The principle of canonical orientation revisited: Evidence from Mesoamerican languages

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Outline

- Spatial reference frames and the Principle of Canonical Orientation (POCO)
- MesoSpace: team, goals, tools
- The Ball & Chair study
- Findings
- Discussion

Spatial Frames of Reference

- two kinds of *place functions* (Jackendoff 1983)
  - i.e., functions from reference entities into regions
    - *topological* (Piaget & Inhelder): perspective- or frame-free
      - independent of the orientation of the ground, the observer, and the figure-ground array (the configuration)

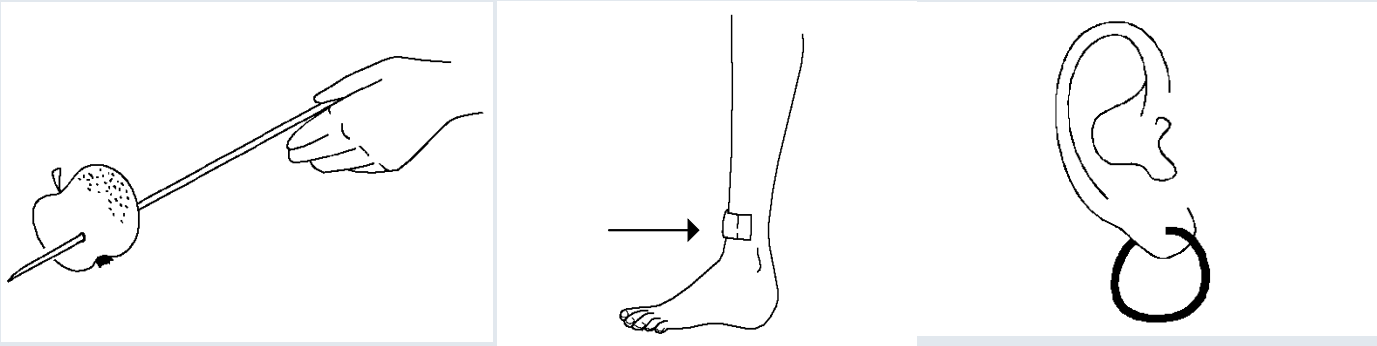


Fig. 1. *Some configurations that might be described in terms of topological place functions*

(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)*

Spatial 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/ground
    - » in **relative** frames, it is the body of an observer
    - » in **absolute** frames, it is some environmental entity/feature

Intrinsic — *The ball is front of the chair.*

Relative — *The ball is to the right of the chair.*

Absolute — *The ball is east of the chair.*

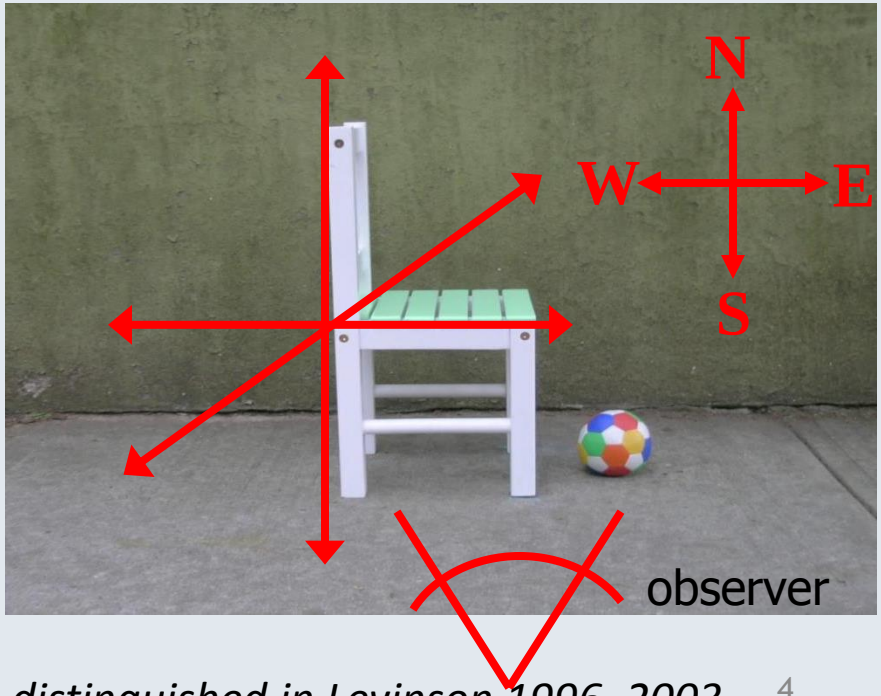


Fig. 2. *The three types of spatial reference frames distinguished in Levinson 1996, 2003*

- Reference frames and the interpretation of spatial relators

	true in a relative frame?	true in an intrinsic frame?
The ball is in front of the chair	Yes	No
The ball is left of the chair	No	Yes

Fig. 3. *Truth conditions of intrinsic and relative descriptions of Ball & Chair 3.9 (left) and 3.12*

The Principle of Canonical Orientation (POCO)

- Levelt (1984, 1996) describes speakers' preference for use of aligned frames
- Intrinsic use requires canonical orientation of ground object
- POCO predicts a constraint against "disaligned" intrinsic frame use

