Frame of Reference Use in Mesoamerica in the Context of Sustained Contact with Spanish

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Synopsis

Hypothesis

• Central question: are practices of language use
  – Diffused through contact (neo-whorfian)?
  – Modified by non-linguistic factors, ex. education/literacy, environment (Li, Gleitman)?
  – Altered by other factor(s)?

• Hypothesis:
  – The use of the relative Frames of Reference by contemporary speakers of Mesoamerican (MA) languages is largely – possibly exclusively – the result of contact with Spanish.

MesoSpace: team, goals, tools

• NSF award #BCS-0723694
  Spatial language and cognition in Mesoamerica

• MesoSpace aims to contribute to the debate from two angles
  – we are working on a series of studies that pit linguistic against non-linguistic predictors
    • in reference frame use across languages
  – we are also investigating a possible lexico-syntactic factor that may bias speakers against relative FoRs
    • namely the productive use of shape-based meronyms in the representation of space

13 Mesoamerican (MA) languages

– Mayan
  • Ch'ol (J.-J. Vázquez)
  • K’anjob’al (E. Mateo)
  • Tseltal (several variants; G. Pollan)
  • Yucatec (J. Bohnemeyer)

– Mixe-Zoquean
  • Ayutla Mixe (R. Romero)
  • Soconusco (S. Gutierrez)
  • Tecpatán Zoque (R. Zavala)

– Oto-Manguean
  • Juchitán Zapotec (G. Pérez Báez)
  • Otomi (N. Hernández, S. Hernández, E. Palancar)

– Huave (S. Herrera)

– Purépecha (A. Capistran)

– Totonac-Tepohuan
  • Huehuetla Tepehua (S. Smythe)

– Uto-Aztecan
  • Pajapan Nawat (V. Peralta)
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- Frames of reference
- MesoSpace: team, goals, tools
- Data: the Ball & Chair study
- Qualitative data
- Quantitative analysis:
  - the distribution of the response variables
  - the impact of the predictor variables
- Discussion and conclusions
- Appendix: the linear regressions

Frames of reference

- background on reference frames
  - two kinds of place functions (Jackendoff 1983)
    - i.e., functions from reference entities into regions
      - topological (Piaget & Inhelder) – perspective-frame-free
        » independent of the orientation of the ground, the observer, and the figure-ground array (the configuration)
  
(1.1) The apple is on the skewer
(1.2) The band aid is on the shin
(1.3) The earring is in the ear (lobe)

- alternative classifications and subtypes

Frames of reference (cont.)

- projective -framework-dependent
  - the place function returns a region defined in a coordinate system centered on the reference entity
  - the axes of the coordinate system are derived from an anchor
    » in intrinsic frames, the anchor is the reference entity
    » in relative frames, it is the body of an observer
    » in absolute frames, it is some environmental entity/feature

Frames of reference (cont.)

- finding: a great deal of crosslinguistic variation
  - in terms of both availability and preferences

Figure 1. Some configurations that might be described in terms of topological place functions

Figure 2. The three types of spatial FoRs distinguished in Levinson 1996, 2003

Figure 3. Reference frame types and their classification

Figure 4. Reference frame use in small-scale horizontal space across languages (Bohnemeyer & Levinson ms.)
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**Spatial reference frames in language, culture, and cognition**

- alignment between language and cognition
  - preferences for particular frame types in discourse and recall memory covary

**Table 1. Animals-in-a-Row in Levinson 2003: the large sample**

<table>
<thead>
<tr>
<th>Linguistically</th>
<th>Relative</th>
<th>Non-verbal coding will be absolute</th>
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<tbody>
<tr>
<td>Arabic</td>
<td>0.43</td>
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<td>Thai</td>
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<td>Yucatec</td>
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</table>

The role of language contact

- Neo-whorfian view
  - Language is a system of transmission for nonlinguistic cognition
    - this suggests that not only a person’s L1, but also their L2/L3/…, may affect their cognition

- experimental support
  - Athanasopoulou 2006
    - advanced Japanese-English bilinguals pattern with monolingual English speakers in the cognitive processing of number
  - Athanasopoulou 2009
    - L2 influence on color naming and color categorization in Greek-English bilinguals

Frames of reference use in Mesoamerica

- MA languages have been reported to make use of the relative FoR in discourse with much less frequency than in other languages
  - Tenejapa Tzeltal
  - O’Meara and Pérez Báz 2011 (eds.)
  - MA language sample: Tarascan (Isolate), Tzeltal and Yucatec (Mayan), Ayutla Mixe (Mixe-Zoquean), San Llifónos Tulepec Otomi and Juchitán Zapotec (Otomi-Manguean), Mesoño Cora (Uto-Aztecan)
  - In no case was the relative FoR the preferred FoR type in either orientation or location descriptions.
  - Highest frequency of use of the relative FoR
    - Yucatec: 17% of orientation descriptions and 18% of the location descriptions (Bohnemeyer 2011)
    - Still, not the preferred strategy
  - Bias against the use of the relative FoR
    - Tarascan: 1% of orientation descriptions and 4% of location descriptions (Capistrán Garza, 2011)
    - Juchitán Zapotec: Not used at all in orientation descriptions, 3% of location descriptions. (Pérez Báz, 2011)

Frames of reference: summary and hypothesis

- Premise:
  - If language plays the role suggested by Neo-Whorfian accounts (Pederson et al 1998, Levinson 2003, contra Li & Gleitman 2002), both first and second languages should have an effect on FoR preferences.

