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### Note

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## Bilingual Language Mixing: Why Do Bilinguals Code-Switch?

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### Abstract

Bilingual speakers often code-switch from one language to another, especially when both languages are used in the environment. This article explores the potential theoretical explanations for this language behavior, the costs and benefits associated with language switching, and the role of language dominance in the direction of the switch. In short, code switching follows functional and grammatical principles and is a complex, rule-governed phenomenon.

Although significant progress has been made in understanding the psycholinguistics of code switching, research is needed to examine the cognitive mechanisms underlying the bilingual's ability to integrate and separate two languages during the communicative process.

### Keywords

bilingualism; code switching; bilingual cognition

Although much has been written on how bilinguals organize

their two languages in memory, little is known about why bilinguals mix their two languages during the communicative process. Code switching, or language mixing, occurs when a word or a phrase in one language substitutes for a word or phrase in a second language (Li, 1996). For example, consider the sentence, "Dame una hamburguesa sin LETTUCE por favor" ("Give me a hamburger without LETTUCE please"). The word "lettuce" replaces the Spanish word ("lechuga"). Why is the word "lettuce" chosen instead of the correct Spanish word? Given the speed with which spoken language occurs, and the cognitive resources required during the comprehension and integration of different linguistic factors (e.g., phonological, grammatical, and semantic information), one would expect bilinguals not to switch languages, especially if retrieving a word from a second language takes more time than retrieving a word or concept from the same language. Why do bilinguals code-switch?

## LANGUAGE PROFICIENCY

One of the most frequent explanations of why bilinguals code-switch is that they do it to compensate for lack of language proficiency. The argument is that bilinguals code-switch because they do not know either language completely. Not surprisingly, when asked about their code switching, Spanish-English bilinguals are quick to point out their "lack of formal knowledge" in Spanish and English (cf. Grosjean, 1982).

One major weakness of this view is that it does not allow for the possibility that code switching is due to failure to retrieve the correct word. This inability to remember is reminiscent of the classic tip-of-the-tongue (TOT) phenomenon, in which people are sometimes unable to remember information that they know. For example, one of us experiences this every time he tries to remember the Spanish word for *estimate* ("presupuesto"). The reason for the difficulty is not that he does not know the correct word, but that he does not use this word frequently. Switching to English makes it easier and faster to retrieve the word. Thus, code switching may be a problem of retrieval affected by a combination of closely related factors such as language use and word frequency.

A second problem with this view is that it cannot explain the finding that code switching is governed by a grammatical structure. For example, Spanish and English differ in relation to how adjectives are used. In English, the adjective precedes the noun (e.g., "I want a green tomato"). In Spanish, the noun precedes the adjective (e.g., "quiero un tomate verde"). Spanish-English language switching can occur between an adjective and a noun only if the adjective is placed according to the rules of the language of the adjective (Lederberg

& Morales, 1985). Thus, the sentence "Pete wants a VERDE motorcycle" would be incorrect because the adjective should follow the Spanish grammatical structure.

A third problem concerning this hypothesis is that the notion of language proficiency is not clearly defined. Do reading and writing take precedence over spoken language? Most language proficiency tests consider written language the determining variable. However, it is not clear whether reading and writing language skills should take precedence over spoken language. This reliance on reading and writing is problematic because most bilinguals receive their formal education in one language although a majority of their personal interactions take place in the other language. When their reading and writing abilities are tested in both languages, the language in which they received more formal education will usually fare better. For example, Spanish-English bilinguals in south Texas typically receive their formal education in English, and most of their personal interaction and communication with other bilinguals takes place in Spanish or in both languages. When their reading and writing abilities are tested, these bilinguals appear less fluent and less proficient in Spanish. This disparity is not due to their lack of knowledge of Spanish, but due to a differential in usage.

Finally, the notion that people code-switch as a strategy in order to be better understood is another plausible alternative. Some ideas are better communicated in one language than another. For example, the Spanish word "cariño" implies a combination of liking and affection. Neither of these English words alone truly conveys the meaning of the Spanish word. Thus, two Spanish-English bilinguals conversing in English would achieve a greater level of understanding by

using this Spanish word if they wanted to refer to this concept.

