



## Syntactic alignment and participant role in dialogue

Holly P. Branigan<sup>a,\*</sup>, Martin J. Pickering<sup>a</sup>, Janet F. McLean<sup>a</sup>,  
Alexandra A. Cleland<sup>b</sup>

<sup>a</sup> *Department of Psychology, University of Edinburgh, UK*

<sup>b</sup> *Department of Psychology, University of York, UK*

Received 22 December 2005; revised 18 May 2006; accepted 19 May 2006

---

### Abstract

We report three experiments that investigated whether the linguistic behavior of participants in a dialogue is affected by their role within that interaction. All experiments were concerned with the way in which speakers choose between syntactic forms with very similar meanings. Theories of dialogue assume that speakers address their contributions directly to their addressees, but also indirectly to side participants. In Experiments 1 and 2, speakers produced picture descriptions that had the same syntactic structure as a previous speaker's descriptions which had been addressed to a third person. This indicated that syntactic alignment is not limited to speaker-addressee dyads. However, the prior participant role of the current speaker affected alignment: prior addressees aligned more than prior side-participants. In contrast, Experiments 2 and 3 demonstrated that alignment was unaffected by the prior participant role of the current addressee. We interpret these findings in terms of depth of processing during encoding.

© 2006 Elsevier B.V. All rights reserved.

*Keywords:* Dialogue; Syntax; Participant role; Alignment; Syntactic priming

---

---

\* Corresponding author. Tel.: +44 131 650 8387; fax: +44 131 650 3461.  
E-mail address: [Holly.Branigan@ed.ac.uk](mailto:Holly.Branigan@ed.ac.uk) (H.P. Branigan).

## 1. Introduction

By its very nature, dialogue is both a social and a cognitive activity. At its simplest, it involves a *speaker* and an *addressee* working together to reach a common communicative goal (e.g., Clark, 1996; Clark & Wilkes-Gibbs, 1986; Goodwin, 1981; Sacks, 1974). Most psycholinguistic research on dialogue has investigated such dyads (e.g., Brennan & Clark, 1996; Garrod & Anderson, 1987), and there is increasing research on the nature of the cognitive mechanisms that underlie language use in dyadic dialogues (e.g., Horton & Gerrig, 2005a, 2005b). But there has been relatively little research on more complex dialogues, and in particular little empirical investigation of the cognitive processes involved in multi-party dialogues. Consider a game where *A* and *C* take it in turn to describe pictures to *B*, who has to find a matching picture for each description. A fragment from their dialogue might look like this:

A: The teacher giving the apple to the doctor.  
B: Okay.  
C: The pirate handing the cake to the sailor.  
B: Yup.

For each utterance, there is a speaker and an addressee, with *A* first being the speaker and *B* the addressee, and so on. But each utterance also involves a side-participant (Clark & Carlson, 1982): a person who is recognized as part of the conversation but is not addressed by the speaker at that point. This person is *C* in the first two utterances, and *A* in the next two. In this paper, we are concerned with the way that such differences in *participant role* of participants<sup>1</sup> in multi-party dialogues affects linguistic behavior, in particular choice of syntactic form.

In successful dialogue, interlocutors come to share many aspects of their representations of the situation under discussion. In other words, they align their situation models. Behaviorally, they tend to imitate each other, in that they make the same linguistic choices at many different levels of representation (Pickering & Garrod, 2004). This tendency to align might hold equally for all types of interaction within a dialogue. Alternatively, alignment might be influenced by participant role. For example, a speaker might align to a greater or lesser extent with a previous speaker depending on whether that speaker had directly addressed him or her. Equally, the tendency to align with an utterance might be stronger when addressing the speaker of the original utterance than when addressing a third person. Additionally, alignment with a previous speaker might be influenced by that speaker's overall importance within the dialogue, and so on. Distinguishing between these alternatives will help determine the extent to which alignment is a by-product of a "coarse" mechanism, and the extent to

---

<sup>1</sup> In this paper, we will use the term *participant* to refer to any person taking part in a dialogue; we will use the term *naïve participant* to designate a naïve volunteer acting as an experimental participant. The terms *within participants* and *between participants* are used with their conventional meaning in all discussion of statistical analyses and experimental design.

which it is “fine-tuned” to the type of interaction that is taking place at that particular moment in a dialogue.

Syntactic alignment is particularly interesting because it is implicit (Greenwald & Banaji, 1995), so that speakers are rarely aware of the syntactic structure of their utterances or the fact that they are imitating each other, and because syntactic alignment is not critical to effective communication in the same way that alignment of semantic and lexical structure may be. Thus, there is no obvious communicative disadvantage in two speakers consistently using different syntactic structures, for example using a Prepositional Object (PO) structure such as *The pirate handing the cake to the sailor* versus a Double Object (DO) structure like *The pirate handing the sailor the cake*. In contrast, divergences in speakers’ interpretation of words or phrases (e.g., using *this weekend* to mean the most recent versus the approaching weekend) may well lead to misunderstandings (Garrod & Anderson, 1987). Hence syntactic alignment is a good example of an automatic effect of context on social behavior in general and of the perception-behavior link in particular (Dijksterhuis & Bargh, 2001). We focus on the way in which participants align the syntactic structure of their utterances as a function of their participant role with respect to a previous speaker, and report three experiments that address this issue.

### 1.1. Participant role and joint activity

Dialogue does not appear to be the product of independent, unrelated actions, but is rather a collaborative effort. Many experiments have demonstrated that speakers take into account their addressees’ knowledge when formulating their utterances (e.g., Clark & Wilkes-Gibbs, 1986; Fussell & Krauss, 1992; Isaacs & Clark, 1987; Krauss, 1987; Wilkes-Gibbs & Clark, 1992). Speakers construct messages that reflect their prior beliefs about their addressees’ knowledge, for example, by using extra identifying information when describing an entity if they believe that their addressee is unlikely to be familiar with it (Fussell & Krauss, 1992; Isaacs & Clark, 1987). Speakers are also sensitive to, and exploit, the shared knowledge that they and their addressees accumulate during the course of a dialogue (Clark & Wilkes-Gibbs, 1986; Krauss & Weinheimer, 1964; Wilkes-Gibbs & Clark, 1992). Such processes are of course not always perfect – speakers may sometimes make faulty estimations of addressees’ knowledge (Fussell & Krauss, 1992) or may initially fail to take that knowledge into account in their utterances (e.g., Brown & Dell, 1987; Horton & Keysar, 1996) – but it is clear that speakers do accommodate their addressees’ knowledge to an extent.

Addressees, in turn, participate in achieving mutual understanding, by giving feedback that helps the speaker to identify which parts of her message have been correctly or incorrectly understood, and by proffering possible conceptions and labels of objects for her to use (e.g., Clark & Wilkes-Gibbs, 1986; Schober & Clark, 1989).<sup>2</sup> Absence of, or inadequate, feedback leads to inefficient or otherwise impaired

---

<sup>2</sup> We will adopt the convention of assuming a female speaker and a male addressee.

dialogues (Krauss & Weinheimer, 1966), even in “asymmetric” dialogues where addressees primarily serve as an audience for a narrative (Bavelas, Coates, & Johnson, 2000).

In multi-party dialogues, speakers and side-participants similarly collaborate. Speakers assume that side-participants share common ground with them. Wilkes-Gibbs and Clark (1992) demonstrated that speakers use shorter and more definite expressions when addressing former side-participants than when addressing former bystanders (listeners whose presence is recognized but who are not part of the conversation) and former eavesdroppers (listeners who have access to what is being said but whose presence is not recognized). There is good evidence that such overhearers are at a disadvantage during comprehension compared to addressees and side-participants. For example, Wilkes-Gibbs and Clark (1992) found that former overhearers took longer to correctly identify referents than did former side-participants, and Schober and Clark (1989) found that overhearers made more errors than addressees in identifying referents.

