

1

Language, Culture, and Mind in Comparative Perspective

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1 Introduction

Language holds a special place in human life. It provides the dominant medium for social interaction helping to enable the distinctive forms of organization that we call cultures. Likewise, it provides an important medium of psychological representation, helping to constitute the distinctive forms of thought we call mind. As language mediates both culture and mind, it necessarily draws all three into a close-knit relationship. Though few doubt the importance of language, we still debate just exactly how large a mediating role language plays and in precisely what ways.

Since there is no one universal language but rather myriad individual languages all differing from one another in important respects, one perennial debate concerns just how important these differences are in the mediation of culture and mind. The contention that the particular language we speak influences the way we experience and think about the world has been called the linguistic relativity proposal (Lucy 1992a). This paper presents an overview of some recent thinking and research on this problem. The discussion first characterizes the nature of the relativity proposal both by contrasting it with related but distinct proposals and by laying out its internal logic. Then it outlines some important historical orientations to research that continue to shape contemporary approaches. Next I place my research within this framework and describe one line of empirical results to

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illustrate it. The final discussion highlights the importance of linguistic diversity in a general theory of the relation of language, culture, and mind.

2 Linguistic Relativity Characterized

As indicated above, the linguistic relativity proposal forms part of the broader question of how language influences thought. Hence it can be characterized first by its relationship to other aspects of this broader question. The potential influences of language on thought can be classed into three types or levels (Lucy 1996). The first, or semiotic, level concerns how speaking any natural language at all may influence thinking. The question is whether having a code with a symbolic component (versus one confined to iconic and indexical elements) transforms thinking in certain ways. If so, we can speak of a *semiotic relativity* of those aspects of thought with respect to other species lacking such a code. The second, or structural, level concerns how speaking one or more particular natural languages (e.g. Hopi versus English) may influence thinking. The question is whether quite different morphosyntactic configurations of meaning affect some aspects of thinking about reality. If so, we can speak of a structural relativity of thought with respect to speakers using a different language. This has been the level traditionally associated with the term *linguistic relativity* and this usage will be employed here. The third, or functional, level concerns whether using language in a particular way (e.g. schooled, scientific) may influence thinking. The question is whether verbal discursive practices affect some aspects of thinking either by modulating structural influences or by directly influencing the interpretation of interactional context. If so, we can speak of a functional relativity of thought with respect to speakers using language differently. This level has been of particular interest during the second half of the twentieth century with the increasing interest in discourse-level analyses of language and can, therefore, also be conveniently referred to as *discursive relativity*.

These three types of language influence on thought are not functionally independent and they interact in important ways (Lucy 1997a). Thus the emergence of symbolic signs enables complex and diverse morphosyntactic systems based on them, which provide in turn the essential means for the discursive interactions central to all cultures. Or inversely, thinking functionally, the impetus to engage in discourse drives linguistic development, which in turn drives the development of the symbolic capacity. In our contemporary division of labor, however, these linkages can be obscured as their investigation is distributed across disciplines. Roughly speaking, psychologists focus more on the cognitive impact of having a(ny) language, linguists tend to be concerned with the structure and diversity of language forms, and anthropologists worry most about the functional deployment of languages in cultural and institutional contexts.

Ultimately, investigation of these issues must address all aspects of the problem drawing equally on the sciences of mind, language, and culture.

If we focus now directly on the structural level, that is, on linguistic relativity proposals per se, they characteristically involve three key elements linked in two relations (Lucy 1997a). They all claim that certain properties of a given language have consequences for patterns of thinking about reality. The properties of language at issue are usually morphosyntactic (but may be phonological or pragmatic) and are taken to vary in important respects. The pattern of thinking may have to do with immediate perception and attention, with personal and social-cultural systems of classification, inference, and memory, or with aesthetic judgment and creativity. And the reality may be the world of everyday experience, of specialized contexts, or of ideational tradition. Whatever form these elements take, they are then linked by two relations: (1) language embodies a particular *interpretation* of reality and (2) these language interpretations can *influence* thought about that reality. The interpretation arises from the selection of substantive aspects of experience and their formal arrangement in the verbal code. Such selection and arrangement is, of course, necessary for language, so the crucial emphasis here is that each language involves a particular interpretation, not a common, universal one. An influence on thought ensues when the particular language interpretation guides or supports cognitive activity and hence the beliefs and behaviors dependent on it.¹ Accounts vary in the specificity of the proposed mechanism of influence and in the degree of power attributed to it—the strongest version being a strict linguistic determinism. All proposals of linguistic relativity thus claim that diverse linguistic interpretations of reality yield demonstrable influences on thought, but they may define these elements and conceptualize their interconnection somewhat differently.

3 Historical Approaches to Linguistic Relativity

Theory and research on linguistic relativity are shaped in important ways by one's general orientation to the two central relations mentioned above.

¹ Many researchers equate language and thought, so for them a language difference necessarily entails a cognitive one. For some, this view stems from a lack of serious reflection on the nature of cognitive activities which surely exist in many species lacking language and may reasonably be expected to continue to do so for humans. For others this position stems from the conviction that languages, once they exist, influence all human thinking; but this, of course, is exactly what is at issue and it makes little sense simply to assume what needs to be shown. Finally, there are others who emphasize that language use itself requires thinking, so that at least these aspects of thinking must surely be influenced by language structure; this seems so self-evident as to be beyond dispute, and by the same token, of only minimal interest in its own right. Claims for a linguistic relativity of thought require an actual demonstration that speaking a specific language influences thinking more generally.

