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Distinguishing three-dimensional forms from their mirror-images: Whorfian results from users of intrinsic frames of linguistic reference

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ABSTRACT

Mopan (Mayan) speakers, who rely heavily on intrinsic frames of reference in spatial language, also classify two-dimensional forms intrinsically on a non-linguistic task (Danziger, 1999). This is compatible with the predictions of the Whorf hypothesis, but could also be an artifact of using 2D materials in a population with low literacy levels. This paper reports that Mopan speakers categorize even 3D objects as predicted by intrinsic encoding, thus increasing support for the Whorfian interpretation of their performance. A group of US English speakers shows the opposite tendency, confirming that task performance is under cultural, and therefore perhaps linguistic, influence.

1. Introduction[1]

The question whether linguistic reference to spatial relations correlates with preferred spatial problem-solving strategies has in recent decades become a major focus of language-and-thought inquiry. Space has become an area where Whorfian claims have been strongly made, empirically supported, and in turn fiercely contested. At stake is some of the clearest evidence for the revival of the Whorfian claim that contingent facts of language structure actually have an effect on cognitive processes like memory, reasoning, and "worldview" (Whorf, 1956 [1940]). Much of the evidence from space supports the claim, since in experimental settings of several types and in many languages, spatial problem-solving strategies have been shown to match differential predictions derived from documentation of language-particular descriptive strategies (Pederson et al., 1998).

One obvious question remains to be settled – are these correlations evidence of causality, and if so, in which direction? But opponents of the Whorfian claim have also attacked the empirical evidence for the correlation itself.[2] The history of one counter-claim and the response to it (Li and Gleitman, 2002; Levinson et al., 2002) has shown that it is imperative for the

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[1] Mopan orthography in this paper follows that of the ALMG (England and Elliott, 1990). Glossing abbreviations follow where possible the Leipzig glossing rules as found at http://www.eva.mpg.de/lingua/pdf/LGR09_02_23.pdf and are as follows: 1 – First Person; 2 – Second Person; 3 – Third person; A – Actor/Possessor Pronoun; B – Undergoer Pronoun; COMP – Complementizer; CONJ – Conjunction; DEM – Demonstrative; DET – Determiner; DUR – Durative; DX – Deictic; IPFV – Imperfective; IRR – Irrealis; LOC – Locative; NEG – Negator; OST – Ostensive; PASS – Passive; PL – Plural; PREP – Preposition; Q – Interrogative; REL – Relativizer; SCOPE – Scope; TR – Transitive; TRR – Transitivizer.

[2] Li and Gleitman claim for example (2002), that under certain task circumstances, US English speakers readily use 'absolute' cognitive solutions despite their non-use of absolute linguistic encoding. However, their claim rests on the mis-assignment of *any* allocentric FoR to the absolute sub-category (see Levinson et al. (2002) for refutation).

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debaters to share an understanding of the particular frame of reference (FoR) classification which is at stake, if they are to avoid arguing at cross purposes (see also Danziger, 2010).

Clarification of terminology and concepts in the FoR literature is especially important when the discussion turns to languages – like those of Mesoamerica – which make heavy use of intrinsic strategies to accomplish spatial reference, and some of which may make little if any use of other strategies in the crucial comparative context (Danziger, 1996, 1999, 2001, papers by other authors in this issue). Many existing experimental tasks are ineffective in offering Whorfian predictions for cognitive strategies under these circumstances (Pederson et al., 1998; Danziger, 2001, Bohnemeyer, this issue), since intrinsic usage in language usually predicts more than one correct solution at the cognitive level on these tasks. In what follows I report recent results from a cognitive task which has been specially designed to offer a Whorfian prediction for heavy intrinsic FoR users that will distinguish them from other populations. The task has only one correct solution, thus also eliminating any possible confounding of consultants' problem-solving strategies by their attempts to guess at the experimenter's desired solution (cf. Pinker, 2007; Li et al., 2011). Comparison of performance on this task between speakers of Mopan (Maya) and a group of US English speakers yields a significant difference in the direction predicted by linguistic relativity. Cross-cultural variation in conceptual frames of reference therefore here runs parallel to–and may derive from–variation in the frames of reference used in speech.