Theoretically, Clark and Schaefer (1992) argued that all participants (i.e., speakers, addressees, and side-participants) have a responsibility for the orderly accumulation of the discourse record (*the Principle of Responsibility*). Hence participants, in contrast to bystanders and eavesdroppers, are involved in a joint activity and consider themselves members of an ensemble (e.g., Clark, 1996; Goodwin, 1981; Sacks, Schegloff, & Jefferson, 1974; Schober & Clark, 1989).

However, the relationship between speakers and side-participants is more distant than that between speakers and addressees. This follows from the fact that speakers address addressees but do not address side-participants, in a way that is reflected in the speech acts that speakers perform towards addressees versus side-participants (Clark & Carlson, 1982). In order to account for a number of aspects of multi-party dialogues, such as the accumulation of common ground, Clark and Carlson proposed that speakers perform one speech act towards their addressee (e.g., asserting or requesting), as well as another speech act (called an informative) towards all participants in the dialogue that informs all participants of the addressee-directed act. For example, when *A* says to *B* *The teacher giving the apple to the doctor*, *A* is both making an assertion to *B* alone and simultaneously informing all participants (*A*, *B* and *C*) of the act of assertion that she is directing to *B*.

Additionally, speakers and their addressees can collaborate on a moment-by-moment basis to establish understanding, whereas side-participants must usually wait until the speaker and addressee are satisfied before taking their turn to ensure that they too have understood correctly (Clark & Schaefer, 1992), if they are allowed to contribute at all. One corollary is that speakers expect some form of response (e.g., evidence of understanding) from addressees but not necessarily from side-participants. In the fragment above, for example, *A* expects *B* but not *C* to acknowledge comprehension of her picture description. (Note however that in keeping with the Principle of Responsibility, she expects that *C* has attended to her utterance and has updated his discourse model accordingly.) Likewise, addressees recognize that they should produce a response, whereas side-participants recognize that they do not necessarily have to.

Addressees may also attempt to achieve fuller understanding than side-participants (Branigan, in press); for example, they may tend to fully resolve referential expressions whereas side-participants may be satisfied with holding unresolved referents in their discourse representations.

### 1.2. Alignment between speakers and addressees in dialogue

Speakers and addressees tend to align many aspects of linguistic structure (Pickering & Garrod, 2004); that is, they converge on the same set of linguistic representations. At meaning-related levels, pairs of interlocutors converge on the interpretation of referring expressions, for example using *square* to refer either to a single node or to a configuration of nodes in a maze (Garrod & Anderson, 1987; Garrod & Clark, 1993; Garrod & Doherty, 1994), and on the referring expression used for a particular object, such as *the pennyloafer* versus *the docksider* to refer to a particular shoe (Brennan & Clark, 1996; Clark & Wilkes-Gibbs, 1986; Schober & Clark, 1989; Wilkes-Gibbs & Clark, 1992). Such effects also appear to be partner-specific: speakers are more likely to use an over-informative expression for an object when addressing a partner with whom they have already used that expression than when addressing a new partner (Brennan & Clark, 1996), and addressees show disrupted comprehension when a previous speaker uses a new expression to refer to an object that she has previously referred to using a different expression (Metzing & Brennan, 2003). Interlocutors also align semantically, so that they converge on common description schemes (e.g., using coordinates like *A4* or *E3*) with particular interpretations (e.g., with the origin at the bottom left of the maze); see Garrod and Anderson (1987). Both lexical and semantic alignment seem to arise naturally and implicitly through the process of interaction (Brennan & Clark, 1996; Garrod & Anderson, 1987), with explicit negotiation being very rare.

There is also evidence for alignment of closed-class items: Levelt and Kelter (1982) found that speakers tended to respond using the preposition *At* to (the Dutch translation of) *At what time does your shop close?* but not to *What time does your shop close?* (though these effects might equally well be syntactic). Additionally, speakers align at other levels, such as speech rate, accent, and breadth of vocabulary (e.g., Bradac, Mulac, & House, 1988; Giles & Powesland, 1975; Giles & Smith, 1979), and in entirely non-linguistic ways, such as in the imitation of bodily movements (the “chameleon effect”; Chartrand & Bargh, 1999).

Branigan, Pickering, and Cleland (2000) demonstrated alignment of syntactic structure in dialogue. A naïve participant and a confederate (who followed a script) took it in turns to describe pictures to each other. Experimental pictures involved “dative” verbs like *hand*, and could be described in two ways: a PO form (e.g., *The pirate handing the cake to the sailor*), or a DO form (e.g., *The pirate handing the sailor the cake*). Naïve participants tended to produce *target* descriptions that had the same syntactic structure as the confederate’s immediately preceding *source* description, even when the source and target descriptions described unrelated events and contained distinct content words, though effects were enhanced when source and target descriptions used the same verb. The same pattern of effects has also been

demonstrated in a corpus of natural language (Gries, 2005). More recent studies have extended these results. Cleland and Pickering (2003) found that naïve participants described a picture of a red sheep (for instance) as *The sheep that's red* more often after a confederate described a picture as *The door that's red* than after describing it as *The red door*. Effects were enhanced when source and target descriptions contained the same noun, or even when they contained semantically related nouns (e.g., *sheep* and *goat*). Hartsuiker, Pickering, and Veltkamp (2004) found syntactic alignment in bilingual participants when the source utterance was in one language (Spanish) and the target utterance was in another (English). Alignment occurs alongside other influences on syntax in dialogue, such as a tendency to avoid certain ambiguities (Haywood, Pickering, & Branigan, 2005).

These results are compatible with what have been termed syntactic (or structural) priming effects (Bock, 1986). Studies of syntactic priming have demonstrated that individual speakers tend to repeat syntactic structure during the production of isolated sentences, outside any dialogue context. Syntactic priming occurs in a range of constructions and languages, using methodologies such as picture description, written and spoken sentence completion, and sentence recall (Bock, 1989; Bock & Loebell, 1990; Bock, Loebell, & Morey, 1992; Ferreira, 2003; Hartsuiker & Kolk, 1998; Hartsuiker & Westenberg, 2000; Pickering & Branigan, 1998; Pickering, Branigan, & McLean, 2002; Potter & Lombardi, 1998; see Pickering & Branigan, 1999, for a review). As in dialogue, the magnitude of such effects is enhanced when prime and target descriptions used the same verb (Pickering & Branigan, 1998). Although syntactic priming has been studied most extensively in experimental settings, studies of natural language corpora have yielded converging patterns of evidence (e.g., Gries, 2005; Szmrecsanyi, 2005).

Such research has provided persuasive evidence that the effects are truly syntactic and are unlikely to be a by-product of repetition at other levels, such as lexical, semantic, prosodic or focus structure (Bock, 1989; Bock & Loebell, 1990; Hartsuiker & Westenberg, 2000), or to be artifacts of a particular task. They occur in the absence of closed class and open class lexical repetition (Bock, 1989); when the prime and target sentences share syntactic structure but not event structure (e.g., locative sentences prime passive sentences; Bock & Loebell, 1990); and for structural alternations that do not differ in focus structure (e.g., main/auxiliary verb word order in Dutch; Hartsuiker & Westenberg, 2000). A focus-based account is also excluded by Scheepers' (2003) results. He did find priming of relative-clause attachment in a way that cannot be straightforwardly due to activation or implicit learning of individual syntactic rules (because the two alternative attachments did not differ in terms of the rules involved); however, he did not find priming for sentences that shared focus structure (in terms of which entity was modified by a subordinate clause) but did not share syntactic structure.

