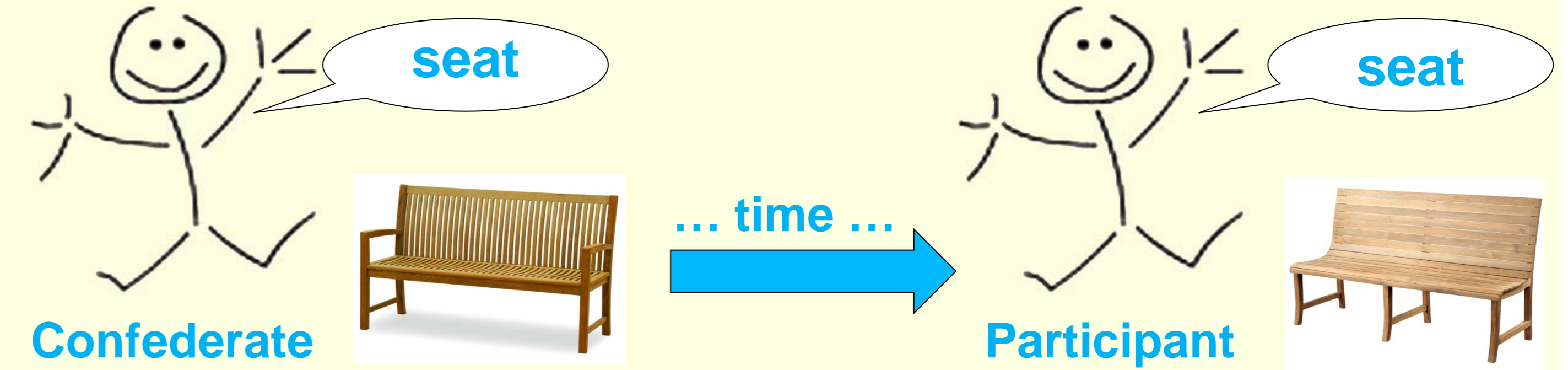


Introduction

- Alignment in conversation: tendency to adopt interlocutor's lexical items, syntactic structures etc.
- Evidence mostly from carefully controlled picture-description experiments (e.g. Pearson et al., 2004) and some corpus studies (e.g. Gries, 2005)
- Alignment is supposed to be ubiquitous and contribute to successful communication (Pickering & Garrod, 2004)



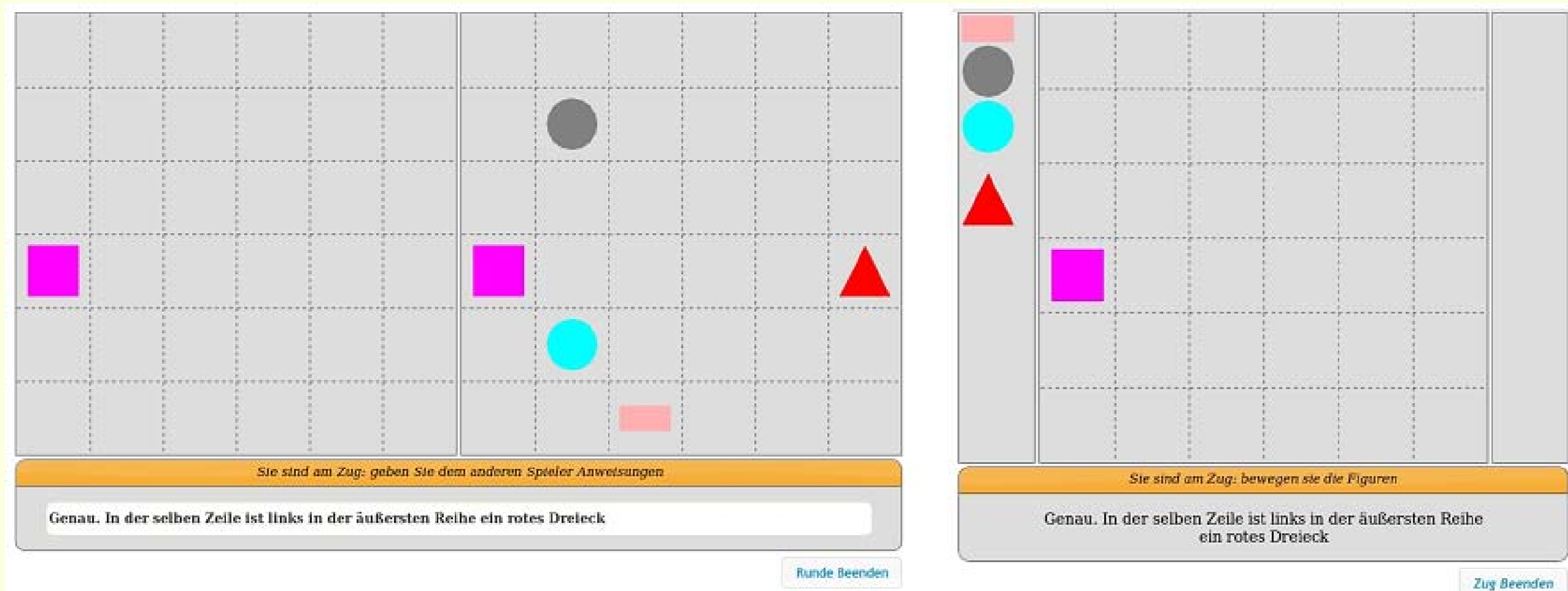
Research questions: **temporal aspects of alignment**

