with levels of academic English proficiency, and is more frequent when the same stories are presented in English than in Chinese.

The expression of causality and causal reasoning

Causal reasoning has also been investigated with reference to bilinguals. For instance, due to differences in causal expressions in English and Russian, causal events are described differently by Russian-English and English-Russian bilinguals and monolingual speakers of their L1, as bilinguals tend towards speakers of their L2 when describing videos of actions in L1 Russian (Wolff & Ventura, 2009). Cunningham, Vaid, and Chen (this volume) found that when describing accidental occurrences Spanish-English bilinguals are more likely to use constructions that de-emphasize agency in Spanish than in English; however, non-agentive constructions are more prevalent in English among bilinguals as compared to English monolinguals, suggesting a carryover influence of Spanish.

Linguistic Categories

Bilingualism can also affect concepts of linguistic categories. Bilingual children are known to develop some concepts of language earlier than monolinguals. For instance bilingual preschoolers have greater awareness of syllable onsets and rimes, basically the ability to separate the initial consonant or consonant cluster from the rest of the

syllable (Bruck & Genesee, 1995), because exposure to more than one language makes language more transparent and open to analysis (Bialystok, 2001). They also develop earlier than monolingual peers the ability to distinguish between a word and its referent, for instance understanding that *train* is a short word but a long thing and *caterpillar* is a long word but a comparatively short creature (Bialystok, 2001; Yelland et al., 1993). While this widely studied phenomenon is a macro effect of bilingualism, there are also micro effects of knowledge of two specific languages. Some researchers argue that bilinguals who speak a language with a 'simpler' phonology (generally measured broadly in terms of syllable complexity, or number of different vowels, etc.) might develop some aspects of phonological awareness in a language with more 'complex' phonology faster than monolingual speakers of the latter language. For instance, 5-year-old children with a reportedly more phonologically complex first language (English) and a less phonologically complex second language (Greek) outperform English monolingual children in tasks measuring awareness of phonemes; on the other hand, when the second language is more phonologically complex than the first, L2 learning does not affect awareness, i.e. Greek children who learn English do not perform better than Greek monolinguals (Loizou & Stuart, 2003). English children attending an English-Italian bilingual school outperform English monolinguals in selecting the one English word in a set that has a different initial phoneme, and in repeating words without the first syllable (Campbell & Sais, 1995); Spanish-English bilingual children outperform English monolinguals in segmenting words into phonemes (Bialystok, Majumder, & Martin, 2003). The way a bilingual's two languages cut up the sound space used for language production then affects the child's ability to identify and manipulate linguistic sounds.

Concepts of language that develop simultaneously with exposure to written language, such as the concept of phoneme or word, develop faster in biliterates than in monoliterate children when the biliterates know a written language that has more regular correspondences between units of writing and units of language. For instance, the concept of Chinese word in English-Chinese adults differs from the Chinese monolinguals' concept, probably because words are separated by word spaces in written English words but not in Chinese (Bassetti, 2005).

Emotion and Person Cognition

Research on emotion in bilinguals has received much attention; for reviews, see Knickerbocker and Altarriba (this volume), Pavlenko (2006, 2008) and Dewaele (in press).

Emotion terms and emotion concepts

One area is the relationship between emotion terms in the bilinguals' two languages and their concepts of emotions. Some emotion terms only exist in one of the bilinguals' two languages, and cannot be translated (e.g., Wierzbicka, this volume, discusses the untranslatability of the English concept of 'frustration' into Russian, and of the Russian concept of 'dosada' into English). In an early cross-linguistic study that included bilinguals (Romney, Moore, & Rusch, 1997), participants judged the similarity of 15 emotion terms, resulting in a model that shows the semantic structure of emotion terms (e.g., 'anger' and 'hate' are close, but far from 'happy'). In spite of the similarities across monolingual and bilingual groups, the Japanese-English

bilinguals' models differed from Japanese monolinguals when tested in Japanese, and when tested in English were in-between the two monolingual groups. Greek-English bilinguals then cannot translate English *frustration* into Greek, and Greek *stenahoria* ('discomfort/sadness/suffocation') into English; they use code-switching to talk about these emotion in the language that does not have a term for them, showing the acquisition of the relevant emotion concept (Panayiotou, 2004). Researchers have also looked at purportedly universal emotions using facial expressions. In one study, researchers had planned to use photographs of seven 'universal' emotions, but had to drop two ('contempt' and 'disgust') because they could not find a term for these emotions in Hindi. When Hindi-English bilinguals were shown photographs of facial expressions of the remaining five emotions, they named three more consistently in English than in Hindi ('anger', 'fear', and 'sadness') (Matsumoto & Assar, 1992). In Spanish-English bilinguals as well emotion labels are more accessible in English than in their first language (Matsumoto, Anguas-Wong, & Martinez, 2008).

Emotional language and emotional responses

Various studies revealed different levels of emotional responses to emotional words and expressions in the bilingual's two languages. On the one hand, L1 emotional words may be more emotional than L2 ones: For example, sequential bilinguals respond more to reprimands (e.g., "don't do that") and taboo words in their first language than in the second language (e.g., Sutton, Altarriba, Gianico, & Basnight-Brown, 2007) and remember L1 emotion terms and emotional words more than L2 ones in recall tasks (Annoshian & Hertel, 1994). On the other hand, other studies found that the level of emotional response depends on proficiency rather than age of acquisition (Harris, 2004); swearwords and taboo words are perceived as more emotional in the language with higher proficiency and frequency of use, and even 'I love you' has different emotional weights in the bilingual's languages (Dewaele, 2004, 2008a, 2008b). In this volume, Knickerbocker and Altarriba describe how "bilingual individuals process and experience emotional words differently in English and in Spanish"; Besemeres also shows the difficulty of adjusting concepts of friendship when moving from one language to another.