Syntactic priming effects have been interpreted in terms of the activation of procedures or representations that are implicated during the construction of syntactic structure (Bock & Loebell, 1990; Branigan, Pickering, Liversedge, Stewart, & Urbach, 1995). These procedures or representations retain activation following use, facilitating subsequent re-use. Branigan et al. (2000) argued that syntactic alignment

in dialogue might arise in the same way, through the repeated use of syntactic representations that are shared between comprehension and production. They suggested that these representations are specified as part of the syntactic component, or lemma, of a verb's lexical entry (Levelt, Roelofs, & Meyer, 1999; Pickering & Branigan, 1998). Thus, comprehension of a sentence with a particular structure would activate the syntactic representations associated with that structure, via activation of the relevant verb lemma; residual activation of these representations would then facilitate subsequent comprehension or subsequent production of another sentence with the same structure. Alternative explanations of syntactic priming make reference to implicit learning processes, in which comprehension or production of a structure leads to adjustments to the language processing system itself (Bock & Griffin, 2000; Chang, Dell, & Bock, 2006). Published studies show large variation in the magnitude of priming, suggesting that the degree of residual activation (in an activation-based account) or the changes in weights (in an implicit-learning account) that occur following exposure to a structure may vary according to the particular experimental circumstances, task demands, or preferences for alternative structures.

### 1.3. Syntactic alignment and participant role

Is syntactic alignment between speakers affected by participant role? One possibility is that it is not, and that alignment would occur to the same extent whenever a speaker has comprehended an utterance with a particular syntactic structure (whether as addressee, side-participant, or indeed overhearer). This appears to most straightforwardly follow from an assumption that alignment results from automatic processes. It would be compatible with Branigan et al.'s (2000) proposal that comprehending a utterance with a particular syntactic structure activates the representations associated with that structure, thereby increasing the likelihood of using that structure again. However, it is more explicitly predicted by Garrod and Anderson's (1987) principle of *output-input coordination*: "formulat[e] your output (i.e., utterances) according to the same principles of interpretation (i.e., model and semantic rules) as those needed to interpret the most recent relevant input (i.e., utterance from the interlocutor)" (p. 207). Under this principle, the degree to which a participant aligns should not be affected by his or her participant role with respect to the source utterance. If the principle can be extended to syntactic processing, then all dialogue participants should tend to use the previous syntactic structure to the same extent.

However, much evidence suggests that priming can be affected by a range of contextual factors, even when people are unaware of the priming manipulation. For example, masked repetition priming is affected by the proportion of repetition-prime trials in an experiment (Bodner & Masson, 2001, 2004; Bodner, Masson, & Richard, *in press*). Likewise, non-conscious behavioral mimicry such as foot shaking (the chameleon effect) is enhanced when participants are consciously or non-consciously provided with a goal to affiliate (Lakin & Chartrand, 2003) or have been induced to develop a context-dependent processing style (van Baaren, Horgan, Chartrand, & Dijkmans, 2004). We also know that syntactic alignment is enhanced by repetition of

the verb or head noun (Branigan et al., 2000; Cleland & Pickering, 2003). Given that we know that participant role affects lexical entrainment (e.g., Brennan & Clark, 1996), we might predict effects of participant role on syntactic alignment.

It is possible that syntactic alignment requires the reciprocal and particularly close relationship between speaker and addressee. For example, it might be a consequence of what has been called the norm of reciprocity (Gouldner, 1960): the tendency to respond in kind. In that case, it would be limited to speaker-addressee dyads, with a speaker *A* aligning with a previous speaker *B* only when *A* reciprocally addresses *B*. As Bock (1986) and others have shown that speakers also repeat their own syntactic structures, this account would predict alignment “within” a speaker and “between” speaker and addressee, but in no other situations. Hence, if we define target interactions in terms of the participant role of each interlocutor with respect to the prior (source) interaction, then this account would predict alignment in the interaction Addressee → Speaker (where the previous addressee now addresses the previous speaker), as well as Speaker → Addressee (where the previous speaker continues to address the previous addressee), but nowhere else. We shall use this notation throughout to describe interactions, with the expression before the arrow identifying the speaker of the target utterance in terms of her role in the source interaction, and the expression after the arrow identifying the addressee of the target utterance in terms of his role in the source interaction.

Alternatively, syntactic alignment might be affected by participant role in more subtle ways that would reflect the closer relationship between speakers and addressees than between speakers and side-participants (Clark & Carlson, 1982). One possibility is that initial encoding of the source utterance is influenced by such relationships. In that case, people might align more with a source utterance when they had been the addressee of that utterance than when they had been a side-participant. That is, they would align more in Addressee → Speaker and Addressee → Side-Participant interactions than in Side-Participant → Speaker and Side-Participant → Addressee interactions. Alternatively, speakers of target utterances might be influenced by their addressee’s previous participant role, such that they might align more when addressing the speaker of the source utterance. In that case people would align more in Addressee → Speaker and Side-Participant → Speaker interactions than in Addressee → Side-Participant and Side-Participant → Addressee interactions.

## 2. Experiments

We now report three experiments that examined the effects of participant role on syntactic alignment. In all experiments, a naïve participant took part in a picture-matching task with one or more confederates of the experimenter. In Experiment 1, the dialogue participants took turns to describe pictures to one another and to find the appropriate picture in an array (see Branigan et al., 2000). In Experiments 2 and 3, they took turns to describe pictures to one another and to decide whether a description matched a picture presented on a computer. The experimental pictures

showed ditransitive actions, for example, a pirate handing a cake to a sailor. In the context of the experiment, each picture could be felicitously described in two ways, using a PO description like *The pirate handing the cake to the sailor* or a DO description like *The pirate handing the sailor the cake*. (Note that speakers produce both alternatives freely in a neutral [baseline] context; Pickering et al., 2002.) Unbeknownst to the naïve participant, the confederates followed a script in which the form of their descriptions was systematically manipulated. We examined whether the form of a confederate's description influenced the form of the naïve participant's immediately subsequent description.

Experiment 1 examined whether speakers in a dialogue align with other participants' utterances when they are side-participants of those utterances, and whether such syntactic alignment differs in magnitude from that shown by former addressees. In this experiment, a confederate and a naïve participant took turns to describe pictures to each other in a two-party dialogue or to a third person in a three-party dialogue. Thus in one condition the naïve participant was the addressee of the source descriptions, whereas in the other condition, the naïve participant was a side-participant of the source descriptions. Experiment 2 directly compared alignment by addressees and side-participants in a three-party dialogue, with naïve participants acting as the addressee and the side-participant of source descriptions in the same dialogue. Additionally, we investigated whether side-participants align more when responding to the speaker of the source utterance than to the addressee of the source utterance. Experiment 3 investigated whether alignment is stronger when addressees respond to the previous speaker than when they address a side-participant of the source utterance.

### 3. Experiment 1

Experiment 1 examined whether former side-participants align with former speakers, and examined the strength of any such alignment. Hence Experiment 1 contrasted alignment in Side-Participant → Addressee interactions (the *Side-Participant → Addressee condition*) with reciprocal alignment in Addressee → Speaker interactions (the *Addressee → Speaker condition*). Recall that the role names (Addressee, Speaker, Side-Participant) refer to participant role in the previous (source) utterance. It is possible that reduced alignment in this task might occur if side-participants are not required to comprehend the speaker's utterance. In Experiment 1, therefore, participants were given an additional task on turns where they acted as side-participants: they were told to check the speaker's descriptions (which included occasional scripted errors) and to correct them if necessary.

#### 3.1. Method

##### 3.1.1. Participants

Thirty-two naïve participants from the University of Glasgow community were paid to take part. All were native English speakers and reported having no reading or speaking difficulties.

### 3.1.2. Items

We prepared two sets of 48 cards depicting actions that involved two or three entities. The entities were chosen to be easily recognizable and nameable (e.g., a pirate, a hat). Twelve of the cards were experimental cards; the remaining 36 cards were filler cards. The experimental cards depicted ditransitive actions involving an agent, a patient and a beneficiary (see Fig. 1). There were two experimental cards for each of six ditransitive verbs (*give, hand, offer, sell, show, throw*); see Appendix A. The filler cards depicted transitive actions involving an agent and a patient (e.g., a waitress poking a sailor). There were two filler cards for each of 18 transitive verbs. On each card, the appropriate verb was printed beneath the picture.