3.1 Orientations to Language Diversity

There have been two dominant approaches to understanding the diverse interpretations of reality embodied in language (see Aarsleff 1982 for discussion and references). First, there are those who adopt the Leibnizian view that there is a natural (or absolute) connection between language and the world. Those holding this view have two ways of explaining the observed diversity. For some the observed forms all represent various sorts of decline, that is, that what we see is an accumulation of human corruption upon some earlier pristine form of language, the language of Adam or the ancient Hebrews being the classic reference points, but any historical reference point suffices. The route to this uncorrupted form lies through the historical reconstruction of the original language. One can hear echoes of this view in any language ideology about the supposed slovenliness of contemporary modern speech as contrasted with earlier, even ancient forms. Alternatively, one can imagine that the pristine form still lies secure within each language and that all we have to do is peel back the superficial encrustation and we will find the natural logic of language revealed. One hears echoes of this view in all those ideologies about underlying competence, deep structures, universal primitives, and the like, ideologies typically held by those who purport to have discovered (yet again) the key to uncovering these treasures lying beneath diversity.

And second there are those who adopt the Lockean view that languages bear an artificial (or conventional) relation to reality and, therefore, that diversity is an unavoidable feature of languages. Again, there are two ways to regard this diversity. One view celebrates this diversity as of local historical significance. So languages, in this view, contain in their form living traces of history and are to be treasured as repositories of the genius of a people. Thus diversity is embraced, but often with a more or less explicit evaluation of one or another language (or language type) as superior—along with the people who created it. (One thinks especially of Humboldt in this regard; see Aarsleff 1988.) Alternatively, one can take a more neutral view of this process, but recognize that the lack of a uniform natural relationship presents obstacles to clear communication, especially in philosophy and science. However, the very conventional nature of language allows us to build up specialized vocabularies and professional jargons as needed to convey our views accurately. So in place of decline and corruption one sees the possibility of progress and perfection in language. Here we find much of the impetus for the rampant multiplication of technical terms that besets contemporary society. And pushed to extremes by those who mistrust the aim of adequately perfecting language in this way, some appeal to a final alternative, namely, to try to dispense with language entirely. Insofar as possible they seek to restrict themselves

to observed facts described and related to one another through abstract models, mathematical and otherwise. It is by no means clear that these approaches really escape the shaping form of language, but even if they do, the knowledge achieved remains imprisoned within the formalisms and can only be set free by recourse to the language of some discursive community, whereupon all the usual problems return.

Disparate as these two dominant approaches are, they share the common underlying assumptions that there is a single unitary reality and an ideal relation of language to it, however elusive. During the 1930s these assumptions were questioned by Benjamin Whorf (1956; see Lucy 1985, 1992a), a linguistic anthropologist working in the American anthropological tradition founded by Franz Boas. Whorf questioned the existence of a single ideal relation of language to reality and in precisely this sense he also questioned our conceptualization of a unitary reality, since its qualities would vary as a function of the language used to describe it. If there is no ideal relation of language to reality, hence a fundamental uncertainty about the character of that reality, then the whole problem of the relation of language to experience changes. Claims for universality in the relation of language to reality cannot now simply be presumed but require empirical proof. And no language, whether ancient or modern, received or constructed, can be judged inferior or superior, corrupted or perfected in light of its match with reality. In this view, we are lacking a language-neutral standard against which to form such judgments. And, consequently, no single language can provide through its system of categories a reliable guide to reality for the purposes of research.

3.2 Strategies of Empirical Investigation

Since the appearance of Whorf's formulation of the problem, two strategies of empirical research have emerged aiming to solve this problem of how to provide a neutral ground or frame of reference for comparing languages and cognition (see review in Lucy 1997a). One approach, which I call *domain-centered*, selects a domain of experience (such as color or time or space) and seeks to describe it on language-independent grounds in order then to ask how individual languages treat the domain and then how speakers regard the domain in cognition. Although this method offers a number of advantages for comparative purposes, it tends toward two flaws. First, the representation of reality is typically drawn from one linguistic and cultural tradition. As such it begs the question being asked, namely, whether such representations are universal. Recognizing this problem, some seek to anchor the description in well-established scientific concepts to help assure neutrality and objectivity. This can be illuminating, but most often what happens is that one ends up with a description in terms of parameters not

relevant to actual linguistic systems either semantically or structurally, which in turn can lead to a dramatic misrepresentation of the languages at issue. Further, by adopting one vision of reality, even a scientific one, as the standard for comparison, one necessarily favors the language and culture from which it arose. This leads, not surprisingly, to any number of demonstrations of difference in which a hierarchy (re)emerges showing, in effect, little more than how well languages do or do not represent the semantic values of the base system. In short, the method used for creating a neutral system based on reality often undermines the very possibility of fair comparison in these ways (see Lucy 1997a for a case example).

A second approach, which I call *structure-centered*, selects some grammatical structure (such as number or gender or aspect marking), asks how it differs across languages, and how reality might appear differently from the vantage of each relevant system. This method seeks to solve the relativity problem by working with multiple languages from the outset. Building on a long tradition of typological work in linguistics (modeled on phonology), this approach is comparative in a way that tends to be more neutral and language-relevant from the outset, so it suffers less from the problems characteristic of the first approach. But it is difficult to implement: comparing categories across languages requires extensive linguistic work both in terms of local description and typological framing, and it can be extremely difficult to characterize referential entailments suitable for an independent assessment of cognition. Nonetheless, this approach most closely respects the linguistic facts and thus holds the greatest promise of identifying structural differences and directing the search for influences in appropriate directions. The study described below provides an exemplification of this approach. (Lucy 1997a provides further examples; Lucy 1992b and 1994 illustrate the linguistic method in detail.)