- Do speakers align in spontaneous, written, task-oriented discourse?
- Does alignment increase **over the course of the discourse**? (cf. Pickering & Garrod, 2004)
- Does alignment contribute to successful communication; i.e. do participants who are more aligned complete the task **in less time**? (cf. Pickering & Garrod, 2004)

We present:

- A novel analysis for alignment,
- which considers the complete discourse,
- not just select primes and targets

Methods



Intuition for applying the cosine distance to measure alignment:

Sentence type	Player / Scenario				
	A	B/1	B/2	B/3	B/4
frequency fragment without verb	1	1	2	4	0
frequency sentence indicative	1	1	2	1	0
frequency sentence imperative	4	4	8	1	0
frequency sentence conjunctive	0	0	0	0	4
cosine similarity to A	-	1	1	0.5	0

Advantages:

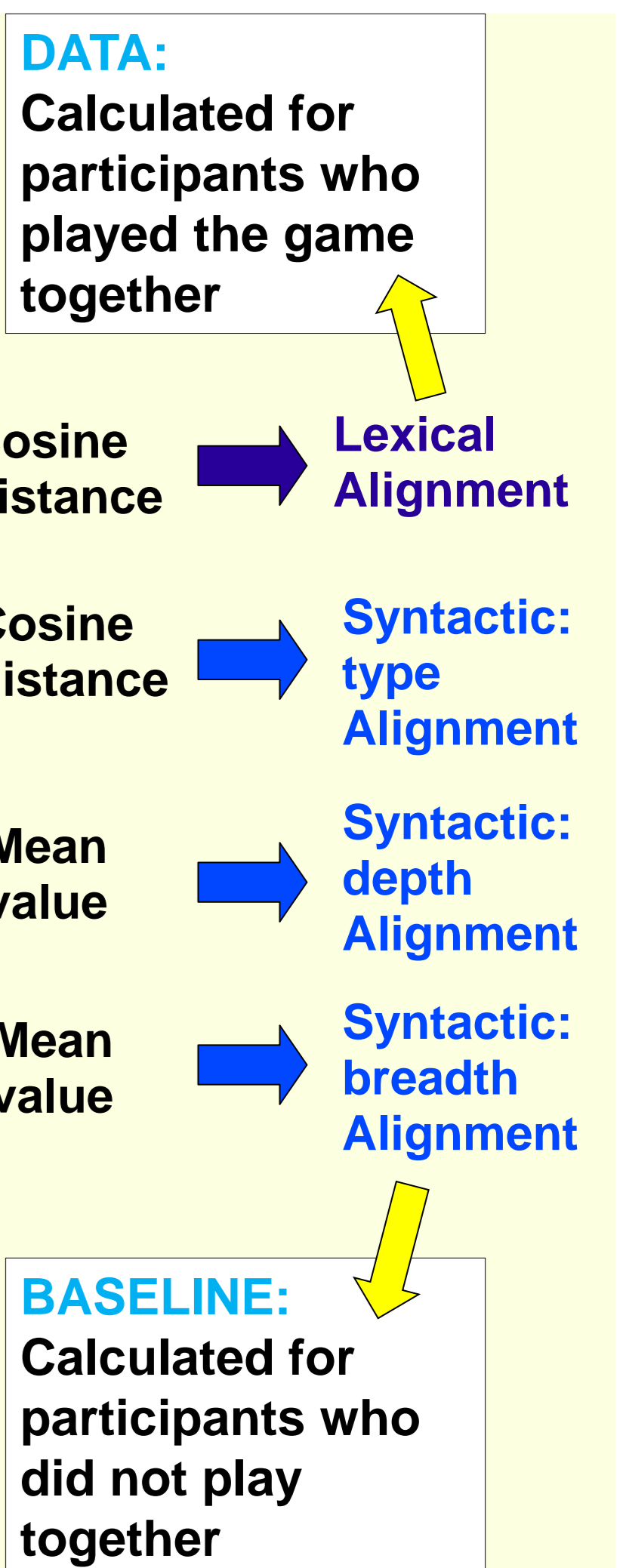
- Incorporates the frequency of distribution for adopted phenomena
- Abstracts away from the number of occurrences (count normalization)

```
<game>...
...
<round timeStarted="16.11.11 17:14" roundId="1">
...
<move shape="magenta_square" time="+155"/>
<chat message="Genau. In der selben Zeile..." time="+203"/>
<annotation-<spelling><word>das</word><correction>Das...
<colors><color shape="yellow">gelbe</color></colors>...
<forms><form shape="triangle">Dreieck</form></forms><colors>...
<sentences><form shape="triangle">Dreieck</form></forms><colors>...
<sentence value="fragment without verb">Genau. In der selben...
<sentence value="sentence indirect indicative">In der selben...
<parsetree depth="3" breadth="4.5"><S><PP>
<APPR lemma="in">In</APPR><PDAT lemma="derselben">derselben</PDAT><NN lemma="Zeile">Zeile...
...
</round>

<round timeStarted="16.11.11 17:22" roundId="2">
...
<chat message="das gelbe dreieck muss..." time="+46"/>
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<colors><color shape="yellow">gelbe</color></colors>...
<sentence value="sentence indirect indicative">das gelbe dreieck...
<parsetree depth="2" breadth="3.3333333333333335">
<S><NPSB><ART lemma="das">Das</ART><ADJA lemma="gelb">gelbe</ADJA><NN lemma="Dreieck">Dreieck</NN>...
<move shape="yellow_triangle" time="+55"/>
...
</round>
...
</game>
```

