Language and Thought

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On almost all occasions, the course of language production begins when speakers formulate the desire to convey certain thoughts. Imagine, for example, a scene in which a child has watched her father throw a ball. If the child were an English speaker, she might utter the sentence, "Daddy threw the ball." If the child spoke any other of the world's thousands of natural languages we would also expect her to be able to express the basic content of this simple English sentence. What would differ considerably, however, from language to language would be the range of grammatical markings required as obligatory addenda to the propositional content (Slobin, 1982).

The sentence "Daddy threw the ball" can serve as a starting point for a brief exploration of variation across the formal features of languages. This straightforward sentence displays much of what is formally required by English grammar (this series of cross-linguistic examples is adapted from Slobin, 1982):

DADDY	threw	the	ball
AGENT	ACTION		OBJECT
[focus]	[past]	[definite]	

Word order in English dictates that "Daddy" is the focus of the sentence. The time of the action is obligatorily marked on the verb. A determiner

indicates whether the ball in question is previously identified ("the") or newly introduced ("a").

Although German shares a strong family resemblance to English, the range of grammatical marking is quite different:

VATER	warf	den	Ball
AGENT	ACTION		OBJECT
[focus]	[past]	[definite]	
	[3rd person]	[singular]	
	[singular]	[masculine]	
		[object]	

The verb indicates not only that the action took place in the past, but also that there was a single person being referred to in the third person. The definite article "den" also goes far beyond the English "the" in specifying that the object of the sentence "Ball" is not only definite but also singular, grammatically masculine, and specifically the object of the sentence.

Consider, as a final example, the same thought rendered in Turkish:

Top- u	baba- m	at-	tı
OBJECT	AGENT	ACTION	
[definite]	[possessed	[past]	
[object]	by speaker]	[3rd person]	
		[singular]	
		[witnessed	
		by speaker]	

The basic word order of Turkish is subject–object–verb, but the child's thought is focused on her father, and Turkish uses the position immediately preceding the verb to encode focus. Therefore, "babam" is moved to the position just before the verb. Furthermore, the child is required by the grammar of Turkish to indicate that the father in question is her own. She must also obligatorily indicate that she is reporting an event that she experienced directly. Were the source of knowledge not direct, the child would append a different suffix to the verb.

This chapter is devoted to exploring the relationship between language and thought. This series of examples—a single thought expressed in three different languages—is intended to illustrate why the study of this relationship has so often proved compelling. We can clearly see the effect of thought on each language's rendering of the scene. In each of the languages, for example, the words for "daddy" and "ball" are kept distinct. We would be surprised, that is, if any language conflated "daddy and ball" into one lexical item (Markman & Hutchinson, 1984). In that sense, the way in which the child structures the scene in thought reflects the way the child structures the scene in language.

What is less immediately clear is whether the different formal requirements of each language—the different obligatory aspects of grammatical marking—will have consequences for the way the child, or the child's addressee, can or typically does think about the scene. Might it be the case, for example, that the German-speaking child habitually notices the genders of objects in a way that an English-speaking child would not? Might it be the case that Turkish-speaking children habitually are attuned to the directness of indirectness of their information in a way that neither English- nor German-speaking children would be? Confirmation of such speculations would constitute evidence for effects of language on thought.

In this chapter we will look at both directions of influence: thought on language and language on thought. That thought influences language has been extensively documented. We will review a representative sample of the empirical literature. The potential effect of language on thought, however, has proven to be among the more troubled areas of psychological research. In the first section of this chapter, we will review this troubled history. By the end of that section, we hope to demonstrate why a renaissance of interest in this topic has emerged out of a recognition of the bidirectional influences of language and thought. In the latter two sections of the chapter, we take up individual topics—conceptual metaphor and language acquisition—to demonstrate the advisability of a balanced perspective on the relationship between language and thought. Although this review will at times require speculative suggestions, we believe that those speculations are justified against the background of received psychological wisdom.

I. THE SAPIR–WHORF HYPOTHESIS REVISITED

Perhaps the strongest claim relating language and thought was framed by John Watson. As part of his behaviorist program to render all aspects of psychological experience directly observable, Watson hypothesized that thought is merely subvocalized speech: "the muscular habits learned in overt speech are responsible for implicit or internal speech (thought)" (1930, p. 239). This view, however, that thought is impossible without some form of covert language has been widely discredited. Physiological aspects of Watson's hypothesis were invalidated through experiments that eliminated muscle activity without impairing cognitive processes (e.g., Smith, Brown, Toman, & Goodman, 1947): Thought remained viable in the absence of "muscular habits." Psychological aspects of Watson's hypothesis fell victim to systematic observation of the thinking skills of prelinguistic children. Well before they utter their first words, children provide abundant evidence that they are inducing structure in the world around them (for a review, see Siegler, 1986). If children begin thinking before they start speaking, we can properly wonder how pre-existing patterns of thought affect the emergence

of language and, at the same time, how the emergence of language affects patterns of thought.

By offering the contrast among English, German, and Turkish renderings of "Daddy threw the ball," we wished, in fact, to create a context in which speculations about the mutual influences of language and thought would seem well motivated. Historically, theories of these interrelationships also emerged out of close analyses of the different ways in which languages convey information about the world. The scholars most associated with theory in this area, Edward Sapir and his student Benjamin Lee Whorf, began by studying just such linguistic differences. In both cases, their explorations led them to the somewhat radical conclusion that differences in language would create differences in thought:

> We see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation. (Sapir, 1941, 1964, p. 69)
>
> We dissect nature along the lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds—and this means largely by the linguistic systems in our minds. . . . We are thus introduced to a new principle of relativity, which holds that all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar or can in some way be calibrated. (Whorf, 1956, pp. 213–214)

For Sapir and Whorf, these conclusions were not abstract ideas but emerged directly from relationships they believed to exist in their own data. Whorf, who wrote most frequently about the influence of language on thought, framed two hypotheses (see Brown, 1976):

> Linguistic Relativity: Structural differences between languages will generally be paralleled by nonlinguistic cognitive differences in the native speakers of the two languages.
>
> Linguistic Determinism: The structure of a language strongly influences or fully determines the way its native speakers perceive and reason about the world.

The burden of modern research in psychology, linguistics, and anthropology has been to create rigorous tests of these ideas (see Lucy, 1992). In this chapter, we begin by reviewing the major areas of research that have been used to argue for or against the Sapir–Whorf hypothesis. We will argue, in fact, that the influence of both thought on language and language on thought can be detected in all these areas.

