

BILINGUALISM AND THOUGHT

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This paper considers a Whorfian view of the relationship between language and thought in bilinguals, relating it to the speech production model of Levelt and colleagues and to the social contexts in which language use occurs. Bilingualism may produce general cognitive effects (e.g., enhanced skills in selective attention) and language-specific cognitive effects (e.g., differences in spatial descriptions as a function of language). Evaluation of experimental data provides no support for the general cognitive effects considered. In contrast, language-specific cognitive effects are demonstrable cross-linguistically but there is a lack of research on such effects within bilinguals. The paper closes with some suggestions for research.

Introduction

The nature of the relationship between language and thought continues to generate debate (e.g., Hunt & Agnoli, 1991; Pinker, 1994; Gumperz & Levinson, 1996). However most research on this issue has explored cross-linguistic differences and effects. This paper explores the relationship in the context of bilingual speakers who may make up much of the world's population (see Cook, 1997). It aims to contribute to the construction of an adequate theoretical base and to propose lines of research that might be productive in this regard. Such a project might also be expected to inform certain practical concerns such as the educational implications of bilingualism (e.g., Baker, 1996; Bialystok, 1994; Hamers & Blanc, 1989) and the effectiveness of multilingual groups in organizations.

How shall we frame the relationship between thought and language? We need to adopt a view that is consistent with the demands of speech production and comprehension. The first part of this paper describes Whorf's view of the relationship (Whorf, 1956) and interprets it in terms of the Levelt model of speech production (Levelt, 1989; Levelt et al., in press). Certain boundary conditions are also identified that place constraints on the interpretation and generalization of research findings.

The acquisition and use of two languages may give rise two types of cognitive effect: general and specific. The second part of the paper discusses instances of these two types. Two claimed general benefits of bilingualism in

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children are enhanced metalinguistic awareness and enhanced skills in selective attention. Both phenomena lack decisive support. A general effect of lexical ambiguity on reasoning style is also considered and dismissed. Specific effects of bilingualism derive from the lexical concepts and obligatory grammatical distinctions that are made in different languages. Here, since current evidence is largely cross-linguistic, plausible predictions can be made but no definite conclusions can be drawn.

Based on the research considered, the third part of the paper outlines a research agenda designed to advance the project of understanding the relationship between thought and language in bilingual speakers.

Languageing Beings

Whorf (1956, pp. 213-214) wrote: "We cut nature up, organize into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way- an agreement that holds throughout our speech community and is codified in the patterns in our language". Two claims are often distinguished here (see Clark, 1996, p. 337): the claim of linguistic relativity and the claim of linguistic determinism. The claim of linguistic relativity is that we cannot talk at all except in terms of holding to such conventions that differ across languages; the claim of linguistic determinism is that we perceive and think about the world in accord with these conventions.

In fact, Whorf never supposed that subjective or interpersonal reality was solely determined by language but he did propose that it is the species specific ability to talk which distinguishes human cognition from animal cognition. We are languageing beings (see Lee, 1996 for a detailed and sympathetic exposition of Whorf's views). According to Whorf, lived experience is a joint outcome of perceptual (gestalt) processes, common to human kind, that abstract "isolates of experience" from the flux of experiential data, together with the distinctive ways in which a language selects and shapes these into "isolates of meaning" that are shareable within a given speech community (Whorf, 1956, p.208). Language acquisition involves a process in which the child is both socialised into a community and into its ways of thinking (see also Vygotsky, 1960¹). The patterns of meaning making, sustained and generated within particular speech communities, become physiologically entrenched (Whorf, 1956, pp. 83-84). Language use serves to maintain this pattern of mental interconnections in a "state of linkage" or "rapport". For Whorf, this patterning lies at the heart of

¹ Vygotsky (1960) proposed that despite the different ontogenetic origins of language and thought, language becomes entrained as an instrument of thought and as means to control and to regulate action.

human conceptual activity. The fundamental effect of language is therefore to affect the conceptual processing of experiential data. It alters "apperceptive" or "post-perceptual"/conceptual representations. Bilingual speakers would then necessarily inhabit different worlds when speaking different languages. How different depends on the languages involved.

Experimental evidence indicates that the coupling of the conceptual system and an articulatory motor system during language acquisition involves a process in which speakers of different languages become sensitised to different prosodic patterns and phonetic contrasts (see Dupoux, Pallier, Sebastian, & Mehler, 1997). So, for example, French speakers (for whom word stress or accent carries no lexical information) are less efficient at a perceptual discrimination task involving accent contrasts compared to Spanish speakers (for whom word stress does carry lexical information). Dupoux et al. showed that Spanish speakers automatically extract accent information even when it is irrelevant to the task. They also showed that French speakers are nonetheless capable of perceiving the acoustic correlates of accent: that is, they make the relevant discriminations when the perceptual task is simplified. The effect of language appears to be post-perceptual: Spanish speakers recode accent information into a more durable, linguistically-relevant, format: French speakers do not. Language-specific effects also exist for the segments or phonetic contrasts in a language and the general finding is that discrimination of non-native contrasts is easier when these cannot be assimilated to the phoneme categories of the native language (Best, McRoberts, & Sithole, 1988; see also Polka & Werker, 1994). Are there also other language-specific effects that relate to the conceptual representation of the world?

