How Does Language Affect Spatial Memory: Insights from L1 German and Spanish Data

Dietha Koster, Teresa Cadierno
University of Southern Denmark

Kenny Coventry
University of East Anglia

Outline

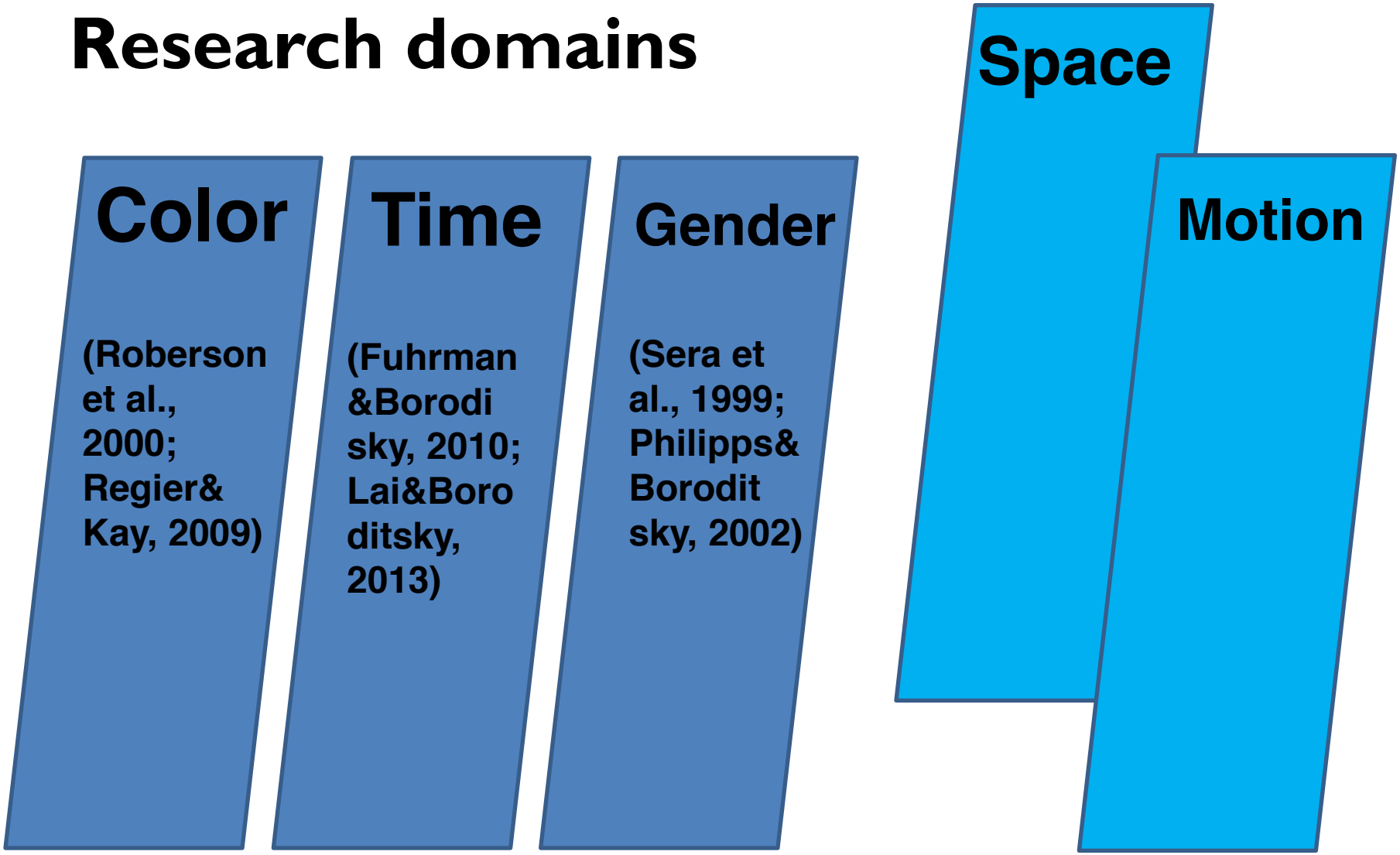
- Theoretical background
- Method (participants, design, materials, procedure)
- Analyses & Results
- Discussion & Conclusion
- Ongoing research

Linguistic relativity

- *"users of markedly different grammars are pointed by their grammars toward different types of observations and different evaluations of externally similar acts of observation, and hence, are not equivalent observers, but must arrive at somewhat different views of the world."*
- *Language, thought and reality,* Whorf (1956: 221)

- Neo-relativism (Bowerman&Levinson, 2001; Gentner&Golden-Meadow, 2003; Gumperz&Levinson, 1996); do cross linguistic differences affect non-linguistic cognitive processes (such as memorizing, categorizing etc.)? And if so, under which (task) conditions?
- Thinking-for-speaking (Slobin, 2003)