A. Color Memory

When researchers first turned their attention to the Sapir–Whorf hypothesis, memory for color was considered to be an ideal domain for study (see Brown, 1976). Whorf had suggested that language users "dissect nature along the lines laid down by [their] native languages" (1956, p. 213): Color is a prototypical continuous dimension divided up in different ways across languages. Researchers set out with the initial hypothesis that differences in the quantity of color labels would bring about differences in episodic memory for those colors (e.g., Brown & Lenneberg, 1954; Lenneberg & Roberts, 1956; Stefflre, Vales, & Morley, 1966). However, two lines of research proved quite powerful in creating the opinion that the color domain provides a strong instance of "cultural universalism and linguistic insignificance" (Brown, 1976, p. 152). In the first line of research, Berlin and Kay (1969) studied the distribution of color terms cross-linguistically and discovered an orderly pattern with which languages employ from two to eleven basic color terms (see also Kay & McDaniel, 1978). Languages with only two terms will have black and white (or dark and light). If the language has a third term, it will be red. The next additions will be sampled from yellow, green, and blue. Brown enters next, followed by some ordering of purple, pink, orange, and gray. Thus, rather than being arbitrary in the way that Whorf might have predicted, languages choose to name different colors according to a strict hierarchy. This strictness suggests that language describes a single external reality, rather than that language divides reality in different ways.

The second line of research that argued strongly against the Sapir–Whorf hypothesis was carried out by Rosch (see Rosch, 1977, for a review) who studied the Dani tribe of New Guinea. Rosch asked members of this group as well as English speakers to try to remember color chips that were either focal or nonfocal members of the basic color categories. English speakers, who have names for all eight categories, remembered focal colors better than nonfocal colors. Dani speakers, who have only two color terms, showed the same pattern of results. Thus, although their language does not differentiate, for example, the categories red, blue, and green, the Dani responded as if their language did. Rosch's results created an indelible impression that experiences of color are unaffected by language practices.

Perhaps because the regularities revealed by Berlin and Kay and by Rosch were so impressive, subsequent research on language and color memory has only rarely penetrated from anthropology into psychology (but see Hunt & Agnoli, 1991). This later body of research, however, has done much to restore a balance toward the mutual influence of language and thought in the experience of color (e.g., Garro, 1986; Lucy & Schweder, 1979, 1988). Lucy

and Schweder (1979), for example, began a series of experiments with a study that demonstrated a methodological weakness in Rosch's work. The array of color chips she had used to test both her Dani and English speakers appeared to be biased in a way that made focal colors a priori more salient than the nonfocal colors. Lucy and Shweder constructed a new test array that was not subject to this bias. With the unbiased array, they failed to replicate Rosch's original results. They demonstrated, in fact, that what mattered most for accurate recognition memory was not focality, but rather the availability of a "referentially precise basic color description" (p. 159). They concluded that "language appears to be a probable vehicle for human color memory, and the views developed by Whorf are not jeopardized by the findings of any color research to date" (p. 160).

Kay and Kempton (1984) extended this conclusion with a methodology that eliminated any possible taint from a biased array. In their initial experiment, they provided their subjects with triads of color chips all taken from the blue–green continuum. The subjects' task was to indicate which of the three hues was most different from the other two. The two groups of subjects in the study were speakers of English, a language which includes a lexical distinction between blue and green, and speakers of Tarahumara, a language that has only a single lexical item, siyóname, which covers both green and blue hues. Kay and Kempton argued that, if the Sapir–Whorf hypothesis is correct, "colors near the green–blue boundary will be subjectively pushed apart by English speakers precisely because English has the words green and blue, while Tarahumara speakers, lacking the lexical distinction, will show no comparable distortion" (p. 68). Kay and Kempton's data strongly bore out this prediction: English speakers distorted the interhue distances in line with the Sapir–Whorf hypothesis in 29 out of 30 instances; Tarahumara speakers' performance was close to the prediction of random shrinking or stretching with a 13 out of 24 split.

In a second experiment, Kay and Kempton invented a methodology that eliminated the utility of the blue and green labels for their single group of English-speaking subjects. With a special piece of equipment, Kay and Kempton displayed the triads only a pair at a time. While the experimenters showed one pair, they labeled one of the chips as greener than the other. While showing the second pair, they labeled a chip as bluer. Under these circumstances, the color boundary was transparently irrelevant to judging the distances among the three chips in the triad: the central chip was both green and blue. Under these circumstances the performance of the English speakers now nearly matched that of the Tarahumara speakers. Because of its forced irrelevance, the effect of language was eliminated. From this second experiment, Kay and Kempton argued against a "radical" form of linguistic determinism. Although language affected thought when it was

relevant to the task at hand, it did not place binding constraints on performance when it became irrelevant.

Kay and Kempton's dramatic results led them to argue for a revision of received wisdom on color experience. They embraced the evidence that suggests that thought in some ways constrains the experience of color; the orderly emergence of color terms into the world's languages argues strongly toward that conclusion. However, a full review of the data also argues strongly toward an influence of language on thought. Far from being a strong case of the failure of the Sapir–Whorf hypothesis, color provides a paradigmatic instance of a domain of experience in which language and thought exert a mutual influence.

B. Counterfactual Constructions and Reasoning

During the period of time in which research on color memory seemed to argue against an influence of language on cognition, Bloom (1981) set out to provide a test of the Sapir–Whorf hypothesis that shared more of the spirit of Sapir and Whorf's original theoretical motivation. Sapir and Whorf were attuned largely to grammatical differences between languages. Bloom nominated such a difference as a possible locus for a language effect. He called attention to a difference in the grammars of English and Chinese relating to the expression of counterfactuals. Consider the English sentence, "If he were Sara's teacher, Sara would do better at school." That the speaker is reasoning contrary to fact is signaled by the subjunctive "were" and the modal "would." No competent speaker of English should mistake such a counterfactual construction for an ordinary if–then relationship. Chinese, by contrast, provides no such grammatical means for marking counterfactuals. The expression of counterfactual reasoning is constructed from ordinary implicational statements: "He is not Sara's teacher. If he is, then Sara will do better at school" (Au, 1988). Bloom hypothesized that this linguistic difference between English and Chinese might cause Chinese speakers to be less able than English speakers to recognize counterfactual arguments.

Bloom (1981) presented evidence in favor of this speculation. He gave English and Chinese speakers stories to read that contained counterfactual implications. For example, one story told of a European philosopher named Bier who would have been able to contribute to philosophy in a variety of ways had he been able to read Chinese. The two sets of subjects were asked to indicate whether Bier had actually made the contributions outlined in the story. Of the English speakers, 98% indicated that he failed to do so. The comparable figure was only 6% for native Chinese speakers. From a series of results of this sort, Bloom concluded that language could have an influence on thought: the absence of a grammatical counterfactual construc-

tion impaired the Chinese speakers' ability to perform counterfactual reasoning.

