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Abstract

Language pervades social life. It is a primary means by which we gain access to the contents of others' minds and establish shared understanding of the reality. Meanwhile, there is an enormous amount of linguistic diversity among human populations. Depending on what counts as a language, there are 3,000 to 10,000 living languages in the world, although a quarter of the world's languages have fewer than 1,000 speakers and half have fewer than 10,000 (Crystal, 1997). Not surprisingly, a key question in culture and psychology research concerns the role of language in cultural processes. The present chapter focuses on two issues that have received by far the greatest amount of research attention from cultural researchers. First, how does language and human cultures co-evolve? Second, what are the non-linguistic cognitive effects of using a certain language? Does speaking different languages orient individuals to see and experience the external reality differently? The scope of the present chapter does not permit a comprehensive review of all pertinent research; only a selected sample of studies will be used to illustrate the main ideas in the present chapter.

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Civilization began the first time an angry person cast a word instead of a rock.

Sigmund Freud (1900, p. 165)

Language pervades social life. It is a primary means by which we gain access to the contents of others' minds and establish shared understanding of the reality. Meanwhile, there is an enormous amount of linguistic diversity among human populations. Depending on what counts as a language, there are 3,000 to 10,000 living languages in the world, although a quarter of the world's languages have fewer than 1,000 speakers and half have fewer than 10,000 (Crystal, 1997). Not surprisingly, a key question in culture and psychology research concerns the role of language in cultural processes. The present chapter focuses on two issues that have received by far the greatest amount of research attention from cultural researchers. First, how does language and human cultures co-evolve? Second, what are the non-linguistic cognitive effects of using a certain language? Does speaking different languages orient individuals to see and experience the external reality differently? The scope of the present chapter does not permit a comprehensive review of all pertinent research; only a selected sample of studies will be used to illustrate the main ideas in the present chapter.

Co-Evolution of Language and Culture?

Throughout the history of hominid evolution, the brain, language, and culture have coevolved in close interaction with each other. Figure 1 illustrates the co-evolution of the brain, language, and culture. Spoken languages emerged about 350,000 years ago, preceded by several remarkable anatomical changes, including a large expansion of the size of the hominid brain, descent of the larynx, redesign of the supralaryngeal vocal tract, and evolution of specialized auditory and memory capabilities for processing speech (Levelt, 1989). Some recent findings also show that the evolution of human language is built on a biological foundation. The Broca's area in the brain controls speech in humans, and a recent study (Petrides, Cadoret, & Mackey, 2005) discovered a distinct brain region in macaque monkeys that controls jaw movements. This region is located in the same region and has the same anatomical characteristics as Broca's area and is connected with the brain area that is involved in the retrieval of information from memory. When this area in the monkey was electrically stimulated, the subject displayed jaw movement sequences.

Before the emergence of spoken languages, hominids had relied primarily on hand gestures and vocal signals to communicate their thoughts to others. Spoken languages have several advantages over hand gestures. A spoken language works at a distance and in the dark, and does not interfere with other motor activities (e.g., hunting). In addition, because humans can produce an infinite number of sound patterns, relative to hand gestures and primitive vocal signals, a vocal language can support a larger number of different words. As such, speech is much more efficient in conveying meanings than are hand gestures and vocal signals (Krauss & Chiu, 1998).

