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# 33

# Language as Mind Tools
## *Learning How to Think Through Speaking*[1]

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> ... the expression of experience in linguistic terms constitutes *thinking for speaking*—a special form of thought that is mobilized for communication. ... We encounter the contents of the mind in a special way when they are being accessed for use. ... In the evanescent time frame of constructing utterances in discourse one fits one's thoughts into available linguistic frames. "Thinking for speaking" involves picking those characteristics of objects and events that (a) fit some conceptualization of the event and (b) are readily encodable in the language. *I propose that, in learning a native language, the child learns particular ways of thinking for speaking,* [our emphases]
>
> **Dan I. Slobin (1996, p. 76)**

Although relative newcomers to the field of child language, we have a long association with Dan Slobin stemming back to our graduate school days at Berkeley in the early 1970s. Dan was a frequent associate at the Language Behavior Research Lab, which housed linguistic anthropologists in those days. He had recently produced the ground-breaking *Afield manual for cross-cultural study of the acquisition of communicative competence* (Slobin, 1967), which was the practical basis for a number of the first PhD dissertations examining child language development in non-Western societies (e.g., Stross, 1969; Mitchell-Kernan, 1972), was helpful in our own field research directed at adults in Mexico and in Tamilnadu, India, and has inspired a succession of such field manuals from the MPI, Nijmegen. Little did we realize then that, some 30 years later, Dan would still be a major intellectual stimulator of our research, including that reported here.

## INTRODUCTION

In this chapter, we examine the implications of a major recent finding for Slobin's notion of'thinking for speaking.' The finding is that in many societies people neither speak nor spatially reckon in terms of left and right, but rather in terms of fixed directions like north and south (see Majid, Bowerman, Kita, Haun, & Levinson, 2004, for a summary; Levinson, 2003, and Levinson & Wilkins, 2006 for the full facts). This implies a strong measure of cognitive diversity in one of the most crucial domains

[1] This chapter is based on 'Linguistic and cultural factors in learning an absolute spatial system,' a talk by P. Brown delivered at the Piaget Society meetings. Berkeley, California, in June 2001. A revised version was presented at the Workshop on Developmental Studies in Spatial Language and Cognition in Geneva in February 2005. We are grateful to participants at these two venues for helpful feedback.

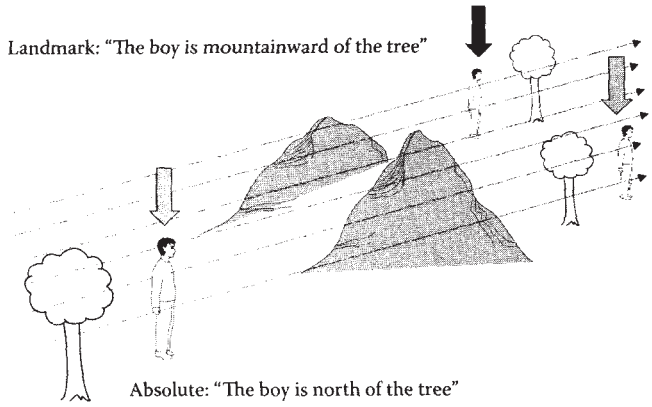


Figure 33.3 Landmark vs. true absolute systems.

"The boy is mountainward of the tree" specifies a different direction on the other side of the mountain, whereas the absolute description "The boy is east of the tree" does not. In this respect landmark descriptions are like arrays described in an intrinsic system: the internal organization of the array (here: boy, tree, mountain) has to be satisfied, but the description tells you nothing about the direction of the whole array, unlike an absolute description. Think about the array being in a large box: now ask yourself if the description tells you how the box is oriented. If it does, the description is in an orientation-bound frame, either relative or absolute; if it doesn't, it's in an intrinsic frame. Although by this test, landmark systems are best treated as a special kind of intrinsic system, the language Tzeltal does not treat them grammatically or semantically in the same way as other intrinsic expressions (like 'at the front of'). Therefore, in the treatments below we code and label landmark responses separately from other intrinsic responses.

It has to be conceded that as the virtual box (the size of the intrinsic array) gets larger and larger the distinction between absolute descriptions and intrinsic landmark use may effectively blur, but it is important to understand the conceptual distinction. For one thing, there's reason to think that landmark use of one kind or another is probably universal, but absolute systems are not—many languages have no way to indicate abstract fixed bearings, and speakers of most do not employ them colloquially and would certainly never use them to describe small-scale arrays.