Bloom's results, however, have been widely criticized on methodological grounds (Au, 1983, 1984, 1992; Cheng, 1985; Liu, 1985; Takano, 1989). Au (1983), for example, argued that the stories read by Bloom's Chinese speakers were not written in idiomatic Chinese. Au suggested, in particular, that Bloom's rendering of "if–then" conditionals provided a different meaning to the Chinese stories than the one he had intended. When Au repaired Bloom's Chinese, all evidence for an influence of language on thought disappeared. Chinese and English speakers correctly perceived counterfactuality at near-perfect rates. Bloom (1984) complained that Au's subjects might have developed a facility with counterfactuals through experience in English, but studies with more purely Chinese monolinguals argued equally against the Sapir-Whorf hypothesis when the stories were appropriately idiomatic (Liu, 1985).

Along with an empirical invalidation of Bloom's results came a shifting of causal analysis from the influence of language on thought to the influence of thought on language. Au (1992), for example, argued persuasively that what in retrospect makes Bloom's claim seem so unlikely is that the types of life situations that give rise to the need for counterfactual reasoning are inescapable, irrespective of language. Although Bloom had argued that counterfactual reasoning is scarcely present in Chinese culture, Au (1992) observed that this type of reasoning underlies a wide variety of human functions: "If regret, frustration, sympathy, causal attribution, gratitude, and feeling vindictive permeate the everyday life of people from all cultures, counterfactual reasoning has to be fundamental and pervasive in human thinking as well" (p. 202). Consider, as one example, feelings of regret. To experience this emotion, speakers must be able to reason about alternatives to reality, for example, If I had pursued other job opportunities, I wouldn't be miserable now (see Kahneman & Miller, 1986; Kahneman & Tversky, 1982). Au's argument, therefore, is that, given the range of everyday thoughts that presuppose consideration of counterfactual states, speakers of all languages must be well practiced at this sort of reasoning. Thought drives language; speakers must find a way to express counterfactuals, whatever the resources of their languages.

Au (1992) also adduced developmental data to support the dominance of thought over language in the use of counterfactuals. Four-year-olds were placed in an experimental situation in which they were asked to pretend that common objects, such as a drinking straw, were some other object, such as a pencil. In one condition of the experiment these pretend transformations were introduced by an explicit counterfactual marker, the subjunctive: "If this were a pencil, what could you do with it?" In the other condition, children heard a simple if–then conditional: "If this is a crayon, what can you do with it?" The children were subsequently asked, "Can you really [whatever the child had said earlier one could do with a pencil] with it?" Au reasoned that if language is necessary to assist in counterfactual reasoning, the children who heard the subjunctive would be more likely than their peers to answer this last question correctly. In fact, the children in both conditions responded appropriately. Au concluded that the children's ability to reason counterfactually was not particularly reliant on the correct use of the subjunctive by their conversational partner. Here, patterns of thought are well formed independent of the contribution of language.

The difficulty with these conclusions—as well founded as they are—is that they cannot logically be extended to conclude that there is no influence of language on thought. Although the experiences undergirded by counterfactuality may be universal, the ease with which various languages allow the counterfactual to be expressed may still have a cross-linguistic impact on ease of thought. Bloom's original experiment, and also therefore those experiments that reworked his translations, took as their dependent measure the accuracy of Chinese and English speakers' reports of counterfactual statements. Error rates, however, are only one index of performance and might mask more subtle differences (Cheng, 1985; Hunt & Agnoli, 1991; Hunt & Banaji, 1988). Imagine, for example, that subjects from both language groups were asked to perform Bloom's task but that their responses were timed. There is no a priori argument that can rule out the possibility that, despite equivalent accuracy, Chinese speakers would take longer to arrive at the correct answers. If this were so—and if we consider this putative result against the background of the limited cognitive resources available to cope with the time pressures of day-to-day conversation—we could imagine it to be the case that Chinese speakers would be less likely, all other things being equal, to undertake counterfactual thought. If this were true, language would be considered to have a clear influence on thought.

We intend this line of speculation to make the Sapir–Whorf hypothesis seem less monolithic than it sometimes has seemed. Sapir and Whorf have often been caricatured as suggesting that the two possible directions of influence between language and thought are mutually exclusive. This is clearly incorrect. We believe it is essential to acknowledge that thought influences language with respect to counterfactuals while still allowing the possibility that language could affect thought. Language may have exactly the type of small but consistent influence on thought that dominates theory building in psychology (Glucksberg, 1988; Hardin & Banaji, 1993; Hunt & Agnoli, 1991; Hunt & Banaji, 1988).

We believe, further, that it is critical to free the study of the Sapir–Whorf hypothesis from any overtones of immorality. The claim that Chinese speakers cannot perform counterfactual reasoning is clearly insulting. To refine the claim by imagining, for example, that this flaw may exist only at

the level of response time does little to remove the sting of that insult. A renaissance of interest in both directions of influence between language and thought should, however, reveal the possibility of a diverse set of advantages and disadvantages for each individual language (something Whorf himself emphasized). It seems quite likely that some functions of thought will be so critical that no language will have evolved that would "force" its speakers to perform that function slowly or poorly. It seems equally likely that some languages will have evolved such that some, perhaps more peripheral, functions will suffer indelible influence. Researchers should be open to both possibilities.

Our review of research on counterfactuals has been intended to argue in favor of theoretical balance. Early research favored an influence of language on thought. Later research corrected methodological weaknesses and suggested, instead, that thought influences language. While embracing that conclusion, we have nonetheless emphasized that the expectation of all-or-none direction of influence is unwarranted. Although Bloom's (1981) research was flawed in method, it was solid in theory (Cheng, 1985; Hunt & Agnoli, 1991). There is ample reason to study the influence of language on thought even against the background of a universal cognitive function. We turn now to an area of research that has provided less controversial instances of language affecting thought.

C. Concept Labels and Cognition

Perhaps the greatest myth on the subject of language and thought concerns the number of words that Eskimos have to refer to snow. Although Whorf mentions the example only in passing (1956, p. 216), and claims only that "Eskimo" contains three different snow words (p. 210), the example has been taken up into scholarly and popular culture and exaggerated to as many as one or two hundred different words (Martin, 1986). Whorf introduced this example, among a set of others, to document the different levels of precision with which languages carve up the world. Whorf believed that those linguistic differences would bring about differences in thought. It seems more likely, however, that thought precedes language in establishing such differences: speakers typically find ways to talk about the things that are most important to them (for a review, see Clark & Clark, 1977). This can be seen even within languages, because speakers vary in their expertise. Surgeons and car mechanics, for example, both have ranges of vocabulary that fall outside the competence of most users of English. In fact, once those specialized vocabularies are in place, they may help call attention to distinctions that would be overlooked by the uninitiated and they might contribute to efficient problem solving. Expertise, thus, can provide circumstances in which language, at least, facilitates thought.