We term one set the *naïve participant's description set* and the other set the *confederate's description set*. Each set of cards depicted the same range of entities and actions, but the pairing of entities with actions was different. We created ordered pairs of source and target cards by pairing each experimental card from the confederate's description set (the source card) with an experimental card from the naïve participant's description set (the target card). Each source card depicted a different action and different entities from those depicted on the corresponding target card. There were two scripts, each containing a description for each of the source cards. In each script, half of the source cards were assigned PO descriptions of the form *the X verbing the Y to the Z*, and half were assigned DO descriptions of the form *the X verbing the Z the Y*.

An experimental item was defined as the confederate's scripted description of a source card plus the naïve participant's target card paired with it. There were thus two versions of each item: PO confederate description, and DO confederate



Fig. 1. An example of an experimental picture, designed to elicit the descriptions *The pirate handing the cake to the sailor* (PO) or *The pirate handing the sailor the cake* (DO).

description. We constructed two lists containing 12 experimental items and 36 fillers. Each list contained six experimental items with PO source descriptions and six with DO source descriptions. Exactly one version of each item appeared in each list. For each naïve participant, we generated a randomized order of the naïve participant's description set, with at least two filler cards intervening between each target card. We randomized the order of the confederate's filler cards in the same way; the source cards were then placed in the same ordinal positions as the target cards.

### 3.1.3. Procedure

The confederate was a female native English-speaking member of the University of Glasgow community. The naïve participant and the confederate were directed to seats at opposite sides of a table. Naïve participants were randomly assigned to the Addressee → Speaker or the Side-Participant → Addressee condition.

In both conditions, a divider prevented the naïve participant and the confederate from seeing each other or each other's cards. In the Addressee → Speaker condition, each participant's description set was arranged in a box in front of him or her and a selection set of cards to choose from was arranged on the table; the confederate also had a script specifying the description (PO or DO) to use for each source card (see Fig. 2). As in Branigan et al. (2000), the sets were arranged in alphabetical order by verb, in a four by six matrix; all of the cards for a given verb were stacked together. Each participant also had an empty box in which to place the chosen cards.

In the Side-Participant → Addressee condition, the naïve participant and the confederate each had a box containing a description set, and a box containing a duplicate of their partner's description set (see Fig. 3). Thus, the naïve participant had a duplicate of the confederate's description set containing all the same cards in the same order, and the confederate had a duplicate of the naïve participant's description set containing the same cards in the same order. The confederate also had a script

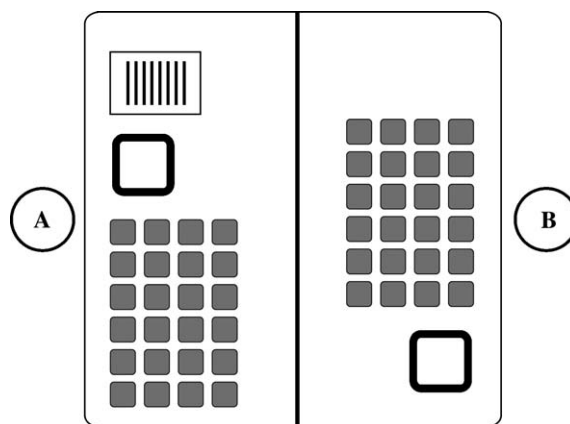


Fig. 2. Overhead view of set-up for Addressee → Speaker condition of Experiment 1; A is the confederate, B is the naïve participant.

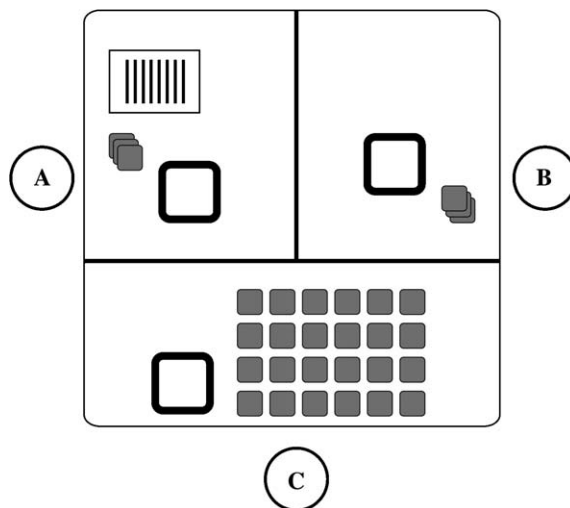


Fig. 3. Overhead view of set-up for Side-Participant → Addressee condition of Experiment 1; A is the confederate, B is the naïve participant and C is the experimenter.

that included four deliberate errors, each relating to a filler card. Each error was a plausible error of a type that had been produced by genuine naïve participants in previous experiments (two errors involved production of an inappropriate verb, and two involved reversal of the agent and patient roles). In every script, the confederate's first or second description was erroneous, to ensure that naïve participants were led to expect errors from the start. The remaining three errors were spaced out, one in each of the remaining three quartiles of the experiment. Duplicates of both description sets were laid out on a separate table in front of the experimenter. The experimenter also had an empty box in which to place the chosen cards.

In both conditions, the experimenter told the naïve participant and the confederate that the experiment was part of a project to examine how people communicate under different conditions, and had the specific goal of investigating how well people communicate when they cannot see each other. Their task was to take it in turns to describe the pictures in their card-filled box. The experimenter explained that the pictures involved a restricted set of people and objects that would appear repeatedly, and gave an example of how a card might be described, using two definite noun phrases and a present participle verb form (e.g., *The waitress dusting the jug*). However, participants were free to describe each card in any way that they chose as long as they used the verb printed on the card.

In the Addressee → Speaker condition, the naïve participant and confederate were told to take turns to describe the pictures in their card-filled box to each other, and to find cards that matched their partner's descriptions. If they did not understand a description, they could say "Please repeat," but nothing else. In the Side-Participant → Addressee condition, they were told to take turns to describe the pictures in their first card-filled box to the experimenter. Additionally, they were told to

check that their partner's descriptions were accurate by turning over each card in their other box and checking whether it matched their partner's description. If it did not, they were told to say "Correction," and describe the card correctly to the experimenter. The experimenter emphasized that it was important that they concentrate and if necessary correct their partner's descriptions.

For both conditions, there was a practice session involving four cards before the experiment began. In both the practice session and the experimental session, the experimenter told the confederate to begin, under the pretext that the person on the left-hand side should go first. Because the source cards appeared in the same ordinal positions in the confederate's box as the target cards in the naïve participant's box, the confederate's description of a source card always immediately preceded the naïve participant's description of a target card. Throughout the session, the experimenter and confederate acted as if the confederate was a naïve participant (e.g., the experimenter checked the confederate's name, the confederate asked the experimenter for clarifications about the method). In the Addressee → Speaker condition, the confederate asked the naïve participant to repeat a description whenever necessary (e.g., if the naïve participant did not use the verb printed at the bottom of the picture); in the Side-Participant → Addressee condition, the confederate corrected inaccurate descriptions whenever necessary. Such errors occurred ten times in total, all involving use of the wrong verb.

#### 3.1.4. Scoring

The experimental session was recorded on audio tape and subsequently transcribed. We coded the first response that the naïve participant produced. We coded target responses as PO if the (inanimate) patient of the action immediately followed the verb and was followed by the preposition *to* and the (animate) beneficiary of the action; and as DO if the (animate) beneficiary of the action immediately followed the verb, and was followed by the inanimate patient of the action. We excluded trials if the naïve participant produced a description that did not use the verb printed on the card, or a description that was non-reversible (i.e., was not grammatical in the alternative scoring category).