## IS CODE SWITCHING A TIME-CONSUMING PROCESS?

A general finding in the bilingual literature is that sentences containing code-switched words take longer to read and comprehend than monolingual sentences. In a classic study, French-English bilinguals read both monolingual and mixed-language passages. Sentences in the monolingual condition were entirely in English or French. In the mixed-language condition, the code-switched words were haphazardly in English or French, with some passages favoring the English and others favoring the French grammatical structure. When bilinguals answered questions about passages they read silently, no differences were found between the code-switched and the monolingual sentences. However, when the participants read the sentences aloud, they were slower to read the mixed-language passages than the monolingual ones (Kolers, 1966). Although these findings have been challenged on methodological grounds, these results have been replicated using other methodologies.

Why is code switching a time-consuming process? Macnamara and Kushnir (1971) proposed that a "two switch mechanism" determines which of the bilingual's two mental lexicons will be "on" or "off" during the course of language processing. They viewed the input switch as functioning at lower levels of perception and the output switch as a higher-order mechanism that is under the bilingual's voluntary control and responsible for the selection of the language used in producing speech.

According to this model, the input switch is responsible for selecting the appropriate lexicon to be employed during the comprehension of a sentence. Although this switch is automatic and beyond voluntary control, it takes an observable amount of time to operate. Thus, during the presentation of a spoken sentence, if the acoustic signal matches English, this switch selects the English linguistic system to process the sentence. One important assumption is that once the English linguistic system is "turned on," the Spanish linguistic system is "turned off." Because both linguistic systems cannot be active simultaneously, the processing of code-switched material is slowed down.

How is the input switch triggered? Macnamara and Kushnir (1971) suggested that this mechanism relies on the distinctiveness of the linguistic code of each language. Thus, before selecting the appropriate lexicon, the bilingual analyzes the incoming acoustic signal at the lowest perceptual level possible (i.e., the phonetic level). Other researchers have suggested that the input switch may be regulated by a continuous monitoring system that remains active during language processing. However, recent findings suggest that this input mechanism may function only when bilinguals know what language to expect and when they are given enough time to activate the appropriate language.

Current research is more concerned than previous studies with studying the on-line processing of spoken language and identifying some of the factors influencing the recognition of code-switched words. For instance, the English language allows both consonant-consonant (CC) and consonant-vowel (CV) clusters at the beginning of a word (e.g., "flight" vs. "bear"). Chinese, in contrast, allows CV clusters but lacks CC clus-

ters. Li (1996) found that this difference in phonological structure affected Chinese bilinguals' processing of English code-switched words: They took longer to recognize English code-switched words containing CC initial clusters than those containing CV initial clusters. Other important factors reported to influence the recognition of code-switched words include context (e.g., semantic context), phonetics (e.g., whether the code-switched word is pronounced according to the phonetics of the first or second language), and homophonic overlap (e.g., whether there are words that are pronounced similarly) across the two languages. Discussing whether or not code switching is a time-consuming process, Li argued that when experimental studies utilize the appropriate methodology and take into consideration some of these factors, the results show that recognizing code-switched words is no different from recognizing monolingual words.

### BILINGUAL MEMORY MODELS

An important limitation of the research on code switching is the lack of models from which to generate testable research hypotheses. Currently, some investigators are addressing this issue utilizing models that propose a bilingual structure composed of separate but interconnected language-specific lexicons (i.e., mental dictionaries) and a conceptual memory store that contains information about how the world works (e.g., Kroll & Stewart, 1994). An important issue for these models is the extent to which the lexicons and the general store are interconnected.

Other models explain bilingual memory by referring to specific features of various word types

(e.g., De Groot, 1993). These models emphasize the relationships between words across languages. Concrete words (e.g., "house") are more likely than abstract words (e.g., "faith") to share a number of semantic features across languages; therefore, concrete words will have similar meaning across languages. Because abstract words overlap less, they are more likely to have language-specific meanings. To date, these models have been most successful in explaining findings from studies involving word translation and differences between abstract and concrete words. Unfortunately, these models cannot be easily extended to explain the process involved in code switching across languages.