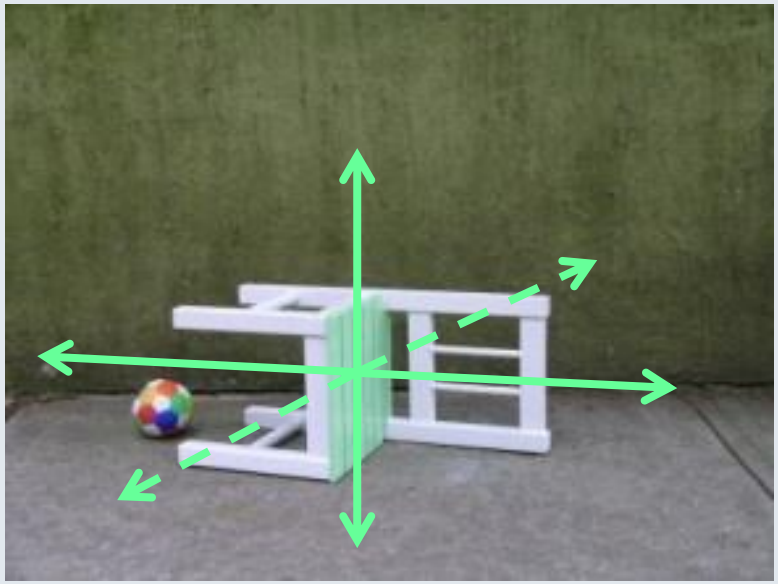


Fig. 4. *A non-canonically positioned chair:*
#'The ball is under the chair.'

- Experimental research (Carlson-Radvansky & Irwin 1993)
  - Participants describe stimuli, allowing them to observe the effects of each frame type in isolation
  - Findings: the selection of vertical relators depends on their *cumulative* applicability across the three types of frames

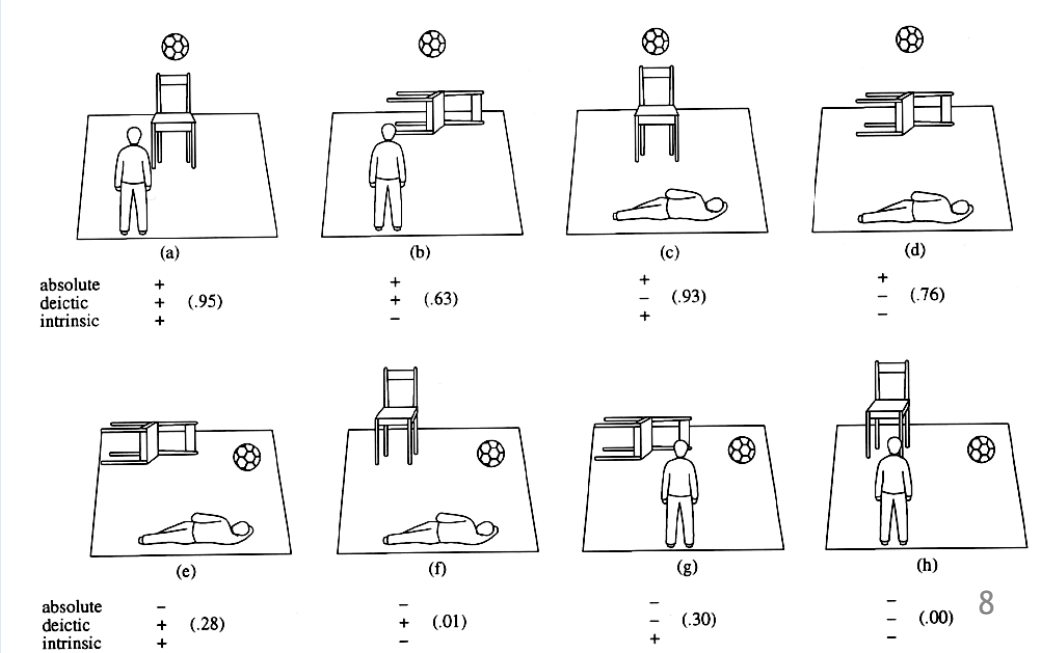
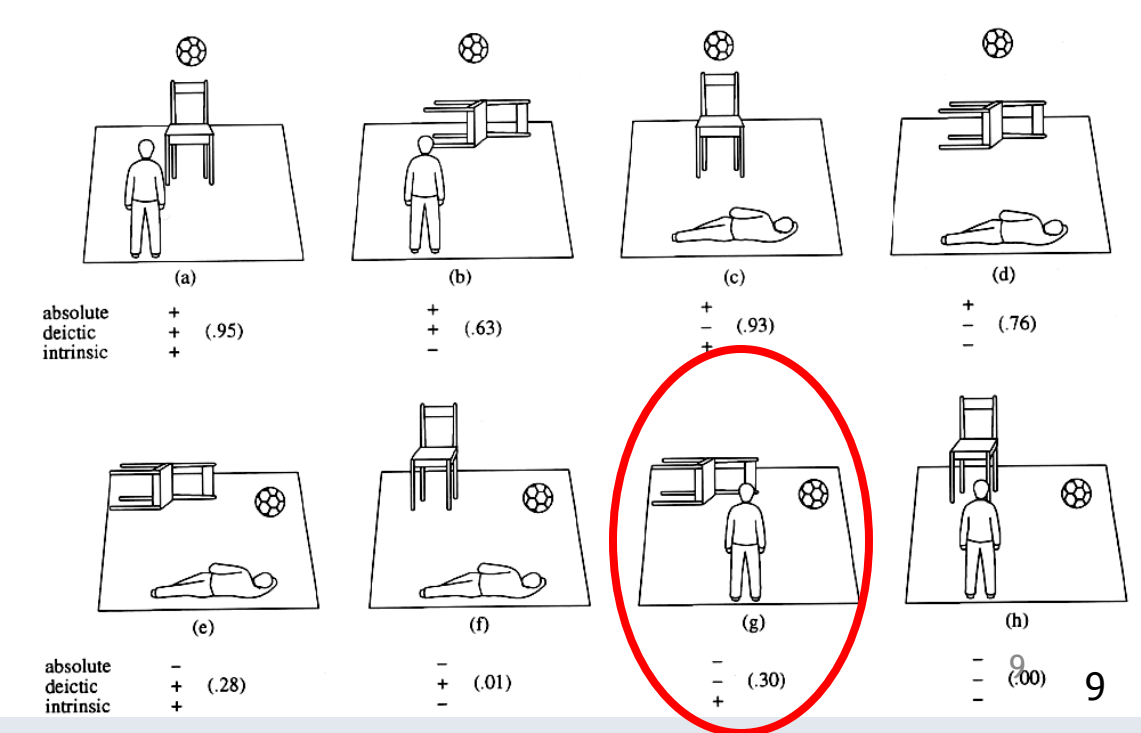


