Tracking Lexical and Syntactic Alignment in Conversation

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Abstract

As much empirical work attests, people have a reliable tendency to match their conversational partner's body movements, speech style, and patterns of language use – amongst other things. A specific version of this tendency, *Structural priming*, which occurs when prior exposure to a particular linguistic structure facilitates one's subsequent processing of the same structure, has gained widespread acceptance. Pickering and Garrod (2004) propose that *cross*-person structural priming is a basic mechanism of conversational coordination – part of an automatic, resource-free *alignment* mechanism that is the basis for all successful human interaction. We present evidence to the contrary from two analyses of a corpus of ordinary conversation. The first suggests that the level of structural (syntactic) matching is no different from chance, and the second that the observed statistical correlation between prime form and target form may be entirely associated with repetition of lexical form.

Keywords: structural priming; alignment

Introduction

The apparent tendency for speakers to repeat their own or others syntactic or structural choices in conversation – a phenomenon referred to as *structural* or *syntactic* alignment – has been a subject of particular scrutiny (see Pickering and Ferreira (2008) for an overview).

The evidence for such alignment in dialogue comes from two main sources: experimental studies of task-oriented dialogue (e.g. (Branigan, Pickering, & Cleland, 2000)), and corpus studies that track frequency of use of these same constructions in language use outside of the laboratory setting (e.g. (Gries, 2005)).

In the basic experimental set-up of Branigan and colleagues, there are two participants, one of whom is a confederate of the experimenter. The participants describe picture cards to each other, the critical items of which require the use of ditransitive verbs in their descriptions. In English, there are two syntactic structures which can be used; one a double object structure ("The thief giving the nurse the banana"), and the other using a preposition ("The thief giving the banana **to** the nurse"). The confederate uses a scripted description of the ditransitive prime sentences, thus manipulating which type naive subjects are exposed to. Participants are more likely to use the type of structure that they have just used or been exposed to. This has been found to hold across comprehension and production (Branigan, Pickering, Stewart, & McLean, 2000; Bock, Dell, Chang, & Onishi, 2007), from main clauses to rel-

ative clauses (Branigan, Pickering, McLean, & Stewart, 2006) and even across languages in bilingual speakers (Hartsuiker, Pickering, & Veltkamp, 2004). Different factors found to increase the *strength* of syntactic alignment include the distance between the prime and the target, participant role (Branigan, Pickering, McLean, & Cleland, 2007) and, importantly for the interactive alignment model (see below), reuse of the same or semantically related lexical items (Branigan, Pickering, & Cleland, 2000).

In a corpus study using the International Corpus of English (ICE-GB), Gries (2005) looked at the same syntactic alternation. His data show that there is a tendency to reuse the form of a ditransitive verb most recently encountered (double object or prepositional), in line with the experimental results. Similar results have been found to hold with different constructions such as particle placement of phrasal verbs (Gries, 2005), future markers ("will" versus "going to") and comparatives ("cleverer" versus "more clever than") (Szmrecsanyi, 2005).

Pickering and Garrod (2004) argue, in their *Interactive Alignment* model, that alignment is the basis for successful communication; "successful dialogue occurs when interlocutors construct similar situation models to each other" (Pickering & Garrod, 2006, p206). In order to do this, interlocutors *align* on situation models; however, as this alignment is not usually negotiated explicitly, it is hypothesised to arise automatically from local alignment, via resource-free *priming* mechanisms.[1] Alignment at local levels, including lexical (repetition of words) and the syntactic alignment discussed above, "percolates", leading to alignment at other levels.

From priming to alignment?

There are three problems with using these studies to support the claim that cross-speaker structural priming is ubiquitous in conversation. First, automatic priming predicts an increase in matching of *all* structures across turns, but this claim has not been directly tested. For practical reasons, experimental studies have focussed on situations in which specific syntactic alternatives can be used to describe the same situation. Similarly, corpus studies have tended to track the frequency of use of spe-

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[1]Note that the observed effects are alignment effects; priming mechanisms are their hypothesised cause, leading to two distinct questions – does such alignment occur; and if it does, is it caused by priming?

cific constructions across participants and time, rather than addressing whether or not people tend to match one-another in general (e.g. Gries (2005)). One exception is Reitter, Moore, and Keller (2006), who examined general syntactic similarity, but results were unclear. Reitter et al. (2006), used two corpora, one task-specific (Map Task) and one more general (Switchboard), and saw a large difference: while *same*-person priming was found in both datasets, *cross*-person priming was found only in the task-specific dialogues.[2]

The second problem is that the data used in these studies is not adequately representative of ordinary dialogue. As Pickering and Garrod (2004, p187) say:

> The interactive alignment model was primarily developed to account for tightly coupled processing of the sort that occurs in face-to-face spontaneous dyadic conversation between equals with short contributions. We propose that in such conversation, interlocutors are most likely to respond to each other's contributions in a way that is least affected by anything apart from the need to align.