The view that language may constrain the kinds of conceptual representations established by speakers of different languages seems at odds with the view that there must be an original "language of thought" (Fodor, 1975). Fodor argued that one cannot learn a language as a child unless one already possesses a "language of thought" in which to structure that learning process. There must be a set of building blocks (conceptual primitives) from which concepts may be constructed in various domains such as natural kinds, number, space and language itself. Such a view leads more readily to the notion that all languages use the same set of semantic primitives identical to a subset of conceptual primitives in which thinking takes place. In consequence, speakers of different natural languages work with common conceptual representations and there are no reasons for supposing an effect of language on thought.

Certainly there may be a common inventory of semantic primitives identical to a subset of the conceptual primitives, but it is the combination of these semantic primitives into the specific lexical concepts of a particular language that is decisive (see Gumperz & Levinson, 1996, pp. 25-26; Fodor, 1975). First, thinking is aided by grouping elementary concepts into larger chunks (e.g.,

Miller, 1956) and lexical concepts are examples of such chunks. They may then have specific conceptual effects and may also affect the solving of non-linguistic problems. Second, speakers need to organise their thoughts (i.e., chunk them) so that they can match available lexical concepts and so produce speech. This point bears expansion.

Three types of processes may be distinguished in the movement of thought into speech: conceptualization, formulation and articulation (e.g., Levelt, 1989; Levelt et al., in press). In Levelt's scheme, conceptualization generates messages that can be expressed verbally. Such a process uses a non-linguistic representation such as a mental model of a situation that captures the entities and their relations in some state of affairs (Johnson-Laird, 1983), to build a verbalizable message. That is, a message is constructed in terms of the lexical concepts of the language in question. Formulation processes use this message to access the syntactic property information for the concept represented in its "lemma". Activation of a lemma contributes to creating the syntactic environment of the word and the grammatical structure of the utterance. In a further step, information about the form of the word itself is retrieved permitting the specification of an articulatory plan. Articulatory processes then use this articulatory plan to produce overt speech.

Why should we believe that the message is formulated in terms of the lexical concepts of the intended language? Suppose, counter to the position here, that the message to be expressed is indeed represented in terms of a string of conceptual primitives - it is unchunked (see, for example, Bierwisch & Schreuder, 1992). On this decompositional theory of meaning a semantically complex word such as *father* is retrieved by accessing conceptual components (e.g., MALE (X), and PARENT (X)). Some of these conceptual components are also used in accessing other words such as *parent* or *mother* (i.e., FEMALE (X) and PARENT (X)). The alternative, nondecompositional, view is that the message is represented in terms of message chunks (lexical concepts) such as FATHER (X) and MOTHER (X) each of which maps onto a single word (lemma)².

The nondecompositional view solves a number of problems with decomposition models of speech production (see Roelofs, 1997 for a comprehensive account). One problem for decomposition models is the word-phrase synonymy problem. For instance, the underlying message for "...is a spinster" and "... is a human unmarried adult female" is identical. How then can

² It is important, as Roelofs (1997) stresses, to distinguish componential analysis, which seeks to make explicit the semantic relationships between words, and decomposition, which is the claim that a lexical concept actually contains these components as proper parts and that these components are necessarily accessed in word retrieval. The nondecomposition view supposes that a lexical concept can give access to such components but does not contain them as proper parts (see also Van Gelder, 1990).

a choice be made between a single word and a phrase? For the nondecompositional view, this synonymy between a word and a phrase, poses no problem because distinct concepts can be part of the message structure (e.g. SPINSTER (X), see Kempen & Hoenkamp, 1987). Which concepts are chosen depends on the communicative intention and is therefore a problem of conceptualization not of word retrieval (see, for example, Roelofs, 1997, p.48).

The nondecompositional view also solves the problem of how a speaker knows how to ensure that a message is verbalizable at all. Not all combinations of primitive conceptual features may be lexical items. Hence, it is necessary to specify which combinations can be verbalized. Of course, where the message is specified in terms of lexical concepts this requirement is met *de facto*.

It follows from such arguments that conceptualisation must be language-specific (e.g., Levelt *et al.*, in press; Roelofs, 1997; Slobin, 1996). In consequence, when speaking different languages, a bilingual speaker must often utilise a different set of lexical concepts. For example, in Dutch there is no lexical item corresponding to the word "sibling" in English (see Roelofs, 1997, p. 44) and so the message content in speaking Dutch must contain a disjunction of lexical concepts: BROTHER (X) or SISTER (X), rather than SIBLING (X). A Dutch-English bilingual may choose the lexical concept SIBLING (X) when speaking English but not when speaking Dutch.

There are no fully developed models of bilingual speech production but the Levelt *et al.* model (in press) provides a guide. Indeed, De Bot (1992) provides a pioneering extension of it to the bilingual case. If conceptualisation is language-specific, the intention to speak one language rather than another must be represented mentally at the stage of conceptualisation. However, on the supposition that the mental lexica of the two language are interconnected (e.g., Paradis, 1997; see also Kroll & De Groot, 1997), lemmas for words similar in meaning (i.e., interlinked lexical concepts) can become activated and potentially compete for selection during the process of speech production. Given that lemmas are the locus of selection, each lemma could be associated with a language tag (De Bot & Schreuder, 1993; Green, 1993, 1998; Poulisse & Bongaerts, 1994; Poulisse, 1997) or with a language node (see Grainger, 1993; Dijkstra & Van Heuven, 1998, for use of this concept in the context of a model of bilingual word recognition).

