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Why Languages Do not Shape Cognition: Psycho- and Neurolinguistic Evidence

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It is popularly believed by language learners and teachers that languages differ in the way they influence thought and perception. For example because Japanese employs different linguistic structures from English, speakers of Japanese will sometimes differ from speakers of English in their world view. This notion, called language relativity or the Sapir-Whorf hypothesis, has been subject to empirical scrutiny over the past forty years, and contrary to popular belief, there has been little evidence in support of linguistic relativity. This paper reviews the prerequisites necessary for empirical investigation of the Sapir-Whorf hypothesis, then summarizes several of the experiments that have been undertaken to validate its possible effects, and finally concludes with some observations about what this lack of supporting evidence might mean to the process of learning and teaching a second language.

言語が認知力を形成しない理由—心理・神経言語学的立証—

語学教師や学習者は一般に、人の思考や知覚に影響するという点で言語間には差異があると信じている。例えば日本語と英語とは違った言語構造を持つ故に、日本人は英語国民とは異質の世界観を抱くという考えである。言語相対論又はサピア・ウォーフの仮説と呼ばれるこの概念は過去40年以上も経験学的精査を受けてきたが、予測に反して言語相対論を支持する証拠は殆んどなかった。本稿はサピア・フォーフ仮説の経験学研究に必要な前提条件を考察し、起り得る結果を確認するためになされた幾つかの実験を要約し、最後にこの確証の欠如が第二語学習得・教授の課程で何を意味するかという観察をのべて結論とする。

One of the most persistent and popular perceptions that is harbored and nurtured by different peoples all over the globe is that their individual languages reflect certain world views that are not found in any other world language. Most commonly, lexical examples are cited to support this perception, especially words that

are difficult to translate directly into another language: *Gemülichkeit* in German; *guanxi* in Chinese; *riaproi* in Thai; *home* in English; or *haragei* in Japanese. So pervasive is this Whorfian perception that it is difficult to debate the topic or to subject it to scientific scrutiny, because it has become accepted as conventional wisdom by almost everyone. In fact, one compelling argument in support of the notion that our native tongues differ in the way they shape the way we think is the fact that almost everyone believes this to be the case. Near universality of belief is not, however, a sufficient criterion for scientific proof. In this paper, I would like to review the prerequisites necessary for a scientific investigation of the Whorfian hypothesis, summarize some of the experiments on the topic which have been conducted during the last four decades, including those which deal with possible neurolinguistic implications, and conclude with a few reflections on what this means for second language acquisition.

One fundamental problem in investigating the idea that language influences cognition is that this general claim is often looked at simultaneously in two different, and somewhat contradictory ways. Slobin (1979) draws the useful distinction between language determinism and language relativity. *Language determinism* is the belief that language in general somehow aids, constrains, or shapes thought and perception in general. One simple example of this belief is the premise that long or complicated linguistic expressions constrain cognitive processing, whereas short, simple expressions enhance cognitive or perceptual processing. Obviously this claim would hold true for all languages. One would not expect Japanese and English (or any two languages) to differ in this regard. For example, it would be quite preposterous to maintain that double or triple negatives would impede understanding in English but would enhance comprehension in Japanese. Language determinism is the basis of psycholinguistics and the psychology of language. By and large, it has been experimentally proven in numerous and diverse experiments (e.g., Aitchison, 1989;

Clark & Clark, 1977; Foss & Hakes, 1978). I have no quarrel, therefore, with the idea that human language—the natural system of human communication comprised of linguistic universals, both formal and substantive (Chomsky, 1967)—determines cognition to some degree. The evidence is strong and incontrovertible and is the foundation of most of the major cognitive models of the psychology of language (e.g., those of Vygotsky, Piaget, and Chomsky).

But another way we can look at language and thought is called language relativity, which, unfortunately, is quite often confused with language determinism. *Language relativity* is frequently called the Sapir-Whorf hypothesis (or more simply, the Whorfian hypothesis) after the names of the two American linguists who were the most popular proponents of this notion. Linguistic relativity presupposes the idea that human language in general influences cognition, but it goes further to claim that what we think, perceive, or remember differs relative to our individual language. This means that the Japanese language will, to some extent, create a Japanese *Weltanschauung* which will differ from the world view created by the English language which, in turn, is different from one shaped by Chinese, and so forth. Note the importance of distinguishing between language determinism and language relativity: the former argues that human language has some influence on human thought; the latter goes one step beyond and contends that since human language is comprised of different languages, linguistic differences among the world's languages will affect how users of these languages think. This popular notion is illustrated by a recent book by Matsumoto (1989), to cite a Japanese example. Writing for a non-Japanese, English-speaking audience, Matsumoto emphasizes the difficulty of explaining the concept of *haragei* to those who do not speak Japanese and who are unacquainted with Japanese culture. For the rest of this paper, I will be concerned solely with language relativity. My basic premise will be that, contrary to conventional wisdom, there seems to be little or no evidence to suggest that languages differ in the way they shape cognition.