In sum, current research trends center on two dominant approaches to addressing Whorf's concerns about presuming a unique, optimal language-to-reality mapping. One attempts to describe reality (in the guise of a selected referential domain) independently of languages, and then ask how that reality is partitioned by languages. The other seeks to describe languages (typically in the form of a particular morphosyntactic category) typologically and independently of prior assumptions about reality and then ask how reality would look from the perspective of each system. The first tends to suffer from implicit bias and semantic irrelevancy in characterizing the domain, the second from descriptive complexity and difficulty in cognitive comparison. In those empirical studies involving some cognitive comparison, domain-centered approaches have predominated to date. However, in recent years structure-centered approaches have found increasing favor, driven by a resurgence of interest in comparative linguistic

research, the appearance of some innovative case studies, and by increased awareness among psychologists of the actual scope of linguistic diversity.

4 Empirical Research: An Illustration

I have worked for many years now exploring the structural differences between American English and Yucatec Maya, an indigenous language of southeastern Mexico, and whether the differences between the two languages have any effects on cognition. This work represents the most fully developed effort at a structure-centered approach to date. It builds on analyses of multiple morphosyntactic structures within a typological framework; it uses a range of cognitive assessments using different stimulus materials and cognitive tasks; and it examines both adult and child performance. Only a representative sample of this work can be presented here. I describe some salient contrasts between the two languages, the associated cognitive entailments, and a study assessing these entailments.

4.1 Language Contrast: Number Marking Semantics

As background for the cognitive assessment, we need to describe a specific language contrast. The focus will be on how Yucatec Maya and American English differ in their nominal number marking patterns.

First, the two languages contrast in the way they signal plural for nouns. English exhibits a *split pattern* whereby speakers obligatorily signal plural for nouns semantically marked as referring to discrete objects (e.g. *car*, *chair*) but not for those marked as referring to amorphous materials (e.g. *sugar*, *mud*, etc.).² Yucatec exhibits a *continuous pattern* whereby speakers are never obliged to signal plural for any referent, although they may opt to do so if they wish, and often do mark it for animate referents.

Second, the two languages contrast in the way they enumerate nouns. English is again split such that for nouns marked as having semantically discrete reference, numerals directly modify their associated nouns (e.g. *one candle*, *two candles*); for nouns not so marked an appropriate unit (or unitizer) must be specified by a form that then takes the number marking (e.g. *one clump of dirt*, *two cubes of sugar*). Yucatec is again continuous in that all constructions with numerals must be supplemented by a special form, usually referred to as a numeral classifier, which typically provides crucial information about the shape or material properties of the referent of the noun (e.g. *'un-tz'ít kib* 'one long-thin candle', *ká'a-tz'ít kib* 'two long-thin candle'). Numeral classifiers of this type are widely found among the world's languages, especially in Asia and America.

² The semantic features used here as well as the optional marking of plural in Yucatec for the [+animate] subset of [+discrete] entities are explained in Lucy (1992b: 56-83).

Since many classifiers have to do with the shape or form of a referent, one common interpretation of them is that they represent a special emphasis on these concepts in a language's semantics in contrast to languages such as English. This claim would be more plausible if the classifiers were optional, occurred in many morphosyntactic contexts, and appeared only in a few languages. But in fact they are obligatory, confined to a single morphosyntactic context, and are fairly common among the world's languages. All of this suggests that they do not represent an emphasis on shape or form but rather an indispensable solution to a referential difficulty characteristic of languages that minimize reference to these values in their basic noun semantics.

So why have numeral classifiers? What problem do they solve? The need for them reflects the fact that all nouns in Yucatec are semantically unspecified as to quantificational unit—almost as if they referred to unformed substances. So, for example, the semantic sense of the Yucatec word *kib'* in the example cited above is better translated into English as 'wax' (i.e. 'one long-thin wax')—even though, when occurring alone without a numeral modifier in conditions other than enumeration, the word *kib'* can routinely refer to objects with the form and function that we would call candles (as well as to other wax things). Once one understands the quantificational neutrality of the noun it becomes clearer why one must specify a unit (that is, use a form such as a classifier) when counting, since expressions such as 'one wax' apparently do not make quantificational sense in this language, much as they do not in our own. By contrast, many nouns in English include the notion of quantificational 'unit' (or 'form') as part of their basic meaning—so when we count these nouns, we can simply use the numeral directly without any classifier (e.g. *one candle*). In essence, then, whereas English requires such a unitizing construction only for some nouns, Yucatec requires one for all of its nouns.

The two paradigms of examples shown in Table 1 should help make clear how the Yucatec system contrasts with our own (examples from Lucy 1992b). The first displays how various classifiers can occur with the noun *há'as* 'banana', such that each combination singles out a different referent. The second, by contrast, displays how a variety of lexical nouns can occur with the classifier *tz'ít* 'one-dimensional/long-and-thin' so as to signal a range of different referents. As should be clear, the two forms, classifier and noun, contribute to the meaning and therefore jointly enter into a productive relationship to produce noun phrase meaning.