Now, an abstract absolute system, requiring an internalized 'mental compass,' is presumably harder to learn to use than landmarks. If we assume (not unreasonably) that children everywhere can readily use local environmental cues in spatial tasks, we would predict that children start out with landmark terms, then slowly graduate to the more abstract absolute terms. Early on, children may even understand adults' absolute terms in landmark ways (see de Léon, 1994, on children's use of absolute terms in the related language Tzotzil). According to this commonsense view, landmark usage should precede absolute terms used absolutely. This we now set out to check.

## FARM ANIMAL INTERACTIONAL GAMES

### *Method*

The task focuses on production for children aged 5 and older. The data are primarily cross-sectional, supplemented by some longitudinal data. The elicitation stimuli consist of 12 Farm Animal photos, portraying toy farm animals, people, trees, fences, and drinking troughs in various arrays. Participants were 5 adult Director-Matcher pairs, 4 pairs of adult Directors to child Matchers, and 22 child Director-Matcher pairs in 4 age groups ranging from age 5 to 16. The participants were grouped as described in Table 33.1.

TABLE 33.1 Data Summary: Tzeltal Farm Animal Games

| Group | Players (D=Director, M=Matcher) | Number of D-M Pairs Sampled | Age Range* of Ds | Age Range of Ms |
|---|---|---|---|---|
| I | D age 5–7 | 5 | 5;7–7;8 | 4;3–13+ |
| II | D age 8–10 | 8 | 8;1–9;8 | 6;1–13+ |
| III | D age 11–13 | 6 | 11–13+ | 6;0–9+ |
| IV | D age 14–16 | 3 | 14+–16+ | 7+–14+ |
| V | Adult D to Child M under age 7 | 4 | adult | 4;1–6;9 |
| VI | Adult D to Adult M | 5 | adult | adult |

* + in the age indicates that the child was unable to provide exact date of birth.

Visually screening off the Director from the Matcher proved impracticable with the children, so for all the child games the Directors were seated behind the Matcher so that they could see the Matcher's progress and respond to misconstruals, but the Matchers could not see the Director's stimulus photo and had to rely on the verbal descriptions. In the adult–adult games, Director and Matcher were side by side, visually screened from each other.

## *Analysis*

The interactional games were videorecorded and transcribed in the field. Spatial descriptions produced by all Directors in the data establishing a direction, an angle on the horizontal, were identified and coded into the following categories:

**deictic** (DEIC):[4] 'coming,' 'going' [toward/away from speaker]
**absolute** (ABS): *ajk'ol* 'uphill,' *alan* 'downhill,' *k'atal* 'acrossways,' *moel* 'ascending,' *koel* 'descending' [when used with the absolute frame of reference, 'uphill' and 'ascending' meaning roughly south, 'downhill' and 'descending' roughly north]
**intrinsic** (minus landmark) (INTR):[5] 'back,' 'face,' 'foot,' 'butt,' etc. [bodypart terms used as Grounds within the scene being constructed]
**relative** (REL): *k'atal* 'across' [when used to mean across speaker's line of gaze']; also absolute or intrinsic terms used relatively (e.g., *moel* 'upward' used to mean 'farther away from us' or *pat* 'back' used projectively to mean 'behind']
**landmark** (LND): 'the bed,' 'the door,' 'the electricity post,' 'the path,' etc. [landmark terms used as Grounds outside of the scene being constructed]
**sunset/sunrise** (SS):[6] 'sun setting place,' 'sun rising place'

A total of 5332 spatial descriptors establishing a direction were coded (note that many utterances employ more than one descriptor—e.g., 'put the cow uphill coming (toward us)' is coded as ABS (for 'uphill') and DEIC for 'coming'). Examples of each category are given in Table 33.2.

[4] In coding the data we did not consider all types of 'deictic' usage, since virtually every utterance included morphemes meaning (roughly) 'this' or 'that.' We restricted ourselves to deictic uses of the directionals *tal* 'coming' and *bel* 'going,' which indicate directions (for placement or facing) toward or away from the speaker. Other categories of spatial language that we also coded for (distance, position, topological 'at') are not relevant to specifying direction and orientation of objects in the array and are therefore ignored in what follows. We also have omitted from the data reported here any forms ambiguous between absolute and relative or intrinsic interpretations, e.g., where *k'atal* can mean either 'across the north/south slope of the land' (ABS) or 'across the line of our sight (REL),' unless it was clear in the context which interpretation was intended.