Mechanisms for selectively activating different lemmas are needed not simply to allow speech in one language rather than another but also to achieve the variety of language use open to bilingual speakers. Grosjean (1985; 1997) defines the notion of a language mode: at one extreme, individuals can be in a unilingual mode (speaking just one language to individuals who themselves speak just one language); at the other extreme, individuals can be in a bilingual mode, communicating with bilinguals with whom they mix languages (code-switch and borrow) in order to achieve desired communicative effects (see

Milroy & Muiyksen, 1995 for a review of code-switching). In a bilingual mode, one language may function as the base language and words or phrases from the other language may be introduced, for example, to signify an attitudinal stance on some issue. Code-switching may also arise in order to fill lexical gaps, or in anticipation of, or as a consequence of, certain 'trigger-words' (Clyne, 1980) such as bilingual homophones or proper names (see Clyne, 1980 and De Bot, 1992 for discussion of the processing implications).

We have adopted the view that conceptualisation processes are language-specific and related this view to a model of speech production. In adopting this view, certain boundary conditions need to be borne in mind.

The first boundary condition has to do with the nature of bilingual speakers. Bilinguals are individuals who use two or more languages (or dialects) in their everyday lives. They are specific speaker-hearers whose language is geared to their communicative needs (Grosjean, 1982; 1985; 1997). Grosjean (1998) identifies what he terms the complementary principle: "Bilinguals usually acquire and use their languages for different purposes, in different domains of life, with different people. Different aspects of life require different languages". Ready examples are the migrant worker who speaks the language of the host country at work only or the business person who uses a number of languages at work but just one in the home or the person who reads and writes in a second language but rarely speaks it. Because individuals use their languages differently the level of a specific language skill will vary. If a language is never used to refer to a particular domain, no specialized vocabulary will be developed. What can be used in speech may not be able to be written down. From this perspective, bilinguals are individuals with a repertoire of language skills used in particular domains for specific purposes. The complementary principle leads one to expect that bilinguals will not necessarily be good translators or interpreters since they may possess vocabulary in only one of their languages for certain referents or domains.

The second boundary condition has to do with the nature of human communication itself. The primary purpose of language is arguably the exchange of thoughts. In order to achieve such an exchange individuals must coordinate with others just as a joint activity like shaking hands cannot be done separately. Languages, as Lewis (1969) argued, are systems of conventions that are community-wide solutions to a recurrent problem of coordination. A given speech community accepts a specific pairing of sound and meaning. English speakers, for instance, use the word "dog" to denote a domesticated carnivorous four-legged mammal. When a speaker uses this term on the belief that the addressee is a member of an English-speaking community, he or she has a reasonable expectation that the addressee will identify a relevant entity.

Convention is important as a coordinating device and it is the one emphasised by Whorf (1956). Whorf, as Clark (1996, p.352) states, assumed that a

speaker's use of a word such as "animal" elicits in an absolutely obligatory way a ready-made concept of animals. But this assumption plays down the role of context. If a person says "I saw some animals in the park", what are the intended referents? If it were country park in England it might be horses and deer. If it were a game park in Africa it might elephants, rhinos and lions. A change in the context of the utterance changes the category of object denoted. In other words, the use of a word on a given occasion leads the addressee to construct a novel concept for an ad hoc category (Barsalou, 1983). In consequence, there is no obligatory link between the use of a word and the concept conveyed by it in different contexts (Clark, 1996). However, as Whorf stressed, languages also consist of syntactic conventions and differ in what must be obligatorily-expressed. These factors might well lead to language-specific cognitions.

The third boundary condition is that thinking is not all of one kind. It is usual to emphasise the modularity of mind, at least as a developmental outcome (e.g., Karmiloff-Smith, 1992; Elman, Bates, Johnson, Karmiloff-Smith, Parisi, & Plunkett, 1996) and to envisage substantial modularity in those central processes that Fodor (1983) treated as non-modular. But modules (or rather functional subsystems) may differ in their degree of autonomy of linguistic processes. For instance, numerical cognition may be strongly independent (Brysbaert, Fias, & Noël, in press) whereas social cognition may not be. Without a deep understanding of the nature of the representation used by different systems and how linguistic representations interface with these, it is hazardous to make general claims in advance of experimental research.

Bilingualism: General and Specific Cognitive Effects

General Cognitive Effects of Bilingualism

Work in the 1960s (e.g., Peal & Lambert, 1962), in contrast to earlier research (e.g., Saer, 1923), found evidence of increased mental flexibility in bilingual children. However, such studies leave open the direction of causation (Cook, 1997). Is mental flexibility the outcome of a bilingual education or a prerequisite for the acquisition of a second language? Subsequent research using within-subjects designs and improved statistical techniques, at least gives no warrant for any deficit (Diaz, 1985). In fact, it is possible to imagine a chain of causation which runs from the context of acquisition to a general cognitive skill. Children brought up in bilingual environments must learn to discriminate lexical concepts and sounds of one language from those of another (based initially on prosodic differences, see Dupoux et al., 1997). In the course of acquiring lexical concepts they must use procedures that discriminate the form of a language from its meaning and reference. In consequence, relative to

unilingual matched controls, they might show greater awareness of the nature of language (metalinguistic awareness). The requirement to select form over meaning might also be reflected in enhanced skill in other tasks requiring selective attention (Bialystok, 1992). The degree of lexical ambiguity in a language has also been mooted as producing a general cognitive effect by affecting the reasoning style of its speakers (Hunt & Agnoli, 1991). We will also consider this possibility.