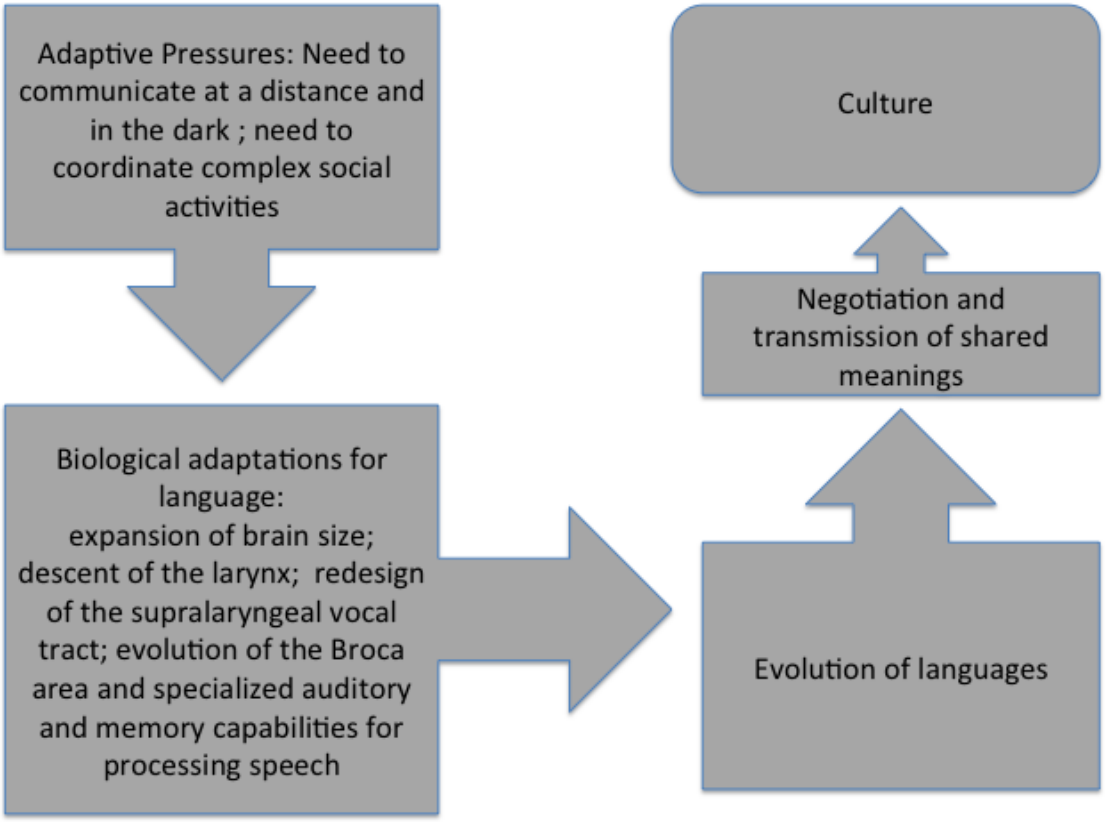

Figure 1. Co-evolution of biology, language and culture

The development of human language is also an adaptive response to the need to represent non-immediate events symbolically. The use of language as a means to represent non-immediate events is a unique human accomplishment (Hockett & Altmann, 1968). Based on their pragmatic functions, speech acts can be classified into five major types: directives (e.g., orders, demands, requests), expressives (e.g., *Ouch* or *I love you*.), representatives (use of linguistic symbols to represent an immediate, non-immediate, or displaced event), commissives (commitments, promises), and declaratives (e.g., *You're fired*; Austin, 1962; Searle, 1975). Other mammals use directives and expressives extensively, but the use of representatives, commissives, and declaratives is predominantly human (D'Andrade, 2002). Additionally, while other mammals typically use representatives to refer to immediate events only, humans often use representatives to refer to something that is not immediately present (e.g., *Some scientists are convinced that lives exist in other planets*.). D'Andrade (2002) believes that as human societies grew in complexity, to coordinate social activities and facilitate division of work, people needed to be able to represent non-immediate events mentally. This in turn increases the demand for the development of grammar and true symbols (a sign that may refer to different referents) as opposed to indexical signs with rigid one-to-one mapping between a sign and its referent.

The importance of spoken languages in the evolution of culture cannot be overstated. As Bruner (1990) said, “Our culturally adapted way of life depends upon shared meanings and shared concepts and depends as well upon shared modes of discourse for negotiating differences in meaning and interpretation” (pp. 12–13). An important design feature of human languages is their arbitrariness: the same expression can mean different things, and the same object can be referred to differently. Furthermore, because there are indefinite ways sounds can be mapped onto meanings in a spoken language, people can describe the same event in different terms, and therefore assign different meanings to it. Individuals in a collective may share many experiences, but different individuals may describe these experiences differently. As these individuals interact, they will collaborate to find a mutually acceptable expression to describe their experiences. Shared meanings arise and are encoded in the resulting shared expressions (Lau, Chiu, & Lee, 2001). Through this meaning negotiation process, a culture or shared reality emerges. Because different human groups may agree upon different ways of referring to their group experiences, different variants of symbolic cultures gradually evolve in different populations.

Linguistic Influences on Non-Linguistic Thoughts

There are several ways language use can affect non-linguistic thought processes.

Processing the language’s characteristic form

Using a language requires repeated engagements of the perceptual and cognitive operations involved in processing the language’s characteristic form. For example, written languages differ in writing directions. English is written from left-to-right and English speakers are accustomed to scanning reading materials from left-to-right. In contrast, Hebrew is written from right-to-left. Israelis, who are used to read from right-to-left, have developed the habit to scan reading materials from right-to-left. When asked to perform the visual test illustrated in Figure 2, speakers of English tend to perform better on trial 1 than on trial 2, and Hebrew speakers tend to perform better on trial 2 than on trial 1 (Braine, 1968).