[5] The intrinsic system of Tzeltal is not described here, but see Brown & Levinson (1993), Levinson (1994), Brown (2006). It involves a fixed set of body parts like 'face,' 'back,' 'side' with precise spatial meanings.

[6] As mentioned, these are intermediate between ABS and LND terms; they provide geocentric directions but these are tied to specific mountains and are subject to significant solstitial variation, unlike the true absolute terms.

TABLE 33.2 Examples of Spatial Descriptions (in Gloss) in Farm Animal Games

| ABS | INTR | LND | SS | REL | DEIC |
|---|---|---|---|---|---|
| pig to downhill (5–7) | underneath the pig's nose (5–7) | (toward) edge of the bench (5–7) | to sunset (11–13) | at the back of (i.e., behind) the little tree (8–10) | uphillward coming here (5–7) |
| uphillward to above the tree (8–10) | pig in the middle (between trees) (8–10) | (toward) the lime tree (8–10) | to sunrise, to sunset (adults) | first, last (meaning left, right) (11–13) | put it coming here (8–10) |
| and the little tree just uphill here; put the cow below it! (11–13) | put the pig at the fence's back (i.e., outside it) (14–16) | toward where there's a nail (in the table) (8–10) | | put the trough acrossways [relative to our line of sight] (adults) | and the pig here coming downhill-ward (11–13) |
| to downhill put its little nose; well sideways here to downhill (14–16) | make the horse look at the tree (11–13) | toward Turuwit (mountain) (11–13) | | | |

*Note:* Absolute (ABS), Intrinsic (INTR), Landmark (LND), Sunset/Sunrise (SS), Relative (REL), deictic (DEIC); age group of speaker in parentheses.

## *Results*

A summary of the results for each age group is provided in Table 33.3. For each of the six different age groups, we present the proportion of linguistic forms in the Directors' Farm Animal descriptions for each of the six spatial categories described above.

Most noteworthy in these results is the fact that the spatial descriptors for all of the groups look remarkably the same in several categories: deictic information was always the most frequently used, and, with the single exception of the adult-adult group, absolute and intrinsic descriptions were always second and third most frequent. The outstanding difference across groups is in the use of landmark terms: these were very rare (6% or less) in the child groups from age 5 to 13, and rather more frequent (12%) from age 14 to 16. Adults when speaking to child Matchers under the age of 7 used around 10% landmark terms, but when speaking to other adults, landmark usage jumped dramatically to 25%, with a corresponding drop in the proportion of absolute terms by the adults.

We can see that the children in Group I hardly used LND descriptions (just 3% of their 464 spatial descriptors). In fact these were all produced by children aged 7; the 5- to 6-year-olds used no landmark terms. Those used by the 7-year-olds are restricted to just three types: '(to) the edge of table/bench,' '(to) where mama is,' and 'beside Ermi's hand.' These children in Group I relied very heavily on the deictic adverbs 'coming/going' (42%). They also used intrinsic body parts freely: e.g., 'put its nose at the cow's chest.' Four of the five children used absolute terms as well, about as often as intrinsic; absolute was usually used correctly but was often not explicit with respect to the figure and

TABLE 33.3 Directional Language Usage in Tzeltal Farm Animal Games

| | DEIC | ABS | INTR | LND | SS | REL | Total |
|---|---|---|---|---|---|---|---|
| I. CHILD 5–7 | 42% | 27% | 27% | 3% | 0 | 0 | 464 |
| II. CHILD 8–10 | 38% | 35% | 23% | 5% | 0 | 0 | 968 |
| III. CHILD 11–13 | 40% | 28% | 24% | 6% | 2% | 1% | 889 |
| IV. CHILD 14–16 | 35% | 29% | 25% | 12% | 0 | 0 | 469 |
| V. ADULT – CHILD | 40% | 27% | 22% | 10% | 0 | 0 | 860 |
| VI. ADULT – ADULT | 30% | 14% | 22% | 25% | 8% | 1% | 1682 |
| | | | | | | | 5332 |

ground objects. For specifying precise angles the children used gesture, not landmark terms. The 3% exceptions indicated that lack of landmark usage was not always due to lack of competence—some of the 7-year-olds at least were capable of using landmarks, but on the whole used absolute instead. On the basis of their usage we may conclude that children aged 5–7 know where the absolute 'up'/'down' directions are, and know that they are the conventional way to express directional information.