Fig. 5. *Percentage of* above *responses by trial type in experiment 4 of Carlson-Radvansky & Irwin 1993. Trial types are distinguished in terms of the frame types in which* 'above' *is applicable to the stimulus. (The objects shown are not the actual stimuli.) (Levelt1996: 90)*

POCO (cont.)

- (gravitational) absolute frames play the strongest role in licensing vertical relators
  - relative frames play the weakest
- 30% of trials supporting "disaligned" intrinsic frames elicited *above* – in violation of POCO
  - so even in English, POCO is merely a tendency, not an absolute constraint



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- Bohnemeyer & Tucker 2010
  - POCO not always adhered to
  - Yucatec speakers make use of a ground object's axes and use an intrinsic frame type

Fig. 6. *Ball & Chair Pic 1.6*

An atypical description from English speakers:

(1) # The ball is under the chair.

Yucatec description of Picture 1.6:

(2) Le=bòola=o', **y=àanal** te'l tu'x k-u=kutal máak=o',
DET=ball=D2 A3=underside DADV where IMPF-A3=sit:INCH.DIS person=D2
'The ball, **under** (lit. (at) its underside) there where a person sits…'

Research Questions

- How does POCO apply in other (non-English) languages?
- What factors, if any, might influence the applicability of POCO?

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MesoSpace: team, goals, tools

- *Spatial language and cognition in Mesoamerica*
- 13 Mesoamarican (MA) languages (Campbell, Kaufman, & Smith-Stark 1986)
  - Mayan
    - Chol (J.-J. Vázquez)
    - K'anjob'al (E. Mateo)
    - Tseltal (several variants; G. Polian)
    - Yucatec (**PI: J. Bohnemeyer**)
  - Mixe-Zoquean
    - Ayutla Mixe (R. Romero)
    - Soteapanec (S. Gutierrez)
    - Tecpatán Zoque (R. Zavala)
  - Oto-Manguean
    - Isthmus (Juchitán) Zapotec (G. Pérez)
    - Otomí (N. Hernández, S. Hernández, E. Palancar)

Fig. 7. *MesoSpace: Field sites*

- Huave (S. Herrera)
- Purépecha (A. Capistrán)
- Totonac-Tepehuan
  - Huehuetla Tepehua (S. Smythe)
- Uto-Aztecan
  - Pajapan Nawat (V. Peralta)

MesoSpace: team, goals, tools (cont.)

- 3 non-MA "controls" & Spanish
  - Seri (C. O'Meara)
  - Cora (Uto-Aztecan; V. Vázquez)
  - Mayangna (E. Benedicto, A. Eggleston in collaboration with the Mayangna Yulbarangyang Balna)
  - Mexican, Nicaraguan, and Barcelonan Spanish (R. Romero; E. Benedicto, A. Eggleston)
- 2 (interrelated) domains
  - **frames of reference**
  - **meronyms**

Fig. 8 The *MesoSpace team (most of them)*

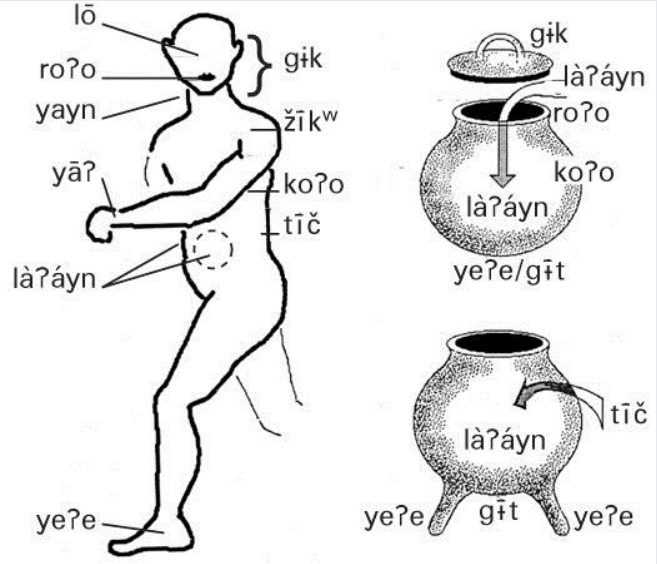
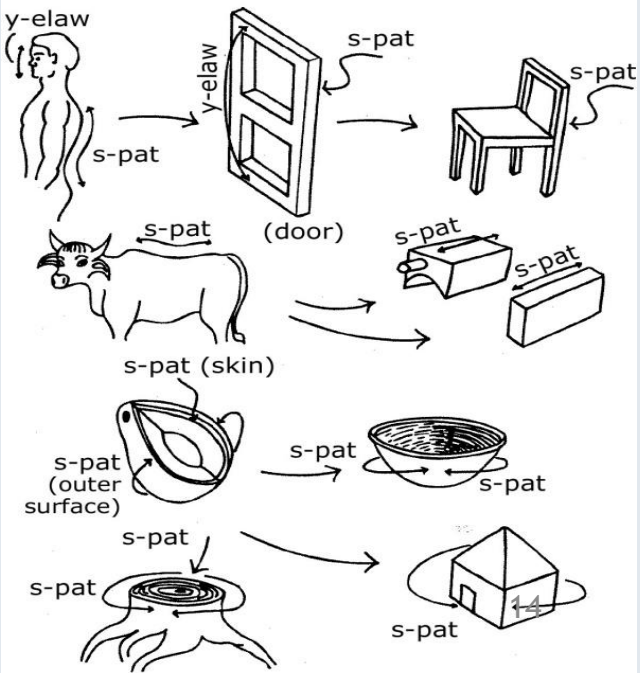