The availability of labels has most thoroughly been shown to influence thought when information must be committed to memory. In a classic demonstration, Carmichael, Hogan, and Walter (1932) showed that the label applied to ambiguous figures could influence subjects' ability to reproduce those figures. Subjects, for example, were shown a drawing that consisted of a pair of circles connected by a short line segment. Half were given the label "eyeglasses" to go with the drawing. Half were given "dumbbells." When later asked to reproduce the figure, subjects' drawings tended to err in the direction of the label. No claim can be made that the application of the label changed the original perception of the figure, but language nonetheless affected the way in which the figure was reconstructed from memory.

Verbal labels can also affect other judgments that rely on reconstructions from memory. Consider an experiment by Loftus and Palmer (1974) in which subjects watched a film depicting a traffic accident. Each subject was required to provide a general description of what had happened and then answer a series of questions. One critical question had the form, "How fast were the cars going when they _____ each other?" For each subject, the blank was filled with a verb ranging from *contacted* through *hit*, *bumped*, and *collided*, to *smashed*. Subjects who read the question with *contacted* estimated the cars' speeds to have been 31.8 mph. With *smashed*, the estimates rose to 40.8 mph—and, in a subsequent question, subjects were more likely to report that they had seen broken glass in the original film. Here again, language had an effect on what subjects believed they had experienced.

In each of these earlier studies, the experimenters manipulated the verbal labels that were given to the subjects. Schooler and Engstler-Schooler (1990) have examined circumstances in which memory is impaired when the subjects themselves have been responsible for generating the verbal information. In one experiment, for example, subjects were asked to watch a 30-second videotape of a bank robbery. Twenty minutes later, half of the subjects spent five minutes writing a detailed description of the robber's face. The other half of the subjects were in a control group that performed an unrelated task. Schooler and Engstler-Schooler found that 64% of the control subjects were able to recognize the robber's face correctly among an array of eight faces—but only 38% of the subjects who verbalized about the face. In another experiment, subjects were presented with color chips and were asked to write about the color or to perform a control activity. Recognition performance was, once again, much impaired by verbalization: 73% versus 33% accuracy for the control and verbalization groups, respectively.

Schooler and Engstler-Schooler designed a further experiment that enabled them to focus in on the causal mechanism for this decrement in performance. Subjects in this experiment viewed black and white photographs from a university yearbook. As in the previous studies, half of the

subjects were asked to write descriptions of the faces in the photographs and half were in a control group. In this experiment, however, half of the subjects from each of these two groups were asked to make their recognition judgments within five seconds whereas the other half were given as much time as they wanted. With unlimited time, subjects again suffered a performance decrement from verbalization: 80% versus 50%. However, with limited time, there was no such decrement: performance was 76% correct for the control group and 73% correct for the verbalization group.

Schooler and Engstler-Schooler argue that this pattern arises as a consequence of *recoding interference*. Subjects, they believe, tend "to rely on a verbally biased recoding at the expense of the original visual memory" (p. 37). With limited time to make their recognition judgments, subjects relied more heavily on their accurate visual memory. With unlimited time, however, the inaccurate verbal information overwhelmed the original visual information. These results are compelling not just because they demonstrate an effect of verbal information on subsequent judgments. Beyond that, they show that subjects defer to the language information even when access to memories for the original information allows more accurate performance.

Hoffman, Lau, and Johnson (1986) moved the study of the effects of labels on memory to comparisons between speakers of different languages. These authors created descriptions of four individuals, two of whom could easily be labeled by personality type terms in English, but not in Chinese, and two of whom could easily be labeled in Chinese, but not in English. Consider the term *shì gù*. In Chinese, this term succinctly captures an individual who is "worldly, experienced, socially skillful, devoted to his or her family, and somewhat reserved" (p. 1098). In English, no single term or phrase unifies these diverse traits. Hoffman et al. suggested that the availability or unavailability of succinct labels in each language would have a direct influence on the way in which speakers of the two languages made judgments about the characters. To make as dramatic a comparison as possible, Hoffman et al. used as subjects Chinese–English bilinguals. By random division, half of these subjects were asked to read character descriptions in Chinese and half in English. This methodology allowed Hoffman et al. to make claims about the impact of language differences independent of cultural differences.

Predictions for the study arose from the belief that the availability of a succinct label would cause subjects to reason in a fashion guided by their stereotypes. That is, if the bilinguals read the description of the *shì gù* individual in Chinese, Hoffman et al. expected to see evidence that they had reasoned with recourse to the *shì gù* stereotype. If comparable bilinguals read the description in English, they expected to see little evidence of stereotype-based reasoning. This expectation was borne out. The impressions subjects wrote down for each character were considerably more con-

gruent with a stereotype when the language of processing matched the language in which a succinct label was available. The subjects' ability to recognize statements from the original stories and their ratings of the likelihood that other statements would be true of each character were similarly contingent on the match between the processing language and the label language. Hoffman et al. acknowledged that their procedure was abstracted away from ordinary circumstances of "person cognition." Nonetheless, their data provide a compelling example of circumstances in which the language in which readers encountered an identical body of information had a substantial impact on their later performance with respect to that information. The study demonstrated, as the authors put it, "that a language's repertory of labeled categories (its lexicon) affects the categorizing behavior of its speakers" (p. 1105).

Having reviewed a selection of past research on language and thought, we will now turn our attention to two areas that augur the future. Researchers on both *conceptual metaphor* and *language acquisition* have provided avenues for speculation, and alluring data, with respect to the impact of both thought on language and language on thought.

II. CONCEPTUAL METAPHORS

Shortly before the Gulf War erupted, George Lakoff (1991) circulated over computer networks an essay entitled "Metaphor and war: The metaphor system used to justify war in the gulf." The essay began in a striking fashion: "Metaphors can kill." Lakoff filled out this claim by identifying a series of metaphorical systems that he believed to underlie discourse about the actions of Saddam Hussein and the United States' possible responses. These metaphors could kill, Lakoff argued, because they allowed details of reality to be ignored in a potentially harmful way. Consider a metaphorical schema that Lakoff refers to as "The Fairy Tale of the Just War." This schema requires a cast of characters, a villain, a victim, and a hero, for which there were easy matches in the Gulf. Kuwait was the innocent victim, invaded by the villainous Saddam Hussein at the helm of Iraq. At the time Lakoff wrote his essay, the United States and its allies were impatient to fill the role of the hero. The difficulty with this metaphor is that it makes it all too easy to ignore finer aspects of the real-life situation. Even as the consensus toward war was emerging, for example, Kuwait's innocence was regularly called into question. The United Nations formally acknowledged, for example, that Kuwait had stolen oil from Iraq. Meanwhile, the narrow focus on Saddam Hussein as villain made it possible to forget that many other Iraqis would be adversely affected by war (and, as it turned out, Saddam survived the war intact while thousands of innocent Iraqis were killed). Lakoff's general claim, thus, was that the metaphors that were used

to rouse public sentiment in favor of the Gulf War shaped the public's perception of the world. This is a straightforward assertion that language affected thought. In this section, we examine both this possibility that metaphors can structure thought as well as the possibility that thought structures metaphors.