#### 3.2. Results

We excluded 18 trials (4.7% of the data), 7 in the Addressee → Speaker condition and 11 in the Side-participant → Addressee condition. Of these, 6 were excluded because the naïve participant produced a target response without *to* (the verb *throw* in the construction *throw something at someone*), 10 because the naïve participant repeated the source verb, and 2 because of experimenter error in ordering the cards.

Of the remaining 366 target responses, 248 were PO responses and 118 were DO responses. An example of an actual PO target is *The pirate showing the jug to the boxer*; an example of an actual DO target is *The chef handing the monk the apple*. Proportions of PO target responses in the different conditions are reported in Table 1. We carried out one-way analyses of variance (ANOVAs) on the proportion of PO responses produced in each condition, treating participants ( $F_1$ ) and items ( $F_2$ ) as

Table 1  
Experiments 1–3: Mean proportion of Prepositional Object target utterances by condition

Interaction type	Source Description	PO target response
Experiment 1		
Addressee → Speaker	PO	.82
	DO	.50
	Alignment effect	.32
Side-participant → Addressee	PO	.76
	DO	.63
	Alignment effect	.13
Experiment 2		
Addressee → Speaker	PO	.78
	DO	.45
	Alignment effect	.33
Side-participant → Speaker	PO	.73
	DO	.59
	Alignment effect	.14
Side-participant → Addressee	PO	.77
	DO	.54
	Alignment effect	.23
Experiment 3		
Addressee → Speaker	PO	.78
	DO	.56
	Alignment effect	.22
Addressee → Side-participant	PO	.83
	DO	.60
	Alignment effect	.23

Note: PO, prepositional object; DO, double object.

random effects. (Note that the proportions of PO and DO responses in each condition were complementary.) The two factors were Source (PO vs. DO), which was within participants and items, and Interaction Type (Addressee → Speaker vs. Side-Participant → Addressee), which was between participants but within items. The analyses revealed a significant effect of Source,  $F_1(1, 30) = 28.44$ ,  $p < .01$ ,  $MSe = .836$ ;  $F_2(1, 11) = 22.79$ ,  $p < .01$ ,  $MSe = .690$ . Overall, naïve participants produced 23% more target descriptions with the same syntactic form as the source description than with the alternative syntactic form. There was also a significant interaction,  $F_1(1, 30) = 4.83$ ,  $p < .05$ ,  $MSe = .142$ ;  $F_2(1, 11) = 5.88$ ,  $p < .05$ ,  $MSe = .105$ . As Table 1 reveals, naïve participants produced more syntactically aligned descriptions when they had been the addressee of the source description (32% more PO responses following a PO source description than following a DO source description) than when they had been a side-participant of it (13% more PO responses following a PO source description than following a DO source description).

Analyses over each level of the Interaction Type factor demonstrated an effect of Source in both the Addressee → Speaker condition,  $F_1(1, 15) = 30.59$ ,  $p < .01$ ,  $MSe = .833$ ;  $F_2(1, 11) = 40.04$ ,  $p < .01$ ,  $MSe = .690$ , and the Side-Participant → Addressee condition (marginal by items),  $F_1(1, 15) = 4.58$ ,  $p < .05$ ,

MSe = .144;  $F_2(1, 11) = 4.8$ ,  $p < .07$ , MSe = .128. Hence, naïve participants aligned with confederates in both conditions.

Naïve participants in the Side-Participant → Addressee condition were generally accurate at detecting and correcting the confederate's (scripted) errors, with a correction rate of 84%. Ten naïve participants corrected all four errors, five corrected three errors, and one corrected two errors. There was no correlation between magnitude of alignment and error detection rate (Pearson's  $r = -.183$ ,  $p > .1$ ).

### 3.3. Discussion

Experiment 1 shows clear evidence of syntactic alignment between speakers and side-participants in dialogue. Participants tended to describe pictures using the same types of description (e.g., *The pirate showing the cup to the soldier*) as those found in other dialogue experiments using different tasks (e.g., Clark & Wilkes-Gibbs, 1986; Horton & Gerrig, 2002). However, the precise syntactic structure that participants chose was influenced reliably by that used by another participant in the immediately previous utterance, both when that utterance had been addressed to the speaker and when it had not been: speakers were more likely to use a DO description after hearing another participant produce a DO description than after hearing that participant produce a PO description, and were more likely to use a PO description after hearing another participant produce a PO description than after hearing that participant produce a DO description. This tendency towards syntactic alignment occurred in the absence of any open-class lexical repetition, because the verb and noun phrases varied between source and target utterances. The effects are unlikely to rest on priming of the order of thematic roles, because the reported effects of such priming (Chang et al., 2003) are much smaller than those found here. They are also unlikely to rest on priming of the assignment of animate/inanimate noun phrases to particular linear positions: Bock and Loebell (1990) found priming for PO/DO structures between sentences whose arguments differed in animacy, and Huxley, Pickering, Branigan, and McLean (2005) found PO/DO priming for sentences in which both post-verb arguments were animate. Hence, it appears that speakers were aligning abstract syntactic structure.

These results complement previous demonstrations of syntactic alignment in dialogue, which showed that speakers tended to respond to another dialogue participant using the same syntactic structure as that participant had just used in an utterance addressed to the current speaker (Branigan et al., 2000). They indicate that syntactic alignment is not limited to reciprocal exchanges between interlocutors in two-party dialogues. Instead, it can also arise in the course of a multi-party dialogue, when the current speaker was a side-participant of the previous utterance.<sup>3</sup>

However, this tendency towards syntactic alignment was modulated by the participant role of the speaker relative to the source utterance. Although speakers tended to produce aligned descriptions when they had been the side-participant of the source

<sup>3</sup> A further experiment that replicated the Side-Participant → Addressee condition using the same experimental method but without requiring participants to carry out an additional description-checking task yielded a 22% alignment effect (significant by participants and items).

utterance, alignment was stronger when they had been the addressee of the source utterance. Naïve participants' high accuracy rate in detecting and correcting errors in descriptions of which they were side-participants suggests that this pattern cannot be attributed to a failure to comprehend the source utterance by side-participants. A simple explanation based upon timing differences between the two conditions can also be excluded, because time per trial was actually slightly less in the side-participant condition (7.57s) than in the addressee condition (11.90s). Some results suggest fairly rapid decay of syntactic priming (in writing: Branigan, Pickering, & Cleland, 1999), whereas others do not (in isolated speech: Bock & Griffin, 2000; Branigan, Pickering, Stewart, & McLean, 2000). Whichever is correct for dialogue, timing differences clearly cannot explain the experimental results.

#### 4. Experiment 2

Experiment 1 found that side-participants tended to align with the previous speaker in a three-party dialogue to a lesser extent than did addressees in a two-party dialogue. In Experiment 2, we investigated whether the difference in alignment between addressees and side-participants occurred in the context of a single three-party dialogue involving a naïve participant and two confederates (neither of whom was the experimenter). On one account, the strong alignment between speakers and addressees is not a consequence of the role of the addressee, but occurs because alignment is stronger in dialogues involving fewer participants than in dialogues involving more participants (perhaps because mutual influence might play a larger part when the dialogue involves fewer relationships). Consistent with this account, Fay, Garrod, and Carletta (2000) found that participants tend to align with each other to a greater extent in small than in large groups, with participants in a group of five tending to align with the previous speaker, and participants in a group of 10 tending to align with the dominant speaker. Note, however, that the alignment was semantic (relating to opinions) rather than syntactic, and that both groups were larger than those in Experiment 1.