Enhanced metalinguistic awareness? Do children brought up in a bilingual environment show enhanced metalinguistic awareness? Galambos and Goldin-Meadow (1990) found that bilingual Spanish-English speaking children (aged between 4.5 years and 8 years of age), relative to aged-matched unilingual controls, progressed more rapidly to a form-based approach to language as demonstrated by their ability to spot and to correct ungrammatical constructions (e.g., "Steven and Robert is a brother") despite their semantic interpretability. However, their bilingual experience did not hasten their ability to explain the error in such constructions.

In a similar vein, research also suggested that bilingual children are better at recognizing the arbitrariness of the linguistic sign (De Saussure, 1916) presumably because of their experience that the same object could be referred to using different words. Ianco-Worrall (1972) found that twice as many English/Afrikaans bilingual children agreed that the names of objects ("Can a cow be called a dog?") could be interchanged compared to unilingual children. Similarly, Ben-Zeev (1977) examined the extent to which English/Hebrew bilingual children could distinguish the properties of objects from the names of objects. She found that such children, relative to unilingual controls, were better at answering hypothetical questions of the form: if we call a bird "spaghetti" can we say "spaghetti flies"?

However, whether such relative advantages are a product of bilingualism per se or a product of the kinds of language task carried out in school settings (e.g., translation) is unclear. Mohanty (1992), for instance, showed no advantage in metalinguistic tasks for bilingual children who were not attending school. Indeed, Grosjean's complementary principle (Grosjean, 1998) would lead us to expect no simple relationship between bilingualism and metalinguistic awareness especially if such abilities are fostered by the recognition that the same meaning can be expressed in different forms. Where individuals use different languages in different circumstances, the conditions for such awareness may not be present.

Cook (1997) reviewed a number of studies contrasting the performance of unilingual and advanced users of English on a variety of explicit grammatical judgement and grammatical acceptability tasks. The main outcome is perhaps unsurprising. Advanced users of a second language (L2) are much slower to

reach such decisions even when they make the normatively correct decision. For instance, Cook (1990) reports a study showing that there can be relatively small differences in the accuracy with which native English speakers and advanced Japanese users of English identify the referent of a pronominal pronoun ("John said Peter helps him") or of a reflexive pronoun ("John said Peter helps himself"). However, the times taken to reach such judgements differ markedly with the Japanese users taking at least 65% longer on average. Other research (e.g., Coppetiers, 1987) showed that near fluent bilingual speakers (American residents in France) differed radically in their grammaticality judgments compared to native French speakers. One point to make about such studies is that such advanced users are still much less practised in their non-native language compared to native speakers (see Segalowitz & Gatlinton, 1995 for a discussion of skill in second language learning). Would such advanced speakers differ in their decision times and their grammatical judgments relative to controls matched for the number of years speaking the language?

A second point is that such explicit metalinguistic tasks may not tap implicit language use. Here too it seems reasonable to suppose differences relative to a unilingual norm. For instance, the procedures for implementing certain constructions, such as producing a subordinate clause in German with a subject-object-verb word ordering in contrast to the subject-verb-object word ordering required in main clauses may require an explicit act of attention during the production of an utterance (see also Ellis, 1995, and Paradis, 1994 for a discussion of implicit and explicit systems in second language acquisition). The involvement of such an explicit procedures presumably depends on a person's level of fluency in German and the degree of precision required in the speech setting.

Enhanced selective attention? The data with children suggest, but do not prove, that acquiring two languages may have a short-term cognitive advantage, at least in certain contexts, perhaps because it fosters the capacity to select some aspect of the stimulus field (e.g., form) and to ignore some other aspect (e.g., meaning). Bilingualism may lead to enhanced executive procedures for controlling task performance (Johnson, 1994). Indeed Bialystok (1992, p.501) identified selective attention "as a unique cognitive process in which bilingual children demonstrate consistent advantages over monolingual children"³.

Bialystok (1992) predicted that young bilingual children, relative to unilingual controls, would generally be better at high control tasks that require them, for example, to ignore meaning and either to judge the grammaticality of

³ Earlier, Peal and Lambert (1962) had proposed that the bilingual children's experience of switching between languages helped them in tasks requiring symbolic reorganization - however there is no empirical support for such a view, see Diaz and Klingler, 1991.

semantically anomalous sentences such as "Why is the cat barking so loudly?" or to judge how many words there are in a sentence. Her predictions broadly confirmed (on samples of children aged between 5-9), she examined performance on an embedded figures test in order to determine whether or not there was indeed a general cognitive benefit.

An embedded figures test (EFT) requires individuals to locate a hidden or camouflaged figure (e.g., locating a simple cuboid in a more complex figure). Performance on this task has been co-opted as a measure of cognitive style (Witkin, Dyk, Faterston, Goodenough, & Karp, 1962) but as Bialystok (1992) notes, performance on EFT correlates with spatial ability and, indeed, the historical roots of the test are amidst tests of spatial ability. On the basis that it is a spatial test, Bialystok proposed that "any relation between performance on EFT and metalinguistic tests based on control of processing would constitute evidence for some transfer effects of selective attention across domains"⁴. She reports (Bialystok, 1992, p. 508) that performance on EFT was significantly predicted by performance on metalinguistic tasks of control even when age, verbal ability and spatial ability was partialled out and so concludes in favour of her hypothesis that bilingualism fosters enhanced skills in selective attention.