However, certain connectionist, or network, models that assume many language-processing activities occur simultaneously deserve special mention. The bilingual model of lexical access (Léwy & Grosjean, 2000) was designed to simulate the ongoing processes that occur during the recognition of a code-switched word. This model relies on the assumption that during the course of spoken-language recognition, the incoming signals activate phonemes, which in turn activate words. How the phonemes and words from the appropriate language are recognized depends on the preceding context and the phonological structure of the language. Thus, according to these models, the bilingual's two languages can be activated or deactivated to different degrees depending on the similarities or differences between the two languages under consideration (e.g., Li, 1996).

### LANGUAGE DOMINANCE

One important shortcoming of most models and general accounts

of bilingualism is that they rely on the assumption that the bilingual's first language has special status. Some models (e.g., Kroll & Stewart, 1994) depict the first-language lexicon as bigger and containing more information than the second-language lexicon. As a consequence, the first language is always accessed faster, and is always the primary language. Given this argument, one would expect that code switching would take place only when the bilingual is speaking the second language. That is, bilinguals would experience more first-language interference as they communicate in their second language than second-language interference as they communicate in their first language. This would be because of their limited knowledge of their second language. Although this may be the case for beginning bilinguals, Spanish-English bilinguals in south Texas report more English interference when they communicate in Spanish, and little or no interference from Spanish when they communicate in English. In other words, these bilinguals code-switch more when they communicate in Spanish than when they use English.

Are these observations supported by research? In a recent study, Spanish-English bilinguals listened to English sentences (e.g., "It is difficult to admit that a WAR sometimes brings profits") and their Spanish translations. Immediately after the critical word (e.g., "war" or "guerra") in each sentence, the participants named a visually presented English or Spanish target word that was either related ("peace," "paz") or unrelated ("light," "luz") to the critical word. The results showed that bilinguals were faster to name English target words while listening to Spanish sentences than to name Spanish words while listening to English sentences. Also, when listening to English sentences, bilin-

guals retrieved English words faster than Spanish words, as expected. In fact, participants were faster to retrieve English than Spanish words in all conditions—even when listening to Spanish sentences (Heredia, 2000a). These results suggest a reliance on the second language rather than the first language. They seem somewhat counterintuitive if we assume that the bilingual's first language is the reference, or base, language. If Spanish were the bilinguals' base language, they should have been faster to access words in Spanish than in English. Likewise, they should have been faster to access Spanish words than English words as they listened to English sentences.

How can these results be explained? We suggest that after a certain level of fluency and frequency of use is attained in a second language, a language shift occurs and the second language behaves as if it were the bilingual's first language. In other words, the second language becomes more readily accessible than the first language, and the bilingual comes to rely more on it. Other studies have had similar findings (e.g., Altarriba, 1992, 2000; Heredia, 1997), lending support for this interpretation.

What is the mechanism underlying this language shift? One possibility is that it is due to frequency of language usage. That is, regardless of which language a bilingual learned first, perhaps the more active (dominant) language determines which lexicon is accessed faster (Heredia, 1997). Consider the case of most Spanish-English bilinguals in the United States. Although their first language is Spanish, they obtain most of their formal education in English. Likewise, many of their everyday interactions involve English. As a result, the words and concepts of English become more readily accessible than the words and con-

cepts of Spanish. An implication of this interpretation is that during early stages of bilingualism, when bilinguals tend to rely more on their first language, their code switching would mostly involve intrusions from their first language as they communicate in their second language. However, as the second language becomes the dominant language, their code switching would tend to consist of intrusions from the second language as they communicate in their first language. In short, we suggest that language dominance plays an important role in how bilinguals access their two languages. We argue that bilingual lexical representation is not a static but a dynamic representational system in which the first language can fall in strength, while the second language becomes the dominant language.