However, in the experiments, the confederate is scripted, and the naive participants were told that if they didn't understand they "could say "Please repeat," but nothing else" (Branigan et al., 2007, p175). And while corpora can provide more spontaneous data, Gries (2005)'s corpus is biased towards written and spoken *monologue*, and a significant proportion of the dialogues it samples involve specialised institutional settings, e.g. legal cross-examinations and broadcast interviews.

The third problem is that these studies have not used a control condition. As a result the chance level of structural matching is unknown and effects such as conversational genre cannot be discounted (cf. Tannen (2007)).

In order to address two of these issues,[3] we conducted an experiment which tested the degree of match of dative alternation structures in a corpus of naturally occurring dialogue data. We compared this measure to control conditions for the same genuine conversational data manipulated to create 'dialogues' from turns actually occurring in different conversations (see below).

Experiment 1

Method

The corpus used here is the Diachronic Corpus of Present-Day Spoken English (DCPSE). This consists of 885,436 words together with a full set of parse trees that have been hand-checked by linguists. It includes

several distinct genres of dialogue. We consider the two-person portions of the three largest samples: Face-to-Face Formal (90,000 words), Face-to-Face Informal (403,000 words) and Telephone Conversations (47,000 words). This gives us 127 dialogues with an average of 45.24 turns per person (per dialogue), which ought to provide us with the data most likely to exhibit alignment phenomena (see above).

Creating control dialogues In order to discount the potential biasing effect of conversational structure (e.g. recurrent patterns of turn-taking, topic shifts, openings and closings) on syntactic similarity, a control condition that captures how similar two people's conversational turns would be by chance is needed. For each 'real' dialogue in each genre in the corpus, we therefore create two types of 'fake' control dialogue. For the first, the *random-speaker* control, one speaker's turns are kept and interleaved with the turns of another speaker from a different dialogue (matching dialogues by genre, matching by length as closely as possible, and discarding any 'unmatched' turns). This 'fake' dialogue thus maintains turn order for each speaker; but consists of the turns of two speakers who did not, in fact, interact. For the second 'fake' dialogue, the *random-sentence* control, a new dialogue of the same length is created by randomly choosing sentences, each time allowing a new choice of dialogue and speaker (but always matching dialogue genre). This 'fake' dialogue thus maintains neither turn order nor speaker identity (see table 1 for comparisons).

Table 1: Real and control dialogues comparison

GENUINE DIALOGUE:
A: Are you going to go to all of the phonology lectures
B: I think I ought to do that
A: Yes. I think you had. Yeah
B: I mean I don't know how much I'll take in
A: I think I'll go to most of them. But I won't go to all of pragmatics the day before

RANDOM-SPEAKER CONTROL DIALOGUE:
A: Are you going to go to all of the phonology lectures
C: Well uh ask one of the stallholders down Chapel Street. They'll all know
A: Yes. I think you had. Yeah
C: Uhm I was down there the other day and I got some excellent salmon
A: I think I'll go to most of them. But I won't go to all of pragmatics the day before

RANDOM-SENTENCE CONTROL DIALOGUE:
A: Are you going to go to all of the phonology lectures
D: Uhm one of the few. Oh George was impossible
E: Just normal water
F: Yes. What do they call it
G: Oh dear. It does not bode very well

Creating these control dialogues allows us to compare the syntactic similarity observed in the real data with the similarity that would be observed by chance. By choosing a suitable similarity metric, we can express the

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[2]In fact, the opposite appeared to hold in the general corpus – participants seemed to *avoid* repeating each others' syntactic structure.