Personality descriptors and person cognition

Bilingualism might also affect people's reasoning about personality and human relationships, for instance due to the effects of different personality descriptors in the two languages on person cognition. English and Chinese have different personality descriptors, or terms that describe a set of characteristics, such as *artistic* in English, which includes characteristics such as unconventionality, and has no equivalent in Chinese, and Chinese *shi gu*, which includes world experience and family orientation. When evaluating the personality traits of fictional characters, Chinese-English bilinguals were affected by stereotypes associated with different terms in their two languages, and also performed differently in different languages, for instance attributing unconventionality to characters who were described as *artistic* in English, but not to the same characters described in Chinese (Hoffman et al., 1986).

SOME SUGGESTIONS FOR FUTURE RESEARCH ON BILINGUAL COGNITION

The review above, albeit highly selective, provides a taste of the rapid growth and variety of research in bilingual cognition, still just scratching the surface. This section then makes some suggestions for future research.

More Replications of Cross-linguistic Studies of Monolinguals

The most straightforward approach to bilingual cognition research uses evidence of cross-linguistic differences among speakers of different languages as a basis for looking at bilinguals who know both languages involved. Bilingual cognition researchers find themselves in an easier position than researchers working on cross-linguistic comparisons, who must start from observed cognitive differences among speakers of different languages, or from linguistic differences among pairs of languages (see Cook, this volume). Bilingual cognition researchers can choose one of the already known cross-linguistic differences to check out with bilinguals.

Future research could then continue to follow this path of extending cross-linguistic discoveries to bilingualism. For instance, Chinese children develop Theory of Mind earlier than English-speaking children because their language has different verbs for false beliefs (i.e. *xiang/dang*, 'to believe' and *yiwei*, 'to believe incorrectly'; for examples from other languages, see Siegal et al., this volume). These linguistic effects could then be investigated in bilingual children. There are many differences among speakers of different languages that have not been investigated in bilinguals, from perception of saltiness in bilinguals with say Korean and English (for cross-linguistic differences, see O'Mahoney and Muhiudeen, 1977), to concepts of kinship and family relations (see Anggoro & Gentner, 2003), to concepts of teen numbers in bilingual children with English and Chinese (English has individual nouns for teen numbers -- *eleven*, *twelve*, whereas Chinese nouns are formed by rule, with decade noun followed by unit noun -- 11 = *shi yi*, 'ten-one', 22 = *er shi er*, 'two-ten-two'; Chinese children learn the number system faster than English children, Miller, Major, Shu, & Zhang, 2000). These and endless other cross-linguistic differences can provide a starting point for bilingualism researchers.

The Linguistic Commitment

Research on bilingual cognition needs to provide an adequate description of the linguistic phenomena under analysis, both in general and in reference to the specific languages involved, called the Linguistic Commitment in the introduction to Part A of this volume (Cook, this volume). The bridge between language and cognition has to have a firm foundation on both banks. This is particularly important in ensuring that effects are truly linked to language rather than to other factors. A scientific description of the language phenomena supposedly related to cognitive differences is fundamental to any claims of co-occurrence of linguistic and cognitive phenomena in bilinguals.

Descriptions of the aspects of language involved should meet some basic requirements. For a start, descriptions should be consonant with contemporary linguistic views of language (or clearly state how they disagree from current

approaches), rather than coming out of a general common-sense view of language, or the Latin-based school tradition of grammar. This does not mean that linguistic descriptions necessarily have to be completely up to date -- linguistic theories are notoriously prone to change. Linguistics also comes in all shapes and sizes and flavors. But any statement about language implies a theory, whether it is the phonological theory of the term 'phoneme' or the semantic theory of satellite and verb-framed languages; adequate research into bilingual cognition requires an explicitly stated language theory or description.

Research has mostly concentrated on small-scale aspects of language. Older lexically-based research looked at limited areas of the lexicon, such as whether there is a word for 'green' or not, or what is meant by the words 'chair' and 'stool'. Much recent research continues to concentrate on small areas of the lexicon, such as color terms, or whether verbs convey information on manner or path of motion, a minute fragment of English grammar probably unknown to most teachers of English and indeed most grammarians. Some researchers have turned to more complex linguistic phenomena in morphology and syntax (as Whorf originally suggested), for instance grammatical gender or tense markers. Still, there are many less obvious aspects of linguistic systems. For instance, research on causal reasoning in bilinguals has looked at differences between languages that obligatorily convey agentive but has not looked say at pro-drop and non-pro-drop languages (languages where the subject can or cannot be omitted, e.g., English *he sings* vs Italian *canta* 'sings' or Chinese *chang ge*, 'sing'; for a cross-linguistic study, see Jisa, Reilly, Verhoeven, Baruch, & Rosado, 2002). Such areas of research could emerge from contemporary linguistic theories, e.g., semantic or syntactic theories, rather than common-sense semantics or ad hoc syntax. While this shift towards contemporary linguistic theories should probably originate in cross-linguistic studies and then be extended to bilingual cognition studies, it is equally vital for bilingual cognition studies, and researchers in this area could take the lead.

The Linguistic Commitment also implies the duty of observational adequacy -- do people really say *a tree* and *water* rather than *tree* or *a water*, or is the countable/uncountable distinction something merely handed down in the grammar-book tradition? Actual linguistic descriptions need be provided for the relevant aspects of both languages involved. Descriptions should be linked to real-world language use, not based on prescriptive grammar books. In bilingual cognition research, it does not matter what an idealized highly schooled speaker would say or write, but what actual people say or write. It is important to avoid confusing idealized with real-life language production, standard with non-standard varieties of language, written with spoken varieties, and so on. This is particularly relevant whenever cognitive effects are attributed to habitual thought: A prescriptive description might be beside the point as speakers might never have come across the aspect of language outside grammar books, which typically say whether something exists in a language at all, not how common it is. Among other factors, it might be necessary to say how frequent a certain phenomenon is in all the languages involved, easy enough these days with the availability of large corpora. For instance, classifiers affect object categorization more in Chinese than in Japanese speakers because classifiers are more frequently used in Chinese (Imai & Saalbach, 2010). Yet frequency of use is scarcely ever reported in bilingual cognition (and indeed linguistic relativity) studies. If

Language X affects Language Y it might simply be that the phenomenon occurs more often in Language X than in Language Y.