'un-tz'út	há'as	'one one-dimensional banana (i.e. the fruit)'
'un-wáal	há'as	'one two-dimensional banana (i.e. the leaf)'
'un-kúul	há'as	'one plant(ed) banana (i.e. the plant/tree)'
'un-kúuch	há'as	'one load banana (i.e. the bunch)'
'um-p'út	há'as	'one bit banana (i.e. a bit of the fruit)'
'un-tz'út	há'as	'one one-dimensional banana (i.e. a banana)'
'un-tz'út	kib'	'one one-dimensional wax (i.e. a candle)'
'un-tz'út	che'	'one one-dimensional wood (i.e. a stick)'
'un-tz'út	nal	'one one-dimensional corn (i.e. an ear)'

Table 1. Paradigms of Yucatec numeral classifier constructions showing different classifiers with a single noun and different nouns with a single classifier

These patterns of plural marking and numeral modification are closely related and form part of a unified number-marking pattern evidenced across many languages. In particular, languages with rich, obligatory plural marking such as Hopi tend not to have obligatory unitizing constructions such as numeral classifiers, and those with a rich, obligatory use of numeral classifiers such as Chinese tend not to have plural marking. Languages at these extremes are essentially continuous in their number-marking pattern over the entire spectrum of noun phrase types. However, many languages have both types of marking, that is, both pluralization and unitization are present. In such languages the lexicon tends to be internally split such that noun phrases requiring plural marking with multiple referents tend not to require unitizers for counting, and those requiring unitizers for counting tend not to require plurals when used with multiple referents. More specifically, there is an ordering relationship such that, across languages, it is more common for some referents to have plural marking and others to have unitizer marking (see Lucy 1992b: 61-71, for full discussion).

Yucatec exhibits the continuous pattern requiring unitizers in the form of numeral classifiers for all nouns and not requiring plurals for any of them. English exhibits the split pattern; it requires plurals but not unitizers for nouns referring to ordinary discrete objects, and it requires unitizers but not plurals for nouns referring to amorphous entities, those lacking discrete form. This contrasting pattern is displayed graphically in Table 2.³

³ It should be emphasized that the label unitizer employed here to indicate the cross-language functional similarity should not be overinterpreted in terms of structural-semantic meaning. Even where these languages look similar there are important differences in syntactic structure and hence in semantic value for the various form classes. In particular, quantification-neutral Yucatec nouns are not structurally identical to quantification-neutral English nouns (so-called

Language Type	Referent Type	
	+Discrete	-Discrete
Continuous (Yucatec)	unitizer	unitizer
Split (English)	plural	unitizer

Table 2. Obligatory number marking patterns: contrast for [+discrete] and [-discrete] referent types for continuous (e.g. Yucatec) and split (e.g. English) type languages

4.2 Cognitive Hypotheses and Predictions

To assess whether traces of these contrasting verbal patterns appear in speakers' cognitive activities more generally, we need first to draw out the implications of these grammatical patterns for the general interpretation of experience. We have seen that English encodes quantificational unit (or some equivalent) in a large number of its lexical nouns whereas Yucatec does not. It is difficult to form a single generalization about the meaning value of such patterns because the kind of unit presupposed apparently varies across the spectrum of lexical noun types both within and across languages. What might be a good default presupposition may well differ dramatically for an animate referent, an object, a material, and so on.

If we consider first the denotational meaning of nouns referring to discrete concrete referents, then certain regularities exist from which cognitive implications can be drawn. We will focus our attention on what we will call *stable objects*, that is, ordinary objects that typically maintain their physical appearance over time (e.g. a comb) (for details, see Lucy and Gaskins 2003). The quantificational unit presupposed by English nouns referring to objects of this type is frequently the shape of the object. Hence use of these English lexical items routinely draws attention to the shape of a referent as the basis for incorporating it under some lexical label and assigning it a number value. Yucatec nouns referring to objects of this type, lacking such a specification of quantificational unit, do not draw attention to shape and, in fact, fairly routinely draw attention to the material composition of the referent as the basis for incorporating it under some lexical label. If these linguistic patterns translate into a general cognitive sensitivity to these properties of referents of the discrete type, then we can draw the following prediction: Yucatec speakers should attend relatively

'mass nouns') since the Yucatec nouns do not enter into a systematic contrast relation with quantification-marked nouns (so-called 'count nouns'). Likewise, their actual cognitive construal remains an empirical question.

more to the material composition of stable objects (and less to their shape), whereas English speakers should attend relatively less to the material composition of stable objects (and more to their shape).

We can develop a second prediction about material referents. Any concrete material referent must appear at any given moment in time with some spatial configuration, that is, in some shape or arrangement. We will confine our interest here to those materials that retain their contiguity without the assistance of a container (e.g. a squeeze of toothpaste), what we can term *malleable objects* (for details, see Lucy and Gaskins 2003). For these referents, a temporary (or accidental) shape is available at the moment of reference, but it could be otherwise for it is highly contingent on the current state of affairs. Since both Yucatec and English nouns referring to such material referents lack a presupposed quantificational unit, their semantics should ignore the temporary shape and, in fact, should routinely draw attention to the material composition of a referent as the basis for incorporating it under a lexical label. If the linguistic patterns translate into a general cognitive sensitivity to these properties of referents of the material type, then both Yucatec and English speakers should attend relatively more to the material composition of such malleable objects (and less to their shape), that is, the two groups of speakers should not differ.