- Mesospace hypothesis:
  - The use of the relative FoRs by contemporary speakers of Mesoamerican (MA) languages is largely – possibly exclusively – the result of contact with Spanish as L2
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- MesoSpace: team, goals, tools
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The Ball & Chair study (cont.)

- the data set of the present study
  - B&C data from 11 varieties
    - 6 Mesoamerican languages
      - Yucatec Maya (J. Bohnemeyer)
      - Ayutla Mixe (R. Romero)
      - San Ildefonso Tultepec Otomi (N. Hernández, S. Hernández, E. Palancar)
      - Purépecha (or Tarascan; A. Capistrán)
      - Chi’koma Tseltal (G. Polian)
      - Juchitán Zapotec (G. Pérez Báez)
    - 2 non-Mesoamerican indigenous languages
      - Seri (C. O’Meara)
      - Sumu-Mayangna (E. Benedicto, A. Eggleston, Mayangna Yulbarangyang Balna)
    - 3 varieties of Spanish
      - from Barcelona (A. Eggleston), Mexico (R. Romero), and Nicaragua (A. Eggleston)
- coding
  - we coded descriptions of the location of the ball
    - distinguishing among eight categories (see Figure 3 above)
      - allocentric intrinsic
      - egocentric intrinsic (‘direct’; Danziger 2010)
      - egocentric extrinsic = relative
      - intrinsic and relative aligned (Carlson-Radvansky & Irvin 1993)
      - geocentric (= geomorphic, landmark-based, or absolute)
      - vertical absolute
      - vertical absolute and intrinsic aligned (Carlson-Radvansky & Irvin 1993)
      - topological (no reference frame involved; Piaget & Inhelder 1956)

The Ball & Chair study (cont.)

- all of the languages in the sample have the lexical and grammatical resources for using all FoR types
  - in no case does the grammar or lexicon of the language constrain the use of particular frame types
  - reference frames are semantic patterns
    - which are only indirectly related to particular lexical items
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Qualitative Data

- In San Ildefonso Tultepec Otomi the use of the relative FoR occurs almost only in conjunction with the loanword *lado* ‘side’ (< Sp. lado) (Hernández Green et al. 2011)
- Polian & Bohnemeyer 2011 present evidence of increased use of relative FoRs in Tzeltal varieties possibly as a result of contact with Spanish.

SIT Otomi

(1) Ø=beng-a=no=r pelohta *n’a lado*
3.PRS=lie.A-B=DEF=SG ball one side
‘The ball is lying on the side.’

The word *lado*

- The relative FoR accounts for only 3.6% of the total number of propositions.
- However, the majority of these expressions (82.6%) contain the word *lado*.

Tzeltal

- Brown and Levinson (1990s)
  - Tenejapas hardly use relative FoRs

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  - Relative uses of these terms in Tzeltal may be due to contact with Spanish.

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Tseltal: Lum, Tenejapa

- Use of relative FoRs: 14%
  - as opposed to 9% in Ch’ajkoma
  - 10% of the Lum population are Spanish monolinguals
  - Cha’jkoma has 100% native speakers of Tzeltal
- Four out of five pairs used relative FoRs at least once.
  - Pair 4: only pair to use ‘left’ and ‘right’ terms
    - Native and Spanish terms were used
  - use of relative FoRs accounts for 47% of their descriptions and 59% of all relative uses in the overall results.
- Speakers of pair 4 are neither the youngest nor the most educated
  - This suggests that bilingualism, a linguistic factor, may play a more important role in the use of relative FoRs than the non-linguistic factors of education and literacy.

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The distribution of the response variables

- the flow of the quantitative analysis
  - step I: identify the response variables that showed the greatest differentiation among participants
  - response variables
    - the (frequency/probability of) use of each of the eight strategies we coded the data for
  - step II: linear regressions to find the predictor variables significantly contributing to the variance
    - in those response variables identified in step I
    - predictor variables:
      - L1, L2 use, literacy, education, (topography, population geography)

The distribution of the response variables (cont.)

- the similarity matrix
  - for each participant, we calculated a set of eight frequencies
  - these sets can be interpreted as points in an octodimensional space
  - the distances between the points represent the similarity across the participants’ responses
  - we calculated the distances in the “Manhattan” metric
    - where the distance between two points is the sum of the differences of the coordinates
  - we can use this similarity measure to analyze
    - how the responses cluster
    - which factors predict the similarity between participants

The distribution of the response variables (cont.)

- how do the participants’ responses cluster?
  - we ran a three-dimensional Multi-Dimensional Scaling (MDS) analysis of the similarity matrix
    - three dimensions produced a better goodness of fit than two
    - cf. Schiffman et al 1981

Figure 15. Plotting the first two dimensions of the MDS analysis
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Discussion

- The MDS analysis shows that the participants differentiated themselves most strongly in their use of relative and geocentric frames of reference with the topological and intrinsic strategies as runners up.