Language Pairs and the Position of English

The English language is all-pervasive in bilingual cognition research. Since researchers are largely (native or non-native) English speakers and, more often than not, based in English-speaking countries most research involves bilinguals or second language learners who have English either as their first or second language, because English language learners are widely available everywhere, and native English speaking learners of other languages are available in the English-speaking countries, where most researchers are based. Studies of bilinguals or L2 learners with no English in their language combination are rare (e.g., Spanish-Swedish bilinguals in Bylund, 2009; Italian-German bilinguals in Bassetti, this volume; Quechua-Spanish bilinguals in Sánchez, 2004).

This bias towards English means that there is little research on linguistic phenomena that do not exist in English. Research mostly looks at how something that exists in English but not in Language X is acquired by Language X-speaking learners of English, or its consequences for Language X-English and/or English-Language X bilinguals; or less frequently at how a phenomenon that exists in Language X but not in English is acquired by English-speaking learners of Language X and used by bilinguals. Potentially interesting language combinations have not been studied even where there are cross-linguistic differences among monolingual speakers: For instance, Thai children learn the concept of 'speed' faster than Japanese children, whose language has no separate spoken forms for 'early' and 'fast' (Mori, Koyima, & Tadang, 1976). Also, there has been considerable research (reported above) on tense and aspect and conceptualization of time in bilinguals who are native speakers of languages with no inflectional morphology like Chinese, and whose second language English does, to some extent. On the other hand, there has been no research on evidentiality in bilinguals. Languages with evidentiality mark morphologically whether there is evidence for what is being reported, and what type of evidence it is; for example in Turkish there is a difference between direct and indirect experience as in *gel**di***, '[he] came' (I saw it) vs *gel**mis***, '[he] came' (apparently, reportedly; Slobin & Aksu, 1982). Tosun, Vaid, and Geraci (2010) found differences in memory of events between Turkish and English speakers, due to the presence of evidentials in Turkish but not in English. While evidentiality may not be marked in English morphology, it is marked in those of a substantial number of the languages of the world (see Aikhenvald, 2004), and so is worth investigating in bilinguals. While Tosun et al. report planning a bilingual replication of their study, it is rarer to find research about language phenomena that exist in other languages but not in English, compared with phenomena that exist in English but not in other languages; more in general, it is hard to find bilingual cognition research where English is not involved.

One urgent issue is then to look into bilinguals with different language combinations in which English does not take part. At present, bilingual cognition research mostly shows that learning English widens the mind and opens new horizons. It would be stimulating to read more research where English speakers have their minds opened by learning another language. This might counteract any linguistic imperialistic beliefs that learning English is good for users of other languages, while the opposite effect is

never tested. Instead of reading that Navaho speakers discover 'orange' from learning English, why can't we read how English speakers discover that there are two types of 'blue' from learning Italian or Greek? English may be convenient because of the ready availability of L1 and L2 English users; from the point of view of bilingual cognition research, it is only one of the 7000 odd languages in the world.

MULTI-COMPETENCE, BILINGUAL CONCEPTS, AND THE OUTCOMES OF BILINGUALISM

In general, this volume makes the point that knowing more than one language gives access to more than one description of the world, and therefore bilinguals should have a clearer mental representation at least for those aspects of the world that are described differently in their two languages. This positive effect of bilingualism should then be seen on a concept-by-concept case, applying to some concepts but not all -- a contrastive analysis of differences between two languages and two groups of speakers does not necessarily predict what will happen in bilinguals. For example, Jameson and Alvarado (2003) found that their sample of Vietnamese-English bilinguals were closer to English monolinguals in the categorization of 'orange', and closer to Vietnamese monolinguals in the categorization of 'blue' and 'green'. For reasons to be discovered, some L2 lexical items affect concepts more than others. Of course there is also the possibility that, once bilinguals realize that language affects their cognition, they can develop a greater sensitivity than monolinguals to the potential impact of language on cognition, therefore leading to a general cognitive effect of bilingualism that goes beyond the specific effects on specific aspects of reality.

This section introduces the theory of multi-competence, proposes a categorization of bilingual concepts and of bilinguals, discusses whether bilingualism's effects on cognition are always positive, and highlights some variables that modulate bilingualism effects.

Multi-competence and Bilingual Cognition

The assumption behind much linguistic relativity research and indeed most research in linguistics and in second language acquisition is that the human mind normally knows one language: Another language is an optional added extra. Hence people who know two languages are treated as exceptions and studied in spin-off applied disciplines rather than as part of the mainstream in psychology and linguistics. However, people who use two languages are perhaps in the majority among human beings today; the potential of all human beings is that they can learn and use more than one language if exposed to it (Cook, 2009). For twenty years the idea has been spreading that L2 users (aka bilinguals) should be studied in their own right (Grosjean, 1989), called by some 'multi-competence' (Cook, 2001). An engrained idea in most language research is that monolingual native speakers are the ideal and that L2 users should be measured against them, whether in terms of language proficiency or in terms of cognition: If the L2 user does it differently from the native speaker, they are wrong, if they approximate the native speaker they are improving. A typical view is "Very few L2 learners appear to be fully successful in the way that native speakers are" (Towell & Hawkins, 1994, p. 14). From the multi-competence perspective, using a native speaker standard for measuring L2 users is like describing

apples in terms of pears; it may yield some insights -- there are cone-shaped apples called Worcester Pearmains -- but it distorts the picture considerably and it never yields the distinctive qualities of apples that makes them different from pears. L2 users have to be treated sui generis; any comparison with monolingual native speakers is a methodological device for understanding them, not a way of cataloguing their alleged deficiencies.