Chinese characters are written from left to right, but are sometimes read from top-to-bottom as well. Not surprisingly, Chinese speakers can perform vertical scanning just as efficiently as they do horizontal scanning (Freeman, 1980). Americans are not used to read from top-to-bottom, because English texts are seldom written in that direction. Thus, Americans often find it harder to perform vertical scanning than horizontal scanning. More important, Chinese American children who do not have any experience with written Chinese perform more poorly in vertical scanning than in horizontal scanning, just as the American adults do (Hoosain, 1986), suggesting that experiences with reading Chinese texts is responsible for the cultural differences in the preferred direction of visual scanning.

Trial 1							
B	B	P	B	B	B	B	B

Trial 2							
B	B	B	B	B	P	B	B

Figure 2. A visual scanning task

Shared experiences

People use language to encode experiences. As a result, some aspects of the shared experiences in the culture are associated with the language itself. Thus, using a certain language will automatically call out its associated shared experiences. Several studies have illustrated how language calls out its associated cultural knowledge and influence behaviors (Earle, 1969; Ross, Xun, & Wilson, 2002; Sussman & Rosenfeld, 1982; Trafimow, Silverman, Fan, & Law, 1997). In one study (Earle, 1969), Chinese–English bilinguals in Hong Kong responded to a measure of dogmatism either in its original English version or in a Chinese translation of it. Previous research has reported higher levels of dogmatism among Asian students than British and American students (Meade & Whittaker, 1967). Earle found that her bilingual participants scored higher on dogmatism when they answered the Chinese questionnaire than when they completed the English one. To explain these results, Earle (1969) proposed that the English language culture is relatively less authoritarian than the Chinese language culture. English-Chinese bilinguals, who have learned their two languages in distinct settings and live in a bicultural environment, can maintain two somewhat different belief systems. Moreover, these bilingual individuals may activate one or the other belief system depending on the language being used in the current situation.

Subsequent studies have provided further evidence for the idea that language can temporarily push bilinguals' responses in one or the other direction. For example, Trafimow et al. (1997) found that Chinese–English bilinguals in Hong Kong used more demographic and social categories to characterize themselves when they described themselves in Chinese and more references to personal beliefs, attitudes, and qualities when they described themselves in English. In another study (Ross et al., 2002), China-born students studying in Canada responded to a set of questionnaires written in either Chinese or English. An English-speaking Canadian group was included as a control group. Compared to the bilingual Chinese group, who responded to the English version of the questionnaires and the Canadians, the Chinese bilingual participants who responded to the Chinese version of the questionnaires reported more collectivist qualities of the self, lower self-esteem, a more balanced (vs. predominately positive) mood, a more balanced (vs. predominately favorable) view of the self, and higher endorsement of Chinese values.

Language priming also affects nonverbal behaviors. Compared to North Americans, Venezuelans interact at closer distance than do the Japanese (Engebretson & Fullmer, 1970; Watson, 1970). In one study (Sussman & Rosenfeld, 1982), Venezuelans and Japanese had conversations with another member of their culture on their most favorite

sports and hobbies. Some were induced to hold the conversation in their native language, and some in English. When the conservation was conducted in their respective native language, Japanese sat farther away from their interaction partner than did Venezuelans. However, when the conversation was conducted in English, Japanese shortened their conversation distance (relative to their peers conversing in the Japanese language), and Venezuelans increased the distance (relative to their peers conversing in the Venezuelan language).

Because of the learned associations between language and culture, individuals who are motivated to assert or defend their cultural identity often intentionally or inadvertently exaggerate the speech characteristics (e.g., accent) of the dominant language used in their cultural group (e.g., Tong, Hong, Lee, & Chiu, 1999). A recent set of studies (Ogunnaike, Dunham, & Banaji, 2010) measured individuals' implicit attitudes toward their ethnic culture when they were tested in the language of their ethnic culture, and found that individuals automatically associate positive attitudes with their ethnic culture when they were tested in the language of their ethnic culture. For example, French-Arabic bilinguals in Morocco showed more favorable implicit attitudes toward Morocco when they were tested in Arabic as compared with French. Likewise, Hispanic Americans showed more implicit pro-Spanish attitudes when tested in Spanish compared with English.