Fig. 9 *Meronyms in Ayoquesco Zapotec (left) and Tenejapa Tseltal (adapted from MacLaury 1989 and Levinson 1994)*



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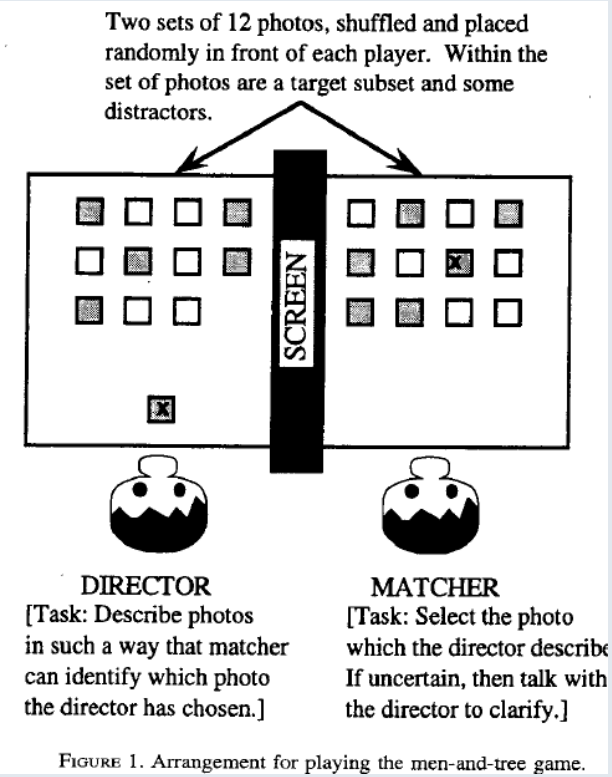
The Ball & Chair study

- Task for studying reference frame use in discourse
  - a referential communication task: Ball & Chair (B&C)
    - replacing Men & Tree (M&T) in Pederson et al (1998) etc.
    - B&C allows us to discover selection preferences for any of the reference frame types
    - 4 sets of 12 photos; ~5 pairs per population

Fig. 10. *Design of the Men and Tree task (Pederson et al. 1998: 562)*



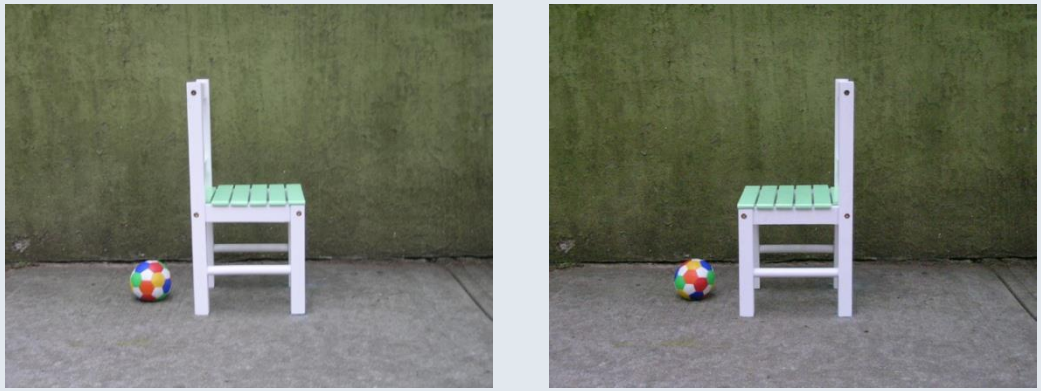


Fig. 11. *Two of the Ball & Chair photos, featuring an intrinsic contrast*

- the present study - B&C data from 11 varieties
  - 6 Mesoamerican languages
    - Yucatec Maya (J. Bohnemeyer)
    - Ayutla Mixe (R. Romero)
    - San Ildefonso Tultepec Otomí (N. Hernández, S. Hernández, E. Palancar)
    - Purépecha (or Tarascan; A. Capistrán)
    - Chacoma Tseltal (G. Polian)
    - Juchitán (Isthmus) Zapotec (G. Pérez)
  - 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
      - **allocentric (or “disaligned”) 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)

- Of the 48 pictures in the set, 10 have configurations that afford POCO violations, where the chair is in non-canonical orientation;
- POCO violations
  - coded as allocentric intrinsic
  - used vertical relators