Language and Cognition in L2 Users

Looked at from the multi-competence perspective, four relationships for language and cognition are possible, illustrated here with the example of 'lunch' in English-Italian L2 users. When the present authors googled images of *lunch*, the first page of results contained only photographs of sandwiches with bags of crisps (indeed, Google helpfully suggested the related search term *sandwich*). The authors then googled images of *pranzo* (Italian for 'lunch'), and the first page showed meals with pasta and a main course, or pasta dishes; not a single photograph of sandwiches showed up. The concept labeled by the English word *lunch* then seems to refer to sandwiches and crisps, whereas the Italian word *pranzo* refers to a pasta dish and a main course such as fish or meat, as seen in Figure 7.1.

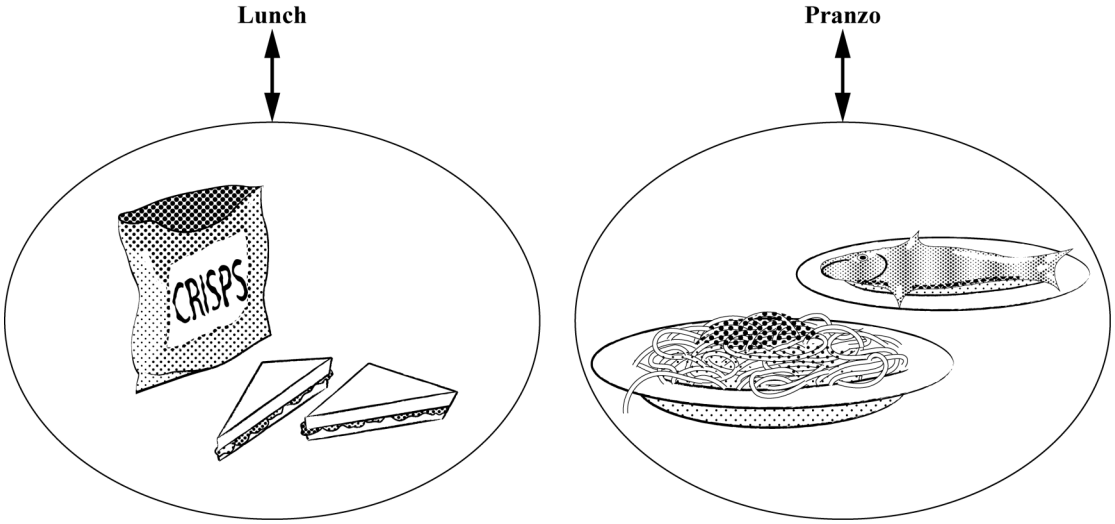

Figure 7.1 The concept of 'lunch' in Italian monolinguals and English monolinguals

So what does an English-Italian L2 user have for lunch? Here are four possible scenarios, illustrated briefly and tentatively from the literature and sketched in Figures 7.2 - 7.5.

1) *The one-concept scenario*. In this case the L2 user has a single concept 'lunch', with two labels attached -- Italian *pranzo* and English *lunch*, approximating to Weinreich's view of compound bilingualism (Weinreich, 1953). The concept can be a Language X concept (sandwich and crisps) or a Language Y concept (pasta and fish), depending on various factors. No matter whether talking about *lunch* or *pranzo*, some English-Italian L2 users will be thinking about sandwiches and crisps, others about pasta and a main course (see Figure 7.2). Presumably an English beginner in Italian will be thinking of sandwiches and crisps, while an advanced learner might be thinking of pasta and fish/meat.

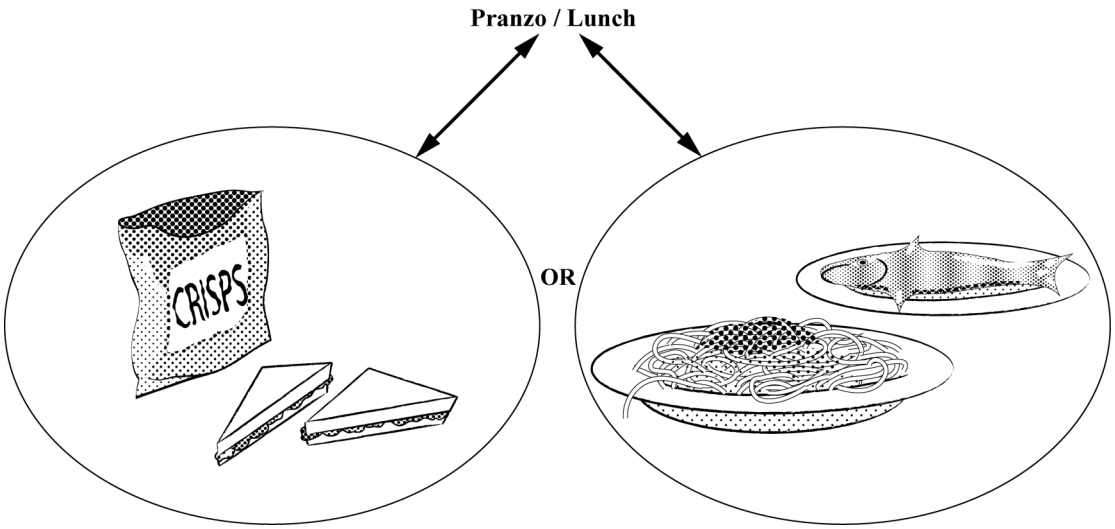

Figure 7.2 The concept of lunch in an English-Italian bilingual -- The one-concept scenario

A more well-known example is colors. The Italian language distinguishes two colors: *Blu* and *azzurro*, the former referring to darker shades of blue and the latter to lighter shades, such as 'sky blue'. The English *blue* covers all colors called *blu* and *azzurro* in Italian. The Italian *blu* therefore labels a range of darker blues compared to English *blue* (since lighter shades are *azzurro*), while the English *blue* labels a wider range of color shades and its focus (best example) is lighter than the focus for Italian *blue* (see Athanasopoulos for Greek and English, this volume). So in the one-concept scenario the L2 user has two labels, Italian *blu* and English *blue*, but these are used for the same color, which will be a lighter blue (for instance, for an English beginner learner of Italian) or a darker blue (for instance, for an advanced learner).