The two sets of predictions can be brought together into a unified prediction for these two types of objects as shown in Table 3. English and Yucatec should disagree on their treatment of stable objects in line with the differences in their grammatical treatment of them, but the two languages should agree on their treatment of malleable objects in line with the similarity in their grammatical treatment of them. Alternatively, looking within each language, we can predict that English will show a cognitive split vis-a-vis the two types of objects whereas Yucatec will show cognitive continuity across them. Notice that the predictions are relative rather than absolute, that is, they contrast two patterns, not absolute values. Notice also neither pattern of classification can be described as inherently superior to the other.

4.3 Cognitive Contrast: Shape versus Material Preference

4.3.1 Preferences with Stable Objects

The prediction for stable objects was tested with both adult and child speakers from both languages (Lucy and Gaskins 2001). Twelve speakers in each group were shown fifteen triads of naturally occurring objects familiar to both groups. Each triad consisted of an original pivot object and two alternate objects, one of the same shape as the pivot and one of the same material as the pivot. So, for example, speakers were shown a plastic

Language Type	Object Type	
	Stable	Malleable
Continuous (Yucatec)	material	material
Split (English)	shape	material

Table 3. Predicted relative preference for material versus shape: contrast for stable and malleable object types for speakers of continuous (e.g. Yucatec) and split (e.g. English) type languages

comb with a handle as a pivot and asked whether it was more like a wooden comb with a handle or more like a plastic comb without a handle. The expectation was that English speakers would match the pivot to the other comb with a handle whereas the Yucatec speakers would match it with the other comb made of plastic. Informants were shown a large number of such triads which, across the stimulus set, controlled for size, color, function, wholeness, and familiarity. Examples of two triad types appear in Figure 1.

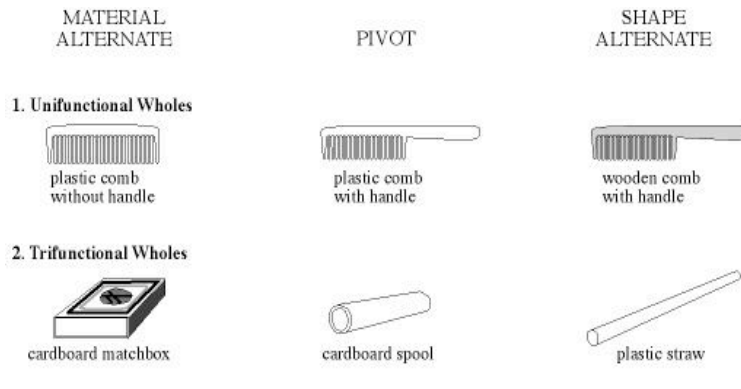


Figure 1. Examples of triad stimuli for stable objects.
(Excerpted from Figure 9.1 in Lucy and Gaskins 2001: 266)

The predicted classification preference was strongly confirmed with adult English speakers choosing the material alternate only 23% of the time and adult Yucatec speakers favoring it 61% of the time. Clearly the two adult groups classify these objects differently and in line with the expectations based on the underlying lexico-grammatical structures of the two languages. However, English-speaking and Yucatec-speaking seven-year-olds showed an identical early bias toward shape—choosing material alternates only 12% of the time. But by age nine, the adult pattern was

visible: English-speaking children continued to favor shape, choosing material alternates only 18% of the time whereas Yucatec-speaking children were choosing material alternates 42% of the time. Thus, the same kind of language-group difference found among adult speakers is also found in children by age nine—and the result is statistically reliable. The adult and developmental data are jointly displayed in Figure 2.

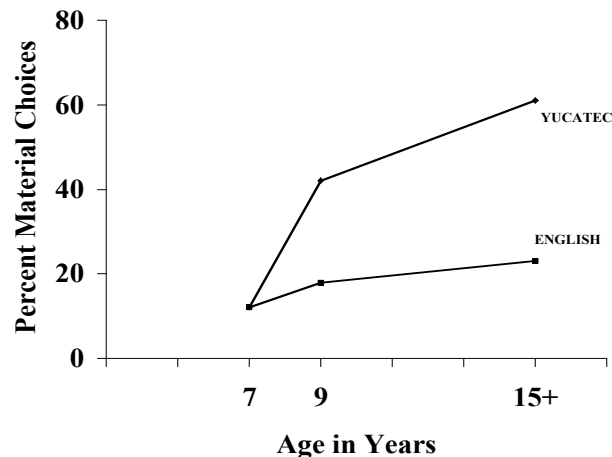


Figure 2. Developmental pattern for English and Yucatec classification preferences with stable objects: material versus shape

4.3.2 *Preferences with Malleable Objects*

The prediction for material referents in the form of malleable objects was also tested with adult and child speakers from both languages again using a triads-classification task (Lucy and Gaskins 2003). Informants were shown six triads such that each pivot and its alternates were composed of different sorts of materials such as foams, creams, gels, pastes, powders, particles, or granules, each formed temporarily into distinctive shapes—as shown in Figure 3. Although both the materials and shapes were selected to be familiar to both sets of informants, the individual combinations of shape and material were relatively novel for everyone. It is worth mentioning that the transitory properties of these objects made the assessment itself difficult especially in the Mexican field conditions. For example, arranging beads, toothpaste, and the like into fixed shapes was intrinsically difficult in both settings and working with shaving cream and instant coffee in the Yucatec setting, that is, in a house open to tropical humidity and occasional breezes, was especially difficult. Just at this practical level it was obvious that these were ‘objects’ in a different sense than those used in the first study.