Experiment 2 also manipulated whether the addressee of the target utterance was the speaker or a side-participant of the source utterance. In the Side-participant → Addressee condition of Experiment 1, the addressee of the target utterance was also the addressee of the source utterance, whereas in the Addressee → Speaker condition of Experiment 1, the addressee of the target utterance was the speaker of the source utterance. It is possible that degree of alignment is not dependent on the prior participant role of the current speaker, but rather on whether the previous speaker is addressed or not. For example, there might be an expectation that for politeness, any speaker should align with a previous speaker when addressing that speaker (because that speaker has established a precedent). To test this account, Experiment 2 contrasted conditions in which the previous side-participant addressed the previous addressee with a condition in which the previous side-participant addressed the previous speaker.

Hence the experiment manipulated three experimental conditions under which one naïve participant and two confederates described pictures to each other: an

*Addressee* → *Speaker condition* (confederate *A* addressed the source utterance to naïve participant *B*, who then addressed the target utterance to *A*); a *Side-Participant* → *Speaker condition* (*A* addressed the source utterance to confederate *C*, and *B* then addressed the target utterance to *A*); and a *Side-Participant* → *Addressee condition* (*A* addressed the source utterance to *C*, and *B* then addressed the target utterance to *C*). Therefore, confederate *A* always acted as speaker of the source utterance in the *Addressee* → *Speaker*, *Side-Participant* → *Speaker* and *Side-Participant* → *Addressee* conditions, and as the addressee of the target utterance in the *Addressee* → *Speaker* condition and *Side-Participant* → *Speaker*; confederate *C* always acted as addressee of the source utterance in the *Side-Participant* → *Speaker* and *Side-Participant* → *Addressee* conditions, and as addressee of the target utterance in the *Side-Participant* → *Addressee* conditions.

If the results of Experiment 1 are attributable simply to differences in the number of participants involved in the dialogue, then we should find comparable alignment in all three conditions. If the number of participants is not the relevant factor, then we can distinguish two possibilities, both of which are compatible with the results of Experiment 1. First, participants might align more with a source utterance when they were the addressee of that utterance than when they were a side-participant of that utterance. If so, then the relevant factor would be the prior participant role of the current speaker (i.e., her role while comprehending the source utterance). If we therefore consider the two conditions that hold the prior participant role of the current addressee constant, this account would predict greater alignment in the *Addressee* → *Speaker* condition than in the *Side-Participant* → *Speaker* condition. Second, participants might align more with a source utterance when addressing the speaker of that utterance than when addressing any other participant. If so, then the relevant factor would be the prior participant role of the current addressee. If we therefore consider the two conditions that hold the prior participant role of the current speaker constant, this account would predict greater alignment in the *Side-Participant* → *Speaker* condition than in the *Side-Participant* → *Addressee* condition. It is also possible that both factors play a role, in which case alignment would be strongest for *Addressee* → *Speaker* interactions, intermediate for *Side-Participant* → *Speaker* interactions, and weakest for *Side-Participant* → *Addressee* interactions.

Experiment 2 employed the same picture stimuli as Experiment 1, but used a computer-based picture-matching method that made it possible to manipulate straightforwardly the order in which each participant described and matched pictures. In this method, one participant had to decide whether a picture presented onscreen matched a description addressed to him by another participant. On experimental trials, confederates used a scripted description.

#### 4.1. Method

##### 4.1.1. Participants

Thirty-two naïve participants from the University of Edinburgh community were paid to take part. All were native English-speakers and reported having no reading or speaking difficulties.

#### 4.1.2. Items

We prepared three sets of stimuli to describe, one for each of the dialogue participants (termed *A*, *B*, and *C*, with *B* being the naïve participant). Experimental source stimuli were scripted descriptions; all other stimuli were pictures. The stimuli comprised the experimental items and fillers from Experiment 1, 12 additional stimuli involving ditransitive actions, and 48 additional stimuli involving transitive actions. In *A*'s description set there were 18 descriptions involving ditransitive actions and 36 pictures depicting transitive actions. In *B*'s description set there were 24 pictures depicting ditransitive actions and 48 pictures depicting transitive actions. In *C*'s description set there were 6 descriptions involving ditransitive actions and 12 pictures depicting transitive actions. To form the experimental items, we paired each of the ditransitive descriptions from *A* and *C*'s sets (the source description) with a picture from *B*'s description set (the target picture). Thus there were 24 experimental items (see Appendix A). Each Source description involved a different action and different entities from those depicted on the corresponding target picture.

An experimental item was defined as a confederate's (either *A*'s or *C*'s) source description plus the naïve participant's target picture paired with it. There were six versions of each item corresponding to the six experimental conditions, with PO and DO referring to the form of the source description: PO, Addressee → Speaker; DO, Addressee → Speaker; PO, Side-Participant → Speaker; DO, Side-Participant → Speaker; PO, Side-Participant → Addressee; DO, Side-Participant → Addressee. Additionally, each target picture appeared in two further versions, in which the confederate *C* addressed the naïve participant *B*, using either the PO or the DO description, and *B* then responded to *C*. These trials were included as filler trials so that *B* sometimes addressed *C* after acting as addressee and not always after acting as side-participant. This meant that *B* served as side-participant and addressee equally often. Additionally, it meant that *B* addressed *C* as often as *B* addressed *A*. These trials also maintained the fixed order of interactions necessitated by the software controlling stimulus presentation.

We constructed 8 lists containing 24 experimental items, 3 from each condition, and 96 filler items. Exactly one version of each item appeared in each list. Hence both Interaction Type (Addressee → Speaker vs. Side-Participant → Speaker vs. Side-Participant → Addressee) and Source (PO vs. DO) were manipulated within participants and items. In addition, each picture to be described had a corresponding picture. Of the 144 pictures to be described, half had a corresponding picture that matched it (matching pictures), and half had a corresponding picture that did not match it (mismatching pictures). Of the experimental mismatching pictures (i.e., describing ditransitive actions), ten had a different agent, eight had a different beneficiary, and six had a different patient. Of the filler mismatching picture (i.e., describing transitive actions), half had a different agent, and half had a different patient. The picture to be described and the corresponding picture (whether match or mismatch) always used the same verb. The order of the pictures to be described was randomized for each naïve participant, with at least two fillers intervening between targets.

#### 4.1.3. Procedure

The confederates were one male and one female native English-speaking member of the University of Edinburgh community. The confederates and the naïve participant sat on three sides of a square table; each participant was equidistant from each of the other participants (see Fig. 4). Each participant had his or her own monitor on which pictures appeared and a keyboard to make match/mismatch responses.

The experimenter told the naïve participant and the confederates that the experiment was investigating how well people communicate when they cannot see each other. Their tasks were either to describe a picture to one of the other participants (acting as describer), or to decide whether a picture matched another participant's description (acting as matcher). They were instructed that on a describing turn one of the other participants' name would appear on the describer's monitor so that the describer would know to whom she should address her description. The describer was asked to say the name aloud, so that the other participants would know to whom the description was addressed and so that the relevant participant knew that it was his turn to listen and to respond; after saying the name aloud, the describer should then describe the displayed picture to that person, using the verb written below the picture (participants were otherwise free to choose how to describe the picture). Once the describer had completed the description she was to press the space bar on the keyboard in front of her. (Note that for both confederates' describing turns, a sentence appeared on their monitors in a scripted order which they read out as if they were describing a picture.) Participants were instructed that on a matching turn, they would hear their name, so that they knew it was their turn to listen and respond, followed by a description. Once the description had been given, a picture would appear on the matcher's monitor and he had to decide whether it matched the description he