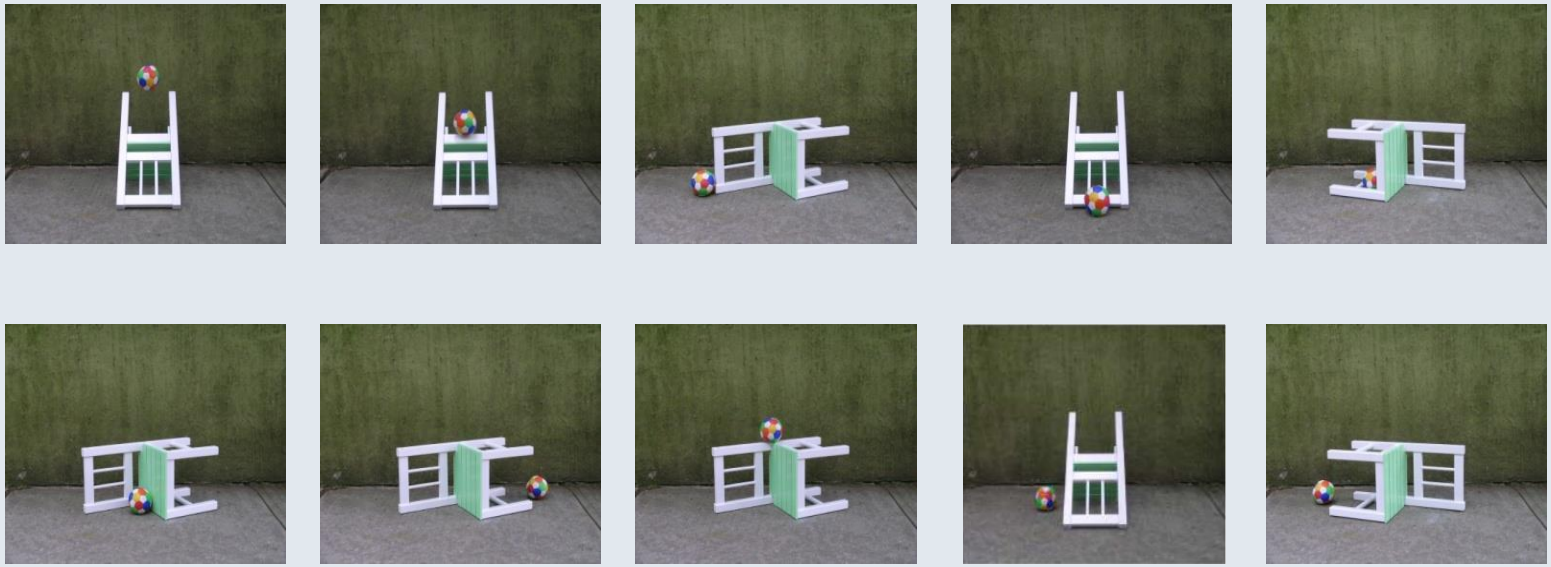


Fig. 12 *Target B&C photos – chairs in non-canonical orientation*

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Findings

- POCO violations occur across languages of the sample

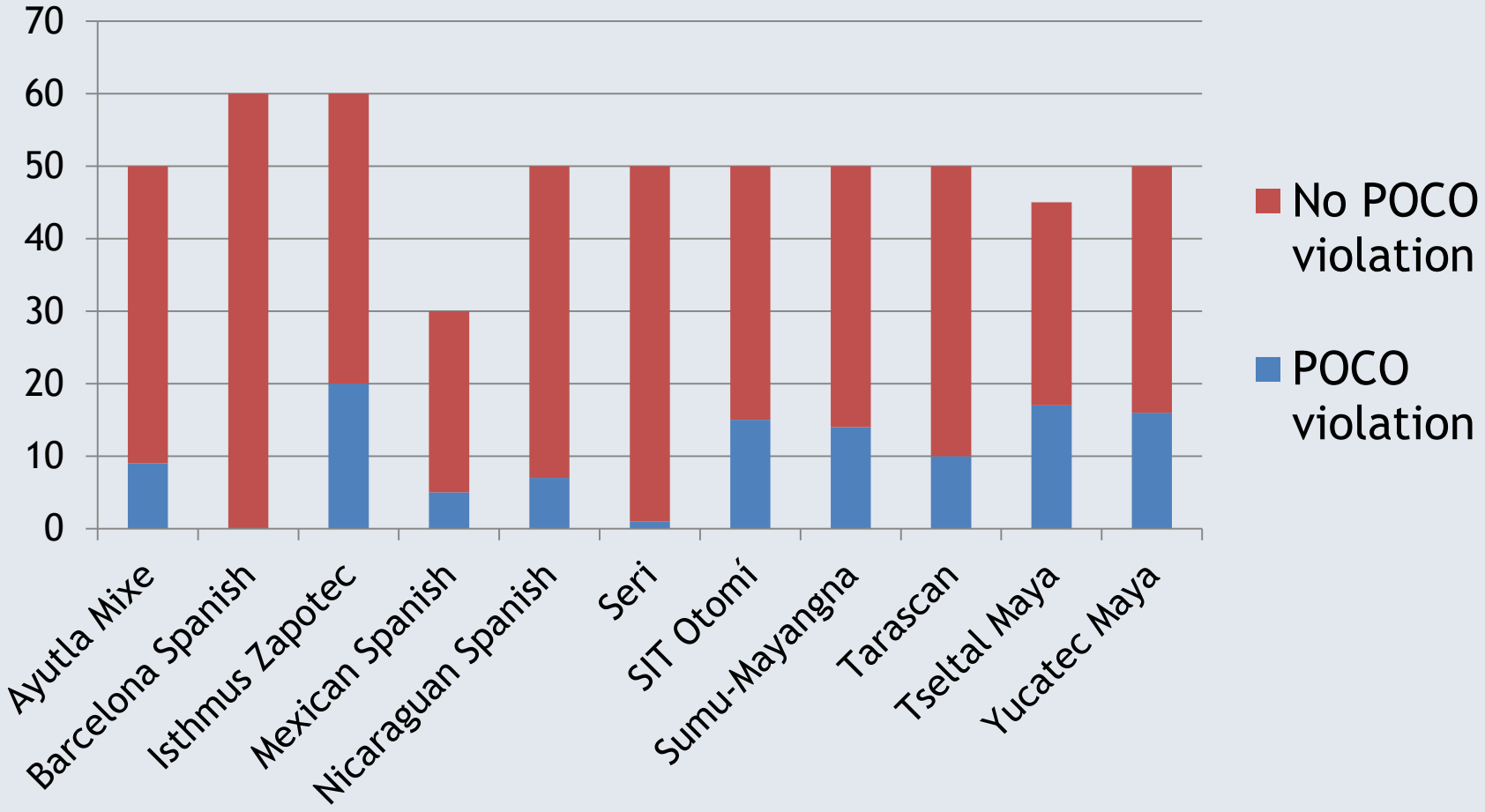

Fig. 13 *Frequency of POCO violations by linguistic variety*

- Fisher Exact test
  - languages differ significantly in their propensity to violate POCO ($p < .001$)
    - i.e. use vertical relators to refer to the ground object's intrinsic axes, even when said object is in non-canonical orientation