Research domains



Space, motion & memory

Study	Test bed	Languages	Memory term	Presentation linguistic stimuli	Visual stimuli	Effect on memory
Filipović(2011)	Motion verbs	English, Spanish	straight after studying phase	before	videos	Yes
Bosse & Papafragou (2010)	Motion verbs	English, German	10 minutes	during	pictures	No
Coventry et al. (2010)	Spatial prepositions	English, Spanish	750 ms	during	pictures	No
Feist & Gentner (2007)	Spatial prepositions	English	10 minutes	during	pictures	Yes
Gennari et al. (2002)	Motion verbs	English, Spanish	10-20 minutes	before	videos	Yes (Naming Condition)
Papafragou, Massey & Gleitman (2002)	Motion verbs	English, Greek	2 days	before	pictures	No

…

Caused motion; placement verbs

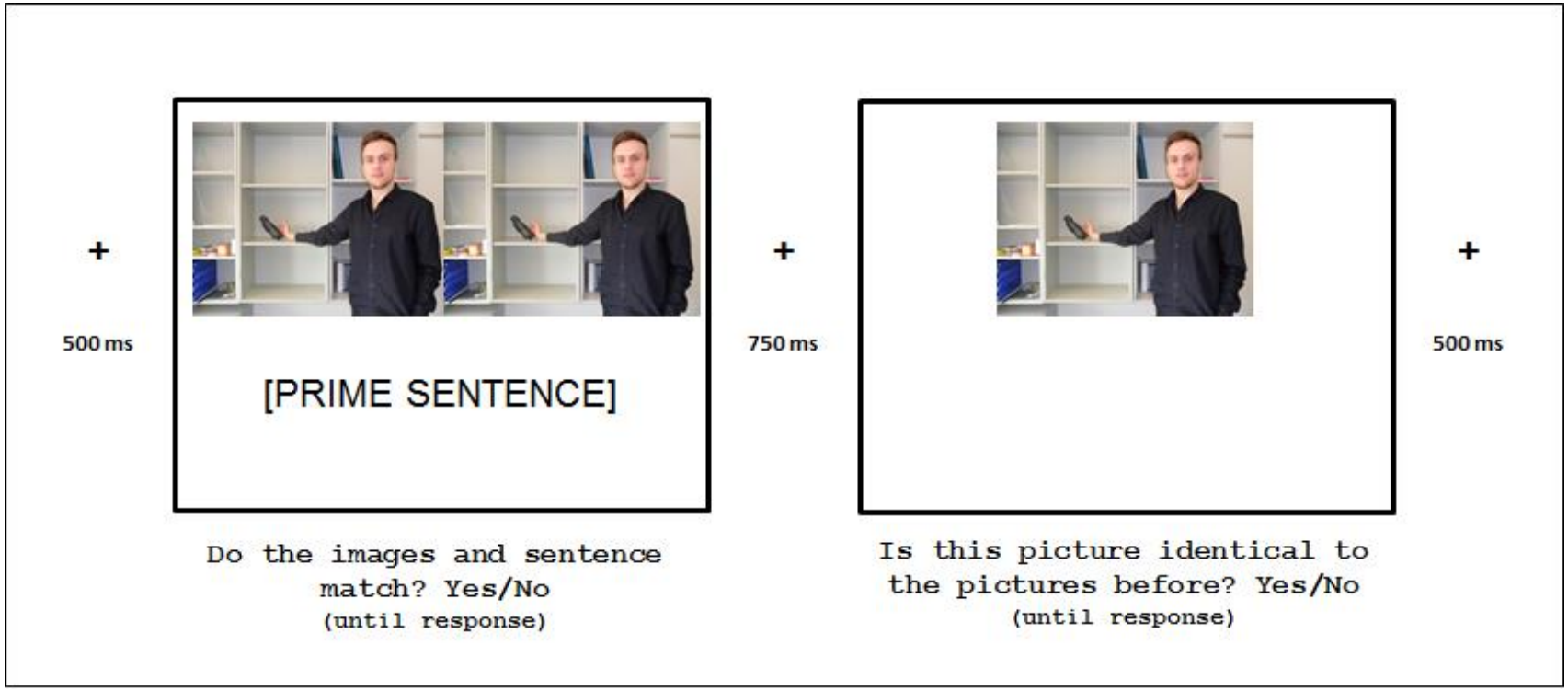
legen (to lay)	stellen (to stand)
poner (to put)	poner (to put)
sie (they)	sie (they)
ellos (they-masc.)	ellas (they-fem.)

Current study

- Do cross linguistic differences in the expression of placement events have an effect on spatial memory?