A broad spectrum of life experiences are, in fact, communicated almost entirely by virtue of metaphor (Gibbs, 1994; Lakoff, 1987; Lakoff & Johnson, 1980). Consider this series of utterances that might be spoken retrospectively about an argument (Lakoff & Johnson, 1980, p. 4):

He *attacked every weak point* in my argument.
His criticisms were *right on target*.
I *demolished* his argument.
If you use that *strategy*, he'll *wipe you out*.
He *shot down* all of my arguments.

What unifies this series of statements is the conceptual metaphor ARGUMENT IS WAR. If none of the statements seem particularly metaphorical it is because speakers of English have grown so accustomed to using war expressions to characterize argument that those uses have lost their novelty. It is almost impossible to talk about arguments without making tacit reference to this metaphor. This need not, however, be the case. We could imagine, for example, that English might be governed by the metaphor ARGUMENT IS A GAME OF CHANCE in which case we would say things like, "I was lucky to think of that point" or "I probably won't win the next time around." Or English might use the metaphor ARGUMENT IS A THEATRICAL PRODUCTION, which might lead to "I performed my side of the argument brilliantly" or "I think he took his curtain call too soon."

Against this example, we can frame the question of the influence of both thought on language and language on thought. One reason that English characterizes argument as war might be that the way that people think about argument makes the metaphorical extension of the war lexicon particularly apt. If this is true, we could look for evidence across languages that argument is often characterized as war. At the same time, we can wonder what effects the characterization of argument as war might have on the way that English speakers think about arguments. We can wonder whether the use of the metaphor ARGUMENT IS WAR rather than ARGUMENT IS A GAME OF CHANCE or ARGUMENT IS A THEATRICAL PRODUCTION might change the types of thoughts English speakers can have about their life experiences.

A. The Influence of Thought on Metaphorical Language

We begin with instances in which universal patterns of thought appear to dictate the emergence of highly similar metaphors cross-culturally. Asch

(1955) began one early demonstration of cross-cultural equivalence with the observation that the same terms, for example, *warm, cold, hard, bitter,* and *bright,* are often applied both to physical sensations and to people. He wondered if the extension of those terms from the physical to the psychological domain was governed purely by conventional associations or if there was a systematicity that would establish a deeper consonance.

To answer this question, Asch turned to a comparison across languages. He sought to see, first, whether all of the languages he consulted used these words for dual functions and then, second, whether the use of the words remained consistent across languages. Asch chose for his explorations a group of languages "belonging to different families and as far as possible separated in time and space" (p. 31): Old Testament Hebrew, Homeric Greek, Chinese, Thai, Malayalam (a language spoken in southwestern India), and Hausa (a language spoken in western Africa). Asch found that each of these languages did, in fact, include physical terms that had been extended to the psychological domain, although the number of such extensions differed among languages. Furthermore, some of the terms were extended in strikingly similar ways across this diverse sample. Asch concluded, for example, that "the morpheme for 'straight' (which may also denote 'right' or 'vertical') designates well-nigh universally honesty, righteousness, and correct understanding. Correspondingly, the [morpheme] for 'crooked' stands equally clearly for dishonesty and wile" (p. 33). Given the great differences among the cultures in which Asch's sample of languages were spoken, it seems safe to conclude that overlapping perceptual experiences gave rise to the consistency of these metaphors—thought influenced language.

For a second example of the way that thought may influence metaphorical language, we can look to metaphors that relate different sensory modalities. Consider these lines of poetry, each of which unites the visual and auditory domains (from Marks, 1982a):

The murmur of the gray twilight (Poe)
The quiet-colored end of evening (Robert Browning)
A soft yet glowing light, like lulled music (Shelley)

Marks (1982a) asked subjects to read each of a set of fifteen such metaphorical phrases and adjust a light stimulus and sound stimulus such that the intensities of each stimulus matched those implied by the line of poetry. Marks found that there was a nearly perfect correlation between the levels set in each domain. Furthermore, subjects' performance on this task very nearly mimicked the results of more traditional experiments that have examined equivalences between perceptual domains, independent of language. Marks (1982b) suggested that the equivalence of direct perceptual experience and perceptual experience mediated through language may well arise from some "fundamental, phenomenological property of the makeup

of sensory experience" (p. 192). If that is true, we would expect to find universal consistency in the way that languages map relations between sensory modalities.

On the whole, there are a broad range of physical experiences that are shared regardless of culture and language, experiences that may give rise to equally shared metaphors. Table 1 presents five examples of conceptual metaphors that are used in English and that also might be universal because they arise from experiences in the physical world (see also Johnson, 1987). These conceptual metaphors are potentially universal in two senses. First, some languages might choose not to use the potential mapping between these target domains and the up–down dimension. That is, we would not expect to find that every language uses these conventional expressions. Second, there is always the possibility that some language might violate

TABLE 1   Potentially Universal Conceptual Metaphors[a]

1. HAPPY IS UP; SAD IS DOWN

Linguistic instantiations: I'm feeling *up*. That *boosted* my spirits. He's really *low* these days. I *fell* into a depression.

Physical basis: Drooping posture typically goes along with sadness and depression, erect posture with a positive emotional state.

2. CONSCIOUS IS UP; UNCONSCIOUS IS DOWN

Linguistic instantiations: Get *up*. He *rises* early in the morning. He *dropped* off to sleep. He *sank* into a coma.

Physical basis: Humans and most other mammals sleep lying down and stand up when they awaken.

3. HAVING CONTROL or FORCE IS UP; BEING SUBJECT TO CONTROL or FORCE IS DOWN

Linguistic instantiations: I have control *over* her. I am *on top of* the situation. He *fell* from power. He is my social *inferior*.

Physical basis: Physical size typically correlates with physical strength, and the victor in a fight is typically on top.

4. MORE IS UP; LESS IS DOWN

Linguistic instantiations: The number of books printed each year keeps going *up*. My income *rose* last year. The number of errors he made is incredibly *low*. His income *fell* last year.

Physical basis: If you add more of a substance or of physical objects to a container or pile, the level goes up.