## CONCLUSIONS AND FUTURE DIRECTIONS

The research we have reviewed suggests that language accessibility may be the key factor in code switching. Bilinguals switch languages whenever a word in a base language is not currently accessible. At issue is whether or not this switch is time-consuming. Although some evidence suggests that language switching is strategic and occurs only when bilinguals have enough time to select the appropriate lexicon, empirical research is needed to clarify the linguistic as well as the psycholinguistic factors influencing this language switch.

Although significant progress has been made in formulating models of bilingual memory, it is unclear how these models can be applied to code switching. Theoretical work is needed to explain how the bilingual's two linguistic systems interact. For example, why is it that bilinguals experience interference

across languages while processing them, and, simultaneously, have the ability to keep the languages separate? Is the input switch a viable construct? Theories explaining how languages are integrated and how they remain separate should provide the foundation for research on how switching occurs in normal, spoken language.

Finally, applied research (e.g., Altarriba & Santiago-Rivera, 1994) has revealed that code switching is often used strategically in counseling settings, as clients choose to speak in a second language when trying to distance themselves from emotional events. Because the first language is often associated with a broader range of emotions than the second language, language switching becomes a defense mechanism. Further research should address how code-switching techniques might provide an effective means of directing the access of information from memories of different emotional content.

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## The Projective Way of Knowing: A Useful Heuristic That Sometimes Misleads

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### Abstract

For many purposes, people need a reasonably good idea of what other people know. This article presents an argument and considers evidence that people use their own knowl-

edge as a basis for developing models of what specific other people know—in particular, that they tend to assume that other people know what they know. This is a generally useful heuristic, but the assump-

tion is often made uncritically, with the consequence that people end up assuming that others have knowledge that they do not have.

### Keywords

knowledge; projection; false consensus; expertise; egocentrism

People's behavior is influenced in many ways by what they know about what other people know. Effective conversation, for example, depends not only on shared knowledge

between participants, but also on each person having knowledge, or making reasonably accurate assumptions, about what the other knows.

### BUILDING A CONCEPTUAL MODEL OF WHAT ANOTHER PERSON KNOWS

Over time, one can develop a detailed conceptual model of what a specific other person (spouse, sibling, friend, associate) knows, fine-tuning and updating the model with information gleaned from frequent interactions. But what does one use for a model of what a stranger knows? How does one cope with the task of communicating with a collection of people—an audience to whom one has to give a talk, or the readership of a newspaper for which one is writing an article—when one has few specifics about its composition? I assume that the basis for the construction of a default model of what a random other person knows is one's model of what one knows oneself.

What an individual knows changes over time. It follows that if a model of another person's knowledge is to be and remain functionally accurate, it too must change on a continuing basis. Several researchers have noted that refining one's model of another person's knowledge dynamically is important if communication is to be successful.

These ideas are incorporated in Figure 1, a conceptualization of how an individual develops a model of another person's knowledge (from Nickerson, 1999). According to this conceptualization, one's model of one's own knowledge serves as a default model of what a random other person knows. This default model is transformed, as individuating information is acquired, into models of specific other individuals. The models of specific others are con-

tinually refined and updated as new information that is relevant to them is acquired. This article focuses on the idea that what serves as the point of departure for developing a model of another person's knowledge is what one knows, or thinks one knows, oneself.

