

# Modality vs. Typology: Using spatial dimensionality to investigate the divide

Pamela Perniss<sup>1</sup>, David P. Vinson<sup>1</sup>, Frank Seifart<sup>2</sup>, Gabriella Vigliocco<sup>1</sup>



<sup>1</sup>Deafness, Cognition and Language Research Centre, University College London

<sup>2</sup>Department of General and Comparative Linguistics, University of Regensburg



## Background

The visual-spatial modality of sign languages affords a high potential for iconic/imagistic representation and for encoding visuospatial dimensions (e.g. shape of objects).

Differences in language modality lead to differences in the involvement of imagery and visuospatial cognition (e.g. Emmorey et al. 1993; Vigliocco et al. 2005).

## Research Question

To what extent does *modality* vs. *typology* impact the language-cognition interface?

Compare a “spatially impoverished” spoken language (English) with a “spatially rich” spoken language (Bora) and a “spatially rich” sign language (British Sign Language; BSL).

## Predictions

(a) **Modality:** Affordance of iconic/imagistic representation in the visual-spatial modality predicts differences between spoken vs. signed languages: BSL>English and Bora

(a) **Typology:** Obligatory linguistic encoding of spatial properties predicts differences between users of “spatially rich” vs. “spatially impoverished” languages: BSL and Bora>English

## Language info: Bora

**Family:** Witotoan (Columbian and Peruvian Amazon)

**Morphological type:** Agglutinating

Inventory of ca. 70 noun class markers (classifiers)

- Appear obligatorily on nouns, pro-forms, and modifiers (e.g. demonstratives, numerals)
- **Shape** is primary semantic component

Use of class markers (classifiers) is pervasive in grammar; not restricted to a particular domain, e.g. counting (as with numeral classifiers).

### Examples:

'bench' akui:βe-gwa sitting-CL.PLANK  
'candle' pe:té-i burning-CL.STICK

(Seifart 2005)

### Core set of 8 inanimate classifiers:

saliently one-dimensional:	upright:	-ʔe	(CL.TREE)
	medium:	-i	(CL.STICK)
	pointed:	-ko	(CL.POINTED)
saliently two-dimensional:	straight edge:	-gwa	(CL.PLANK)
	no straight edge:	-hi	(CL.TUBE)
saliently three-dimensional:	general:	-ba	(CL.GENERAL)
	spherical:	-iii	(CL.ROUND)
	oblong:	-ʔo	(CL.OBLONG)

## Language info: BSL

Signs consist of four (phonological) parameters: *Handshape, location, movement, orientation*

The **handshape** reflects visuospatial dimensions of size and shape in two main ways:

- (1) Depiction (2) Manipulation

The handshape represents the object itself



TABLE

The handshape represents manual handling of the object



MATCHSTICK

## Method

### Meaning similarity judgment

#### Triadic task:

Participants were presented with triads of lexical words/signs and asked to decide which two words were most similar to each other in meaning

Because shape is an important conceptual property that speakers may use in judging meaning similarity regardless of their language, semantic neighbors that do not share shape were selected for the triads (based on English word similarity ratings).

#### Stimulus materials:

40 words/signs for objects that differ in shape (dimensionality) as basis for triad creation

1-dimensional (long)	2-dimensional (flat)
scissors	banknote
broom	wall
nail	table
matchstick	blanket
log...	road...

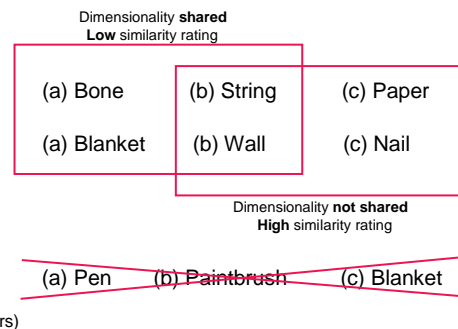
#### Participants:

**English:** 40 native speakers (1-3 triad lists each); 50 lists completed (collection ongoing)

**Bora:** 10 native speakers (5 triad lists each); 50 lists completed

**BSL:** 14 early/late signers (1-5 triad lists each); 24 lists completed (collection ongoing)

#### Examples of triads:

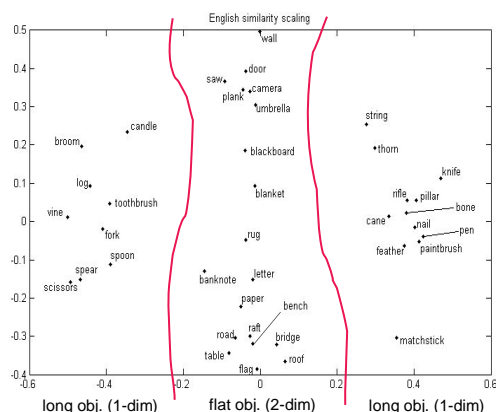


Total triads: 710 (7 lists; 2 orders)

## Results

### Multidimensional scaling analysis (MDS) for English:

English speakers use shape in judging meaning similarity:



### Multiple regression:

Dependent variable: Triadic similarity  
(The probability that a word pair is selected as “similar” across all triads in which it appeared.)

#### For Bora:

	Beta	St. Error	p-value
English	.225	.046	<.001
dimension	.035	.015	.020

#### For BSL:

	Beta	St. Error	p-value
English	.789	.128	<.001
dimension	.043	.021	.039

Enter English triadic similarity for each word pair (as baseline) in first step.

Second step tests whether shape (*shared dimensionality*) predicts any residual variance in Bora or BSL.

Performance of both Bora and BSL participants was predicted by the performance of English speakers, who used shape as a criterion for judging meaning similarity even though English is “spatially impoverished”.

Shape remained a significant predictor for Bora and BSL even after English similarity was factored out.

Shape is more important in Bora and BSL than it is in English.

## References

Emmorey et al. (1993). Visual imagery and visual-spatial language: Enhanced imagery abilities in deaf and hearing ASL signers. *Cognition* 46: 139-181.

Seifart (2005). *The Structure and Use of Shape-based Noun Classes in Miraflores (North West Amazon)*. Doctoral dissertation, MPI Series in Psycholinguistics 32, University of Nijmegen.

Vigliocco et al. (2005). Language and imagery: effects of language modality. *Proceedings of the Royal Society: Biological Sciences* 272(1574): 1859-1863.

## Summary

### Modality:

- No significant difference between signed and spoken modality: Bora and BSL both differ significantly from English.
- Sensitivity to spatial distinctions is not necessarily a modality-dependent effect (between modalities).

### Typology:

- Significant difference between typologically different spoken languages: Bora and English differ significantly
- Modality-independent typological differences (within modalities) play a role and are important to investigate.