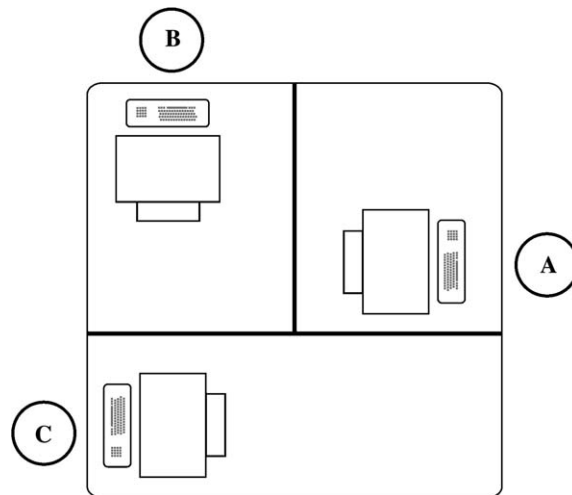


Fig. 4. Overhead view of set-up for Experiments 2 and 3; A and C are the confederates, B is the naïve participant.

had heard. If it did, he was to say “Yes” and press 1 on the keyboard; if it did not match, he was to say “No” and press 2 on the keyboard. Participants could say their descriptions, their match decisions, and “Please repeat,” to request repetition of a description, but nothing else. Half of the naïve participants experienced one fixed order of naming and matching turns; the other half experienced a different fixed order. Throughout the experiment, the experimenter and the confederates acted as if the confederates were naïve participants. Before the experiment, confederate *A* described four pictures to naïve participant *B*, and *B* described two pictures to *A* and two to confederate *C*. In both the practice and experimental sessions, a confederate gave the first description. Hence a confederate’s description of a source picture always immediately preceded the naïve participant’s description of a target picture. One male and one female confederate were used throughout the experiment. The role of the different confederates was counterbalanced such that each took the role of *A* and the role of *C* once on each version of a list.

At the end of the experimental session, all of the participants gave written responses to the questions:

1. Imagine that someone asked you to describe what you did and what happened in the study you just participated in. What would you tell them?
2. What do you think this study was investigating?

The experimental session was recorded on audio tape and subsequently transcribed.

#### 4.2. Results

We excluded 4 trials (0.5% of the data). Of these, 3 were excluded because the naïve participant produced a target response without *to*, and one because the target response was preceded by the wrong source description. We coded the remaining 764 target responses using the same criteria as Experiment 1. Of these responses, 486 were PO responses and 278 were DO responses. Proportions of PO target responses in the different conditions are reported in Table 1. The two within-participant and -item factors were Interaction Type (Addressee → Speaker vs. Side-Participant → Speaker vs. Side-Participant → Addressee) and Source (PO vs. DO).

Two-way ANOVAs on the proportions of PO target responses revealed a main effect of Source,  $F_1(1,31)=32.3$ ,  $p<.001$ ,  $MSe=0.080$ ;  $F_2(1,23)=63.1$ ,  $p<.001$ ,  $MSe=0.032$ , reflecting an overall 23% alignment effect. There was no main effect of Interaction Type (both  $F_s < 1$ ). However, there was an interaction between Interaction Type and Source (marginal by items),  $F_1(2,62)=3.14$ ,  $p=.05$ ,  $MSe=0.050$ ;  $F_2(2,46)=2.79$ ,  $p=.07$ ,  $MSe=0.047$ . Separate analyses over each level of the Interaction Type factor revealed an effect of Source for each type of interaction: Addressee → Speaker,  $F_1(1,31)=29.2$ ,  $p<.001$ ;  $F_2(1,23)=27.1$ ,  $p<.001$ ; Side-Participant → Speaker,  $F_1(1,31)=5.91$ ,  $p<.05$ ;  $F_2(1,23)=5.79$ ,  $p<.05$ ; Side-Participant → Addressee,  $F_1(1,31)=12.1$ ,  $p<.01$ ;  $F_2(1,23)=18.0$ ,  $p<.01$ . There was a 33% alignment effect for Addressee → Speaker interactions; a 14% effect for

Side-Participant → Speaker interactions; and a 23% effect for Side-Participant → Addressee interactions (see Table 1).

The question of whether speakers were more likely to align when they had been addressed than when they had not been addressed was assessed by comparing the Addressee → Speaker and Side-Participant → Speaker conditions (as the prior role of the current addressee does not vary in these conditions). Planned comparisons showed that alignment in the Addressee → Speaker condition was significantly greater than in the Side-Participant → Speaker condition,  $F_1(1,31)=6.06$ ,  $p<.05$ ,  $MSe=0.103$ ;  $F_2(1,23)=7.63$ ,  $p<.05$ ,  $MSe=0.068$ . Thus speakers were more likely to align when they had previously been directly addressed than when they had not been directly addressed.

The question of whether speakers were more likely to align when they addressed the previous speaker than when they addressed the previous addressee was assessed by comparing the Side-Participant → Speaker and Side-Participant → Addressee conditions (because the prior role of the current speaker does not vary in these conditions). Planned comparisons showed no difference between the conditions ( $F_s < 1.3$ ). Thus people were no more likely to align when addressing the previous speaker than when addressing the previous addressee. (In fact, the numerical trend is toward stronger alignment when addressing the previous addressee.)

A further analysis included the identity of the confederates as a between-participants and within-items factor (as we manipulated which confederate served as *A* and which served as *C* between participants). Confederate identity had no effect on any of the effects found above (all  $F_s < 1$ ). Analyses of the debriefing questions revealed that whilst 6 naïve participants had been aware that the ditransitive pictures could be described using more than one word order, none had been aware that the other participants were confederates nor that the confederates had used more than one word order. Although the numbers are too small for statistical comparison, there was no suggestion of any difference in alignment between the naïve participants who reported awareness of the confederates' use of alternative word orders and those who did not. The largest difference between participants who were aware of the existence of alternative word orders and those who were not was in the Side Participant → Speaker condition, in which participants who were aware of the alternative word orders actually showed 6% less alignment than those who were not.

#### 4.3. Discussion

Experiment 2 demonstrated that participant role affected syntactic alignment, and that the effects could not be due to the number of participants in the dialogue. In a three-party dialogue, speakers aligned syntactically with a prior utterance more often when they had acted as the addressee of that utterance than when they had acted as a side-participant of that utterance. In contrast, speakers' tendency to align syntactically was not influenced by the previous participant role of their current addressee: alignment was no stronger when naïve participants addressed the previous speaker than when they addressed the previous addressee. These results suggest that the tendency towards syntactic alignment is influenced by participant role at the point when the source utterance is initially encoded, but not at the point when the target utter-

ance is encoded. Hence alignment appears to be in some sense egocentric, tied to the speaker's previous experiences and not to her addressee's previous experiences.

One potential issue about the generalizability of these results (and the previous experiment) is whether syntactic alignment depends on there being a close semantic relationship between the events described in source and target utterances. There is evidence from both dialogue and monologue experiments that effects are enhanced when the same head, or semantically related heads, appear in the source and target utterances; however, the same experiments show that effects occur even when the head is not repeated (Branigan et al., 2000; Cleland & Pickering, 2003). Moreover, Bock and Loebell (1990) found in monologue experiments that speakers repeated syntactic structure even when prime and target described very different events (e.g., a locative sentence like *The foreigner was loitering by the traffic light* primed a passive sentence like *The boy is woken by the alarm clock*). In our experiments, the source and target pictures always involved different entities. However, there were a small number of source-target pairs (4 out of 24 pairs; items 2, 7, 22, and 24 in the Appendix A) in which the same verb could have been used felicitously to describe both the source and target picture (e.g., a picture involving *give* could also be described felicitously using *hand*); in the remaining pictures, the actions were depicted in such a way that the source and target verbs were not interchangeable (e.g., the beneficiary displayed money to the agent in the *sell* pictures). The overall alignment effect remained when these 4 items were removed from the analysis,  $F_1(1, 31) = 31.1, p < .001, \text{MSe} = 0.087$ ;  $F_2(1, 19) = 47.8, p < .001, \text{MSe} = 0.0325$ . Hence, alignment does not depend on repetition of an event (in terms of either the specific entities or the specific action involved) across the source and target utterances, though it is possible that repeating the event enhances alignment just as repeating the verb does (indeed, this would accord with the account of Pickering & Garrod, 2004). The results of the post-experimental questionnaire also argue against any explanation in terms of strategic effects.