Social relationships

The grammar of a language may draw its users' attention to certain aspects of social relationships and hence reinforce a certain conception of interpersonal relations that is shared in the culture. A series of studies carried out by Emi Kashima (Kashima & Kashima, 1998; Kashima & Kashima, 2003) provide a good illustration of this point. In these studies, Kashima and her colleagues examined how the linguistic system of pronoun may encode conceptions of the social self in the culture. The use of pronouns sustains attention on the referent of the pronoun, bringing the person out from the conversational background. For example, the use of first-person pronoun (*I* in English) draws attention to the speaker, and maximally distinguishes the speaker's self from the conversational context. Likewise, the use of second-person pronoun (*you* in English) maximally distinguishes the addressee(s) from the conversational context. In some languages (e.g., English), the use of both first- and second-person pronouns is grammatically obligatory. In other languages (e.g., Spanish), the subject pronoun can be dropped because the referent can be recovered from the verb inflections. There are some languages (e.g., Chinese) in which the subject pronoun can be dropped even though there is neither verb inflection nor the subject–verb agreement rule. The obligatory use of subject pronoun is suggestive of whether the self and the addressee must be made salient in the conversational context, and the omission of either one or both first- and second-person pronouns deemphasizes the salience of their corresponding referent(s).

Not surprisingly, a cultural-linguistic group's emphasis on individualism is correlated with the grammatical intolerance for pronoun drop in the group's dominant language. In a country that privileges individualism, its dominant language has higher intolerance for

pronoun drop. In an individualist country, its dominant language tends not to allow dropping the first- and second-person pronouns that sustain attention on the individual actors.

Facilitation of shared thought processes

The availability of grammatical markers for a certain thought process in a language can facilitate the same thought process among speakers of the language. For example, Puerto Rican (PR) Spanish and Turkish have specific verb forms for marking false-belief states explicitly. PR Spanish uses *creer* to denote that the speaker is neutral on whether the grammatical subject in the sentence holds a true belief or not, and adds a reflexive clitic to the verb phrase (*creer-se*) to denote that the speaker is sure that the grammatical subject holds a false belief. English and Brazilian (BR) Portuguese have no such specific forms. In one study, Shatz, Diesendruck, Martinez-Beck, and Akar (2003) compared the performance on a false-belief understanding task of PR Spanish- and Turkish-speaking preschoolers with their English- and BR Portuguese-speaking counterparts. In this study, one experimenter showed the preschooler a crayon box and a blue box in the presence of a second experimenter. Then, the second experimenter left the room to get some paper. After the second experimenter had left, the first experimenter opened both boxes, remarked that the crayon box was empty and the blue box contained crayons, and asked the preschooler, “Where does [Experimenter 2] think the crayons are?” Note that in the question, the verb *think* provides an explicit marker of the false belief in the two languages with formal markers for false beliefs. If having explicit grammatical markers for false beliefs in one’s own language improves understanding of false-belief states, PR Spanish speakers and Turkish speakers should do better than BR Portuguese and English speakers on the comprehension task. As expected, the Turkish- and PR Spanish-speaking children outperformed the two other groups in the comprehension test, indicating that having explicit markers of false beliefs in a language can promote comprehension of false-belief states.

Relatedly, the availability of economical referring expressions in a language can affect memories of social experiences. Each language has its distinct vocabulary that would allow a certain type of experiences to be expressed easily, rapidly, briefly and uniformly. In this study, Hoffman, Lau, and Johnson (1986) show that the use of such economical expression to encode a state of affairs may influence the way the language user processes information pertinent to that state of affairs. These investigators identified English- and Chinese-language personality adjectives that have no economical equivalent in the other language. For example, there is no single English term equivalent in meaning to the Chinese personality adjective *shì gu*, which depicts a person who, among other things, is worldly, experienced, socially skillful, and somewhat reserved. Likewise, there is no single Chinese adjective for someone who has artistic skills and interests, an “artistic” cognitive style and temperament, and leads a “bohemian” lifestyle. The appropriate English term is *artistic* (or, better, the *artistic type*).

The study involved three groups of participants: a group of English monolinguals, a group of Chinese-English bilinguals who processed the information in English, and a group of Chinese-English bilinguals who processed the information in Chinese. Participants read a set of concrete behavioral descriptions of four fictitious characters, either in English or in Chinese. Two of the characters exemplified personality schemas with economical labels in Chinese but not in English (the Chinese-specific adjectives) and the other two characters exemplified personality schemas with economical labels in English but not in Chinese (the English-specific adjectives).

When the behavioral descriptions of the two characters exemplifying the personality types with English-specific labels were processed in English, participants' subsequent memory of the original description was biased in the direction of the labels: They tended to infer label-congruent attributes not found in the original descriptions. Similar memory bias was also observed when the behavioral descriptions of the two characters exemplifying the personality types with Chinese-specific labels were processed in Chinese.