In a little known but significant article published before most of the experimental work on the Sapir-Whorf hypothe-

sis, Lenneberg (1953) stressed the importance of establishing experimental guidelines in order to investigate language relativity in a rigorous fashion. Based on Lenneberg's early work and on my own reading of the relevant psycholinguistic literature, I believe that there are several issues that must be considered before experimentation is undertaken.

1. Strong vs. Weak Versions of Relativity: The strong version assumes that irrespective of conditions, linguistic structures will affect cognitive processing without exception. The weak version admits to the intervening effects of nonlinguistic variables and claims that language will or can affect cognitive processing in certain, but certainly not all, conditions. Sapir, who ordinarily was a careful and articulate writer, seems to espouse both versions in his most quoted paragraph about relativity:

> Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but *are very much at the mercy of the particular language which has become the medium of expression for society.* . . . We see and hear and otherwise experience very largely as we do because *the language habits of our community predispose certain choices of interpretation.* (my emphases) (Sapir, 1929, p. 209)

"Being at the mercy" of one's mother tongue, or being "predisposed toward certain choices" by one's native language is essentially the choice between the strong and weak versions of the Sapir-Whorf hypothesis. Although it remains unclear as to which version Sapir himself was committed, most people accept the possibility of exceptions and intervening variables and thus reject the idea that we are at the mercy of our language.

2. Quantifying Language: Language is such a broad term that it can refer to literature, speech, nonverbal communication, as well as to grammar and accent, so obviously it is instructive to define what aspects of language are expected to exert an influence over cognitive processing. The typical

linguistic categories of phonology, lexicon, and syntax are the three which have been considered for quantification in Whorfian experiments, with the majority of studies focussing on lexical differences and their possible influence on cognition and perception. Except for some highly speculative observations drawn by a few psycholinguists (see McNeill, 1987), most investigators have assumed that phonological differences among languages have no influence on thought. Lexical differences have been the richest source of evidence for experimentation, partly because words are easy to quantify, and partly because vocabulary seems to be the linguistic system most obviously linked to cognition and perception. There have also been a few studies which have examined the potential influence of syntactic differences between languages.

3. Quantifying Cognition: A much more daunting problem for researchers is to come up with a quantifiable measure of differences in how people think. Neither Sapir nor Whorf attempted to explain in their writings how differences in cross-cultural cognition could be identified or measured. Whorf never attempted to quantify how "thinking" in Native American languages like Chippewa, Kwakiutl, and Nootka differed from "thinking" in what he called "Standard Average European"—his unique and quite extraordinary way of conglomerating all European tongues together into one linguistic amalgamation. Both Whorf and Sapir failed to provide any quantifiable evidence that Europeans and Native Americans had different world views; they simply assumed there were *cognitive* differences between these two groups of cultures because the *linguistic* differences were so salient.

4. Causality: One fallacy of unsystematic research is to assume that once you find a correlation between A and B, you have proven that A caused B. Steinberg (1982), in his chapter which lists problems with the notion of language relativity, cites examples using English and Japanese. English demands that noun phrases be quantified according to number and that certain verbs and noun quantifiers agree

with the number of the noun phrase ("Much rice is consumed by many Asians."), a linguistic feature that does not exist in Japanese. Assuming this feature of English would be an advantage in mathematical cognition, and also assuming that math grades on standardized tests would be one accurate measure of mathematical thinking, then based on the notion of linguistic relativity, one would assume that English speaking children would have a cognitive advantage in math over Japanese speaking children. No one would dispute the linguistic facts nor the logic of this example, but the results obtained for such an experiment would probably be the reverse of those predicted. Even if English speaking children did score consistently higher on math tests, it is not at all clear that language would have anything to do with the results. It is much more likely that differences in educational systems, social attitudes about the importance of scholastic testing, and so forth were the causal variables, and not the linguistic differences in how noun phrases are marked. This simple example demonstrates the inherent difficulty of weeding out the influence of culture and environment from the potential influence of language. Remember that language relativity claims that differences in language, not distinctions in culture or environment, create differences in the way people think or perceive.