- What factors could contribute to this variation between languages?

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Discussion: Influence of the *Sprachbund*??

- Could POCO violability be an areal feature?

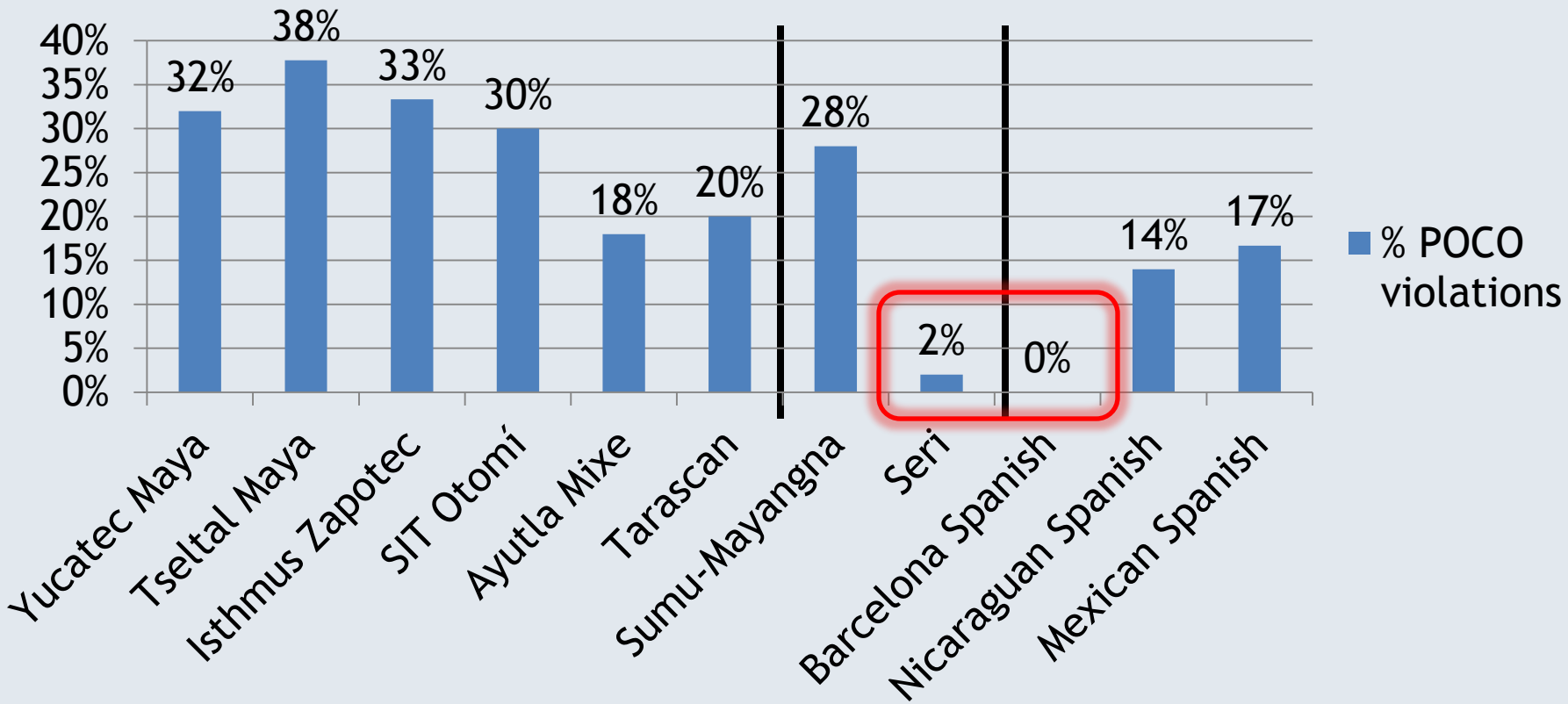

Fig. 14. *Percentage of target photos with POCO violations*

Discussion: Variation an artifact of Intrinsic preference in Mesoamerica?

- Increased POCO violation may be an artifact of increased preference for intrinsic frames
- Compare POCO violations in target items to use of Intrinsic throughout the data set

POCO and Intrinsic use: corelation?

