Does structural priming occur in ordinary conversation?

Patrick G. T. Healey, Christine Howes and Matthew Purver
Queen Mary University of London,
Interaction Media and Communication Research Group,
School of Electronic Engineering and Computer Science,
London E1 4NS.
{ph,chrizba,mpurver}@dcs.qmul.ac.uk

1 Introduction

A substantial body of empirical work suggests people have a reliable tendency to match, amongst other things, their conversational partner's body movements, speech style, and patterns of language use (Giles, Coupland and Coupland, 1991). Recently, a more specific 'structural priming' version of this claim has gained prominence (e.g. Pickering and Ferreira, 2008). Structural priming occurs when people's processing of a particular linguistic structure is facilitated by prior exposure to the same structure. Much of the psycholinguistic evidence for these effects comes from experimental studies of single individuals processing a sequence of sentences. However, Pickering and Garrod (2004, 2006) propose that cross-person structural priming is a basic mechanism of conversational co-ordination. They claim that it is part of an automatic, resource-free priming mechanism that helps to underpin all successful human interaction. We present evidence from a corpus analysis of ordinary conversation which suggests that this claim is incorrect.

The strongest evidence for structural priming effects in dialogue comes from experimental studies of task-oriented dialogue (e.g. Branigan, Pickering and Cleland, 2000) and from corpus studies that track frequency of use of particular constructions (e.g. Gries, 2005). There are three problems with using this work 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 (e.g. dative alternation). Corpus studies have also tended to track the frequency of use of specific constructions rather than addressing the question of whether people tend to match one-another in general (e.g. Gries, 2005). An exception is Reitter, Moore and Keller (2006), who examined general syntactic similarity, but

results were unclear – see below. The second problem is that the data used in these studies is not adequately representative of ordinary dialogue. Gries's (2005) 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. Reitter, Moore and Keller (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 dialogue.[1] 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).

2 Methods

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 also 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 (77,000 words). We test two key predictions:

1. Priming: Participants in conversation should display reliably more turn-by-turn structural matching than would occur by chance.
2. Genre: Relatively restricted registers should promote a higher level of cross-speaker structural matching than less restrictive registers.

Following Reitter, Moore and Keller (2006), we look at general syntactic similarity: the number of syntactic rules shared by the analyses of pairs of successive conversational turns, normalised to account for the total number of rules in both turns.[2] This gives a score between 0 and 1, where 1 corresponds to perfect syntactic matching between turns and 0 to no common syntactic structure.

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 is needed that captures how similar two people's conversational turns would be by chance. For each 'real' dialogue in each genre in the corpus, we create a 'fake' control dialogue: one speaker's turns were kept and interleaved with the turns of another speaker from another dialogue (matching

[1] In fact, the opposite appeared to hold in the Switchboard corpus – participants seemed to avoid repeating each others' syntactic structure. We note that this corpus also has some task-oriented characteristics.

[2] For efficiency, we use Moschitti's (2006) fast subset tree kernel calculation method, applied to mother-daughter subtrees corresponding to standard phrase structure grammar rules.

dialogues by length as closely as possible, and discarding any unmatched turns from the end). These 'fake' control dialogues thus consist of the turns of two speakers who did not, in fact, interact.

3 Results

In order to test predictions on Priming (1) and Genre (2) the average turn-by-turn syntactic similarity scores for each dialogue participant in each Genre were analysed in a mixed analysis of variance with Dialogue Type (Real × Control) as a within subjects factor and Genre (Face-to-Face Formal × Face-to-Face Informal × Telephone Conversations) as a between subjects factor.

For cross-person similarity, the analysis showed no reliable difference between the Real and Control (i.e. 'fake') dialogues ($F_{(1,237)}$ =1.32, p = 0.25) and no interaction between Dialogue Type and Genre ($F_{(2,237)}$ = 0.67, p = 0.51). The absolute levels of cross-turn syntactic matching were not reliably different from chance (see Table 1).

The analysis showed a significant main effect of Genre ($F_{(2,237)}$ = 20.13, p = 0.00) and post-hoc Bonferroni tests showed reliable pairwise differences between each of the Genres sampled (Face-to-Face Formal × Face-to-Face Informal p = 0.004; Face-to-Face Formal × Telephone Conversations: p = 0.000; Telephone Conversations vs. Face-to-Face Informal p = 0.002). Means are summarised in Table 1.

Table 1: Mean Cross-Turn Syntactic Similarity

Dialogue Type	**N**	**Mean Similarity**	**S.D.**	**Control Similarity**	**S.D.**
Face-to-Face Formal	60	0.21	(0.07)	0.21	(0.06)
Face-to-Face Informal	91	0.19	(0.05)	0.18	(0.05)
Telephone Conversation	89	0.17	(0.05)	0.16	(0.06)
Overall Mean	**240**	**0.19**	**(0.06)**	**0.18**	**(0.06)**

4 Conclusions

These results suggest that the strength and ubiquity of cross-person structural priming have been overstated (e.g. Pickering and Ferreira, 2008). There is insufficient data in the DCPSE corpus to definitively prove that there is no structural matching in ordinary conversation. However, in the dialogues considered here people's level of structural (syntactic) matching is no different from chance. We are as likely to use the same syntactic structures as someone we have not, in fact, spoken

to as we are to match those of our actual conversational partners. This is inconsistent with a priming mechanism that predicts automatic matching of syntax.

In addition, the present results show that genre (operationalised here as the DCPSE categories of dialogue) significantly alters the likelihood that people will produce similar syntactic constructions. If we are speaking in the same 'style' then we are more likely to use the same syntactic forms; regardless of whether we actually interact. It seems possible that the structural priming effects observed in laboratory-based studies and task-/domain-specific corpora thus reflect the influence of a particular interactional context and task experience rather than general mechanisms of human interaction.

References

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

Giles, H., Coupland, N., & Coupland, J. (1991). Accommodation theory: Communication, context, and consequence. In H. Giles, J. Coupland, & N. Coupland (Eds.), Contexts of accommodation (pp. 1–68). Cambridge: Cambridge University Press.

Gries, S. (2005). Syntactic priming: A corpus-based approach. Psycholinguistic Research, 34(4), 365–399.

Moschitti, A. (2006). Making tree kernels practical for natural language learning. In Proceedings of the 11th Conference of the European Chapter of the Association for Computational Linguistics.

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

Pickering, M., & Garrod, S. (2004). The interactive alignment model. Behavioral and Brain Sciences, 27(2), 169–189.

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 R. Sun (Ed.), Proceedings of the 28th Conference of the Cognitive Science Society (pp. 685–690).

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