Evidence from less proficient bilinguals and L2 learners supports the view that they use L1 concepts with both L1 and L2 labels -- the one-concept scenario. Various researchers found that L2 learners were relying on L1 concepts regardless of the language they were speaking (for instance, see Malt & Sloman, 2003, for object categorization; Jarvis & Odlin, 2000, and Kellerman & van Hoof, 2003, for motion events). This is more common among less proficient L2 users (e.g., Graham & Belnap, 1986; Jarvis, 2000).

2) *The double-concepts scenario.* The L2 user has two separate concepts, and thinks differently when speaking different languages -- Weinreich's coordinate bilingual. When speaking in English, *lunch* suggests sandwiches and crisps; speaking in Italian, *pranzo* suggests pasta and meat/fish (see Figure 7.3). In terms of colors, this means that, speaking in English, an L2 user says *blue* and thinks of a lighter blue, but speaking Italian says *blu* and thinks of a darker blue.

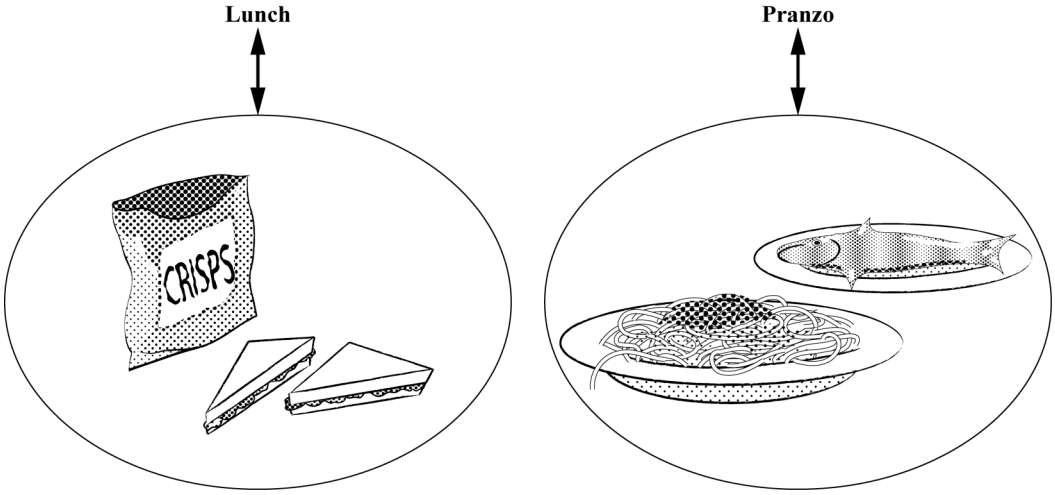

Figure 7.3 The concept of lunch in an English-Italian bilingual -- The double-concept scenario

The double-concepts scenario is supported by evidence that L2 users 'think' differently when speaking different languages (for instance, see Hoffman et al., 1986, for person cognition; Sutton et al., 2007, for emotional language; Boroditsky et al., 2002, for temporal representations).

3*) The one-integrated-concept scenario*. The L2 user combines the L1 and L2 concepts into a single concept in-between those of the two languages, and so thinks differently from monolingual speakers of either language. For instance, an Italian-English L2 user might think of a dish of pasta accompanied by a packet of crisps (see Figure 7.4). In colors the L2 user has a single concept of 'blue', whose focus is darker than *blue* and lighter than *blu*.

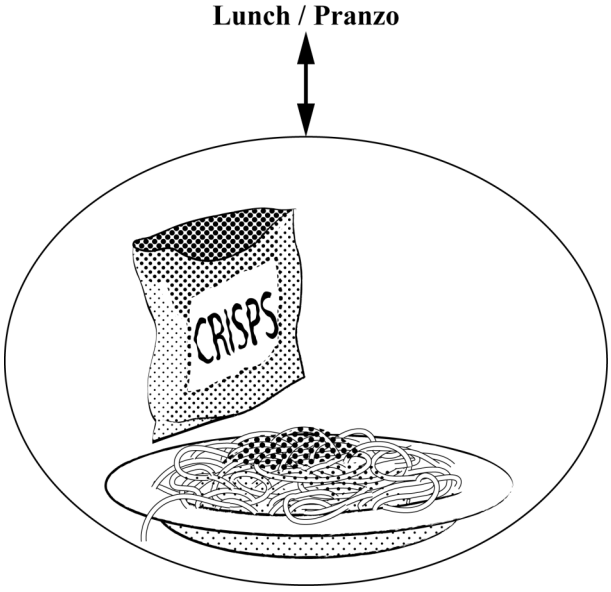

Figure 7.4 The concept of lunch in an English-Italian bilingual -- The one-merged-concept scenario

Much evidence seems to support the one-integrated-concept scenario -- so that L2 users think differently from monolingual speakers of both their first and second language. Most designs have compared monolingual speakers of language X and

monolingual speakers of language Y with L2 users who know both X and Y to see whether they have concepts in-between. Most of the papers in this volume provide evidence for this scenario, e.g., Bassetti for concepts of animals, Chen and Su for temporal representations, Czechowska and Ewert for motion conceptualization, etc. (outside this volume, this was also found in object naming and typicality rating by Ameel et al., 2009, in motion conceptualization by Brown and Gullberg, 2008, etc.).