[3]The first issue we address in additional work; see e.g. Healey, Howes, and Purver (2010); Healey, Purver, and Howes (2010).

average similarity observed between turns or between speakers; and examine the difference between the real and control corpora. Choosing a general syntactic similarity metric (which takes all observed structural rules into account) would allow us to compare with Reitter et al. (2006); see e.g. Healey, Purver, and Howes (2010). In this paper, we only consider the specific ditransitive alternation discussed above, allowing comparison with Branigan, Pickering, and Cleland (2000) and Gries (2005).

Metric and predictions Considering only a single syntactic phenomenon gives us essentially a binary metric: a target sentence scores 1 if it reuses the form of the most recent prime sentence, and 0 otherwise. More concretely, each sentence is given a score of 1 only if:

1. it uses one possible form of the phenomenon in question: a double-object or prepositional-object construction; and

2. the most recent prior sentence in the same dialogue which exhibits the same phenomenon also uses the same form.

and 0 otherwise. Summing sentence scores and normalising by the number of sentences gives us the score for each individual in a dialogue. These scores can then be compared between the real and control corpora.

We test three key predictions:

1. Priming: Sentences in real conversations should display reliably more turn-by-turn structural matching than would occur by chance.

2. Person: Structural matching should be observed both between sentences produced by the same participant, and between those produced by different participants.

3. Genre: Relatively restricted registers should promote a higher level of cross-speaker structural matching than less restrictive registers.

Results

Two different analyses were carried out: the first compares real levels of matching against the control dialogues as outlined above, and the second compares the level of (real) same-person matching against (real) other-person matching.

In order to test predictions on Priming (1) and Genre (3) the average turn-by-turn syntactic similarity scores for each dialogue participant[4] in each Genre were analysed in a mixed analysis of variance with Dialogue Type (Real $\times$ Control) as a within subjects factor and Genre (Face-to-Face Formal $\times$ Face-to-Face Informal $\times$ Telephone Conversations) as a between subjects factor.

For overall similarity (this measure includes both same-person and other-person matching), the analysis showed no reliable difference between the Real and Control (i.e. 'fake') dialogues (random-sentence control: $F_{(1,251)} = 1.067, p = 0.30$, random-speaker control: $F_{(1,251)} = 0.11, p = 0.92$),[5] no significant main effect of Genre (random-sentence control: $F_{(2,251)} = 1.279, p = 0.28$, random-speaker control: $F_{(2,251)} = 1.881, p = 0.16$) and no interaction between Dialogue Type and Genre (random-sentence control: $F_{(2,251)} = 0.213, p = 0.81$, random-speaker control: $F_{(2,251)} = 0.809, p = 0.45$). The absolute levels of syntactic matching of the dative alternation were not reliably different from chance (see Table 2). There were also no significant results when comparing only cross-person similarity with its control condition.

Comparing same-person versus cross-person similarity using a mixed analysis of variance with Speaker (Same $\times$ Other) as a within subjects factor and Genre as a between subjects factor showed a reliable difference between the Same and Other person ($F_{(1,251)} = 4.124, p = 0.043$), no significant main effect of Genre ($F_{(2,251)} = 1.058, p = 0.35$) and no interaction between Dialogue Type and Genre ($F_{(2,251)} = 0.499, p = 0.61$) (see Table 3). This means that there is reliably more matching to one's own prior utterances than to another person's.

Discussion

These results seem to show that, at least for the dative alternation construction, in contrast to hypothesis (1), sentences in the DCPSE do not show reliably more structural matching than would occur by chance. In regards to (2), the overall level of same-person matching was higher than that of other-person matching (in line with experimental findings that production-production priming is higher than comprehension-production). However due to the control conditions used, it is not possible to ascertain whether the same person matching on its own is reliably higher than chance (though recall that both other person matching and overall levels of matching were not). As for hypothesis (3), although it appears from tables 2 and 3 that there is greater matching in the more restricted registers as predicted, pairwise comparisons did not show any significant effects. This could be due to the relatively small values, and limited number of cases, and further work is necessary to see if this is a genuine effect.

As the observed power values were in some cases as low as 0.2, we cannot reject the null hypothesis outright. Power calculations suggest that we require four times more data in order to be able to do so, and to this end we are currently conducting analyses on the

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[4]Shown as N in tables 2 and 3. As we were only looking at 2-person dialogues this equates to 127 dialogues overall.