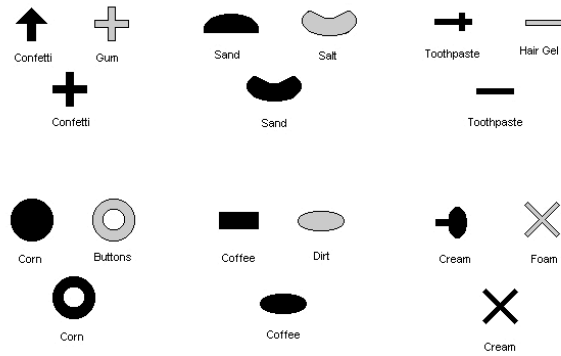


Figure 3. Examples of triad stimuli for malleable objects.

The results show both groups making a substantial number of material choices as expected with adult Yucatec speakers favoring material choices 53% of the time and adult English speakers favoring them 34% of the time. Although the direction of contrast is similar to that found for stable objects, with the English speakers showing some tendency to favor shape even with these stimuli, nonetheless the group difference was not statistically reliable, exactly in line with the prediction.

English-speaking and Yucatec-speaking seven-year-olds also showed a substantial number of material choices. English-speaking children choose the material alternate 42% of the time and Yucatec-speaking children choose the material alternate 46% of the time. At age nine there is essentially no change: English children choose material alternates 43% of the time and Yucatec children choose them 50% of the time. Thus, the similarity of response found among adult speakers for objects of this type also appears in children. The adult and developmental data are jointly displayed in Figure 4. Viewed in contrast to the developmental data, the adult results appear more strongly differentiated in a manner reminiscent of the stable object results, which perhaps suggests some general transfer of effect from the latter category to these somewhat novel malleable objects.

4.3.3 *Interaction of Referent Type and Language Type*

On the basis of these results, we can draw three conclusions about the development of language-related classification preferences for these types

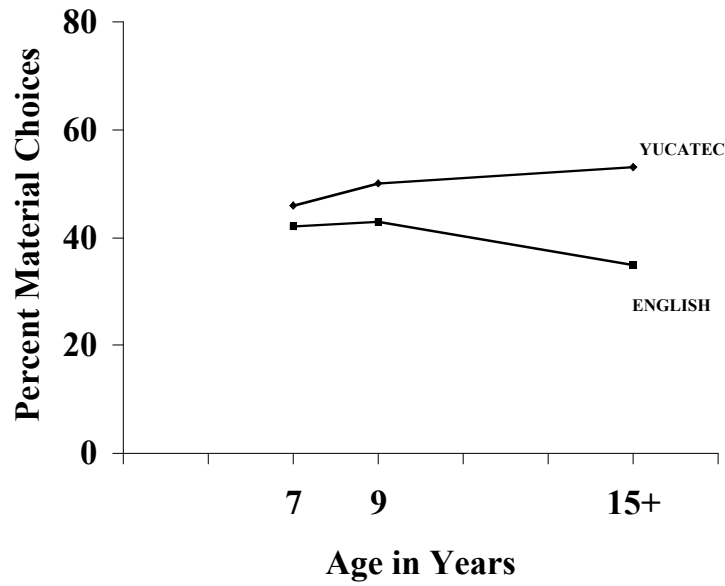


Figure 4. Developmental pattern for English and Yucatec classification preferences with malleable objects: material versus shape

of referents. First, with respect to adult behavior, the nonverbal classification behavior follows the language pattern. Where the two languages agree in their treatment of malleable objects, adults show no reliable difference in their degree of preference for material classification. But where the two languages disagree in their treatment of stable objects, then adults show divergent preferences for material or shape classification as a function of the language difference.

Second, with respect to the developmental data, seven-year-olds show clear sensitivity to referent type independently of language group membership.⁴ They show a relative preference for material as a basis of classification with malleable objects and relative preference for shape as a basis of classification with stable objects. Both bases of classification

⁴Just as English-speaking children have substantial command of plurals by age seven, so too do Yucatec-speaking children have substantial command of numeral classifiers by this age. Seven-year-old Yucatec-speaking children reliably use classifiers when counting, draw appropriate semantic distinctions among them in comprehension tasks, and will judge a number construction lacking them as faulty. However, they do still fall short of having the full adult range of classifiers in comprehension and production. Insofar as the cognitive results derive from basic structural characteristics of the language rather than mastery of the full range of lexical items, there is no reason the effects should not appear at age seven.

respond to stimulus properties and are fully available to and used by both groups. Apparently, referent type but not language type is the dominant factor in these nonverbal cognitive tasks at this age. By contrast, nine-year-olds show differential sensitivity to referent type along adult lines: their classification preferences differ where the languages differ and correspond where the languages correspond. This suggests that language categories increase in their importance for cognition between ages seven and nine.

Third, in the context of the developmental data, we can see that there is some trend in the adult responses towards consolidation into a dominant pattern for each group. The Yucatec responses converge towards material choices and the English responses towards shape choices. The split-marking pattern in English obviously militates against the complete erasure of the distinction in that language, that is, this trend remains subordinate to the main effect of cognition aligning the specific linguistic treatment of a referent type. But we can summarize the overall pattern by saying that the two groups begin by grouping different referent types in the same way and end by grouping these same referent types in quite different ways as a function of language type. Figure 5 displays this overall pattern of results.