4) *The original-concept scenario.* The L2 user creates concepts that differ from those of either language. The L2 user might reject a lunch made of sandwiches and crisps, thinking, like all Italians, that these are awful, and might reject a lunch made of pasta and fish, thinking, like English people, that this is too heavy, and might develop a new concept of 'lunch' -- maybe a pasta with a cup of tea (see Figure 7.5). Indeed, in real life experience the Italian co-author of this chapter embarrasses her parents by insisting on tea after her lunch in Italian restaurants. In the case of *blue* versus *blu*, the L2 user might have a concept of 'blue', which is neither (1) *blue* or *blu*, nor (2) in-between *blue* and *blu*, but is (3) a different shade of blue.

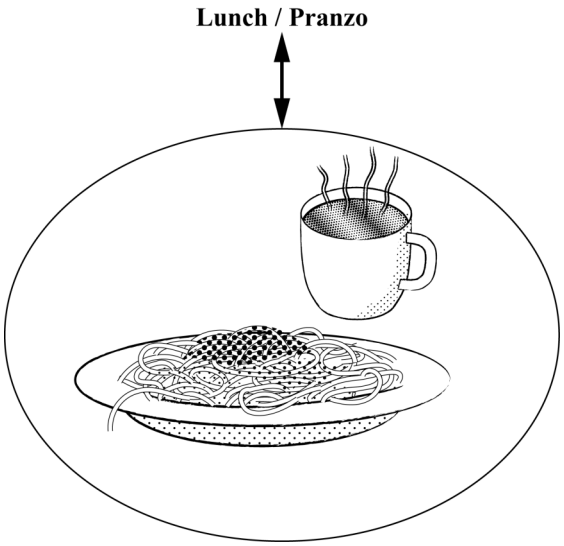

Figure 7.5 The concept of lunch in an English-Italian bilingual -- The original-concept scenario

The original-concept scenario relates to research such as Athanasopoulos (this volume) that Greek-English L2 users have a concept of 'ghalazio' ('light blue') that is lighter than Greek monolinguals. This cannot be predicted by the one-integrated-concept scenario (which only predicts that their concept of 'ble' will approximate the concept of L2 English 'blue'). It is a new color category that L2 users have created for themselves that does not lie in-between the concepts in their two languages but is something of its own. Czechowska and Ewert (this volume) also found that highly proficient L2 users notice aspects of motion differently from native speakers of both L1 and L2, in ways that are not predictable from their language combination.

The four scenarios described above apply to concepts rather than people, so that the same bilingual individual can have concepts belonging to different types. An English-Italian L2 user might have a different concept of 'lunch' compared with a monolingual, having compounded *pranzo* with *lunch*, but might share the concept of 'blue' with an English monolingual, having not changed it as a consequence of learning the words *blu* and *azzurro*. Indeed, even within the same field, such as

colors, L2 users can have single concepts for some colors and integrated concepts for others, for instance having a new concept with a new name for 'orange' (coded in L2 but not in L1 Vietnamese), but without any effects from the L2 on their 'blue' and 'green' (Jameson & Alvarado, 2003).

Nevertheless it is possible to categorize individual L2 users in terms of the scenario they use most. Bilinguals who have mostly single concepts from one of their languages might be considered type 1 bilinguals (dominant in one language), those who mostly have double concepts (one for each language) might be type 2 bilinguals, those with one integrated concept might be type 3 bilinguals, and those with one original concept might be type 4 bilinguals.

This classification resembles the three familiar types of bilinguals proposed by Weinreich (1953): Subordinate, coordinate, and compound. The main differences are that subordinate bilingualism is here conceived of more as crosslinguistic influence which also includes effects of L2 on L1 (Cook, 2003); and that L2 users can create concepts that are new creations -- in the present conception, L2 users are active and creative learners and users of their languages.

Are Bilingualism-induced Conceptual Changes always Positive?

Mostly in the review above we have seen that bilinguals know concepts that are unknown to monolingual speakers of one of their languages, e.g. the concept of 'orange' in Vietnamese-English bilinguals, or that bilinguals' concepts differ from those of monolinguals as a consequence of knowing more than one way of representing the world, e.g. Italian-German bilinguals think that storks are less feminine than Italian monolinguals. But can L2 learning and bilingualism have the negative effects? Knowing L2 English, a language with a smaller motion lexicon than L1 Russian, does not lead to an impoverished perception of motion in Russian speakers (as pointed out by Czechowska and Ewert's, in this volume, with reference to Pavlenko, 2010); on the other hand, Russian-English bilinguals show attrition of the distinction between dark and light blue (Andrews, 1994). Some cognitive consequences of bilingualism could be considered negative. Kurinski & Sera (to appear) found that learning Spanish leads English-speaking children to consider objects as more masculine or feminine, in line with their grammatical gender -- presumably learning Spanish introduced a language bias that was not present in English children. Similarly, Cook et al. (2006) found that when substances were arranged in simple shapes, some Japanese native speakers with longer exposure to an English-speaking environment preferred shape-based classification of substances, whereas none of those with shorter stay revealed this preferences. This is arguably a negative effect of learning English, as objects and substances are supposed to be universal categories, and objects should be matched with objects of the same shape, while substances should be classified by their material -- this language-induced bias has been previously found in English monolinguals (Imai, 2000). Bassetti (2008) also argued that learning English negatively affects the understanding of counterfactual stories in Chinese speakers.

Bilingualism is currently mostly portrayed as a positive thing. It increases metalinguistic awareness, improves literacy, increases selective attention (Bialystok, 2005), it even slows down cognitive aging (Bialystok et al., 2004). Of course, this

rosy picture is not the whole story; bilingualism for instance can slow down children's vocabulary development in the first language (for overviews of negative effects, see Ardila and Ramos, 2007; Bialystok, 2010). The results reported above show that bilingualism can also introduce language-induced biases that were not there in the first place, and so cloud bilinguals' representations of reality.

What Factors Modulate the Effects of Bilingualism on Cognition?