[5]For completeness we report exact probabilities but throughout adopt a criterion probability level of < 0.05 for accepting or rejecting the null hypothesis.

Table 2: Mean Dative Alternation Similarities

Dialogue Type	N	Real Similarity	(s.d.)	Random-Sentence	(s.d.)	Random-Speaker	(s.d.)
Face-to-Face Formal	60	0.017	(0.016)	0.013	(0.016)	0.018	(0.019)
Face-to-Face Informal	94	0.013	(0.015)	0.012	(0.014)	0.014	(0.016)
Telephone Conversation	100	0.012	(0.025)	0.012	(0.018)	0.011	(0.022)
Overall Mean	254	0.014	(0.019)	0.012	(0.016)	0.014	(0.019)

Table 3: Mean Dative Alternation Similarities

Dialogue Type	N	Same Person	(s.d.)	Other Person	(s.d.)
Face-to-Face Formal	60	0.010	(0.014)	0.007	(0.010)
Face-to-Face Informal	94	0.008	(0.012)	0.005	(0.007)
Telephone Conversation	100	0.007	(0.012)	0.006	(0.019)
Overall Mean	254	0.008	(0.012)	0.006	(0.014)

British National Corpus (BNC), which includes 2884 2-person conversations (Healey, Purver, & Howes, 2010). Another alternative to increase power would be to treat each occurrence of either form of the dative alternation as a separate datapoint, as Gries (2005) did, rather than taking an overall value per person per conversation. Experiment 2 reports such an approach.

Experiment 2

These results suggest that there is little or no priming above chance for the dative alternation in ordinary dyadic conversation. Prima facie, this is inconsistent with the evidence from Branigan, Pickering, and Cleland's experiments and also Gries' corpus study on the same constructions.

Other than the power issues discussed above, these differences could be due to differences in the data used. Whilst our natural conversational data is obviously different from the task specific experiemntal data, it is also different to the corpus data used by Gries, in one important respect. Although the DCPSE corpus overlaps with the ICE-GB corpus used by Gries, the data in the DCPSE is all spoken, while the ICE-GB contains a mixture of written and spoken data.[6] Additionally, our experiment 1 used only dyadic (two-person) dialogues, as this makes creation of the control corpora more straightforward.[7]

Method

A further study was therefore carried out, following Gries' methodology but using the DCPSE, to attempt to replicate his positive results. We once again restricted the analysis to the three largest genres, but this time

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[6]Note, however, that (Gries, 2005) did not find any significant effect of MEDIUM.

[7]Although one might expect that priming would be stronger in the canonical two-person case – see (Pickering & Garrod, 2004).

Table 4: Comparison of corpus data used

	Spoken	Written	Total prime/ target pairs
Gries (2005)	600,000	400,000	3003
This paper	540,000	N/A	1438

included all conversations in those genres (i.e. we did not restrict this to dyadic conversation as in experiment 1, but still discounted e.g. broadcast interviews, legal cross-examinations and spontaneous commentaries, which would also have been included in Gries' data; see table 4). Following Gries, prime-target pairs in the DCPSE were coded for the variables shown in table 5, using the DCPSE's ICECUP tool to detect particular forms based on fuzzy tree fragments (Nelson, Wallis, & Aarts, 2002).

Results

The general result, as for Gries, is the significant effect between CPRIME and CTARGET ($\chi^2_{(1)} = 10.573, p = 0.001$), as shown in table 6. We observe priming for both the ditransitive and prepositional dative forms: observed target frequencies of each are greater than expected frequencies when following a prime of the same form, and lower than expected when following a prime of the other form.

The variables in table 5 were entered into a General Linear Model (GLM) analysis with CTARGET as the dependent variable and CPRIME, VFORMID, VLEMMAID, SPEAKERID as independent variables and DISTANCE as a covariate. Like Gries (2005), we found a main effect of CPRIME ($F_{(1,1425)} = 76.364, p = 0.000$) as expected given the general result above, and indicating that the form of the prime strongly predicts the constructional choice of the target, and an interaction effect of CPRIME

Table 5: Variables

Variable	Description
CPRIME	the form of the prime (ditransitive v prepositional dative)
CTARGET	the form of the target (ditransitive v prepositional dative)
CID	yes if CPRIME and CTARGET are the same form, no otherwise
DISTANCE	the number of parsing units between prime and target
VFORMID	yes if the verb and its form were identical in prime and target, no otherwise
VLEMMAID	yes if the verb lemma was identical in prime and target, no otherwise
SPEAKERID	yes if the speaker of prime and target was the same person, no otherwise