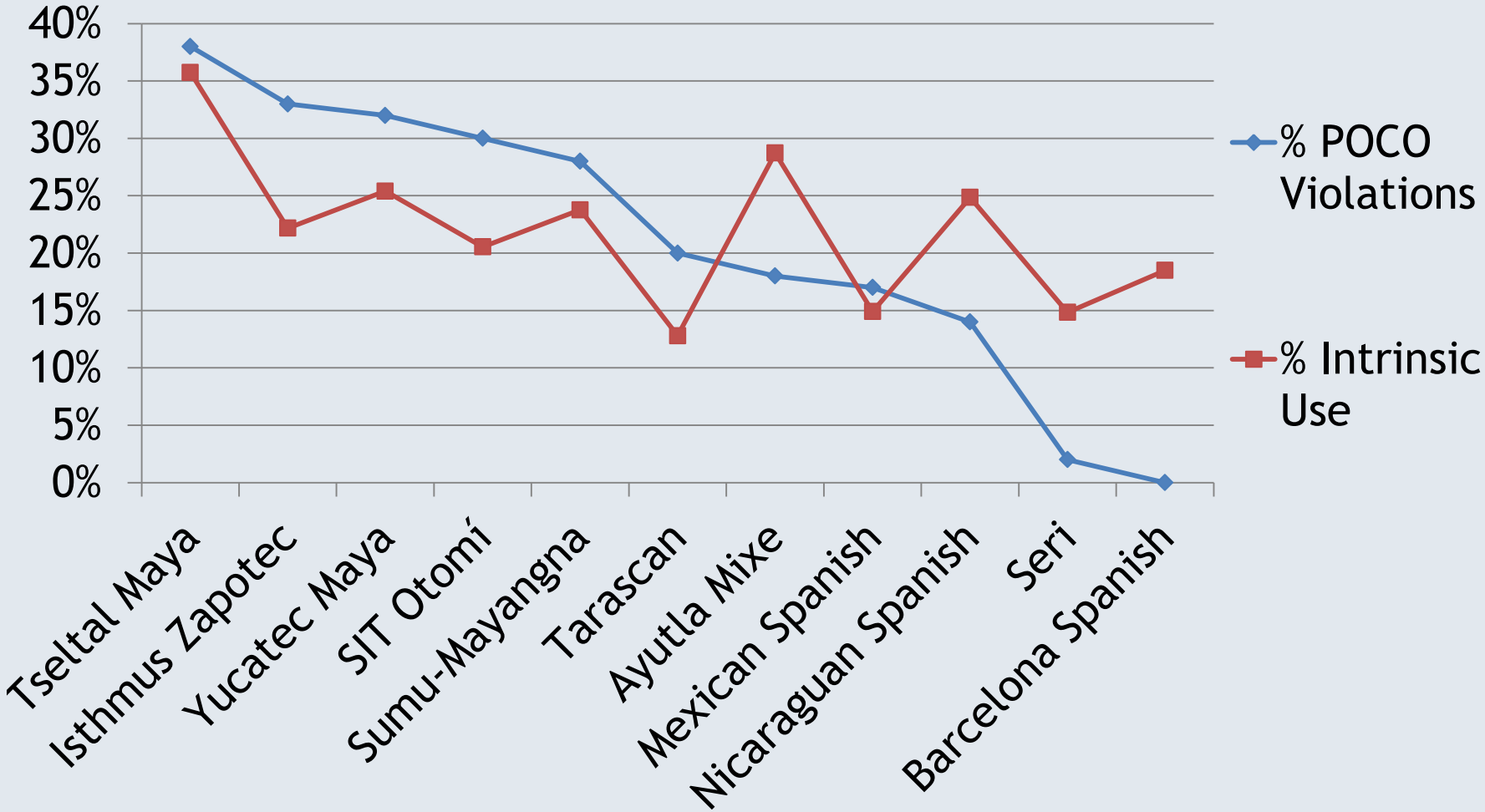

Fig. 15 *Percentages of POCO violations in target photos & use of Intrinsic in all photos*

POCO and Intrinsic use

- Correlation: 0.567276679
- Approaching significance
  - P-value > 0.05
- Suggests a possible effect
  - (needs additional data)

Discussion: Influence of Meronymy?

- Impact of POCO reduced by the pervasive use of meronyms in encoding spatial relations?
  - E.g. Yucatec *àanal*

    bodypart term used

    to denote a spatial region

Fig. 6 *B&C 1.6*

Yucatec description of Picture 1.6:

(2) Le=bòola=o', **y=àanal** te'l tu'x k-u=kutal
DET=ball=D2 A3=underside DADV where IMPF-A3=sit:INCH.DIS
máak=o', kóoh-ol tu=chan ba'l-il (...)
person=D2 hit\MIDDLE-INC PREP:A3=DIM thing-REL

'The ball, **under** (lit. (at) its underside) there where a person sits (it's) touching (the chair's) thing (...)'

Meronymy Data

- Preliminary results from MesoSpace tasks:
  - Subset of data from the Novel Objects task