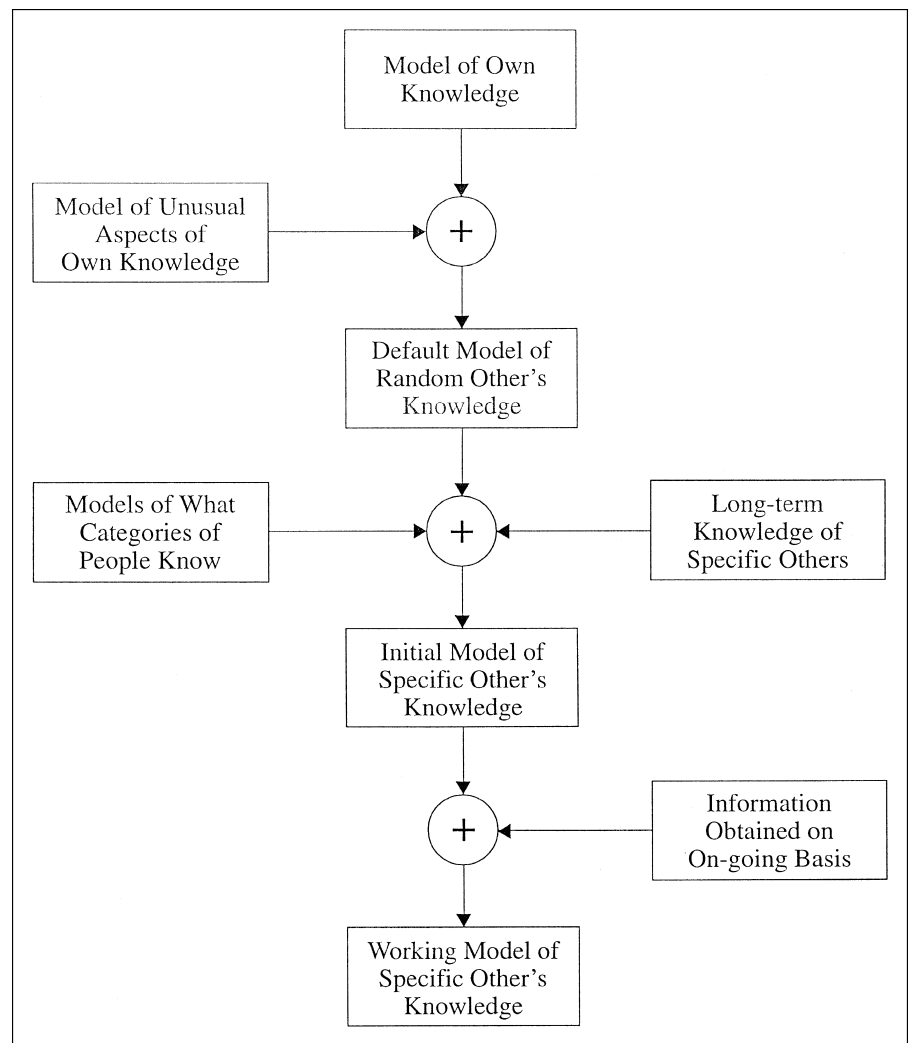
### SELF AS A SOURCE OF HYPOTHESES ABOUT WHAT OTHERS KNOW

The notion that a basic source of assumptions or hypotheses regarding what a random other person

knows is what one knows oneself has some currency among psychologists. It is closely related to the *simulation* view of how one individual understands another, according to which one imagines oneself in the other's place and discovers how one would think or feel in that situation (Gordon, 1986).

### The Projective Way of Knowing

The idea that we understand others by assuming that they are like ourselves is intuitively compelling, and there is much evidence to support the notion that people employ this "projective mode of



**Fig. 1.** Illustration of how an individual develops a working model of the knowledge another person has (from Nickerson, 1999).

knowing," as O'Mahony (1984, p. 58) has called it. People who engage in a particular behavior estimate that behavior to be more prevalent than do people who do not engage in that behavior. When attempting to assess the attitudes of specified groups, people tend to project their own attitudes onto those groups. People who are experiencing an experimentally induced emotional state are more likely to project that state to others than are people who are not experiencing it. People generally see their own attitudes and behavior as rational or normative, and they see attitudes and behavior that differ greatly from their own as irrational or deviant. In the political arena, extremists on both ends of the left-right continuum tend to doubt the rationality of those on the opposite end. People sometimes take their own behavior as the norm even in the light of sample-based information to the contrary.

#### Advantages of Using the Self as a Basis for Developing a Model

Our own knowledge of how we would behave or react in specific situations can be a useful basis, arguably the best basis we have, for anticipating how other people will behave or react in those situations (Hoch, 1987). Projecting our own feelings and reactions to others works because, in fact, people do react similarly in specific situations. The idea that we do well to assume that others are like ourselves is captured in the *principle of humanity*, according to which when trying to understand what someone has said, especially something ambiguous, we should impute to the speaker beliefs and desires similar to our own.