$\times$ VLEMMAID, ($F_{(1,1425)} = 28.969$, $p = 0.000$) indicating that when the verb lemma is identical across prime and target, the effect of priming is stronger. We did not find an effect of CPRIME $\times$ SPEAKERID, as Gries did, however, this could be due to the different corpora used, as written material would inevitably only include cases where the producer of prime and target are the same (note also that the effect he found was a marginal one).

Following Gries, a second analysis using CID as a dependent variable was carried out. There was a significant main effect of CPRIME ($F_{(1,1425)} = 4.935$, $p = 0.026$), the direction of which suggests that there is more likely to be an identical target following a ditransitive prime than a prime in the form of the prepositional dative. There was also a significant main effect of VLEMMAID ($F_{(1,1425)} = 27.255$, $p = 0.000$), such that the target is more likely to have the same form as the prime if the verb lemma used is the same. Like Gries, we did not find an effect of distance when it was entered into the model linearly, but when transformed to a logarithmic scale, it had a significant effect on CID ($F_{(1,1425)} = 4.540$, $p = 0.033$). Adding GENRE to the model did not reveal any additional effects to those outlined above.

Table 6: Observed v expected frequencies

CPRIME:	CTARGET: Ditran		CTARGET: Prep		Total
Ditran	527	(497.1)	319	(348.9)	846
Prep	318	(347.9)	274	(244.1)	592
Total	845		593		1438

These results suggest that whilst there are genuine alignment effects being observed, due to the large effect of VLEMMAID we cannot rule out the possibility that they are lexically specified, or collocational, rather than specifically syntactic or structural. To test this possibility, two post-hoc analyses were carried out. When the prime-target pairs which have an identical lemma are removed from the analysis, there is no longer any effect of CPRIME on CTARGET ($F_{(1,1211)} = 0.563$, $p = 0.45$), and there are also no other significant effects. See also table 7 ($\chi^2_{(1)} = 0.454$, $p = 0.50$). Conversely, looking just at those with an identical lemma we get a large effect of CPRIME on CTARGET ($F_{(1,1211)} = 171.358$, $p = 0.000$), as is obvious from table 8 ($\chi^2_{(1)} = 105.6$, $p = 0.000$). Note that these findings do not, in fact, contradict Gries (2005), as his major finding was that individual verbs differ in their sensitivity to priming effects, a finding that is supported by the evidence that the variation in our data can be accounted for by those cases in which the lemma is identical between prime and target.

Table 7: Observed v expected frequencies of prime-target pairs where LEMMAID = no

CPRIME:	CTARGET: Ditran		CTARGET: Prep		Total
Ditran	370	(375.8)	304	(298.2)	674
Prep	308	(302.2)	234	(239.8)	542
Total	678		538		1216

Table 8: Observed v expected frequencies of prime-target pairs where LEMMAID = yes

CPRIME:	CTARGET: Ditran		CTARGET: Prep		Total
Ditran	157	(129.4)	15	(42.6)	172
Prep	10	(37.6)	40	(12.4)	50
Total	167		55		222

Conclusions

The results show that, in ordinary dyadic conversation, there is no unequivocal evidence of syntactic priming effects for the specific constructions that have been the focus of previous experimental and corpus work. The results presented here show that individual people do tend to repeat the same structure. However, they are no more likely to converge on the same version of each structure with their conversational partners than would be expected by chance. In addition, the overall likelihood of a match in syntactic structure across turns appears to be accounted for by the repetition of specific words.

Our results seem to be inconsistent with previous findings, however, as already noted, there may be several reasons for this disparity. Firstly, laboratory based experiments on dialogue are always subject to concerns about

ecological validity and it's possible that the restricted, task-oriented, exchanges used in previous studies do not generalise well to the more open-ended dialogue samples in the corpus data. Note though, that the present results do replicate the strong effects of lexical choice on syntactic similarity reported by Branigan, Pickering, and Cleland (2000). Another point of contrast between the current study and previous work are the specific characteristics of the corpus we use. Our data only includes exchanges in ordinary dialogue (and is further restricted in experiment 1 to dyadic exchanges). We specifically exclude spoken monologue, institutionally specialised contexts such as tutorials and broadcast interviews and one-sided interactional activities such as story-telling. Note however, that in doing so we focus on just those cases where Pickering and Garrod (2004) predict that priming should be strongest.