5. FORESEEABLE FUTURE EVENTS ARE UP (and AHEAD)

Linguistic instantiations: All *upcoming* events are listed in the paper. I'm afraid of what's *up ahead* of us.

Physical basis: Normally our eyes look in the direction in which we typically move (ahead, forward). As an object approaches a person (or the person approaches the object), the object appears larger. Since the ground is perceived as being fixed, the top of the object appears to be moving upward in the person's field of vision.

[a] Adapted from Lakoff and Johnson (1980), pp. 15–16).

these mappings and, for example, associate "happy" with "down." The safest prediction, therefore, would be that, to the extent that the claims about the physical bases of these metaphors are accurate, the vast majority of languages that make these mappings would align the dimensions identically. We would interpret all of these cross-linguistic parallels as instances in which thought constrained the type of language structures that can emerge.

B. The Influence of Metaphorical Language on Thought

Even if many conceptual metaphors arise from universal experiences, there are still a variety of circumstances in which different metaphors apply within the same domain. We can wonder, in those cases, whether the use of one metaphor rather than another can have an impact on thought. Consider an experiment by Gentner and Gentner (1983), which provides direct evidence that a particular metaphorical characterization of a domain can influence success at reasoning in that domain. These authors began by observing that analogies are quite often used in science, and wondered to what extent the use of these analogies influences thought in those domains. To address this question, they proposed a test of the Generative Analogy hypothesis: "that conceptual inferences in the target [domain] follow predictably from the use of a given base domain as an analogical model" (p. 100).

Gentner and Gentner chose electricity as their domain of inquiry and outlined two contrasting metaphors that help to explain the behavior of electricity in circuits. The first metaphor, the water-flow model, likens electricity flowing through a wire to water flowing through a pipe. Along these lines, batteries can be conceived of as pumps or reservoirs and resistors as narrow pipes. The second metaphor, the moving-crowd model, characterizes electric current as crowds of objects moving through passageways. Batteries can be thought of as a force that encourages the crowds to move and resistors as gates along the passageways.

Gentner and Gentner found that different individuals from a group that had been screened to be "fairly naive about physical science" (1983, p. 117), spontaneously used these two different metaphorical mappings. Furthermore, the use of one or the other model predicted success on different types of electricity problems. The water-flow model allows problem solvers to have easy access to prior knowledge about pumps and reservoirs, which facilitated performance on problems about configurations of batteries. The moving-crowd model allows easy access to prior knowledge about the way in which gates regulate the flow of movement, which facilitated performance on problems about configurations of resistors.

Consider a contrast between circuits containing one versus two resistors. With respect to the moving-crowd model it is easy to understand that two parallel gates would allow more of the crowd to pass than one gate would,

and thus two resistors allow more current to pass than a single resistor allows. The water-flow model, on the other hand, provides a contrast between one and two narrow pipes. The intuition is not nearly so clear—and, accordingly, subjects' performance suffered. With respect to the domain of electricity, thus, the success of reasoning is genuinely influenced by the metaphorical mapping of choice. Because the metaphorical mapping is mediated through language, this result constitutes an influence of language on speakers' ability to formulate certain thoughts efficiently. Research like Gentner and Gentner's may provide a cautionary note to teachers: Some metaphorical mappings may make aspects of a subject area less rather than more accessible to easy cognition. We now look to instances where language might influence thought well outside the classroom.

Consider an important domain of human experience for which there are a great number of overlapping conceptual metaphors, the domain of romantic love (see Kovecses, 1988, 1990; Lakoff & Johnson, 1980). Kovecses (1988) estimated that there are about three hundred conventional expressions about love in English, many of which can be subsumed within a variety of productive conceptual metaphors. Consider these instantiations of the metaphor LOVE IS A NUTRIENT (pp. 13–14):

She's *starved for* affection.
I *need* love.
I *can't live without* love.

Or these instantiations of LOVE IS A JOURNEY (p. 15):

Look *how far we've come.*
We'll just have *to go our separate ways.*
We've gotten *off the track.*

We can wonder, in each case, whether the expressions that individuals use to talk about love will influence the way in which they think about their relationships. We can make, along these lines, a variety of speculations. It might be the case, for example, that someone who talks of love as a nutrient might experience more distress by being without a partner than someone whose language is not dominated by this image. Such a person might also be more likely to stay in a bad relationship. We might also predict that those individuals whose language is dominated by the metaphor of love as a journey would have a different sense of how a relationship should unfold over time than would other individuals who chose other metaphors. Finally, we can wonder whether individuals who primarily express themselves about love via contrasting metaphors might find themselves to be strangely incompatible. Note that it could very well be the case that different life experiences would give rise to the preference for different metaphors. What

we are suggesting is that once those preferences are in place, there could be consequences for subsequent behavior. Such predictions are well within the range of psychological experimentation.

For a final example, we turn to a case in which a single conceptual metaphor characterizes a domain, but that metaphor alone might prevent successful reasoning. Consider this series of statements (Reddy, 1979, p. 286):

Try to *get* your *thoughts across* better.
None of Mary's *feelings came through* to *me* with any clarity.
You still haven't *given me* any *idea* of what you mean.

Reddy (1979) provided a series of examples like these to argue that talk about language is dominated by "The Conduit Metaphor." This metaphor has three components (Lakoff & Johnson, 1980, p. 10):

IDEAS (or MEANINGS) ARE OBJECTS.
LINGUISTIC EXPRESSIONS ARE CONTAINERS.
COMMUNICATION IS SENDING.

It is virtually impossible to talk about communication in English without partaking of this metaphor—and that, Reddy explicitly argued, has undesirable consequences. To make this case, Reddy focused on the way that the conduit metaphor trivializes the real difficulties of communication: "In terms of the conduit metaphor . . . success [at communication] appears to be automatic" (p. 295). But in real-life circumstances, "partial miscommunication, or divergence of readings from a single text, are not aberrations. They are tendencies inherent in the system, which can only be counteracted by continuous effort and by large amounts of verbal interaction" (p. 295).

Reddy suggests that the conduit metaphor has ill effects at both the personal and societal level. At a personal level, the conduit metaphor encourages speakers, in particular, to attribute miscommunication to their own ineptness rather than to the inherent difficulty of encoding and decoding ideas. At a societal level, the conduit metaphor encourages communities to believe that culture can be preserved independent of human cognition. But, as Reddy points out, "we do not preserve ideas by building libraries and recording voices. The only way to preserve culture is to train people to rebuild it, to 'regrow' it, as the word 'culture' itself suggests, in the only place it can grow—within themselves" (p. 310). Reddy acknowledged that English speakers are capable of thinking about the true complexity of language: the conduit metaphor does not make such thoughts impossible (as required, perhaps, by the strongest version of the Sapir–Whorf hypothesis). Even so, because this metaphor so permeates everyday discourse, Reddy

argues that it is the habitual basis for our reasoning about meaning—so that language consistently leads us astray. This strong prediction of an effect of language on thought warrants empirical scrutiny.