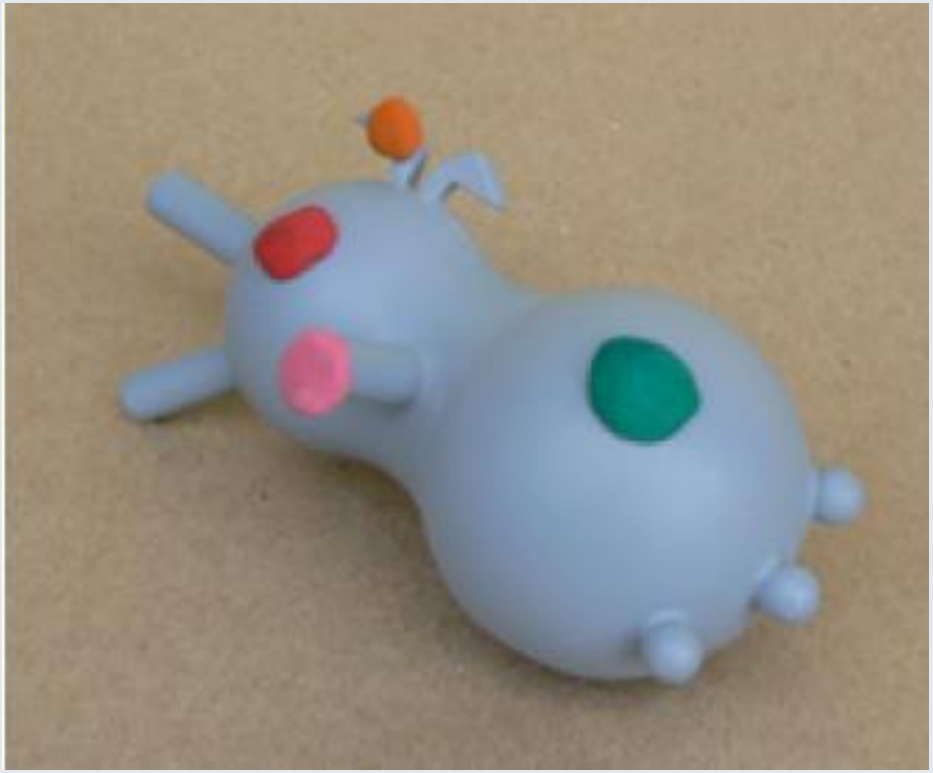

Fig. 17 *Novel Object Part Identification*

Meronymy Data

- Preliminary results from MesoSpace tasks:
  - Subset of data from the Novel Objects task
- Percentage of parts named using meronyms
- If we compare POCO violations to the meronymy usage in languages of the sample, we should see a correlation

POCO and Meronymy

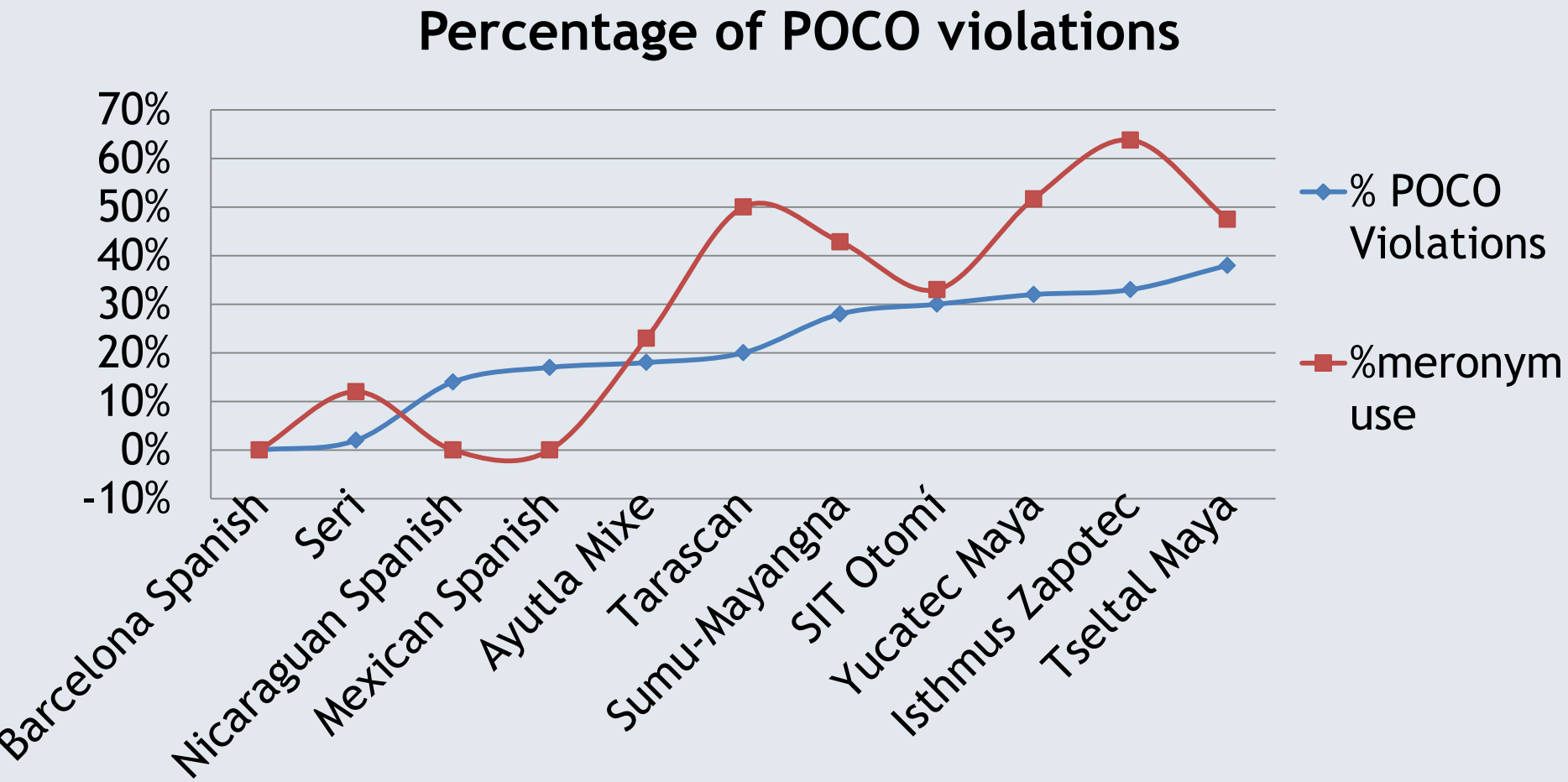

Fig. 18 *Percentage of POCO violations and use of meronyms*

POCO and Meronymy

- Correlation: 0.781261797
- Significant!
  - P-value < 0.01**
- Suggests an effect

Future Directions

- Perform analyses using finalized meronymy results
- Add more languages
- Further investigations of the relationship between meronymy and reference frame use
- Collecting more data using additional Ball & Chair sets

Thanks!

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- All of you!

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