Using our own knowledge as a default model of what a random other person knows simplifies life. If we could not assume, in the absence of contrary evidence, that other peo-

ple are much like ourselves, the problem of communicating effectively would be overwhelmingly difficult (Davidson, 1982).

#### THE RISK OF OVERIMPUTATION OF OUR OWN KNOWLEDGE

Although, in the absence of more direct information, one's model of one's own knowledge may be as good a basis as there is for a default assumption about what a random other person knows, evidence suggests that the tendency to impute our own knowledge to others often leads us to assume that others have knowledge they do not actually have, and this can impede communication and mutual understanding in various ways.

Failure to make sufficient allowance for the difference between one's own subjective experiences or perspectives and those of one's hearers or readers has been noted as a source of difficulties in communication in both spoken and written form. Teaching can be adversely affected if teachers underestimate the difference between their own knowledge and that of their students; products of technology may be designed suboptimally if designers underestimate how much difficulty people other than themselves will have in learning to use them. Piaget (1962) remarked on the difficulty that beginning instructors have in placing themselves in the shoes of students who do not know what they themselves do about a course's subject matter, and surmised that they are likely to give incomprehensible lectures for a while as a consequence. Flavell (1977) similarly pointed out that one's own viewpoint can work as an impediment to attaining an accurate appreciation of the viewpoint of another person, and that it may be es-

pecially difficult for one to appreciate fully the ignorance of another person with respect to something one understands very well oneself.

#### The False-Consensus Effect

The *false-consensus effect* refers to a tendency to see oneself as more representative of other people than one really is. The results of numerous studies suggest that the tendency is very common and that it manifests itself in a variety of ways. People are likely to overestimate the amount of general consensus on beliefs and opinions they themselves hold, and to underestimate the degree of agreement on beliefs and opinions that differ from theirs. The effect is illustrated by the finding that U.S. voters typically overestimate the popularity of their favored candidate in a presidential election (Brown, 1982), as well as the extent to which the positions of favored candidates correspond to their own (Page & Jones, 1979).

#### The Curse of Expertise

People who are experts in specific areas and who recognize themselves as such must realize, almost by definition, that they know more than most other people with respect to their areas of expertise. Nevertheless, the results of several studies suggest that although experts assume that others know less than they about their areas of expertise, they may still overestimate what others know.

The point is illustrated by a study by Hinds (1999), who found that experts in performing a task were more likely than people with only an intermediate level of expertise to underestimate the time novices would take to complete the task. Experts also proved to be resistant to debiasing techniques intended to reduce the tendency to underestimate how difficult novices would find a task to be.

In laboratory studies, participants who have been given privileged information for purposes of an experiment may behave as though other participants also have that information even when, if asked, they acknowledge that the other participants do not have the information.

### Egocentric Bias in Imputing General Knowledge

The results of many studies suggest that people's estimates of what general knowledge other people have tend to be biased in the direction of the knowledge they themselves have or think they have. When college students were asked to answer general-knowledge questions and to estimate, for each question, the percentage of other college students who would be able to answer that question correctly, they gave higher estimates for questions they thought they knew the answers to (as indicated by confidence ratings), even when their own answers were wrong, than for questions they knew they did not know the answers to, and they were more likely to overestimate the commonality of knowledge if they themselves had it than if they did not.

When students living in New York City rated their familiarity with each of 22 landmarks in the city and estimated the proportions of other city residents who would be able to identify them, students who were highly confident of being able to identify specific landmarks judged those landmarks to be more familiar to others than did students who were not very confident of their own ability to identify them. Students who could identify pictured public figures by name rated the individuals as more recognizable than did students who could not identify them by name. Students who could identify an everyday object estimated the proportion of peers who would be able to iden-

tify that object to be higher than did people who could not identify it.