5. Phenotypical and Cryptotypical Evidence: As Clarke et al (1981) have pointed out, in several of his essays and letters, Whorf distinguished between traditional morphological and grammatical classes which he called "phenotypes" and more "elusive, hidden, but functionally more important meanings" called "cryptotypes" (Whorf, 1956, p. 105). An example of the former would be the difference just cited between a language like English, that distinguishes between singular and plural nouns, and a language like Japanese, that makes no such distinction. Although Whorf was never specific about cryptotypical differences, it appears to me that they are somewhat similar to Chomsky's early notion of "deep structure." So a possible cryptotypical distinction between English and Japanese is that English marks nouns syntactically (e.g., noun modifiers tend to

differ in syntactic number but not in syntactic category: "*much* rice" vs. "*many* bowls of rice"), whereas Japanese marks nouns semantically but not syntactically (e.g., ni*mai*, ni*hon*, ni*satsu* differ not in number but in the semantic classes of nouns they categorize). Because cryptotypical differences are difficult to define and almost impossible to quantify, investigators have focussed exclusively on the phenotypical differences between languages.

Although Whorf never provided clear examples or a precise definition of cryptotypes, some contemporary linguists have looked at differences among languages in a manner that I would consider cryptotypical. Two examples of this modern form of relativity are the notion by Lakoff and Johnson (1980) that language is highly metaphorical, and the idea presented recently by Wang (1989) that each language is packaged with unique "prefabs." Although both notions are insightful reflections on the more "cryptotypical" nature of languages, they cannot meet the criterion of quantifiability and therefore be considered amenable to experimental verification.

Many anthropologists and psycholinguists have attempted to investigate language relativity experimentally. The most famous, but ultimately among the least convincing set of experiments undertaken to verify the Sapir-Whorf hypothesis, are the studies made almost forty years ago which correlated the differential effect of color terminology on the perception and classification of colors. Lenneberg and Roberts (1953), for example, investigated differences in color classification tasks between speakers of Zuni, who have no simple term for "orange," and speakers of English. Although this classic study, like other similar investigations of the effects of color terminology, appeared to provide quantifiable verification of language relativity, later work by Berlin and Kay (1969) revealed that color classification is based on a universally predictable hierarchy of terms which is determined by the perceptual properties of human vision. Furthermore, some linguistic differences in color terminology appear to be influenced by geographical dissimilarities in sunlight. Born-

stein's 1973 survey of over 100 different languages indicates that groups who live on or close to the equator tend to have one word for blue and green, possibly due to the fact that the prolonged exposure to ultraviolet radiation damages the eye's ability to perceive differences in the shorter wavelengths (Taylor, 1976, p. 300).

Representative of the several experiments which have been conducted on syntactic differences between languages and their potential Whorfian influence is Bloom's 1981 study of counterfactual clauses in Chinese and English. In the following examples, note that Chinese has no changes in the verb phrase for "if" clauses, whereas English frequently does.

Chinese: *ruguo ta shi wode pengyou, wo jiu bu ma ta*
if he be my friend, I then not curse him
English: If he *were* my friend, I *would*n't curse him.
or: *Were* he my friend, I *would*n't curse him.

Bloom conducted a series of experiments involving the ability of Chinese and English subjects to answer comprehension questions about texts they had read in their native languages. Bloom hypothesized that English subjects would do a better job of remembering the truth and falsity of counterfactual clauses in the English text because the inflection of English verbs, as illustrated above, would help English speakers to remember that they were counterfactuals. Chinese readers did not have such linguistic help, however, and so they might not do as well in remembering which information was factual and which was not. The results supported Bloom's hypothesis. In almost every case, English speakers did a significantly better job than the Chinese speakers in distinguishing between the factual and counterfactual statements. Bloom concluded from his research that languages do indeed differ in the way they shape thought.

Like the color experiments which at first blush seemed to confirm the existence of language relativity, at least at the lexical level, but then proved to be disconfirming, subsequent research on this syntactic contrast between

Chinese and English has demonstrated that Bloom's experiments are misleading. One major problem is that Bloom's Chinese texts were imperfect translations of English passages, and so it appears that the Chinese subjects had trouble answering questions about the veracity of what they had read, not because Chinese does not mark counterfactuals in the verb phrase, but because it is difficult to be tested on material that is poorly written. Probably due to this problem with translation, two researchers who replicated Bloom's study with Chinese texts which were as comprehensible as the English ones found that Chinese readers showed no comparative deficit in understanding counterfactuals (Au, 1983; Liu, 1985).