However, the effect of bilingualism on EFT performance may not reflect enhanced skills in selective attention as such. Bilingual children, relative to unilingual controls, may be more likely to use their languages to control their behaviour and perception (see Diaz & Klingler, 1994). Conceivably, verbal labels (e.g., one in one language and one in another) help hold one organization of the figure in mind whilst another competing alternative is considered. Alternatively, it may not be bilingualism that is critical. Performance on embedded figures tasks is sensitive to schooling and to specific training (Kolinsky, Morais, & Brito Mendes, 1990). Indeed, it seems reasonable that it should be since one of the primary functions of the visual system is to identify object contours - a function that also serves the biological purpose of uncovering camouflage and hence detecting hidden predators or prey (Dresp, 1997). It would be helpful if the outputs of this system were sensitive to enhancement through experience. Performance on EFT is also highly correlated with general ability. Both Zigler (1963) and Cronbach (1970) showed that it has shared

⁴ Enhanced performance on an embedded figures test may be achieved by successfully ignoring the overall figure and so reflect a process of selective attention. Alternatively, it may reflect a decreased ability to perceive the whole and a tendency to focus on the parts of objects. Autistic children, for instance, perform well on an embedded figures test not because of enhanced skills of selective attention (or even superior spatial ability) but because of a general focus on local information and a decreased ability to grasp the wider context (Frith & Happe, 1994). Strictly speaking, in order to interpret EFT data appropriately, it is necessary to establish that individuals can correctly use information about the whole figure or the linguistic context of an utterance when it is relevant to do so. It is assumed here that this is the case for the children in the study described in Bialystok (1992).

variance with intelligence (see McKenna, 1984, p. 596). Indeed, McKenna reports a correlation of 0.64 between EFT and Cattell's Culture fair test. Since intelligence is a general ability it can account for the correlations amongst EFT and other factors. Lastly, skilled communication involves the ability to construct alternative description of the same object and to use the same word to convey different meanings as function of context. As noted earlier, the capacity to convey, and to determine, significance based on the shared context of the communication is critical. Identifying and using such context requires an effective understanding of the intentions and beliefs of others so that language can be used to alter what is mutually known. Exercising such a mental skill requires an adequate "Theory of Mind", in which, for instance, individuals are able to contrast what they know with what is known to others (e.g., Baron-Cohen, Leslie, & Frith, 1986; Baron-Cohen, 1993; Happe, 1993). Controlling such representations requires mechanisms of selective attention. Since both unilingual and bilingual speakers face this requirement, a bilingual environment is not causally decisive in enhancing any general skill of selective attention.

Changes in reasoning style? Hunt and Agnoli (1991: p. 384) proposed that lexical ambiguity (i.e., the presence of different word senses for the same word form) might affect the style of reasoning enforced by different languages. They assume that determining what an utterance means can either be achieved entirely within the linguistic system or it can be achieved by moving outside the linguistic system to determine what meaning is plausible. Given this assumption, if languages differ in lexical ambiguity, they may force different styles of reasoning on their speakers. Hunt and Agnoli speculated on the consequences for understanding English and Italian. English, they argued, is more polysemous than Italian. If individuals have adapted to this problem then utterance length should be shorter in English thereby minimising the interpretive burden on the addressee since longer sentences (according to Hunt & Agnoli) will merely compound the interpretive problem by increasing the multiplicity of possible meanings. In fact, Bates and Devescovi (1989) found that Italian speakers did produce more complex sentences than English speakers in describing pictures and so Hunt and Agnoli concluded that "Different languages pose different challenges for cognition and provide differential support to cognition" (p. 387). Again we have no evidence regarding how bilingual Italian-English speakers might perform on this task. In any case does it really follow that differences in lexical ambiguity force different styles of reasoning? Hunt and Agnoli's initial assumption is questionable. They presume the priority of a code-model of language (see Sperber & Wilson, 1986). Language is indeed a code: it does pair senses with sounds and the existence of such pairings are part of the conventions of a language. However, in order to understand an utterance, as pointed out

above, its context has to be considered. The same words can convey many different thoughts. In consequence, there is no basis for believing that the ambiguity of words in isolation poses an interpretive problem when these words appear in a pragmatic context. Determining the intended meaning or significance of an utterance is always an inferential process. In short, different languages will not induce different styles of reasoning by virtue of their lexical differences⁵. Hence, bilingual speakers will not reason differently either when speaking these two languages.

Specific Cognitive Effects of Bilingualism

So far, we have considered the putative effects of acquiring two languages on awareness of language itself, on selective attention, and on reasoning style. We argued earlier that in speaking one language rather than another that individuals conceptualise their messages in terms of the lexical concepts of the language in question: thinking for speaking is language-specific (Slobin, 1996). Two kinds of specific effects have been proposed: - a) effects of the availability of lexical concepts in one language rather than another on cognitive processes and b) effects of obligatory syntactic distinctions on these processes and representations.