Experiencing the world

Finally, languages may also affect how individuals experience the world. According to the linguistic relativity hypothesis (Whorf, 1956), which is illustrated in Figure 3, individuals in an ethnolinguistic group are led by their shared language experiences to acquire shared, habitual ways of thinking, which influence cognition in a general way. This hypothesis is premised on the following assumptions about perceptual experiences, language, and culture. First, some perceptual experiences (e.g., experiences of time and colors) are presented in a kaleidoscopic flux of impressions. These experiences need to be organized by the human minds. Second, the formal structure of each language embodies a distinctive internal logic. Third, the distinctive internal logic of a language constrains its speakers' thought processes, creating marked differences in cognitions between speakers of different languages (Whorf, 1956). If the ways in which a language is organized stand in isomorphic relation to how its associated culture is organized, culture, like language, would also possess an internal logic, and be highly patterned, systematic, and distinctive. If so, a language a person speaks would determine how the person encodes his or her experiences.

The possibility that language can influence encoding or categorization of experiences has received a lot of empirical attention. Many studies that tested the linguistic relativity hypothesis have focused on the effect of language on color perceptions and memory, because although people in different cultures have more or less equivalent experiences with colors, variations in color vocabulary can be readily found in natural languages. For example, American English has 11 basic color terms, and Dugum Dani (a stone age tribe from Irian Jaya) has only two achromatic terms for color. It should be emphasized that in color perception, the perceptual order imposed by properties of the visual system limits the range of language's effects on color categorization. For example, no language has color categories that include two color spaces (e.g., yellow and blue) and

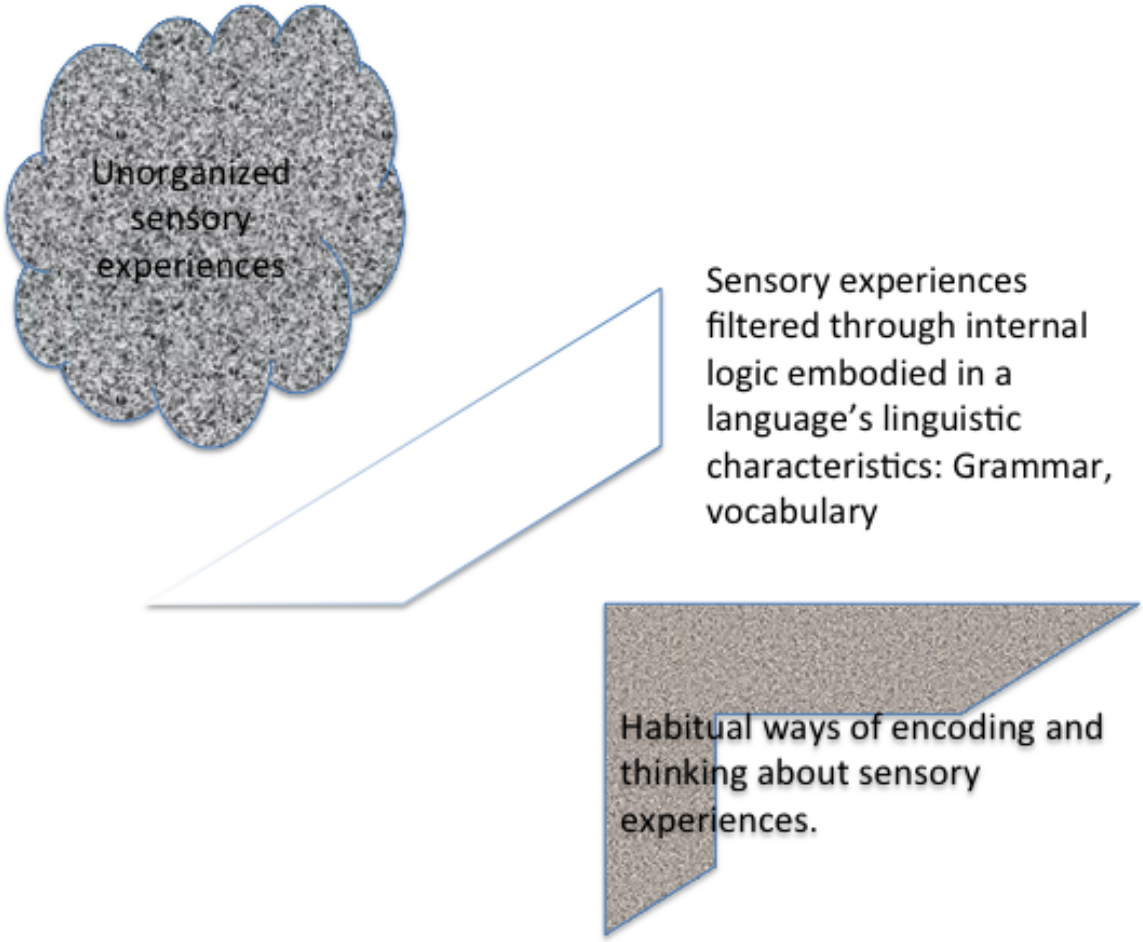

Figure 3. The linguistic relativity hypothesis

exclude the connecting color space (e.g., green, Davidoff, 2001). Nonetheless, within the constraints imposed by the visual system and the structure of the color space, languages partition the color space differently (Roberson, Davies, & Davidoff, 2000). If it can be shown that the different ways different languages partition the color space can affect their users' perceptions and memory of color experiences, this finding will provide strong support for the linguistic relativity hypothesis.