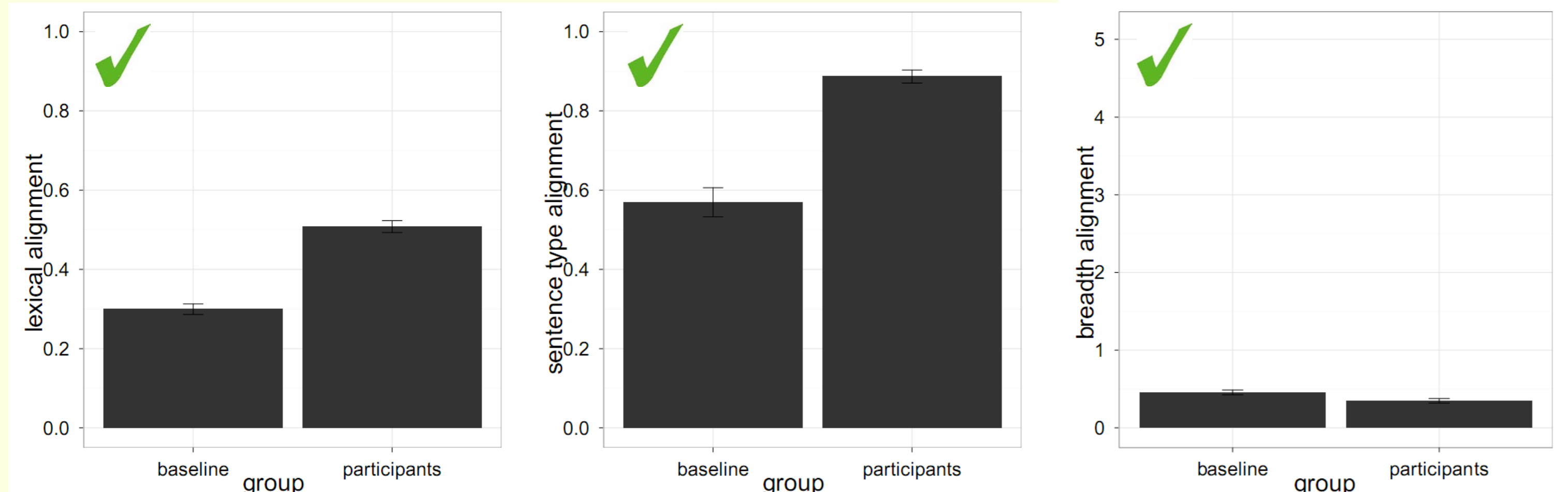
N, ADJ, V frequencies P1	
Zeile 3	Dreieck 2
...	
Sentence type frequencies P1	
Fragment without verb 5	Sentence indirect indicative 2
...	
Avg depth P1	3.2
Avg breadth P1	5.2
Round completion time	8.0

N, ADJ, V frequencies P2	
gelb 1	Dreieck 4
...	
Sentence type frequencies P2	
Fragment without verb 10	Sentence indirect indicative 3
...	
Avg depth P2	3.4
Avg breadth P2	4.5
Round completion time	6.2