The children in Group II, aged 8–10, showed a dramatic improvement in the explicitness of spatial descriptions. All of them used absolute terms accurately, and distinguished absolute placement ('cow downhillward of horse') vs. absolute facing ('cow facing downhillward') information. They still had very little landmark usage (5% of their total spatial descriptions), but showed some productivity: all but one of the 8 children used landmarks at least once and their 44 tokens were distributed across 24 different types (e.g., 'to Letti,' 'to the roof,' 'to the orange tree,' 'in line with Mario'). They very occasionally used absolute terms in a relative frame of reference (where 'up' = 'away from me'), a usage possibly derived from schooling in Spanish.

The children in Group III, aged 11–13, were confident in their use of absolute terms. Four of the six children in Group III also showed a range of uses of landmark terms, with 49 tokens and 15 types of a similar range to that of Group II; one child (age 11) also used the sunset/sunrise terms.

Landmark terms were much more in evidence in the data from the 14- to 16-year-olds in Group IV, comprising 12% of their spatial descriptors, with 25 distinct tokens. Predominantly, these references were 'to you/me,' 'to your/my bodypart,' or else to the edge of the table/bench on which the array was being constructed. The range of the rest was comparable to that of the children in Groups II and III.

Adults speaking to children under 7 also used relatively few landmark terms. Clearly the adults treated landmarks and sunset/sunrise terms as not suitable for directing children in this task. It was with the adult-adult pairs where the use of landmarks really came into its own; here the Directors produced 410 tokens. The adults exploited a feature of landmarks—an ad hoc landmark can be found in any conceivable direction—to provide precise characterizations of exact angles at which to place the referent.

All the data for children and adults are graphically represented in Figure 33.4.

To sum up, child Directors by age 5–7 already described the spatial relations depicted in this task naturally and frequently in absolute terms such as *ajk'ol* 'uphill' or *alan* 'downhill.' There was, incidentally, and contrary to the suggestions in Li & Gleitman (2002), no apparent facilitation of absolute usage when the players were outdoors as opposed to indoors. There was almost no landmark usage among the youngest, and landmark usage is the only category showing a developmental trend

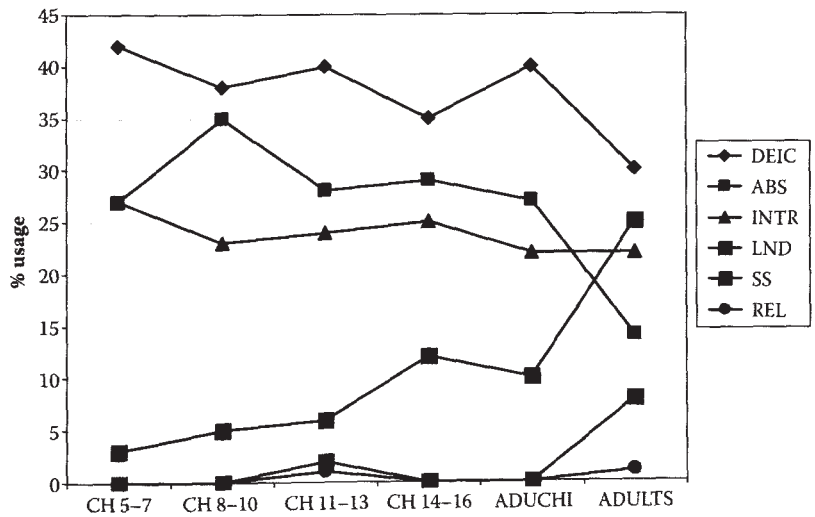


Figure 33.4 Proportions of types of directional usage in Tzeltal Farm Animal Games.

of gradual increase with age. There was only marginal sunset/sunrise usage by anyone except the adult pairs. Relative usage of intrinsic terms ('back' as 'behind') and of absolute terms ('acrossways' meaning 'at an angle orthogonal to viewer's line of gaze') occasionally appeared in the data of adults, but were extremely rare in the children's data.

We may conclude on the basis of the evidence from their performance on these space game tasks that Tzeltal children do *not* use landmarks at first, prior to absolute, at least not in this task. When they have difficulties communicating, they do not fall back on local ad hoc visible landmark cues. This is in contrast to the adults, who, when there are problems, switch strategies and use local ad hoc landmarks (the dog, the bed, the electricity post, etc.). In these data, landmark usage does not precede absolute, even if it is supposedly simpler, more concrete, and 'more natural.'