Lexical concepts: Effects on mental processing? The availability of lexical concepts may carry implications for the cost of expressing ideas (Hunt & Agnoli, 1991). Where a lexical concept is available then individuals do not need to compute a phrase in order to convey their meaning. Hunt and Agnoli (1991) go further: a thought, they suggest, that is readily expressed in one language may never be developed by speakers of another language that lacks such a lexical concept (see Hunt & Agnoli, 1996, p.377- 378). They give the example of the word "mokita" in the Kiriwina language of New Guinea that means "a truth everyone knows but no-one speaks". Certainly, lexical concepts may make it easier to communicate with others and to make an issue an object of shared attention. Certainly, such concepts may also make thinking about a problem easier because they organize information and may allow this information to be maintained in mind more easily. But Hunt and Agnoli's claim is too strong. Speakers always find themselves embedded in a living culture and concepts are also conveyed in proverbs and stories (e.g., the Emperor's new Clothes) and these cultural devices are also available for explicit reference.

⁵ The results of the study by Bates & Devescovi (1989) might reflect other differences between these languages such as obligatory gender marking which might it easier to keep track of referents in constructing a representation of the state of affairs being described.

A more testable prediction of theirs derives from their proposal that languages evolve to move the computational demands from short-term memory to long-term memory (Hunt & Agnoli, 1991). The invention of vocabulary serves to code or chunk complex descriptions (e.g., the vocabulary invented by surfers such as "hollow" or "flat" for describing waves, Hunt & Banaji, 1988; cited in Hunt & Agnoli, 1991). According to Hunt and Agnoli individuals will think most efficiently about those topics for which the lexicon has provided an efficient code. Bilingual speakers would seem to provide a test bed for such a claim: do they change language to support their thinking about an issue when one language but not the other provides an efficient code? From a communicative point of view, a direct prediction is possible: code-switching should be more likely to occur (all else being equal) when one language provides a lexical concept for a complex idea whereas the current language does not.

Lexical concepts: Effects on colour perception? The availability of lexical concepts has also been assumed to affect the coding of experience. Colour perception has been a traditional hunting ground for researchers exploring cross-linguistic effects. Although colour perception depends on physiological and perceptual mechanisms common to human kind, it is conceivable that when a child learns its first language, attention is directed to the foci and boundaries of the basic colours terms in the language. In consequence, language may modulate the performance of universal mechanisms of colour perception. In fact, there is still no decisive evidence on this proposal. For instance, Davies and Corbett (1997) required individuals to sort colour tiles into similar groups. They found overall similarity in the colour groupings produced by speakers of three different languages but also found a predicted difference supporting earlier research (Garro, 1986; Heider, 1972; Lucy & Schweder, 1979⁶). As they expected, blue-green colour tiles were more likely to be grouped together in Setswana (the main language of Botswana that has a single term, *botala*, to cover the blue-green part of the colour space), than in English or Russian, both of which distinguish the green part of the colour space from the blue. On the other hand, Russian speakers were no less likely to group dark blue tiles with light blue tiles compared to English speakers despite the fact that Russian has distinct lexical concepts (*sinij*, and *goluboj*) for these regions. However, as in all previous studies of this type it is conceivable that individuals used their language to group the tiles. Their behaviour, but not necessarily their

⁶ Lucy and Schweder (1979) used colour arrays where all colours were equally distinctive in contrast to the arrays of Heider (1972) where focal colours were unintentionally more distinctive than the non-focal colours. Lucy and Schweder found that focal colours were not significantly better discriminated than non-focal colours though there was small improvement overall - just 10%. However, in three later experiments on English speakers that used Lucy and Schweder's arrays, Garro (1986) did find substantial improvement for focal colours.

cognition of colours, would have been affected

What of bilingual speakers of two languages that differ in their coding of the colour dimension? It is reasonable to expect that their classification of colour may be affected by knowledge of their two languages. Indeed there is some evidence that this is the case. Caskey-Sirmons and Hickerson (1977: cited in Cook, 1997) found that Korean-English bilingual speakers use the Korean term "paran sekj" (blue) to refer to a colour that is more purple and less green than unilingual Korean speakers. Such an outcome would be expected if different lexical concepts (the Korean term and the English term) compete to code the input. To date research on colour discrimination and taste discrimination (O'Mahoney & Muhideen, 1977) are consistent with post-perceptual effects. However, in the bilingual case, strict control of language mode is needed at the time of test if we are to determine how knowledge of more than one language affects perception⁷.

Lexical concepts: Effects on person perception? The availability of a lexical concept might also be expected to affect the integration of information. Hoffman, Lau, and Johnson (1986) examined the processing of personality descriptions in bilingual Chinese-English speakers living in Canada. English has the label "artistic type" that interrelates a set of attributes relating to skills, temperament and lifestyle. Chinese lacks such a label and does not treat these attributes as part of a personality schema. In contrast, Chinese has a single label (shi gu) for a cluster of attributes that include worldly, strong family orientation and interpersonally skilled. The supposition was that in reading different personality descriptions the availability of a label within the language would serve to integrate the attributes mentioned and also license other inferences and impressions. Separate matched groups of Chinese-English bilinguals were asked either to read the personality descriptions in English and to think and to respond in English or were required to read them in Chinese and to think and to respond in Chinese. Hoffman et al. showed that the presence of labels in a language strongly affected individuals' impressions of the character and the inferences they were prepared to make about them. Indeed the performance of