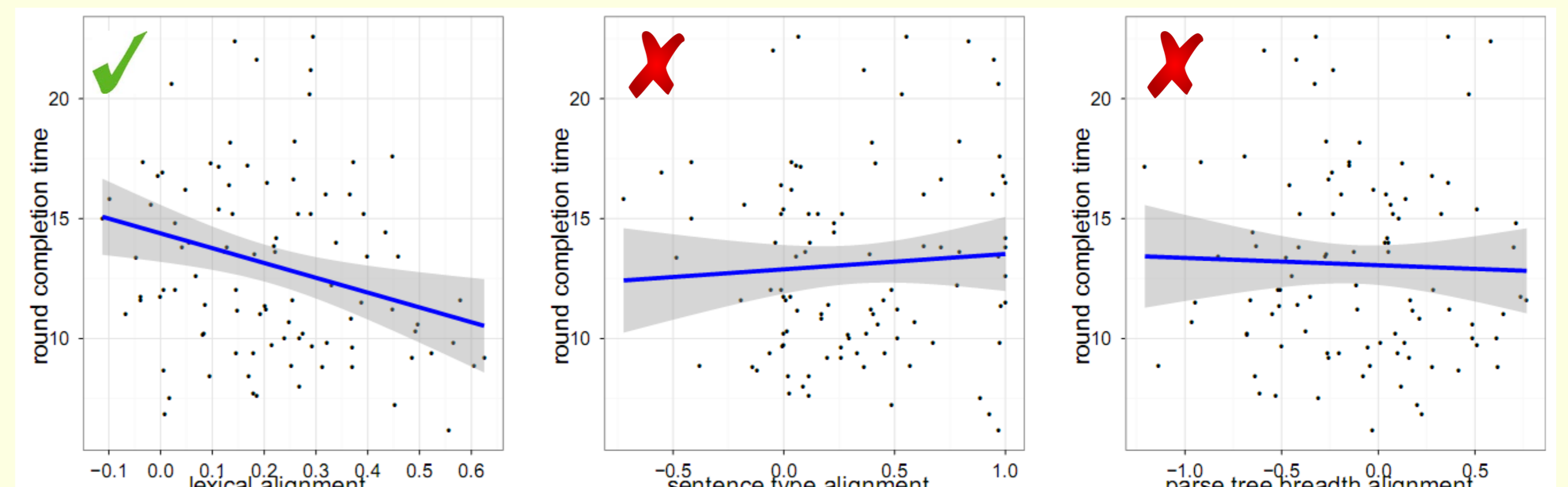


Results

1. Do speakers align at all in spontaneous, task-oriented, written discourse?