The children's failure to use landmarks is probably due to less flexibility and inventiveness than adults—they are less good at seeing what the Matcher doesn't understand and at thinking of a new way (e.g., a more fine-grained angle) to phrase the spatial relation at issue. And they are less concerned with precision, more willing to say 'yes, it's the same,' when the array produced by the Matcher is not exactly the same as that portrayed in the stimulus photo. Tzeltal adults, however, find precision important in this task and landmarks make greater precision of angle possible.

## CONCLUSIONS

Our results from these space games show the following:

1. Children use the abstract absolute system confidently and frequently from the earliest age cohort we have sampled here (from age 5). There is in fact remarkably little development in the use of directional language from age 5 to age 16: children of all ages use pretty much the same proportions of absolute, intrinsic, and deictic specifications to make the spatial discriminations required by the task. Only in a few cases do any of them use a relative frame of reference, making front-back or acrossways discriminations relative to their own viewpoint.
2. We find no evidence of development from children's use of the more concrete landmark cues to the more abstract absolute system, as one might have a priori expected. It could be that this development has already occurred by age 5, the earliest age sampled (as suggested by the Tzotzil study of de León, 1994). However, that seems unlikely, as the only developmental trend in the data is in the reverse direction: the increase of landmark specifications over successive age groups.
3. The production data of adults vary depending on the addressee. When adults talk to child Matchers, their data show a similar pattern of distribution of the different categories as that produced by the older children. When they talk to adult Matchers, their use of absolute specifications is halved, and their use of landmark specifications increases by threefold.
4. The explanation for the increase of landmark specifications is clear enough. Adults are attempting a level of precision that cannot be communicated by the abstract absolute system alone, which only divides directions into four 90-degree quadrants. To give more precise angles, local landmarks can be brought into play, so one can say in effect 'heading southward, toward Red Cliffs,' now precise to, say, 20 degrees of arc. Caring about precision and having the inventive means to produce it are what mark fully adult speech.

We turn now to consider how consistent these results are with a 'thinking for speaking' perspective. Clearly, speaking in terms of absolute coordinates rather than left–right ones does require at the very least a different conceptualization of a scene at the time of speaking. But from a developmental perspective, we would expect a gradual increase of mastery of the absolute system over the age-range we are examining—after all, such a system presupposes a complex geometry of the kind sketched in Figure 33.3. And the only half-way house would seem to be a landmark system. But we

find no such development. This suggests that the acquisition of an appropriate 'thinking for speaking' in early to middle childhood is not the only thing going on in this domain.

On the other hand, there are some telling details that fit a 'thinking for speaking' perspective. A typical finding in that perspective is a special progression toward a dominant pattern in a language, where minor alternatives exist. For example, although English allows locutions of the kind *He entered the room on all fours*, speakers are likely to prefer *He crawled into the room*, because that fits the predominant tendency in English to encode manner in the verb and path in the preposition. Further, a typical Slobin finding is that children gradually acquire this preference, and for a while (usually around age 8) 'hypercorrect,' banning the available alternatives, before developing in their teens a more adult flexibility that permits the minor alternative encodings for special effects (Berman & Slobin, 1994). A glance at Figure 33.4 shows that some such patterns can be detected: Children indeed use a quarter more absolute specifications at ages 8 to 10 than at the other ages. And adults freely use landmark specifications where helpful to the task, reducing their absolute usage concomitantly—a pattern of flexibility that teenagers can be seen gradually acquiring.

The study described above, then, suggests that the early development of the absolute system is a mystery, but otherwise the 'thinking for speaking' perspective fits the data.

We turn now to see how the 'thinking for speaking' perspective fits the wider picture derived from other studies of absolute thinking and speaking. A first point concerns the time stability of the cognitive style involved in speaking a specific language. In the 'thinking for speaking' perspective this cognitive style is "evanescent," it's a frame of mind invoked just for speaking: you have to think in the categories of the language in order to voice your thoughts, but when you've stopped speaking, all bets are off—the Tenejapans, for example, might then go back to *thinking* in terms of left and right. In short, 'thinking for speaking' makes of the speaker only a fleeting Whorfian. But we have a wide range of data from other studies that show that Tenejapans think just like they speak, in absolute and intrinsic terms, even when not involved in language production (see Levinson, 1996, 2003, pp. 146–169). We think this is best explained in what could be called "bottle-neck Whorfianism": if your language provides no output for left/right thoughts, you'll have to remember spatial arrays in (say) north/south terms which do permit linguistic expression. Otherwise, when it comes time to speak, the thoughts will be in the wrong format, and one which cannot be post hoc converted into the right one for speaking (Levinson, 2003, pp. 57–58). So the non-verbal cognition data require a stronger version of the Slobin paradigm, a 'thinking for later possible speaking.' A developmental version of this would hold that the child gradually learns to think the right way, so that plain thinking comes over time to match 'thinking for speaking.'