			Visual memory	Language	
		Domain	Picture manipulation	German	Spanish
1	test	space; motion	spatial orientation changes of objects in pictures	✓	X
2	counter balance	gender	changes in facial femininity/masculinity	X	✓
3	control	neutral	object disappears	✓	✓
4	control	neutral	identical picture	✓	✓

Experimental task



Accuracy (ACC)
Reaction Time (RT)

Linguistic materials

	German	Spanish
Biased	Sie **legen/stellen** das Fernglas auf den Regal. **They lay/stand the binoculars on the shelf.*	**Ellos/ellas** ponen un par de binoculares en un estante. * *They-masculine/They-feminine put the binoculars on the shelf.*
Neutral	Es gibt Männer, Ferngläser und Regale. **There are men, binoculars and shelves.*	Hay hombres, pares de binoculares y estantes.

Picture manipulations

Screen 1 (prime)

Screen 2 (probe)

Placement scenes

Experimental design

- 3 x 4 x 2 experimental design

  - 3 prime sentences (for Germans stellen, legen, neutral; for Spanish ellos, ellas, neutral)
  - 4 picture manipulations (orientation, gender, delete object, identical)
  - 2 language (German, Spanish)

- 48 experimental items (12 trials per placement scene)
- 48 filler items

- Dependent variables: accuracy, reaction time

Participants

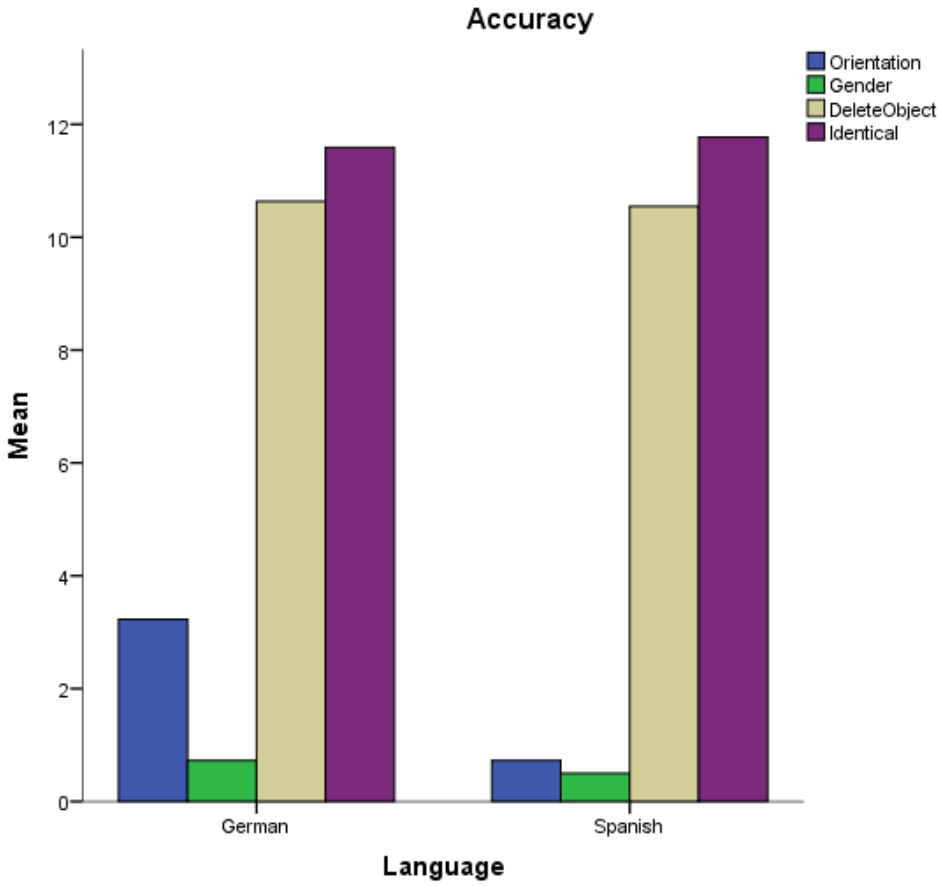
- 27 German university students, recruited at the University of Bremen
- 27 Spanish university students, recruited at the University of Sevilla
- All were mother tongue speakers, who spoke, wrote, read and heard their mother tongue every day. Most participants spoke/had knowledge of English and some other languages, but did not use these frequently.

Analyses

- Participants with 0% correct; 100% the same trials were removed from the data set (5 L1 German; 5 L1 Spanish)

- Extreme outliers in the data set (further away than 2SD from the mean) were removed or winsorized (Field, 2013:196) ; 5.7 % accuracy data; 5.4 % reaction time data on correct trials

Results – accuracy between groups



Results – accuracy between groups

- 2 (language: German, Spanish) x 3 (manipulated picture: orientation, gender, delete object) mixed ANOVA.