When instructors attempted to answer quiz questions as they expected their students would answer them, they provided about twice as many correct answers as did their students on average. Readers of the account of a conversation attributed to the listener the same understanding of the speaker's utterance as their (the readers') own, even when the utterance was ambiguous and the readers knew that the listener did not have the disambiguating information they had. When observers judged the likelihood that listeners would believe a message that contradicted the listeners' prior belief about a situation, they judged the likelihood to be higher if they (the observers) knew the message to be false, even though they were aware that the listeners could not have the basis they (the observers) had for judging the message to be true.<sup>2</sup>

A particularly striking example of overimputing one's own knowledge to others comes from an experiment by Newton (1990) in which some participants tapped the rhythms of well-known songs and others attempted to identify the songs on the basis of the tapped rhythms. Tappers estimated the likelihood that listeners would be able to identify the songs to be about .5; the actual probability of correct identification was about .025. Apparently the tappers, who could imagine a musical rendition of a song when they tapped its rhythm, found it overly easy to project their own subjective experience to the listeners, who did not share it.

### Illusion of Simplicity

The *illusion of simplicity* refers to the mistaken impression that something is simple just because one is familiar with it. It is illustrated by

the findings that people are likely to judge anagrams to be easier to solve if they have been shown the solutions than if they have not and that they are likely to judge sentences to be appropriate for a lower-grade reading level if they have read them before than if they have not (Kelley, 1999). It is a short step from perceiving something to be simpler than it is, only because one is familiar with it, to assuming that someone else, who is not familiar with it, will perceive it the same way.

### ANCHORING AND INADEQUATE ADJUSTMENT

This conceptualization of how we build models of what others know can be seen as a case of the general reasoning heuristic of *anchoring and adjustment* (Tversky & Kahneman, 1974), according to which people make judgments by starting with an "anchor" as a point of departure and then make adjustments to it. In this case, the anchor for one's default model of what someone else knows is one's model of what one knows oneself.

Many of the experimental results noted in this article support the idea that, in serving as the anchor for one's model of another person's knowledge, one's model of one's own knowledge is adjusted to take into account differentiating information either about one's own knowledge or about the other person's knowledge. However, as in other documented instances of anchoring and adjustment, the adjustment is often not as great as it should be, and one ends up assuming that another person has knowledge that he or she does not have.

### CONCLUDING COMMENTS

In this article, I have emphasized the prevalence of the ten-

dency to overimpute one's own knowledge to other people and the fact that this can be problematic in several respects. Dawes (1989) has made the point that it is possible to err in the other direction as well, and has argued that an uncritical assumption of dissimilarity between oneself and others can also have undesirable consequences. This seems an important caution to bear in mind in interpreting the results noted here. Presumably, relatively accurate models of what others know are more useful than models that are biased either toward or away from what one knows oneself; however, on balance, the literature suggests that biasing one's model of another person's knowledge in the direction of one's own knowledge is a more common problem than biasing it in the opposite direction.

What can be done to improve our conceptions of what specific other people know? I have suggested several possibilities elsewhere (Nickerson, 1999). Here, I mention only the belief that this problem, like many others relating to cognitive or judgmental biases, stems, at least in part, from a failure to be very reflective about assumptions we make—from failing to give much attention to alternative assumptions that could be made. If we generally tend to assume that a random other person knows a fact that we know ourselves, and if we give insufficient consideration to reasons why the other person might not know that fact, we are likely to overimpute our own knowledge to others as a rule.

In many cases, failure to be more critical of our own assump-

tions may be defended on the grounds that, although the conclusions that we settle on may not be optimal, they are usually close enough for practical purposes and finding better ones would not be worth the effort. However, if judgments of a particular type are relatively consistently biased in a specified way, as judgments of what others know appear to be, search for effective debiasing techniques seems warranted. Simple awareness of a tendency to overimpute one's own knowledge to others may be helpful, but probably not fully corrective. How best to teach people to make more accurate estimates of what other people know, and to counteract the tendency to overimpute their own knowledge to others, remains a challenge to research.

### Recommended Reading

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### Notes

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2. References for all the studies alluded to in the preceding three paragraphs are listed in Nickerson (1999).

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