

## The emergence of procedural conventions in dialogue

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### Abstract

Existing models of dialogue emphasize the importance of interaction in explaining how referential conventions are established and sustained. However, co-ordination in dialogue requires both co-ordination of content and process. To investigate procedural co-ordination we report a collaborative task which presents participants with the recurrent co-ordination problem of ordering their actions and utterances into a single coherent sequence. The results provide evidence of interlocutors developing collaborative routines which become conventionalized within a group of language users.

### Introduction

A common theme running through models of dialogue is how they contrast their accounts with the "communication-as-transfer-model" (Clark 1997). This model idealizes the perfect delivery involving a hearer recovering exactly the same representation intended by the speaker. Deviations from representational parity are explained by "noise" in the communication channel, e.g. disfluencies, restarts, pauses, errors or signals of misunderstanding.

However, empirical investigation of dialogue has demonstrated that this "noise" consists of mechanisms that assist mutual intelligibility: interlocutors use filled pauses such as "umm" and "uhh" to signal the length of upcoming pauses in an utterance (Clark and Fox Tree 2002), and also to guide referent identification (Arnold, Kam and Tanenhaus 2007). Further, interactive feedback, e.g. "what?", "ok?", leads to interlocutors' referential descriptions rapidly converging and

becoming more concise on successive use (Krauss and Weinheimer 1967). Importantly this contraction does not occur in monologue (Clark 1996). A central feature of these dialogue mechanisms is that they place sequential constraints on interlocutors' contributions (Schegloff 1992).

However, although pre-existing sequential structures (e.g. "adjacency pairs") have been studied in great detail, there has been a paucity of studies that directly investigate how sequential organization in dialogue is established: existing psycholinguistic and conversation analytic studies have treated these mechanisms and their sequential import as static phenomena, already shared by interlocutors, and hence has not led to any systematic investigation of how sequential constraints might develop during conversation.

To address this issue, we report a collaborative task which presents participants with the recurrent coordination problem of ordering their actions and utterances into a single coherent sequence.

### Methods

Pairs of participants communicate via a text-based chat-tool (Healey and Mills 2006). Each participant's computer also displays a task window containing a list of randomly generated words. Solving the task requires participants to combine their lists of words into a single alphabetically ordered list. To select a word, participants type the word preceded with "/". To ensure collaboration, participants can only select words displayed on the other participant's screen and vice versa.

Note that this task is trivial for an individual participant. However, for pairs of participants, this task presents the sequential coordination problem of interleaving their selections correctly: participants cannot select each other's words,

words can't be selected twice, and the words need to be selected in the correct order.

### 1.1 Sub-groups

To test for the development of routines for establishing sequential coherence we drew on the methodology developed by Healey (1997) of assigning participants to different sub-groups: 24 participants were assigned to 6 sub-groups comprising 4 participants each. At any given moment, the chat tool relays 12 conversations simultaneously. On each trial, participants see a new artificially generated name identifying their interlocutor, leading participants to believe they are speaking with a new partner on each trial. The experiment was divided into two phases:

(1) **Convergence phase** comprising 6 trials and lasting 40 minutes. Participants alternated between speaking with 2 of the other 3 members of their sub-group.

(2) **Test phase** comprising a single trial lasting 5 minutes. Half the participants interacted with the remaining member of their sub-group (Within-group). The other half interacted with a participant from another group (Cross-group).

## 2 Hypotheses

Cross-group dialogue will comprise participants who have developed different, group-specific routines for establishing sequential coherence. This should lead to Cross-group participants experiencing greater difficulty co-ordinating, and worse task performance than Within-group dyads.

## 3 Results

24 students from Stanford University received course credit for participating.

**Task performance:** Within-group participants generated significantly more correct answers (83%) than Cross-group participants (51%) ( $\chi^2(1) = 6.8, p < 0.005$ ).

**Self-edits:** Participants in Cross-group dialogue edited their turns almost twice as much (34%) as participants in Within-group dialogue (18%). ( $\chi^2(1, N = 468) = 6.5, p = 0.019$ ).

**Demarcating boundaries in the dialogue:** Cross-group dialogue contained more attempts (9%) to explicitly demarcate boundaries between different

sequences than Within-group dialogue (1.5%). ( $\chi^2(1) = 6.9, p = 0.003$ ).

## 3.1 Discussion

The data provide strong support for the procedural routinization hypothesis: Participants in the Cross-group condition performed worse and encountered more difficulty co-ordinating than Within-group participants.

Despite the task only permitting a single logical solution (and being referentially transparent – the words are the referents), participants develop group-specific routines for co-ordinating their turns into a coherent sequence. Importantly, we show how this development does not occur through explicit negotiation: in the initial trials, participants' attempts to explicitly negotiate these routines more often than not prove unsuccessful (cf Pickering and Garrod 2004, who observed similar patterns in a series of maze game experiments).

Instead, we demonstrate how these routines emerge via tacit negotiation as a consequence of interlocutors' collaborative attempts to deal with miscommunication (noise). Drawing on how interlocutors engage in resolving these misunderstandings in the test phase, we argue that these collaborative routines operate normatively, having become conventionalized by the interlocutors.

## References

- Arnold, J. and Kam, H and Tanenhaus, M. (2007). If you say thee-uh- you're describing something hard. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 33, (5), 914-930.
- Clark, H. H. (1996). *Using language*. Cambridge: Cambridge University Press.
- Healey, P.G.T. (1997). "Expertise or expert-ese: The emergence of task-oriented sub-languages." In Proceedings of CogSci. Stanford University, CA.
- Healey, P. G. T. & Mills, G. (2006). Participation, precedence and co-ordination. In Proceedings of Cog Sci. Vancouver. Canada
- Krauss, R. M. and Weinheimer, S. (1966). Concurrent feedback, confirmation and the encoding of referents in verbal communication. *Journal of Personality and Social Psychology*, 4:343-346.
- Pickering, M. J. and Garrod, S. (2004). Towards a mechanistic psychology of dialogue. *Behavioural and Brain Sciences*, 27(2):169-190.
- Schegloff E. A. (1992) Repair after next turn *American Journal of Sociology* 97(5).