A different set of studies addresses the issue of why we see so little development in the child's mastery of the absolute frame of reference. These suggest that there is something special about the domain of spatial coordinate systems, which is not to be found in other domains explored in the 'thinking for speaking' paradigm. The distinctions between the coding of manner and path in language, a domain where the 'thinking for speaking' paradigm works so well, are distinctions which would hardly arise in a non-linguistic species. But spatial thinking obviously has a rich phylogenetic history before language, and indeed there is a huge literature on the spatial cognition of different species, where spatial coordinate systems have played a prominent role. Thus it makes sense to come back to the questions raised at the outset: what is the prelinguistic Ur-state of spatial cognition in the human infant? Is she a relative thinker, an absolute thinker, both, or none of the above, a blank slate perhaps?

Recently, work in our research group has thrown some light on these questions about underlying cognitive initial states, which are obviously difficult to answer directly. The approach has been to examine our nearest primate relatives, as well as human infants and children, using the very same non-linguistic cognitive tasks. A first study (Haun, Call, Janzen, & Levinson, 2006) examined a different but related aspect of spatial thinking: whether we identify locations by object properties of the landmark or by the place where the target is. The study looked at all the members of our family, the Hominidae, that is, all the great apes including humans. All the apes, including 1-year-old human infants, remembered locations primarily in terms of the place where the target is rather than its

object properties. This amounts to using a coordinate system—either absolute or relative—in preference to a topological system, mere propinquity to a featured landmark. But 3-year-old (German) children reversed this preference. Since language is one of the major new conceptual tools mastered between 1 and 3, we interpret this as showing a likely effect of language on spatial thinking: 3-year-olds have learned through language to attend to object properties of the target (this is what learning concrete nouns is largely about). In other words, being a linguistic species may make a difference to the underlying, phylogenetically inherited spatial cognition: it introduces new possible strategies.

But now we want to know, of that initial preference for a coordinate system, which kind—absolute or relative—is the preferred kind for non-linguistic members of our Hominidae family. A second study (Haun, Rapold, Call, Janzen, & Levinson, 2006) examined the issue of relative vs. absolute frames of reference directly. Again all the great apes were examined together with 4-year-old German children, using a relational task in which bait was shown being hidden under one of three cups, and then the subject was rotated and had to choose between another set of three cups to find the object. The results show that across the great apes there's a preference for absolute (or at least allocentric) spatial coding in this task. And the German 4-year-olds do the same. Using a slightly more complex variant of the task for older humans (five cups rather than three), we compared adults and children of around 8 years old in two cultures, one (= Akhoe Hai//om speakers of Namibia) where the spatial language preference is absolute, and one (Netherlands Dutch) where the language preference is relative. The results on this non-linguistic task show that by age 8 or over, the preference goes along with the language —we find cognitive diversity matching the linguistic diversity.

We interpret these results as showing that a blank-slate approach to human spatial cognition is clearly wrong. All the evidence points to a phylogenetic bias throughout our family Hominidae in favor of a preference for absolute, or at least allocentric, spatial coding. This is in startling contradiction to the long tradition, most strongly voiced by Kant, that has viewed our own Western left–right systems as conceptually foundational (see Levinson, 2003, pp. 9–14).

So now we have perhaps some insight into the lack of observed developmental trends in the Tenejapan data: the children do not have to slowly abstract out an absolute system from a more concrete landmark system, for they are able to build directly on the underlying primate default in favor of, plausibly, absolute coding. They still have to learn, of course, to instantiate the special Tzeltal form of this system, with its specific named directions, 90-degree quadrants, and so forth, which is why we see the telling features of 'thinking for speaking' predicted by Slobin (hypercorrection at age 8, growing flexibility in the teens). In contrast, Western children, by implication, have to override this primate default in favor of a system that emphasizes an egocentric, relative conceptualization of space. This suggests that left–right systems should be slower to acquire, and so indeed they seem to be. The acquisition of language apparently makes possible this cognitive flexibility to override or modify a default—in this case, we have not only 'thinking for speaking,' but 'speaking for thinking.'

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