- There was a significant interaction between language and picture manipulation with p=0.00.

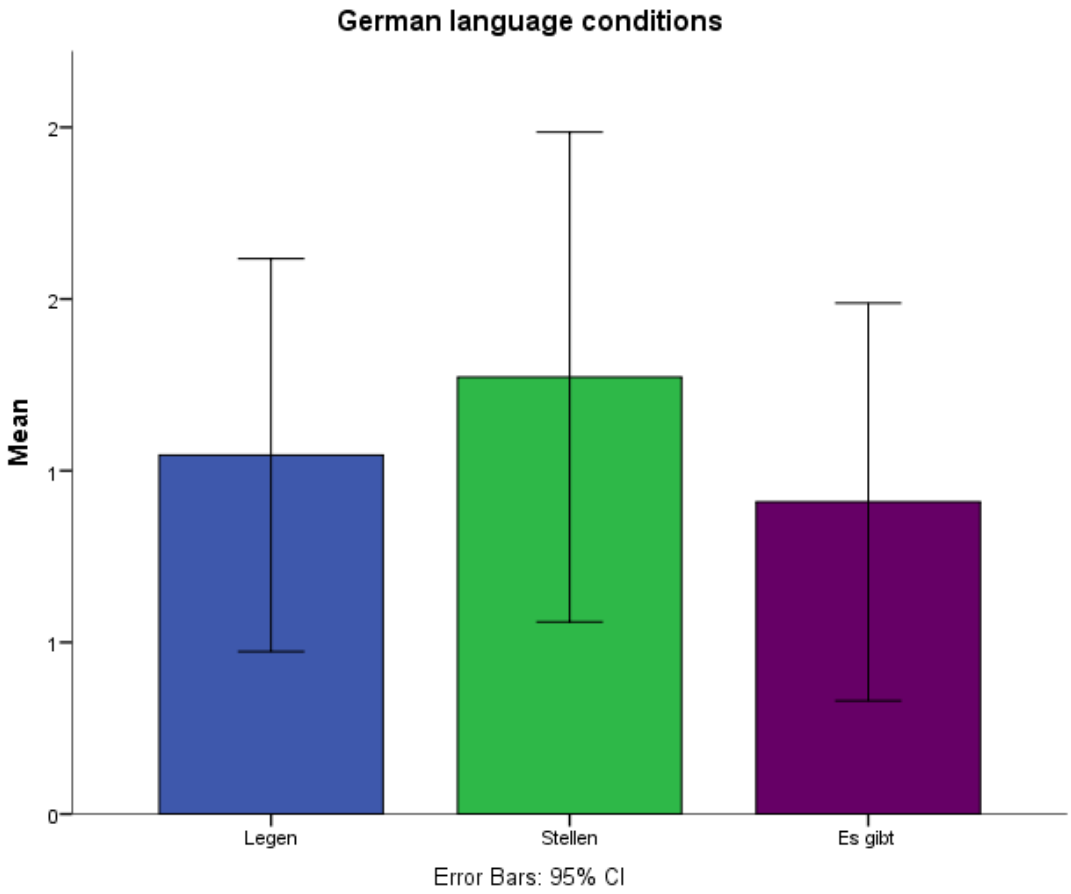
- Contrasts showed that German speakers were significantly more accurate at detecting orientation changes, than Spanish speakers with p=0.01; (German M=3.23, SD=4.05; Spanish M=0.73, SD=1.08).

Results – reaction times between groups

- German: M=1538.77 ms SD=432.65 ms
  Spanish: M=1469.86 ms SD=518.11 ms

- An independent samples T-test on the mean reaction time (RT) for correct responses showed that there were **no significant differences** between the groups with p=0.64.

Results – accuracy within group



Results – accuracy within group

- One-way repeated measures ANOVA for correct responses on the manipulated orientation picture trials.

- The main effect of prime sentence was not significant, with $p=0.06$.

Discussion

- Do cross linguistic differences in the expression of placement events have an effect on spatial memory?

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Discussion & Conclusion

- Between group: Our accuracy results suggest that spatial language can influence short-term visual memory, when language is presented at the same time of encoding of visual stimuli.

- Between group: Reaction time results suggest that our accuracy results are not likely to be a result of a speed-accuracy tradeoff. Control conditions indicate that one group was not simply better at detecting differences/similarities.

Ongoing research

- L2 learners at different levels of proficiency, with a bidirectional design

- L1 speakers:

  - language influence on simulation of object orientation and size (as in Stanfield & Zwaan, 2001)

  - language influence on similarity judgment of placement events (as in Boroditsky, 2002; Gennari et al., 2002)

Thank you for listening!
¡Gracias por escuchar!

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