Evidence from the early studies was not in favor of the linguistic relativity hypothesis. For example, an early study showed that although colors are represented very differently in English and Dugum Dani, speakers of the two languages organize their memory representations of the colors in similar ways (Heider & Olivier, 1972).

However, recent studies (Kay & Kempton, 1984; Roberson, Davis, & Davidoff, 2000) show that when the speaker of a language *uses* the color terms in the language to describe colors, the speaker's subsequent memory of the colors may be influenced by the color terms used in the description. In a cross-language study, Kay and Kempton (1984,

Study 1) presented three color chips at a time to native speakers of English and speakers of Tarahumara (a Uto-Aztecan language of northern Mexico), and had them judge the perceptual distance among the stimuli. Unlike English, Tarahumara lacks the lexical distinction between the color categories of “green” and “blue.” When the participants’ judgments were compared to the physical distance of the stimuli, the English-speaking participants, but not Tarahumara-speaking ones, systematically overestimated the distance between two colors when the green–blue color boundary passed between them. This finding suggests that the basic color terms in a language can influence color perception.

Kay and Kempton (1984) believe that the English-speaking participants might have used a naming strategy when they were performing the judgment task. For instance, when presented with two colors that fell in the green category and one color that fell in the blue category, they might have labeled the two greener colors “green” and the bluer color “blue.” This strategy could have led the participants to overestimate the perceptual distance between the two “green” colors and the “blue” color. However, the Tarahumara-speaking participants could not use this naming strategy because their language lacks the lexical distinction between the color categories of “green” and “blue.” Thus, they did not overestimate the dissimilarity between the bluer color and the two greener colors.

To test this idea, in a second study, Kay and Kempton (1984, Study 2) made English-speaking participants use both verbal labels (“blue” and “green”) to encode the same color. First, the participants were shown the target color with a greener color. Under this circumstance, they named the target color as the “bluer” color. Next, they saw the target color with a bluer color. Now, they encoded the target color as the “greener” color. Following this, the participants evaluated the perceptual distances between the three colors. The effects of linguistic encoding cancelled out each other, because the same color had been encoded both as the greener and the bluer color. As a result, English-speaking participants no longer displayed the perceptual distortion observed previously. Instead, their judgments corresponded closely to the stimuli’s physical distances and agreed with the Tarahumara speakers’ judgments.

Roberson et al. (2000) reported similar findings in a conceptual replication of the Kay and Kempton (1984) experiments. The participants in the Roberson et al.’s experiments were English and Berinmo speakers. Like Tarahumara, Berinmo makes no lexical distinction between “blue” and “green” colors. However, English lacks linguistic labels that refer to “nol” and “wor” colors in Berinmo. When asked to judge the perceptual similarity between pairs of colors, English speakers judged two colors across the green–blue boundary as more dissimilar to the two colors within the green or blue category. However, they did not show such categorical perception for colors across the nol–wor boundary. The reverse was true for Berinmo speakers. Similar results were obtained among both English speakers and Berinmo speakers in color category learning and color memory.

Furthermore, as mentioned people generally perform less well when the task requires discrimination of a target color from a distractor color within the same color category than when the task requires discrimination of the target color and a distractor color from a different color category. Nonetheless, within-category discrimination improves

when the target color is a good exemplar of the color category and the distractor a poor exemplar, compared to the situation in which the target color is a poor exemplar of the category and the distractor a better exemplar (Hanley & Roberson, 2011). This evidence provides further support for the effect language categorization on color perception, suggesting that discriminating colors from different color categories is like discriminating a good exemplar of a category from a distractor color that is at boundary of the color category.

More important, in a subsequent study, when a verbal interference procedure was introduced to prevent subvocal encoding of the stimuli, the effect of categorical perception of colors on color memory disappeared (Roberson & Davidoff, 2000). These findings indicate that a lexical term must be used to encode an event for it to influence the language user's memory representation of the event.