⁷ Brysbaert et al. show the kinds of cross-linguistic research techniques that need to be adopted to rule out input or response artefacts. They examined the effects of different number naming systems in Dutch and French on the time required to solve simple addition problems. In Dutch, the number 24 is expressed in the order four-and-twenty rather than the order twenty-four as in French. They predicted that if numerical cognition is penetrable by language processes then Dutch speakers should be quicker to solve an addition problem such as $4+20=?$ compared to a problem such as $20+4=?$ Whereas the reverse pattern should obtain for French speakers. Brysbaert et al. established that such differences exert no effect when response factors are controlled. Further, for problems presented in Arabic the numerical system is largely autonomous from the language system (except perhaps during acquisition or during difficult arithmetic operations where intermediate products may need to be stored).

the Chinese-English bilinguals responding in English did not differ from that of the unilingual English controls suggesting that they represented the personality descriptions in terms of the personality labels of English not Chinese. However, other techniques are needed to establish whether or not individuals edited possible inferences and impressions so as to comply with their instructions.

Obligatory Distinctions

Languages differ in what must be obligatorily expressed. Slobin (1996, p. 91) notes that in describing a picture of a boy who has fallen from a tree and a dog running from a swarm of bees, speakers of all languages recognize the contrast between the boy's falling (which is punctual and completed) and the ongoing chasing of the bees and the running of the dog. Yet German speakers and Hebrew speakers do not directly mark the contrast between completed and ongoing events grammatically whereas Spanish speakers, for instance, do. In this case, the required information is plausibly part of the mental model of the situation for all speakers but it must be explicitly represented for Spanish speakers if an utterance is to be produced. Likewise, English demands that all expressions contain a marking of their tense. It follows that speakers must always check the temporal properties of their mental models (Levelt et al., in press). In Turkish, speakers have to choose between two past-tense inflections - one for witnessed events and one for non-witnessed events. Again, this information is plausibly part of the mental model of an event for all speakers but in the case of Turkish speakers it must be made explicit in order for an utterance to be produced.

Such examples are consistent with the need for speakers of different languages, and therefore bilingual speakers also, to make certain kinds of information salient when they are talking about a situation or event. To the extent a distinction is required by the grammar, individuals may automatically represent the conceptual distinction as an explicit part of their mental model of the situation even when there is no overt requirement to use language⁸.

⁸ There are also implications for acquisition of a second language (see Slobin, 1996, pp. 89-91). In acquiring a language in childhood individuals learn to pay attention to specific aspects of experience and develop procedures for coding specific aspects of their experience into expression. In consequence, it can be easy for individuals to grasp distinctions that are common between their native language and a later acquired second language but difficult for them to grasp distinctions that are made in one language but not in the other language. For instance, it is difficult for native speakers of English to grasp the Spanish perfective/imperfective distinction whereas there is no problem for them grasping the distinction between the progressive and perfect. On the other hand French speakers have no problems grasping the imperfective in Spanish because they have the same grammatical category but the progressive and perfect pose do problems for them. Adults try to discover patterns in the second language that exist in the first.

language affects what counts as the functional representation of space within the community of speakers. The requirement to code spatial relations in certain ways would then affect the availability or ease of constructing such representations.

An argument can be made though that language will, in fact, affect the nature of the spatial representations constructed. Although the lexical concepts of a language referring to space (including its spatial prepositions) must be compatible with the human visuo-spatial system in order to be learnable at all, intrinsic perceptual and cognitive constraints may not strongly determine the nature of these concepts (Levinson, 1996a, pp. 179-180). Suppose that a system of spatial representation emerges as a product of the multiple levels of interaction in the developing brain (see Elman et al., 1996). In such circumstances, the language environment of the child might directly influence the nature of the mental representation of space (see Bowerman, 1996).

What implications may we derive for the processing of spatial relations by bilingual speakers? The general point is this: we should not expect bilingual individuals to think identically as unilingual speakers of a language. A linguistically-motivated contrast in one language (L1) may yield procedures that automatically encode relevant features of the environment. From the point of view of thinking for speaking in L2, the conceptual representation would then contain features irrelevant to choice of lexical concepts in L2.

An Agendum for Research

This paper has argued that bilingualism does not demonstrably lead to enhanced metalinguistic awareness, nor to enhanced skills in selective attention, nor is there any reason to believe that natural languages by virtue of differences in lexical ambiguity, affect general styles of reasoning. On the other hand, it is reasonable to suppose that languages exert specific cognitive effects.

Languages differ in their lexical concepts and we have argued that speakers of different languages must conceptualise in terms of these concepts when speaking. They must also encode those aspects of experience that must be obligatorily-expressed within the grammars of those languages. The first claim then is that bilingual speakers must, in principle, think differently in their different languages (see also Slobin, 1996). However, we have proposed a further claim: to the extent a distinction is required by the grammar, individuals may automatically represent the relevant conceptual information as an explicit part of their mental model of the situation (cf. Levinson, 1996b). These two claims are plausible but unproven. Research effort may reasonably be directed at addressing them. Such effort would necessarily focus on the cognitive performance within individuals. A complementary effort is needed to consider distributed cognition in bilingual and multilingual groups.

Language-Specific Cognitive Effects in Bilinguals

Experimental research needs first to demonstrate cross-linguistic effects of language on the on-line processing of objects and their relations. Are such effects, as has been suggested here, only post-perceptual? Does language, for instance, only affect the encoding of objects into the mental model of the world and not the initial processing of objects themselves? If there are demonstrable cross-linguistic effects, how are these modulated in bilingual speakers?