In this section on conceptual metaphor we have suggested that each of language and thought influences the other. Many metaphorical mappings seem to arise out of universal aspects of human experience. In those cases, thought has a major impact on language. Other metaphorical mappings seem to be relatively less constrained by experience itself. In those cases, there is room to speculate that language constrains thought.

III. LANGUAGE ACQUISITION

At the beginning of the chapter, we gave renderings of the same idea in three different languages, English, German, and Turkish, and observed that each language requires the child to make a different range of formal distinctions. In this section, we will first consider how the universal unfolding of children's cognitive capacities constrains the time course with which they can acquire these formal distinctions. We then provide some examples of circumstances in which the formal structure of a language may have an impact on children's cognitive development.

A. The Influence of Cognitive Development on Language Acquisition

The proposition that the course of language acquisition is constrained in some ways by the cognitive preparedness of the child is widely accepted (see papers collected in Gelman & Byrnes, 1991; Slobin, 1985a, 1985b, 1992). Because some of the distinctions languages require are beyond children's understanding at the chronological moment at which they begin to acquire language, language development must often wait on cognitive development. All other things being equal, the order in which children acquire the formal devices of their language will be highly correlated with the complexity of the concepts those devices encode. Consider a classic study, in which Brown (1973) examined the time course with which children acquired fourteen suffixes and function words in English. Brown was able to order this set of grammatical morphemes in terms of their relative semantic and syntactic complexity. To master the plural -s, for example, English-acquiring children must understand the concept of number. To use the uncontractible copula be correctly, they must understand both number and time ("Is he your father?" "Was that an airplane?"). To use the uncontractible auxiliary be correctly, they must understand as well the third concept of the ongoingness of a process ("Is that your ball?" "Was that your bus?"). Brown demon-

strated that children acquired these three devices, and with few exceptions the entire set of morphemes, in order of increasing complexity (see also de Villiers & de Villiers, 1973). These data show strong evidence that cognitive attainments most often precede linguistic attainments.

Given that children of all cultures will likely experience the same unfolding of cognitive potential, we would have the strong expectation that children would acquire the same semantic distinctions in the same order (if, that is, their language makes formal notice of a particular distinction). To the extent, for example, that children must discover the concept of plural, we might expect children the world over to acquire mastery of the plural at the same chronological moment. What moves actual performance away from this idealization is the complexity of the means by which each individual language achieves the same semantic distinctions. For example, because of the complexity of the system, German children acquire mastery of plural forms relatively later than their English counterparts (Mills, 1985). On the other hand, to form a tag question speakers of German add a set word or phrase (e.g., "Peter kauft Brötchen, oder?"), whereas speakers of English must, in general, know the right verb and reverse the polarity of the main clause (e.g., "Peter is buying rolls, isn't he?"). Consequently, German children master tag questions before English children (Mills, 1985). Cognitive development, thus, most often provides a window of opportunity for children to acquire particular formal devices.

Because the influence of cognitive development on language acquisition has been so widely documented (e.g., Slobin, 1985a, 1985b, 1992), we have kept this discussion quite brief. We turn now to the less widely discussed possibility that formal features of certain languages might prompt language-specific advances in cognitive development.

B. The Influence of Language Acquisition on Cognitive Development

A major grammatical feature of the Turkish example that began this chapter was the verb suffix that marked the child's utterance as a product of direct experience. In Turkish, each past tense expression must be obligatorily marked as the product of direct experience, with the suffix -di or one of its phonological variants (e.g., it is realized as -ti in our example), or of indirect experience, with the suffix -miş or one of its variants (see Slobin & Aksu, 1982). The situations that are properly marked by -di versus -miş are often only subtly different:

> For example, . . . Kemal gelmiş 'Kemal came,' is appropriate in the context of encountering Kemal's coat, but not in the context of hearing the approach of

Kemal's car. In both cases, the speaker has not SEEN Kemal or his arrival, but in the latter case the auditory sensory experience is part of the process of Kemal's arrival, and thus the speaker's consciousness was involved in the process before its actualization. (Slobin & Aksu, 1982, p. 192)

Slobin and Aksu, in fact, argue that the distinction encoded within this suffix system counts as an "implicit theor[y] of conscious experience": "The distinction between the two past tense forms [encodes] . . . the degree to which the speaker's mind has been prepared to assimilate the event in question prior to forming an utterance about that event" (p. 198). Children who learn Turkish must come into possession of this implicit theory. They begin by using -di and then, with full mastery arriving at about age five, they begin to separate out circumstances in which -miş is appropriate (Aksu-Koç, 1986; Aksu-Koç & Slobin, 1985). In their review of the acquisition of this distinction, Aksu-Koç and Slobin (1985) suggest that "an intriguing research task would be to investigate the possibility that marking of the distinction between direct experience and inference/hearsay might make Turkish children more sensitive at an early age to issues of evidence, point of view, and source of information" (p. 865). We would reinforce that suggestion by recommending the same program of research for adult speakers. A strong claim that speakers, say, of English or German cannot ever be sensitive to the source of information is clearly untenable. Nonetheless, we believe alongside Aksu-Koç and Slobin that speakers of Turkish may have more immediate facility with such analysis—and such a claim may be borne out through data collection. If the experience of language acquisition focuses obligatory attention on a distinction that might otherwise be only voluntarily visited, we might fruitfully explore the possibility of lingering effects on cognition.

Studies of the acquisition of Japanese provide similar instances in which formal characteristics of the language might lead to cognitive precocity. Clancy (1985), for example, reviewed the time course with which Japanese children acquire the ability to make the social distinctions required of them by their language. She suggested that "Japanese children are exposed to linguistic differences correlated with social variables from a very early age, and are probably more sensitive to the social factors which trigger linguistic differences in Japanese, such as relative age, sex, and status of speaker and hearer, than are American children of comparable age" (p. 478). The putative influence, thus, is from language to social cognition. Clancy notes, as well, that personal reference in Japanese is also conditioned on the addressee. Although in English, I is used by both men and women, regardless of their addressee, male and female Japanese speakers use different pronouns at different times. For children, the term expected of girls, (w)atashi, is more formal than the terms expected for boys, boku or ore. Clancy reports a

conversation in which a 3½-year-old girl tried to refer to herself with boku while her mother struggled to correct her. The girl "seemed to be rebelling rather violently against the social behavior characteristic of atashi, preferring to identify herself as boku, and allowed to engage in the loud, active behavior which kindergarten boys enjoy" (pp. 480–481). This one young girl, thus, treated the name with which she could call herself as constitutive of her behavior. More generally, Clancy suggested that the "acquisition of this [first person] system will probably affect the child's developing sense of identity, especially in the area of social and sexual roles" (p. 479). As much as all children come to acquire sex roles, Japanese children might experience them all the more vividly since the little boy's I is not the little girl's I.