Recent advances in cognitive neuroscience have shed new light on how language might affect color perception. According to dual system model of language and culture (Regier, Kay, & Khetarpal, 2007; Roberson, in press), the left hemisphere of the brain has

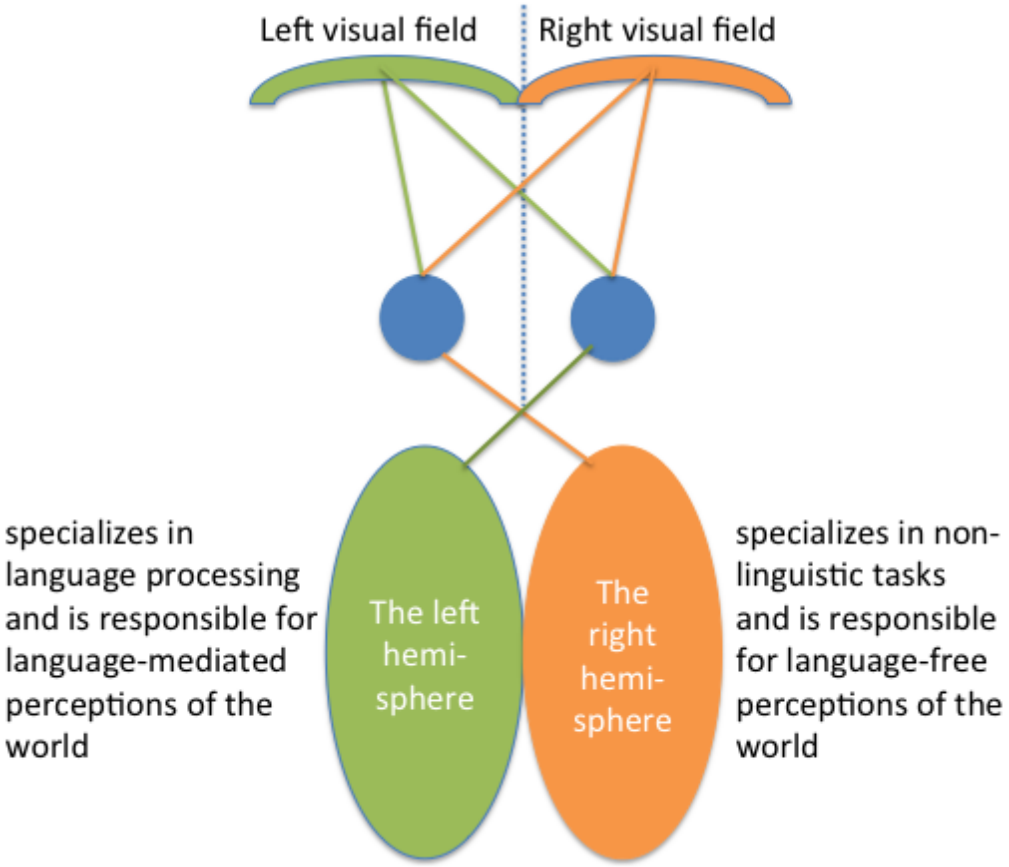

Figure 4. A dual system model of language and cognition

areas that specialize in language processing, allowing the perceiver to see the world through the distorted lens of language, whereas the right hemisphere is associated with non-linguistic tasks and affords a language-free perception of the world. Moreover, the perceiver can switch between the two systems effortlessly. According to this model, the language encoding effect would occur only when the stimuli are presented in the right visual field of the perceiver, which will be processed by the left brain (see Figure 4).

Gilbert and colleagues (Gilbert, Regier, Kay, & Ivry, 2006) tested this hypothesis in the visual search task. On each trial of the task, participants were asked to fixate their eyes on a cross in the center of the computer screen. Then a colored oddball would appear among an identically colored array of distractors either in the right or left visual field. The participants were required to detect the presence of the oddball as quickly as possible. Linguistic encoding effect was measured by manipulating the target and background of colors, holding constant the amount of physical separation between the two colors. In some trials, both the target and background colors came from the same color category (e.g., blue). In other trials, they came from different color categories (e.g., the target color was blue and the background color was green).

Linguistic encoding effect occurred if participants performed better when the target and background colors came from different color categories than if they came from the same category. Significant linguistic encoding effect was found only when the target oddball was presented in the right visual field. Parallel evidence was reported in a subsequent cross-language study that examined linguistic encoding effects in English and the Korean language (Roberson. Pak, & Hanley, 2008).

Conclusions

Language, cognition, and culture evolved together in close interactions. Figure 5 summarizes the intricate relationships between culture, language and the mind. Evolution of the brain supports the development of language, which as a communication tool facilitates the creation, perpetuation, and renegotiation of shared meanings and cultural consensus. Language is a multi-faceted concept; it is an integrated system of sounds, symbols, and meanings. It consists of various features, including writing conventions, grammar, vocabulary, and metaphors.