- The question now: which factors predict which of these strategies a speaker/dyad selects?
  - Candidate predictor variables:
    1. L1
    2. L2 (… Ln)
    3. Literacy
    4. Education
    5. Topography
    6. Population geography
  - The linear regression we present in the following tests (1) – (4)

The impact of the predictor variables

- To analyze the role of the predictor variables, we conducted several linear regression analyses.
- We tested separate models for the strongest differentiating response variables:
  - The use of relative and geocentric frames.
- We tested these models for two sets of populations:
  - On all 11 populations
  - With the predictor variables areal-linguistic affiliation (see below!), literacy, and education.
  - On the speakers of the indigenous languages only
    - Now including the L2 use of Spanish as a predictor variable.

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The impact of the predictor variables (cont.)

- The areal-linguistic affiliation variable:
  - Our dataset includes too many individual languages for a parsimonious model.
  - Therefore, we grouped the languages according to areal-linguistic affiliation.
    - Yielding a three-level variable for the 11-populations models
      - Languages of the Mesoamerican sprachbund, Spanish, and the two non-Mesoamerican indigenous languages.
    - And a two-level variable for the models that include the responses from the speakers of the indigenous languages only
      - Mesoamerican sprachbund languages vs. non-Mesoamerican indigenous languages (Seri and Sumu)
The impact of the predictor variables (cont.)

• discussion: the role of the first language
  – the L1-Spanish speakers differed significantly from the speakers of the indigenous languages
    • using relative frames overall much more frequently and geocentric frames overall much less frequently
    • this finding conforms to the Neo-Whorfian predictions
  – this contribution of L1 cannot be reduced to a combination of any of the other factors
    • to this extent contra Li & Gleitman 2002

The impact of the predictor variables (cont.)

• discussion: the role of the nonlinguistic factors
  – literacy, assessed in terms of the frequency of reading and writing, is a significant predictor of frame use
    • this variable makes a significant independent contribution affecting the use of geocentric FoRs, but not the use of relative FoRs
      – presumably, speakers who read and write more frequently are less likely to use geocentric frames
    – in contrast, we did not find any effect of education
  – overall, this picture is consistent with the varying role of education and literacy across our sample
    • some of the indigenous populations have high education scores across the board
      – and nevertheless use geocentric frames more frequently than relative ones
      – especially the Juchitán Zapotec and Sumu-Mayangna communities

The impact of the predictor variables (cont.)

• discussion: the role of the second language
  – the speakers of the indigenous languages use relative frames in their native languages more frequently
    • the more frequently they use Spanish as an L2
  – this suggests that habituation to the use of relative frames diffuses through contact with Spanish
    • consistent with the Neo-Whorfians’ view of language as a transmission system for nonlinguistic cognition

The impact of the predictor variables (cont.)

• Conclusions
  • The data presented here suggest that not only do structural linguistic changes diffuse through language contact, but practices of language use do too
  • To our knowledge, this study is the first to provide direct evidence of practices of language use diffusing through language contact
Acknowledgements

• we would like to thank
  — our teachers and consultants, the speakers of the languages the MesoSpace team has been studying
  — our colleagues, the members of the MesoSpace team
  — the National Science Foundation, for the necessary resources to conduct these studies
  — the institutions who have partnered with MesoSpace to lend us support, CIESAS and the MPI for Psycholinguistics
  — Matthew Dryer, Jeff Good, Marianne Gullberg, Florian Jaeger, Jean-Pierre Koenig, Steve Levinson, David Mark, Wolfgang Wöß
  • and the members of the UB Semantic Typology Lab, for advice
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  • for comments on previous presentations of some of the material
  — you!

References


References (cont.)


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Appendix: the linear regressions

- implementation
  - we used generalized linear mixed-effects models (GLMM; cf. Gelman & Hill 2007, Jaeger 2008)
  - implemented using the ARM package in R (Gelman et al. 2012)
  - ‘mixed-effects’ models b/c they include random nested intercepts for individual languages and dyads
    - in addition to the ‘fixed’ effects of the predictor variables and an invariable intercept
  - to avoid over-fitting or lack of independence
  - the probability of a given dyad using any of the eight response categories to describe a particular picture
    - is independent of the probability of them using any other type of frame to describe the same picture

- findings I: GEO, L1-Spanish speakers incl.
  - the fitted geocentric model revealed linguistic affiliation and literacy, but not education, as significant factors
  - there was no effect from membership in the MA sprachbund

- findings II: REL, L1-Spanish speakers incl.
  - the fitted relative model revealed linguistic affiliation as the sole significant factor
  - there was no evidence of an areal effect

- findings III: GEO, L1-Spanish speakers excl.
  - the fitted geocentric model showed literacy as the sole significant factor

- findings IV: REL, L1-Spanish speakers excl.
  - the fitted relative model showed the use of L2 Spanish as the sole significant factor