4.4 Common Questions

Three questions are often raised in regard to these findings and therefore deserve some comment. First, are these same verbal and cognitive patterns evident in everyday life? There is evidence that Mayan speakers clearly do exhibit a great sensitivity to the material properties of objects in other contexts. This appears first of all in some of the experimental tasks, especially some of the more complex ones not reported here (see Lucy and Gaskins 2001). In these tasks, Yucatec speakers constantly evaluate the material composition of the test items before sorting them—feeling how heavy they are, poking their nails into them to test for malleability, scraping the surface to see what material might be under any paint, smelling and tasting the objects, and generally questioning or commenting on their material properties—and all this with familiar objects. The English-speaking Americans showed none of this sort of behavior—they could get all the information they needed by sight alone.

A particularly striking example of an alternative sorting strategy spontaneously brought to the task occurred with one Yucatec woman during pilot work. We could not make sense of the principle guiding her selections sorting nine objects that had to be divided into two trays. So we asked her about her reasons during the follow-up discussion and she explained that the things on one tray would melt if they were burned whereas the ones on the

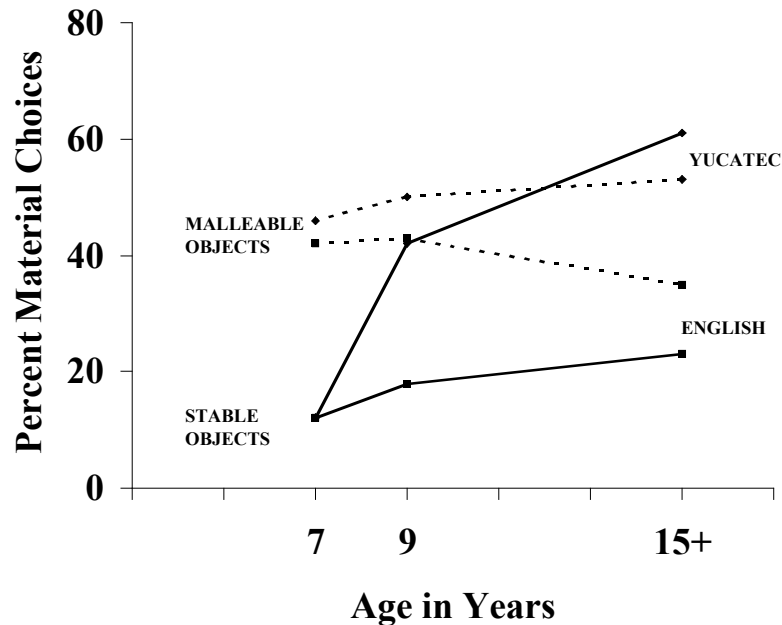


Figure 5. Developmental pattern for English and Yucatec classification preferences with both stable and malleable objects: material versus shape

other tray would turn to ash. This was an unexpected level of attention to material properties that went much deeper than immediate perception.

Outside of our experimental contexts, there are other suggestive incidents. There are, for example, certain patterns for adopting new words. One day a man came to my door and asked to borrow my *gas*. As I went to hand him my bottle of kerosene, he stopped me and clarified (by pointing) that he wanted to borrow my Coleman lantern, the gas fuel apparently being the most salient aspect for reference to this recently introduced cultural object. More generally, loan words in the language favor the material over the shape (e.g., a bowl is referred to by Spanish *porcelana* rather than *taza*). But similar patterns show up in nonverbal behavior as well. On one occasion, my wife took a Yucatec woman and her daughter to nearby Cancun to see the beach and the hotels for the first time and they spent considerable time discussing what the hotel floor was made of and poking their heads under the restaurant table top to see what it was made of. The first act of one Mayan visitor on arriving at my house in the U.S. was to go over to the quite ordinary plaster wall in our guestroom to see what it was made of. One year, preparing to leave our field site at the end of summer,

we put in the trash bag an apparently useless plastic bucket with a large hole cut out of it (we had used the plastic to make a stimulus item). A friend asked whether she could have it; and when we asked why she replied that she could use the plastic material itself to help start fires. Where we saw a damaged shape, she saw a useful material. Granted, these sorts of incidents are anecdotal; but cumulatively over time they have convinced me of the vitality of an orientation to the world that transcends the experimental tasks described above. I hope in future years to provide more systematic evidence in this regard.

Second, are these patterns actually due to language rather than to cultural factors such as lack of education or poverty or rural lifestyle? Such general cultural influences are of course possible with correlational results. But when one considers the whole array of studies (not all of which have been reported here), it seems unlikely that any single cultural 'fact' will account for all the results. First, very specific predictions have been used indicating that language should have an effect in one area but not in another. And these predictions have consistently been confirmed, though they are based different grammatical patterns (plural marking, unitization marking), tap different cognitive functions (attention, recognition and recall memory, classification, inductive reasoning), and use different stimulus materials (pictures, objects). No informed cultural argument has yet been made to explain even one of these results, let alone all of them. Second, children who have lived in the culture their whole life do not show these cognitive patterns before the language patterns are in place, and they do afterwards. Recent work with a deaf adult lacking this linguistic exposure revealed that he did not develop the usual Mayan response pattern. Third, exposure to education in particular will not explain the differences in our samples since they hold true for both educated and uneducated Yucatec speakers. These results have been replicated over a twenty-five year period during which there have been enormous educational changes in the community but without corresponding effects on the results. Finally, Imai and her colleagues (2000; also Imai and Mazuka 2003) have reported similar material sorting preferences for these sorts of stimuli among urban Japanese speakers who also have a classifier type language. This case would seem to rule out both education and rural life as viable sources of the differences (for a detailed comparison of the Yucatec and Japanese results, see Lucy and Gaskins 2003). The close linkage between language prediction and cognitive result in the absence of any plausible alternative cultural account suggests that the shaping role of language deserves to be taken seriously.