Language and cultural processes are intimately connected, as illustrated in the research examples described above. For example, language provides a shared tool for encoding and sharing collective experiences, contains linguistic features that draw its speakers' attention to culturally valued aspects of the physical and social ecology, and has grammatical markers that facilitate thought processes and economical and rich expressions to categorize and make sense of our sensory experiences. There is also emerging evidence that some areas of the left hemisphere of the human brain specialize in language-mediated processing of human experiences, although the same neuroscience findings also suggest that not all human experiences are filtered through the tainted lenses of languages as some radical versions of the linguistic relativity hypothesis has assumed.

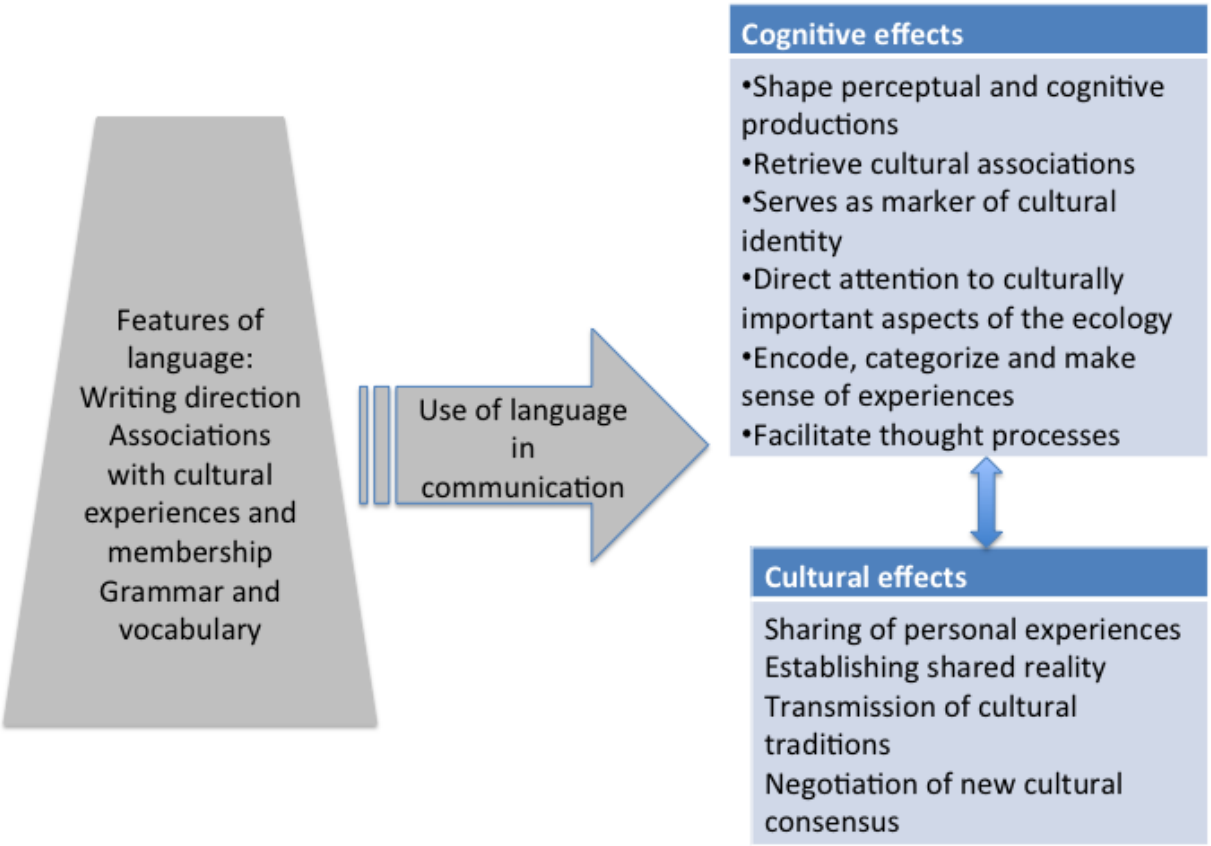

Figure 5. Language effects on culturally shared cognitions

The close connections between language and culturally shared cognitions allow language to call out its learned associations automatically and to serve as a marker of one's cultural identity. Thus, to fully understand culture as a biologically enabled and collectively constructed process, psychologists need to understand the intricate interactions between the brain, culture, language and the mind.

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Video Resources

Lera Boroditsky: How Language Shapes Thought. **Long Now Foundation** Lecture. http://fora.tv/2010/10/26/Lera_Boroditsky_How_Language_Shapes_Thought

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