2. A cognitively-oriented classification of frames of reference in language use

I make use of a set of distinctions developed in Levinson (1996), modified in Danziger (2010), and lightly adapted to the terminology of O'Meara and Pérez Báez (this issue). This classification of linguistic frames of reference contrasts egocentric with allocentric frames on the one hand, and binary (or 'intrinsic') with ternary (or 'extrinsic') frames on the other (Levinson, 1996; Danziger, 2010).[3]

Unlike earlier versions (Levinson, 1996), this matrix identifies two types of binary ("intrinsic") FoRs just as there are two types of ternary ("extrinsic") frames (Danziger, 2010). The term "intrinsic" is therefore used here in the same sense as in Levinson (1996) to refer to any FoR usage in which the anchor is identical to the ground. The term "extrinsic" is used to contrast with it at the same level, i.e. to refer to any FoR usage in which anchor is distinct from ground. New terms ("object-centered", "direct") have been added to unpack the intrinsic frames of reference according to their egocentric/allocentric properties, just as the extrinsic frames have traditionally been distinguished ("relative" and "absolute"). Any use of any one of these terms in this paper should be taken to be in the sense defined by Table 1.

The classification separates FoR types according to their sensitivity to rotation possibilities of participant, ground, and figure-ground array (Levinson, 1996, modified in Danziger, 2010). In identifying four rather than three separate frames of reference, the classification follows the logic of rotation sensitivities to these three criteria to its fullest conclusion (Danziger, 2010).

Such a criterion for assignment of a particular piece of language usage to a FoR category is eminently practical. Since cognitive tasks designed to investigate effects of spatial language use on non-linguistic spatial problem solving have from the beginning been built around rotation manipulations, this classification ensures that each FoR type possesses a unique signature in terms of rotation sensitivity, which can in turn be used for cognitive investigations. Other typologies and classifications, developed on other principles and for other purposes, are of course also legitimate – but less well suited to matching language type with predictions for non-linguistic problem-solving strategies under rotation.[4] Reliance on rotation sensitivities as the final classificatory diagnostic not only keeps classificatory types at the level of language tightly connected to empirically testable cognitive correlations, it also inhibits unfettered proliferation of linguistic FoR "types" each time a slightly new configuration is encountered. Entries in column B of Table 2 (rotation of speech participant) distinguish the two allocentric frames (absolute, object-centered) from the two egocentric frames of reference (relative, direct). Columns C and D on the other hand, distinguish the two extrinsic frames (absolute, relative) from the two intrinsic ones (object-centered, direct).

3. Mesoamerica

In Mesoamerica, the abundant use of 'body-part' terms as spatial relators has long been recognized as an areal feature (Campbell et al., 1986). As the papers of this special issue make clear, such constructions are widely used in this region for the linguistic description of the location of spatial figures with respect to their grounds. The following examples are from Mopan Maya, a language of the Yucatecan (Mayan) subfamily spoken in Southern Belize and Western Guatemala. These

[3] I use Talmy's (1983) terminology, in which 'figure' refers to the entity that is to be located in a spatial expression, and 'ground' to the entity with respect to which the figure is located. In addition, I use Levinson's (1996) notion of 'anchor' – the point from which a matrix of vectors is projected, one of which identifies the direction to be followed from the ground to find the figure. Finally, a notion of 'participant' will be useful: the 'participant' is the locus of psychological perspective for a spatial representation. In most cases the 'participant' is the speaker of a linguistic expression or the solver of a spatial-cognition task, but in some cases the participant may be the linguistic addressee, and in others the participant may even be a third person, as long as this entity has the subjectivity features normally characteristic of speech participants (Benveniste, 1966 [1958]), as in some cases of the generic observer (e.g. English *one*).

[4] Note for example that because of the reliance on rotation sensitivity as the typing criterion in the classification presented here, characterizations of particular cases of language usage as "geocentric" or "landmark" based, as distinct from "absolute" are redundant. These kinds of cases are considered in this classification to be subsumed under the absolute type, since the rotation sensitivities in all of these cases are identical.