There have been, of course, a large number of experiments undertaken to prove the existence of linguistic relativity. The few examples cited above serve merely as an introduction to this important body of psycholinguistic literature, but the examples are also illustrative of the experimental results. Time and again, the experiments show that linguistic differences alone between two languages do not seem to exert a significant impact on the way speakers of the two languages conceive or perceive. And when the results initially appear to support language relativity, successive experimentation reveals non-linguistic factors accounting for the original results. The experimental evidence is abundantly clear—differences among linguistic structures apparently do not affect the cognitive and perceptual processing of speakers of the different languages under investigation.

So much for a summary of the psycholinguistic research, but what about recent studies in neurolinguistics? Does a person's mother tongue influence the preference for a peculiar way of using the brain—for "left" vs. "right" hemispheric processing, to cite a popular dichotomy in learning styles (Brown, 1989)? A neurolinguistic approach to language relativity is especially relevant for teachers of English to speakers of Japanese because of the current popularity of the work of Tsunoda (1978, 1985).

Tsunoda's complicated experimental protocol will not be described here, but suffice it to say that through a combination of the traditional neurolinguistic technique of dichotic listening (Kimura, 1961) and a finger tapping task in rhythm to acoustic stimuli of varying amplitudes, Tsunoda has reputedly demonstrated that speakers of Japanese process most sounds very differently from speakers of almost all other languages. His essential claim is that Japanese speakers rely almost exclusively on their left hemisphere in the way they perceive sounds neurologically, and this contrasts sharply with the way in which speakers of other languages tend to balance acoustic processing in the brain. Normally, the left hemisphere is used for linguistic information and the right hemisphere for non-linguistic noises (e.g., music, sounds of crickets chirping, etc.). Tsunoda believes that the asymmetrical reliance on the left hemisphere for the bulk of auditory processing by Japanese speakers is conditioned by the Japanese language. This is because, again according to Tsunoda, Japanese relies on vowel sounds more exclusively than any other language, and this influences Japanese speakers to depend almost entirely on the left hemisphere for most auditory processing.

Like the psycholinguistic study by Bloom, a major criticism of Tsunoda's neurolinguistic work is replicability. Uyehara and Cooper (1980) and Hatta and Diamond (1981) have replicated Tsunoda's experiments and have found *no* differences in the way Japanese and non-Japanese speakers process sounds in their cerebral hemispheres. In other words, using Tsunoda's own methods, these neurolinguists have discovered that Japanese speakers appear to process non-linguistic sounds the same way Korean, Chinese, and English speakers do. Other questions and criticisms arise—about the way Tsunoda establishes his experimental protocol, about the manner in which he seeks confirming and disconfirming evidence, about his understanding of the linguistic facts of how Japanese differs from other world languages, and finally, about his willingness to consider the neurolinguistic influence of such unusual factors as the

smell of perfume and cigarette smoke.

Although Tsunoda promotes the notion that Japanese brains are neurolinguistically unique, an attractive theme to consider in contemporary Japanese society, there seems to be no scientific evidence to support his Whorfian hypothesis that the Japanese language creates a left hemisphere mind set.

It may seem unusual to draw conclusions from evidence which has been largely negative; nevertheless, I think that there are several valuable implications for second language acquisition which can be drawn from the research I have reviewed which suggests that languages do not differ in the way they shape human conception or perception.

1. Learners of a new language and/or new culture frequently begin their educational quest with the assumption that there are upper limits constraining their ability to become completely successful second language learners. In my own research (Scovel, 1988), except for the trivial ability to sound exactly like a native speaker, I have found in my review of the literature that there are absolutely no upper bounds on the ability to gain native or even supranative abilities in vocabulary, syntax, reading and writing ability, and so on in a second language. Given the lack of evidence in support of language relativity, it is obvious that *every* Japanese learner of English has the potential to become as fluent in English as almost any native English speaker. There are no psycholinguistic or neurolinguistic constraints, except for the aforementioned limit on native sounding accent. I do not mean to trivialize the difficulty of becoming a fluent bilingual, but foreign languages can be learned extremely well, and I see no proof that there is an underlying "soul" or "genius" to English, Japanese, or any other language that remains hidden from all who were not raised as native speakers.

2. A second and perhaps more controversial conclusion I draw from the review of language relativity is that there may be no cognitive benefit to learning a second language.

Foreign language teachers sometimes argue that one of the advantages of learning a new tongue is that it helps to broaden a student's cognitive horizons. However, if there is no evidence that different languages influence different patterns of cognition or perception, then it is probable that learning a new language does not automatically endow a learner with new thoughts or new perceptions. Despite this disclaimer, I still believe that learning another tongue is extremely valuable. Aside from the economic, academic, and professional benefits of bi- or multilingualism, there are important social and personal advantages as well.