We have seen then that there may be variation both in the concepts affected by learning a second language and in the effects on L2 users. What causes this variation? Ideally one would look at the comprehensive list of variables that affect bilinguals' performance in Grosjean (1998). Here are a few factors that seem particularly relevant to bilingual cognition research.

Age of onset of acquisition of the two languages

The age at which sequential bilinguals begin to acquire their two languages has been shown to be important, for instance by Bylund (2009) with motion events conceptualization, Harris (2004) with emotional expressions, and Boroditsky (2001) with temporal representations. And of course age is doubly important when the people studied are still children in process of maturation; research testing effects of grammatical gender on concepts below the age of 8 found no effects (see Sera et al., 2002, for cross-linguistic research, and Kurinski and Sera, to appear, for bilingual research).

Length and type of stay in the two linguistic environments

Researchers have found effects of length of stay in an L2-speaking country on object categorization (Cook et al., 2006) and color categorization (Athanasopoulos, 2009), though such exposure is not a necessary condition as L2 effects on bilingual cognition have been found in bilinguals who have never lived in an L2-speaking country (Bassetti, 2007, this volume; Chen & Sun, this volume). The purposes of stay are also crucial, whether as expat birds of passage, permanent immigrants, indigenous speakers of minority languages, school children, etc. (see Ervin-Tripp, this volume, on Japanese war brides).

Proficiency and use of both languages

Effects of language proficiency have been found, among others, on emotion (Sutton et al., 2007) and numerical cognition (Han & Ginsburg, 2001); Chen and Su (this volume) found effects on temporal representations. Problems arise of how to assess proficiency, whether using vocabulary tests (Cook, et al, 2006), self-rating (Bassetti, 2007), placement tests (Coventry, this volume) or other means, and how to assess knowledge of the specific language phenomenon under analysis.

Other languages known

The other languages known to an L2 user as well as the two under analysis could also affect results, not only because of the macro effects of knowing more than two languages but also because of the particular inter-relationships involved. In the studies

of grammatical gender for instance (Bassetti, this volume), it is particularly important to be aware of the gender system of all the languages the person knows. This is especially important nowadays, as some English is almost always lurking in the background of any L2 learner regardless of which two languages are ostensibly being compared.

THE RELATIONSHIP OF LANGUAGE TO BILINGUAL COGNITION: OVERALL QUESTIONS

Let us sum up the general issues involved in bilingual cognition research by rephrasing the four questions raised in the introduction to this volume about the relationship of language to cognition in terms of bilingualism research (Cook, this volume).

The first question was whether different groups of people think differently. Recasting this in terms of bilingualism means asking whether there are differences in thinking between groups of people who do and do not speak more than one language. To test this question one would want to compare bi- or multilingual communities with monolingual ones. This has, so far, not been done in linguistic relativity studies, except accidentally. The assumption among language researchers has been that communities share only a single language; as Mackey wrote: "An individual's use of two languages supposes the existence of two different language communities; it does not suppose the existence of a bilingual community" (Mackey, 1962, p. 51). The Common European Framework of Reference (CEFR) developed by the Council of Europe in 2009 insisted on the goal of plurilingualism rather than the creation of a pan-European multilingual community (Council of Europe, 2001). Brutt-Griffler (2002) has indeed proposed 'the multi-competence of the community': However, rather than starting with the assumption that communities have a single language, it may be better to consider how languages relate to each other within a community.

The second question in the introduction was "do differences in cognition go with different features of language?". As much of the research in this volume attests, the major research paradigm for looking at language and bilinguals has been the comparison of the thinking of individuals who know only a single language with that of individuals who know more than one language, with one of the languages involved being typically English for practical reasons. The aim is to show that the experience of knowing more than one language affects the L2 users' thinking both in the language-tied perspective of thinking for speaking, where the question is whether thought is structured in order to produce language, and in the language-free linguistic relativity perspective, in which thinking involves non-language concepts. In our own early research with three colleagues reported above (Bassetti et al., 2002; Cook et al., 2006), the aim was to take an area where speakers of language X had been shown experimentally to think differently from speakers of language Y (in this case, the categorization of objects and substances) and then to see how this worked in people who knew both language X and Y. Japanese users of L2 had indeed moved to some extent towards the classificatory preferences of English people. The studies reviewed in this chapter and those reported in Part B of this volume tend to show that people who know two or more languages have slightly different cognition from monolinguals in areas such as colors, space, time, objects, and so on, not necessarily having concepts in-between the LX and LY, but sometimes concepts that are different from

either. The conclusion is that L2 users indeed think differently from monolinguals in most areas tested.

The third question in the introduction was "does a correlation of cognition with language imply a causation"; does acquiring the syntax of, say, classifiers in Chinese actually affect Chinese speakers' categorization of objects (Imai & Saalbach, 2010)? The debate over causation has been long and bitter, but bilingualism research can help address this important issue. In L1 development many other things are happening at the same time as language development, cognitively, emotionally, socially, and physically; any of these might be the underlying source of cognitive differences between language groups, with language being a side-effect. Language-external factors can reinforce language-based representations. For instance, someone walking in the street and looking at public art or flags in different countries will see different things that reflect the local language: Statues representing freedom are women in Italy (reflecting the grammatical gender of 'freedom' in Italian) but men in the Czech Republic; the rainbow in the (American) gay pride flag has only one blue stripe while the rainbow in the (originally Italian) peace flag has one dark blue stripe and one light blue stripe (reflecting the fact that dark and light blue are named in two different ways *blu* and *azzurro* in Italian but are both called *blue* and therefore perceived as a single color category in English). Material culture constantly reinforces differences that are due to language in the first place, making it difficult to disentangle what is due to language and what to culture.