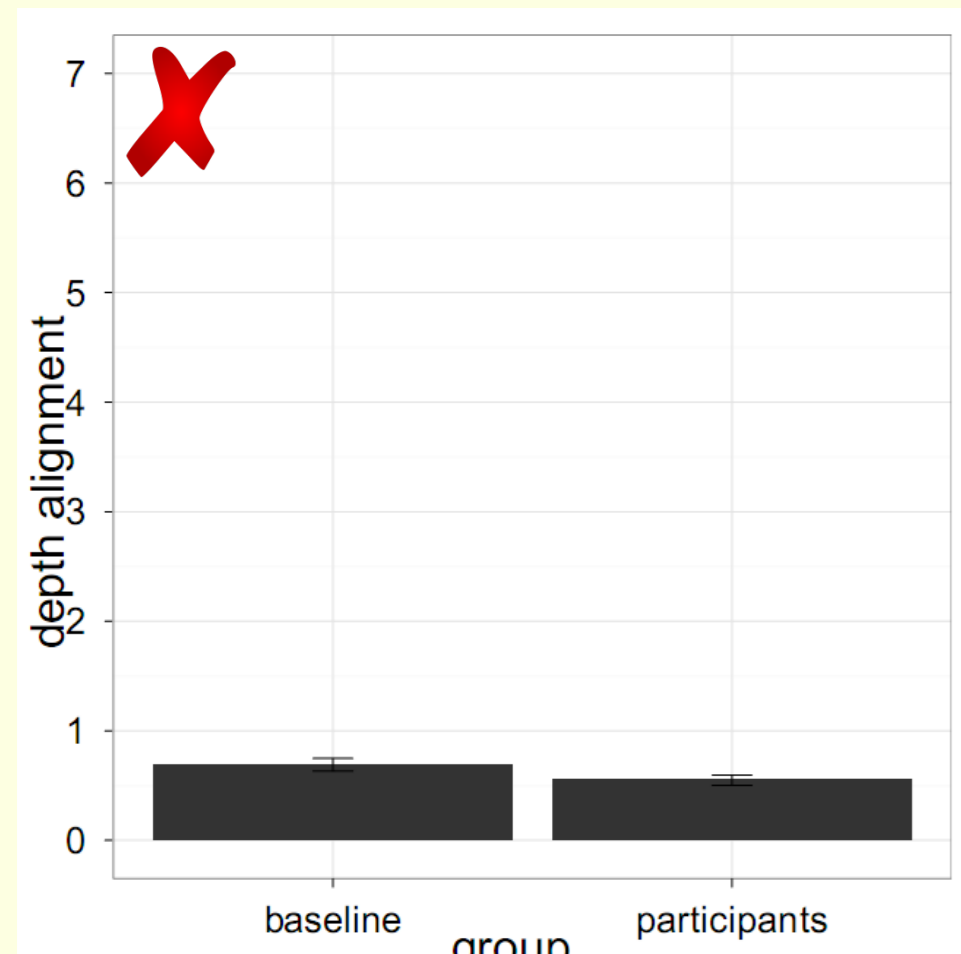


3. Does alignment lead to faster task performance?



results from linear models:

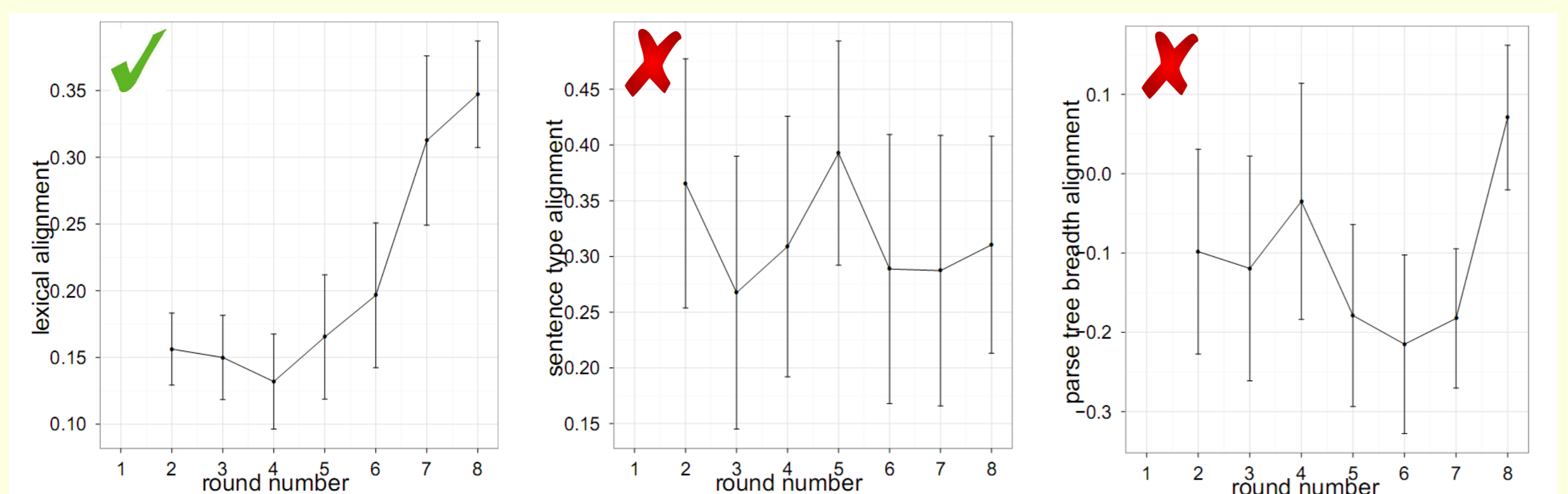
level	estimate	t-value	p-value	Adjusted R ²
lexical	-4.854	-1.813	= .073	0.02327
sentence type	-2.163	-0.873	= .385	-0.002483
breadth	0.6134	0.432	= .667	-0.008546



results from mixed-effects models:

level	estimate	t-value	p-value
lexical	0.20857	9.359	< .0001
sentence type	0.31951	4.494	< .0001
breadth	-0.10819	-2.548	< .05
depth	-0.14498	-1.738	= .0576

2. Does alignment increase over the course of the discourse?



results from linear models:

level	estimate	t-value	p-value	Adjusted R ²
lexical	0.034386	4.095	< .0001	0.1399
sentence type	-0.005215	-0.249	= .8042	-0.009767
breadth	0.007174	0.318	= 7.51	-0.009353

Discussion and Conclusions

- reliable lexical and syntactic alignment
 - in spontaneous, written, task-oriented discourse
 - using a baseline that disentangles real communicative alignment from linguistic conventions and task constraints
 - using a novel analysis approach on the whole data taking frequency distributions into account
 - we see considerable effects of linguistic conventions and the task: underlines importance of a proper baseline
 - syntactic and lexical alignment are rather long-lasting: occur from one round to the next
- lexical alignment increases over time
 - no evidence that syntactic alignment increases over time (possibly because alignment is high from the beginning)
 - compatible both with interactive alignment model (Pickering & Garrod, 2004) and implicit learning account (Chang et al., 2006)
- the more lexical alignment, the faster task completion time
 - lexical alignment contributes to successful communication if measured as task completion time
 - no evidence that syntactic alignment affects task completion time
 - incompatible with interactive alignment model, but possibly compatible with implicit learning account

References: (2005). Syntactic Priming: A Corpus-based Approach. *Psycholinguistic Research*, 34 (4), 365-399.
 Pickering, M., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences*, 27, 169-226.
 Pearson, J., Pickering, M., Branigan, H., McLean, J., Nass, C., & Hu, J. (2004). The influence of beliefs about an interlocutor on lexical and syntactic alignment: Evidence from Human-Computer dialogues. *Poster presented at the 10th Annual Conference on Architectures and Mechanisms of Language Processing (AMLAP)*, Aix en Provence, France.
 Chang, F., Dell, G. S., & Bock, K. (2006). Becoming Syntactic. *Psychological Review*, 113 (2), 234-272.