Third, is this a real linguistic relativity? After all, the preference scores fall short of 100 percent for both groups. The view taken here is not that languages completely or permanently blind speakers to other aspects of

reality. Rather, they provide speakers with a systematic default bias in their habitual response tendencies, especially in ambiguous situations such as we have created with our tasks and as often arise in everyday life. Although some members of each group clearly do not recognize the alternative classification possibility, I believe they could readily be brought to do so fairly quickly, at least for a while. This said, I think the bias would nonetheless return soon after, for it serves a purpose in coordinating social action and guiding individual behavior. That a habitual bias can be recognized and even overcome for a while in special contexts for certain tasks does not render that bias unimportant. In any number of areas such as mastering a foreign language, overcoming racial and gender prejudices, following strict logical inferences, etc. we know that people can modify their behavior for a while in some contexts, but it is another matter to change it wholesale or permanently. For the moment, we can say we have evidence that language structures bear some relationship to thought, that the direction appears to be from language to thought, and the relationship appears to be robust. Although we still have much to learn about the relation of language diversity to thought, evidence for the pervasiveness and significance of such effects has been accumulating rapidly in recent years.⁵

5 General Discussion

This work on linguistic relativity opens a window into the interface among language, culture, and mind. Just as language mediates culture and mind, helping enable them in all human groups, so too it appears to play a role in producing cultural and mental diversity. The two processes go hand in hand. Only by acceptance of the conventions of a particular language can we speak at all and so gain the advantages of having language support for sophisticated cultural and psychological activities. But this same acceptance of a particular language commits us to the specific conventions of that language and in turn to their consequences for our thinking. Just as with language universals then, linguistic diversity and its influences should be viewed as natural in human life: they are not some unfortunate contextual corruption that needs to be peeled away or some intrinsic defect that needs to be hammered out of each of us. Language influences form part of the foundation of what it is to be human, that is, a species that adapts to its environment by means of highly diverse yet stable patterns of symbolic representation.

The implications for research are clear: comparative work on language diversity will be essential in understanding the interaction of language,

⁵ For other recent research, see the following works and references therein: Bowerman and Levinson 2001, Gentner and Goldin-Meadow 2003, Gumperz and Levinson 1996, Hill and Mannheim 1992, Levinson 2003, Lucy 1997, Niemeier and Dirven 2000.

culture, and mind. Further, I have argued that the most revealing approach to comparative work will be through structure-centered approaches, approaches that acknowledge and respect the observed diversity even as they seek to understand it through inductive typology and analysis. The reasons for this should now be clear. If the natural process is to think in accordance with our own language, then what we take as neutral reality may in fact be a projection of the emphasis of our own language. And what we take to be the meaning of a category in another language may be partly a product of our own semantic accent (Lucy 2003). In short, we risk misunderstanding the interpretations of reality implicit in other languages and their influences on thought if we do not control for our own biases. The remedy for these biases lies in taking the observed categories of other languages seriously, exploring empirically their structure and functioning among native speakers. We will surely fail to progress if we simply ignore the existence of diversity or, more insidiously, if we erase it through the application of interpretive approaches that effectively render other systems in terms of our own.

Although not the primary focus here, the developmental aspect of the research reported above complements the comparative approach in important ways. Methodologically, it provides one important means for exploring the causal linkages underlying observed correlations between language and thinking among adults across cultures. And given the relatively late emergence of language effects, it makes clear that research on very young children cannot provide a full picture of the emerging relation between language and thought, let alone establish that language variation does not matter for thinking. The substantive finding that relativity effects arise in middle childhood is also theoretically illuminating. On the one hand, other research on middle childhood indicates that this is a crucial period in the development and integration of higher levels of language, culture, and mind (Lucy and Gaskins 2001). On the other hand, we know that this is also the age at which children begin to lose their flexibility in acquiring new languages and are increasingly likely to show interference accents in languages subsequently learned (Lucy 2003). In short, during this age substantive advances in linguistic, cultural, and mental development seem to come hand in hand with tangible limitations in the capacity to acquire or understand other languages and measurable effects of language codes on thought. This pattern suggests an emerging tradeoff whereby higher levels of intellectual and social development are purchased by a deeper commitment to the mediating role of language, that is, to a particular language, one whose system of categories will then quietly shape our thought and culture thereafter. This vision of a complex tradeoff whereby we advance to higher forms of cognition and social interaction by means of commitment to the categories of a particular code with all the

limitations this implies effectively synthesizes the comparative insights of Whorf with the developmental insights of Vygotsky (Lucy and Wertsch 1987). The emerging picture is that each child can achieve the fully developed humanity implicit in the inherent capacity for language, culture, and mind only by committing to becoming a particular sort of human, that is, one imbued with a historically specific language, culture, and mind. The deeper human universal, then, lies not so much in the substantive commonalities among these historical systems, but rather in the shared functional imperative of the tradeoff, that is, the imperative of engaging particular systems in order to consummate general development.

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