However, this is precisely where bilingualism can provide a sharper focus. Many L2 users live in exactly the same environment as their monolingual peers; the only difference is the additional language. A Japanese child learning English in Tokyo is still in Tokyo, not magically transported to London. So, if there is an effect of learning English on the child's thinking, this can only be due to language; for instance, Bassetti (2007) found differences between Italian- and Italian-German-speaking children living in the same Italian town. Bilingualism then provides a clearer answer to the causation question than is possible through studying monolingualism, by separating language out from other developmental factors: "L2 research can be used as a kind of touchstone to test ideas in developmental psychology" (Cook, 1981, p. 256). A powerful argument for studying bilingual cognition is that it permits one to isolate the effects of language from those of the environment. If L2 users think differently from monolinguals who live in the same environment, then language is the likely cause of the cognitive difference -- or at least there are far fewer alternatives to consider. A consequence of this approach is having to treat the L2 user as a whole with a single mind that combines the two languages into one system. Much research has shown how the L2 user is unable to totally isolate the two languages but has both accessible at some level of activation whichever is being used, whether in syntax, vocabulary or phonology (Cook, 2003). It is not then that we can treat the L2 user as a monolingual when they are processing one language or the other, efficient in their L1, less efficient in their L2, but that they are L2 users at all times. So it cannot be assumed that the L2 user has a monolingual's knowledge of the syntax of their first language (or indeed their second) nor that they think in an L1-related way or an L2-related way. Their difference from monolinguals is the constantly changing balance between the two languages in their minds. On this view, bilingual cognition research takes a much more central role in linguistic relativity research; it is not a fringe activity but something at its very heart. One consequence is the need for linguistic

relativity research to exert more control over the choice of participants. It is vital to control the other languages that participants know. L2 users are not suitable participants for monolingual studies of linguistic relativity, pace Whorf. If true monolinguals cannot be found, researchers need to be aware of the possibility that their results are due to the other languages their participants know. It may be possible to find monolinguals in some remote enclave of the Amazon rainforest or the New Guinea Highlands, but in most places people are 'contaminated' by other languages whether in multilingual communities or in classrooms. It is still an empirical issue how much of a second language needs to be learnt to affect cognition and this may vary in all sorts of ways. Until this is settled, it cannot be assumed that L2 users think in the same ways as monolingual native speakers.

The above question, whether language affects thinking, leads naturally to the fourth question in the introduction: "can cognition be changed by language control or teaching?". Many L2 users acquire their language 'naturally', that is to say by being immersed in a situation where they learn another language to deal with other groups within their own country or their new country of immigration; restaurant staff in London acquire Spanish as a lingua franca (Block, 2006), their counterparts in Toronto learn Italian (Norton, 2000); Arabic-speaking prisoners in Israeli jails learn Hebrew; English children in Swiss sanatoria pick up the languages of the other patients. Thus, unlike the relatively homogeneous context of monolingual L1 acquisition of L1, L2 learning and bilingual first language acquisition occur in a variety of circumstances (Cook, 2010).

However, very many L2 users are actually **taught** the second language to a greater or lesser extent; their language and learning environment is under tight control from a teacher. Cook (this volume, chapter 22) discusses what bilingual cognition research means for L2 teachers, arguing that "the objective of language teaching can be precisely the enhancements to cognitive processing that knowing another language brings" (p. 000). Language teaching is in essence a vast uncontrolled experiment in language and cognition where the variables of language and situation are systematically manipulated by teachers. This does involve some disadvantages; in the case of people who are formally taught a second language, it is a question of whether the methodological advantages of exemption from other factors outweigh the sometimes imponderable variables induced by the teaching method involved, which can range from the physical actions of the Total Physical Response Method to the ratiocination of Focus on Form instruction and to the conversational interaction of communicative language teaching (Cook, 2008). The question about effects of language on bilingual cognition is intertwined with the question of whether language learnt by the 'studial process' (Palmer, 1926) is the same as language knowledge 'naturally' acquired from use.

Apart from the four main questions discussed above, there are many questions that spring from the area of bilingual cognition that have barely started to be considered in their own right, though the research in this volume hints at possible answers:

- Does conceptual change relate to a critical or sensitive period for language acquisition, or is conceptual change possible with language learning at any age?
- How much contact with another language leads to conceptual change? Does a small amount of contact have any effects?

- Is multilingualism 'better' than bilingualism? I.e. are there more cognitive changes the more languages are known? As Whorf put it, does an objective view of reality come from knowing "very many … linguistic systems" (1940/1956, p. 214)?
- Do some language combinations lead to more conceptual change than others? For instance, so far as cognitive changes are concerned, is learning Korean for a speaker of English better than learning German (examples of the "widely different linguistic systems" suggested by Whorf, 1940/1956, p. 214)?
- Does formal language study lead to more conceptual change than 'natural' language acquisition, or vice versa?
- Do effects of language on bilingual cognition cross the modalities of speech, writing, and signing? This is suggested for instance, by the effects of written language on non-linguistic cognition reviewed in Cook and Bassetti (2005), and by research on sign language and bilingualism by Emmorey and her colleagues (e.g. Emmorey & McCullough, 2009).
- Is 'passive' use of a language, say by reading, as change-inducing as active use in speaking?
- What roles does culture rather than language play in bilingual cognition change?

The study of bilingual cognition can then benefit the whole enterprise of research into the relationship between language and cognition, as well as being of interest to researchers (and indeed practitioners) working with bilinguals. But it also has practical consequences for everyday human life in these days when a large proportion of people in the world know more than one language, even if it is just a smattering of school English. Whorf was preoccupied with the effects of language on behavior, for instance how language could avoid accidents in the workplace. It is likely that having different concepts might affect real-life behavior of bilinguals, for instance affecting a marital relationship if an English-Italian bilingual spouse has a different concept of 'love' from their English monolingual spouse. Part C of this book raises such practical issues, ranging from language teaching (Cook) to translation (House), intercultural communication (Sercombe and Young), and marketing (Luna).

ACKNOWLEDGMENTS

We are grateful to Professor Jyotsna Vaid for her comments on a previous version of this chapter, and to Stefano Ferrari for preparing the illustrations.

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