Consider, the cross-linguistic contrast in spatial descriptions shown by Levinson (1996b). Bilingual speakers can provide a critical test of the claim that there is a special mode of thinking for speaking. If there is then bilingual speakers should themselves demonstrate cross-linguistic differences. That is, in an English-speaking setting, bilingual speakers of English and Guugu Ymathirr will code the positions of objects in terms of spatial prepositions such as "to the left of" or "in front of". In contrast, in a setting where Guugu Ymathirr is spoken, they will code objects in terms of their cardinal directions. However, it is conceivable that speakers of Guugu Ymathirr automatically code objects in terms of their cardinal directions. In this case, in their mental model of the world, objects will always be coded according to their cardinal directions independent of the language of the conversational setting or test.

An exploration of language-specific cognitive effects in bilinguals is not restricted to such an example. Consider the contrast Slobin (1996) noted between English and Turkish. In Turkish, speakers must obligatorily signal whether an event was witnessed or not. If obligatory distinctions evoke procedures that automatically make the necessary information explicit and salient in the mental model then such information will be accessible for Turkish-English bilinguals even when they describe an event in English. Likewise, the accessibility of such information should not decrease after code-switching from Turkish into English.

The view that language-specific procedures may create autonomous cognitive processes also carries implications for the cognitive consequences of aphasia in bilinguals. If a procedure has become autonomous then it should survive the loss of the language that initially triggered it just as concepts initially conveyed by language may achieve independent conceptual representation (Paradis, 1995; 1997).

From a theoretical and experimental point of view in order to gain a real understanding of language-specific cognitive effects (i.e., whether they are pre- or post-perceptual, or both) we need to develop connections with research on attention since we are assuming that linguistic processes direct attention. There are a variety of mechanisms implicated in selective attention. For instance, one contrast is between a system concerned with the executive control of action (and centred in the frontal lobe) and a system responsible for the

spatial allocation of attention (and centred in the parietal lobe), see, for example, Posner and Petersen (1990). The basic notion is that these systems work together to selectively modulate sensory processing. Now for many kinds of feature we are some way from understanding their cortical representation and processing but in the case of visual features (shape, colour) certain kinds of question can be addressed. For instance, consider a language such as Yucatec-Maya (see above). This requires that numeral-classifiers identify the shape of an object being referred to. Does such a language, relative to one that has no such requirement, elicit enhanced activity in the neural zones specialized for sensory processing of that feature? In fact, we can approach such questions by examining how processing is modulated even within languages that do not make extensive use of such classifiers. We can refer to the properties of objects both explicitly (e.g., "What is the colour of the apple?") and implicitly (e.g., "Is there a ripe apple?").

Bilingualism, Pragmatics and Distributed Cognition

"A common language", as Pinker notes (Pinker, 1994, p. 16) "connects the members of a community into an information-sharing network with formidable collective powers". The effectiveness of a group or organization depends, in part, on how it manages such distributed cognitive processes. Processes of coordination (see Introduction above) and debate both bear on such effectiveness. Any possible commonality of thought can serve as means to coordinate (Clark, 1996). Speakers (whether unilingual or bilingual) attempt to use words and phrases that will allow their addressees to construct the appropriate meaning. Which words and phrases they use depends upon their assessment of what is mutually mentally represented as well as their vocabulary knowledge. Accordingly, a critical component of bilingual communicative competence is socio-cultural knowledge, not simply linguistic knowledge (see also Cheng, 1996). Individuals will think differently in the different speech communities to which they belong because they have to access different lexical concepts and community beliefs in order to ensure effective communication. On this point of view, the effectiveness of bilingual and multilingual groups should depend on the ease with which participants can access the relevant set of beliefs. Is this the case? What exactly is the relationship between a measure of shared beliefs and the effectiveness with which groups perform?

Communicative success also rests on appreciating different contextualization cues. Gumperz (1996) describes how individuals from different language backgrounds utilise different contextualization cues to indicate how an utterance is to be understood. For example, whereas speakers of standard British English use syllable accent to signal a rhetorical point, speakers of Indian English may

use pitch or loudness shifts extending over an entire phrase. In general, sensitivity to such contextualization cues may contribute to the ease with which members of multilingual groups can debate and argue about their views and so influence the effectiveness of the group in managing change. Yet we know little about conversational exchanges in such groups and the pragmatic factors that may limit their effectiveness.

Final Thoughts

This paper has discussed and suggested experimental and empirical research bearing on the relationship between language and thought in bilingual speakers, specifically the effects of language on cognitive processes. Other issues warrant exploration. We are languaging beings and our sense of self and identity is arguably closely tied to this fact. The experience reported by some bilingual speakers that they feel themselves to be different persons when they speak one language rather than the other (e.g., Wierzbicka, 1985) may well be attributable to the change of situation in which individuals find themselves when they speak each language (Grosjean, 1996). But there may be a role too for language itself through its resonances and connections to sustain or to elicit a sense of self. Imagine the world of Mparntwe Arrernte speakers in Australia - their language links the names of objects and places to the system of kith and kin (Wilkins, 1993, cited in Lee, 1996, p. 184). Such a language seems almost to sustain an intimate participation between the self, the group and the world. Different languages evoke different resonances and so may elicit a different sense of self and being-in-the-world. Can we explore these personal spaces? For instance, will the contents of mini-autobiographies and futuroographies (scenarios of a future self in the world) show effects of language?

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