3. Folk beliefs about the potential effect of linguistic differences on the way people think can be dangerous when they foster the possibility of ethnolinguistic stereotypes. A disturbing consequence of Tsunoda's neurolinguistic model of the Japanese people is that it can be used to reinforce the unverified notion that Japanese are more analytic, calculating, and meticulous than speakers of other world languages. It also reinforces an idea—which I hold to be an unvalidated form of self-stereotyping in Japan—that Japanese people are uniquely different from all other cultures. This claim is true only in the superficial sense that Japanese, like Albanians or Zunis, represent a culture that is identifiably distinct from all the other cultures on earth, but it is not true in the more insidious sense of the word "unique" implied in Tsunoda's claim that the Japanese brain is uniquely different from the brains of all other groups of homo sapiens.

In conclusion, I think that language relativity (the Sapir-Whorf hypothesis) needs to be challenged and not simply presupposed. When it is examined in the light of experimental research, the evidence appears to be lacking. Therefore, I believe we can do a more effective job as second language teachers and researchers if we see ourselves as owners, and not prisoners, of the languages we speak.

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References

Aitchison, J. (1989). *The articulate mammal: An introduction to psycholinguistics.* London: Unwin Hyman

Au, K. F. (1983). Chinese and English counterfactuals: The Sapir-Whorf hypothesis revisited. *Cognition, 15,* 155-187.

Berlin, B. & Kay, P. (1969). *Basic color terms: Their universality and evolution.* Berkeley: University of California Press.

Bloom, A. (1981). *The linguistic shaping of thought: A study of the impact of language on thinking in China and the West.* Hillsdale, NJ: Erlbaum.

Bornstein, M. (1973). Color vision and color naming: A psychophysiological hypothesis of color differences. *Psychological Bulletin, 80,* 257-285.

Brown, H. D. (1989). *A practical guide to language learning.* New York: McGraw-Hill.

Chomsky, N. (1967). *Aspects of the theory of syntax.* Cambridge, MA: MIT Press.

Clark, H., & Clark, E. (1977). *Psychology of language: An introduction to psycholinguistics.* New York: Harcourt, Brace, Jovanovich.

Clarke, M., Losoff, A., McCracken, M., & Still, J. (1981). Gender perception in Arabic and English. *Language Learning, 31,* 159-169.

Foss, D., & Hakes, D. (1978). *Psycholinguistics: An introduction to the psychology of language.* Englewood Cliffs, NJ: Prentice-Hall.

Hatta, T., & Diamond, S. (1981). The inferential interference effects of environmental sounds on spoken speech in Japanese and British people. *Brain and Language, 13,* 241-249.

Kimura, D. (1961). Cerebral dominance and the perception of verbal stimuli. *Canadian Journal of Psychology, 15,* 166-171.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: University of Chicago Press.

Lenneberg, E. (1953). Cognition in ethnolinguistics. *Language, 29,* 463-471.

Lenneberg, E., & Roberts, J. (1953). *The denotatation of color terms.* Paper read to the Linguistic Society of America, Bloomington, IN.

Liu, L. G. (1985). Reasoning counterfactually in Chinese: Are there any obstacles? *Cognition, 21,* 239-270.

Matsumoto, M. (1989). *The unspoken way—Haragei: Silence in Japanese business and society.* Tokyo: Kodansha International.

McNeill, D. (1987). *Psycholinguistics: A new approach.* New York: Harper and Row.

Sapir, E. (1929). The status of linguistics as a science. *Language, 5,* 207-

214.

Scovel, T. (1988). *A time to speak: A psycholinguistic inquiry into the critical period for human speech.* New York: Harper and Row/Newbury House.

Slobin, D. (1979). *Psycholinguistics.* Palo Alto, CA: Scott, Foresman.

Steinberg, D. (1982). *Psycholinguistics: Language, mind, and world.* London: Longman.

Taylor, I. (1976). *Introduction to psycholinguistics.* New York: Holt, Rinehart and Winston.

Tsunoda, T. (1978). The left cerebral hemisphere of the brain and the Japanese language. *Japan Foundation Newsletter, 6,* 3-7.

Tsunoda, T. (1985). *The Japanese brain: Uniqueness and universality.* Tokyo: Taishukan.

Uyehara, J., & Cooper, W. (1980). Hemispheric differences for verbal and non-verbal stimuli in Japanese- and English-speaking subjects assessed by Tsunoda's method. *Brain and Language, 10,* 405-417.

Wang, W. (1989). *Language prefabs and habitual thought.* TESOL Summer Institute Forum Lecture, San Francisco State University.

Whorf, B. (1956). *Language, thought, and reality.* (J. B. Carroll, Ed.). Cambridge, MA: MIT Press.