Our data are also compatible with studies on *lexical* alignment – reuse of previously encountered *words*. Despite well documented experimental evidence of lexical alignment (Brennan & Clark, 1996), there are also questions as to how this scales up to genuine conversation – a study of relative lexical overlap in conditions allowing or prohibiting verbal feedback (Hadelich, Branigan, Pickering, & Crocker, 2004) found that in the conditions which were more akin to genuine dialogue (where verbal feedback was permitted), there was less relative lexical overlap.

Additionally, our experiment 2 is in fact an extension of Gries' (2005) work, and completely compatible with it, though it does suggest a shift of focus. While a statistical correlation between prime form and target form is observable, this may be almost entirely associated with repetition of lexical form, rather than reuse of syntactic structure *per se*.

While there is insufficient data in the DCPSE corpus to definitively prove that structural priming effects are absent in ordinary conversation, these results indicate that the strength and ubiquity of structural priming (see e.g. Pickering and Ferreira (2008)) may have been overstated.

Acknowledgements

References

Bock, K., Dell, G., Chang, F., & Onishi, K. (2007). Persistent structural priming from language comprehension to language production. *Cognition*, *104* (3), 437–458.

Branigan, H., Pickering, M., & Cleland, A. (2000). Syntactic co-ordination in dialogue. *Cognition*, *75*, 13–25.

Branigan, H., Pickering, M., McLean, J., & Cleland, A. (2007). Syntactic alignment and participant role in dialogue. *Cognition*, *104* (2), 163–197.

Branigan, H., Pickering, M., McLean, J., & Stewart, A. (2006). The role of local and global syntactic structure in language production: Evidence from syntactic priming. *Language and cognitive processes*, *21* (7-8), 974–1010.

Branigan, H., Pickering, M., Stewart, A., & McLean, J. (2000). Syntactic priming in spoken production: Linguistic and temporal interference. *Memory and Cognition*, *28* (8), 1297–1302.

Brennan, S. E., & Clark, H. H. (1996). Conceptual pacts and lexical choice in conversation. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *22*, 482-1493.

Gries, S. (2005). Syntactic Priming: A Corpus-based Approach. *Psycholinguistic Research*, *34* (4), 365–399.

Hadelich, K., Branigan, H., Pickering, M., & Crocker, M. (2004). Alignment in dialogue: Effects of visual versus verbal-feedback. In *Proceedings of the 8th workshop on the Semantics and Pragmatics of Dialogue*.

Hartsuiker, R., Pickering, M., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish-English bilinguals. *Psychological Science*, *15*, 409–414.

Healey, P. G. T., Howes, C., & Purver, M. (2010). Does structural priming occur in ordinary conversation? In *Proceedings of Linguistic Evidence 2010*. Tübingen.

Healey, P. G. T., Purver, M., & Howes, C. (2010). Structural divergence in dialogue. In *Proceedings of 20th annual meeting of the Society for Text & Discourse*.

Nelson, G., Wallis, S., & Aarts, B. (2002). *Exploring natural language: Working with the British component of the International Corpus of English*. Amsterdam: John Benjamins.

Pickering, M., & Ferreira, V. (2008). Structural priming: A critical review. *Psychological Bulletin*, *134* (3), 427–459.

Pickering, M., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences*, *27*, 169–226.

Pickering, M., & Garrod, S. (2006). Alignment as the basis for successful communication. *Research on Language and Computation*, *4*, 203–228.

Reitter, D., Moore, J., & Keller, F. (2006). Priming of syntactic rules in task-oriented dialogue and spontaneous conversation. In *Proceedings of the 28th conference of the Cognitive Science Society*.

Szmrecsanyi, B. (2005). Language users as creatures of habit: A corpus-based analysis of persistence in spoken English. *Corpus Linguistics and Linguistic Theory*, *1* (1), 113–150.

Tannen, D. (2007). *Talking voices: Repetition, dialogue and imagery in conversational discourse*. Cambridge: Cambridge University Press. (Second Edition)