For a final pair of examples, we turn to Hebrew. In Hebrew, there is reason to speculate that formal features of the language might heighten awareness of gender identity. Berman (1985) observed that Hebrew requires the gender of the subject of a sentence to be marked explicitly on the verb. In English, for example, the same verb phrase is going would be used for either Ron or Rina. In Hebrew, the two sentences would be rendered Ron holech and Rina holechet. Berman suggests that the "formal encoding of sex difference as heard, and subsequently produced, by Israeli children . . . may compel them to make these cognitive distinctions earlier than, say, their English-speaking counterparts" (p. 335). She also cites cross-cultural data that show, in fact, that Hebrew-speaking children's gender identities are fixed somewhat in advance of their English-speaking peers. Berman identifies a handful of other potential loci in Hebrew for language development leading cognitive development. As our final example, consider sentence forms that translate to "She's crying, the girl" or "Don't take it, my ball" (p. 336). In Hebrew, such right-dislocation is used quite frequently by even 2- to 3-year-olds to mark the focus of the utterance. English speakers must learn relatively more complicated passive and cleft constructions to perform the same functions. Accordingly, Hebrew children might get some early help from their language in recognizing "such notions as 'That's what I'm talking about,' or 'What matters to me isn't who or what did something, but who or what it happened to'" (p. 336).

It is likely that cognitive development has a more profound impact on language development than the other way around. Even so, we have provided a series of examples from reasonably dissimilar languages, Turkish, Japanese, and Hebrew, all of which provide instances in which formal aspects of a language may prompt young speakers of those languages to acquire conceptual distinctions in advance of some of their peers. In each case, cross-linguistic data collection could confirm these differences for children and search out perhaps small but consistent differences in their parents.

C. Bilingualism

Our discussion of language acquisition has been focused so far on circumstances in which an individual is learning a first language. Many individuals, however, become to some extent proficient in more than one language. The achievement of bilingualism has, in fact, often become an explicit goal of higher education. The Yale College Programs of Study, for example, dictates that "students should be able to understand, speak, read, and write a language other than their own, and should be acquainted with the literature of that language in the original. Such abilities increase subtlety of mind and sharpen sensitivity to use of one's own language" (1992, p. 15). What Yale College asserts confidently—that bilingualism increases "subtlety of mind"— has often been the source of empirical and even political controversy.

In fact, much of the earliest research on bilingualism focused directly on the question of whether the possession of two languages had good or bad consequences for general cognitive performance (for reviews, see Hakuta, 1986; Hoffmann, 1991; Reynolds, 1991). Initially, this research reported that bilingualism was associated with decrements in performance. These early studies, however, most often compared immigrant bilinguals with native monolinguals, permitting no conclusions to be drawn about the effects of bilingualism independent of the consequences of social and economic disadvantage.

More recent research has reached cautious conclusions more in line with Yale College's assertion that bilingualism is advantageous. Mohanty and Babu (1983), for example, compared monolingual and bilingual members of the Kond tribal society in India. They suggested that experience with two languages would enable bilinguals to reason more effectively about abstract properties of languages. They found, in fact, that even with nonverbal intelligence taken into consideration the bilinguals showed superior metalinguistic ability. Okuh (1980) reasoned that two languages would provide bilingual children with "two windows or corridors through which to view the world" (p. 164), yielding the potential for greater creativity among bilinguals. In studies with both Nigerian and Welsh children, Okuh demonstrated exactly such enhanced creativity for bilinguals with respect to monolinguals, beyond differences in intelligence.

Studies of this sort, with monolingual and bilingual children drawn from the same cultures, provide compelling evidence in favor of the hypothesis that bilingualism covaries with facilitation in certain types of thought. Even so, these studies suffer from the inevitable methodological flaw that monolinguals and bilinguals have not been randomly assigned to the two groups (and random assignment is, of course, virtually prohibited) (Hakuta, 1986; Reynolds, 1991). Without such random assignment, establishing causality in this domain remains somewhat murky. There remains the possibility that

the same cultural circumstances that encourage bilingualism will also encourage, for example, creativity.

To make a less ambiguous argument that bilingualism has a facilitative effect on thought, researchers have begun to study educational settings in which children acquire a second language. Diaz (1985) and Hakuta (1987), for example, report data from a longitudinal study of bilingual education in the New Haven, Connecticut school system. Children in this program were native speakers of Spanish who began to receive training in English in elementary school (the goal of the program was to move the children into monolingual English classrooms). Both Diaz and Hakuta found a positive relationship between the degree of bilingualism and the children's cognitive abilities, but this relationship was strongest for students who were least proficient in their second language. For example, within the group of children who on average had low English proficiency, degree of bilingualism predicted "a substantial amount of cognitive variability" (Diaz, 1985, p. 1382) with respect, for example, to metalinguistic ability. Diaz concluded that "the positive effects of bilingualism are probably related to the initial efforts required to understand and produce a second language rather than to increasingly higher levels of bilingual proficiency" (p. 1387).

Opponents of bilingual education have often claimed that such programs hinder the educational development of minority students (for discussions, see Hakuta & Garcia, 1989; Padilla et al., 1991). Results of the type obtained by Diaz and Hakuta suggest instead that early bilingual training can expand children's cognitive capabilities. In this context, experience with more than one language has genuine potential to enhance the quality of thought. A second important conclusion is that the second language should not be acquired at the expense of the first. The greatest relative advantage almost certainly accrues to children who are able to retain, for example, their native Spanish while acquiring English (see Hakuta, 1986, 1987).

Although there are few methodologically pure data to support the specific claim that bilingualism can "increase subtlety of mind and sharpen sensitivity to the use of one's own language," a general conclusion from this tradition of research is that one's habits of thought can be improved through the acquisition of at least a second language. In a sense, therefore, proponents of nationalistic monolingualism (e.g., English First) risk impoverishing the mental lives of their compatriots (Hakuta, 1986; Lambert, 1992). Future research should confirm that the most thoughtful public policy is to promote widespread multilingualism.

IV. CONCLUSIONS

This chapter has been intended to give a balanced account of the effects of thought on language and language on thought. In almost every instance, the

impact of thought on language has been supported by abundant data. Language's impact on thought has consistently required more speculation. Although we suspect that some of these speculations will prove false, we hope to have demonstrated that the ideas originated by Sapir and Whorf warrant much more systematic exploration than they traditionally have been afforded.

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