### 5. Experiment 3

Experiment 2 suggested that the prior participant role of the current speaker affected alignment, but that the prior participant role of the current addressee (i.e., whether the current addressee had been the speaker or the addressee of the source utterance) did not affect alignment. In Experiment 3, we investigated these effects further. First, we examined whether the null effect of the current addressee's prior participant role would replicate. Second, we explored further how the prior participant role of the current speaker and the current addressee might affect alignment. In Experiment 2, we examined interactions in which the speaker of the target utterance acted as side-participant of the source utterance (i.e., interactions of the type Side-Participant  $\rightarrow$  X). It is possible that because alignment by prior side-participants is generally weak, it is difficult to detect in such interactions possibly subtle differences in alignment that are linked to the prior participant role of the current addressee. In Experiment 3, we therefore focused on interactions which Experiments 1 and 2 demonstrated to yield a higher degree of alignment overall: those in which the speaker of

the target utterance acted as addressee of the source utterance (i.e., interactions of the type Addressee → X). Additionally, Experiment 2 demonstrated only that alignment was unaffected by whether the current addressee had previously acted as speaker or as addressee. A stronger manipulation of the influence of the current addressee's prior role would be to compare alignment when the addressee has previously acted either as speaker or as side-participant, since the distinction between these two participant roles is hypothesized to be stronger than that between speaker and addressee. Experiment 3 therefore compared alignment by speakers who had previously acted as the addressee of the source utterance under two conditions: when their addressee had been the speaker of the source utterance (Addressee → Speaker), and when their addressee had been a side-participant of the source utterance (Addressee → Side-Participant).

### 5.1. Method

#### 5.1.1. Participants

Twenty-four further naïve participants from the same population as Experiment 2 were paid to take part.

#### 5.1.2. Items

The experimental and filler items were the same as in Experiment 2 but in this study all the items were described by either Confederate *A* or Naïve participant *B*. (Confederate *C* did not describe any cards.) We term the description sets the *Naïve participant's description set* and *Confederate A's description set*. We created ordered pairs of source and target pictures by pairing each experimental picture from Confederate *A*'s description set (the source picture) with an experimental picture from the naïve participant's description set (the target picture). The corresponding pictures (i.e., match and mismatch pictures) were identical to Experiment 2.

There were 24 experimental items. There were four scripts, each containing a description for each of the Source pictures. In each script, half of the source pictures were assigned PO, and half were assigned DO descriptions. An experimental item was defined as confederate *A*'s source description plus the naïve participant's target picture paired with it. There were four versions of each item corresponding to the four experimental conditions: PO, Addressee → Speaker; DO, Addressee → Speaker; PO, Addressee → Side-Participant; DO, Addressee → Side-Participant.

We constructed four lists containing 24 experimental items, 6 from each condition, and 96 fillers. Exactly one version of each item appeared in each list. Hence both Interaction Type (Addressee → Speaker vs. Addressee → Side-Participant) and Source (PO vs. DO) were manipulated within participants and items.

#### 5.1.3. Procedure

The procedure was identical to Experiment 2 with the exception that the participants did not complete a questionnaire at the end of the experiment. The male and female confederates were the same as in Experiment 2, and both took the role of confederate *A* and the role of confederate *C* once for each list.

## 5.2. Results and discussion

One target response that did not include the correct preposition (*to*) was excluded (0.2% of the data). We coded the remaining 575 target responses using the scoring method described in Experiment 1. Of these responses, 398 were PO responses and 177 were DO responses. Two-way ANOVAs on the proportions of PO target responses produced in each condition revealed a main effect of Source,  $F_1(1,22) = 36.3, p < .001, MSe = 0.033$ ;  $F_2(1,23) = 33.6, p < .001, MSe = 0.038$ , reflecting an overall alignment effect of 23% (see Table 1). There were no other effects (all  $F_s < 1.5$ ). Separate analyses over each level of the Interaction Type factor revealed an effect of Source for both Addressee  $\rightarrow$  Speaker,  $F_1(1,23) = 31.0, p < .001$ ;  $F_2(1,23) = 7.73, p < .05$ , and Addressee  $\rightarrow$  Side-Participant,  $F_1(1,23) = 20.1, p < .001$ ;  $F_2(1,23) = 21.8, p < .001$ . Participants were 22% more likely to use the same syntactic form as the source than the alternative form when addressing the previous speaker, and 23% more likely to use the same syntactic form as the source than the alternative form when addressing the previous side-participant.

The results of Experiment 3 demonstrate that naïve participants who had previously acted as addressees syntactically aligned with a previous utterance to the same extent whether their current addressee had been the speaker of that utterance or a side-participant of that utterance. In accord with Experiment 2, alignment was unaffected by the prior participant role of the addressee. In particular, alignment was unaffected by the extent to which a participant contributed to the dialogue as a whole: it was as strong with Confederate C, who never acted as speaker in the dialogue, as with Confederate A, who acted as both speaker and addressee. Hence these results argue against any explanation of the finding that former addressees aligned more than former side-participants in Experiment 2 in terms of differences in the overall contributions of the two confederates in that experiment to the dialogue as a whole.

## 6. General discussion

There is a substantial body of research on the nature of the cognitive mechanisms that underlie language use in two-party dialogues. In contrast, there has been much less research on the mechanisms of language processing, and specifically syntactic processing, in multi-party dialogues. We reported three experiments that examined one aspect of this issue: how variations in participant role influence speakers' syntactic behavior in dialogue. In Experiment 1, we demonstrated that participants align syntactically even when they do not stand in a speaker-addressee relationship. Naïve participants were more likely to produce descriptions that had a PO structure after acting as side-participant of a previous utterance that had a PO structure than after acting as side-participant of an utterance that had a DO structure; conversely, they were more likely to produce descriptions that had a DO structure after acting as side-participant of a previous utterance that had a DO structure than after acting as side-participant of an utterance that had a PO structure. However, Experiment 1 also

demonstrated that alignment was smaller under these conditions than in two-party dialogues in which the source utterance was directly addressed to the naïve participants. Experiment 2 showed that the same pattern of effects occurred within a single multi-party dialogue: naïve participants were more likely to align with a previous speaker when that speaker had directly addressed them than when that speaker had addressed a third person. However, naïve participants' behavior was not affected by whether their current addressee had been the speaker or the addressee of the source utterance with which they were aligning. Experiment 3 extended these results by demonstrating that when naïve participants had been the addressee of the source utterance, their tendency towards alignment was unaffected by whether the current addressee had previously been the speaker or a side-participant.

Our experiments show that syntactic alignment occurs in multi-party dialogues, and that it is not restricted to speaker-addressee dyads within such dialogues. We can therefore conclude that syntactic alignment is a pervasive phenomenon in dialogue. However, they also show that syntactic alignment is sensitive to variations in participant role. Naïve participants' behavior as speakers was influenced by their prior participant role on an immediately preceding turn within the same dialogue. Specifically, speakers were less likely to align syntactically with a previous speaker when they had been a side-participant of the previous speaker's utterance than when they had been the addressee. In contrast, speakers were not influenced by the prior participant role of their addressee; they aligned to the same extent whether they were addressing the prior speaker, addressee, or side-participant. Thus syntactic alignment appears to be sensitive to the current speaker's role with respect to the source utterance, but not the current addressee's role with respect to the source utterance.

Our results show that the overall magnitude of syntactic alignment is affected by participant role, although the effect of participant role on syntactic alignment appeared to be numerically stronger for DO than for PO responses. For example, in Experiment 1 former addressees produced 13% more DO responses after a DO source utterance than did former side-participants, but only 6% more PO responses after a PO source utterance; a similar pattern was found in Experiment 2. The most likely explanation for these differences lies in the preference in British English for POs in the neutral discourse context used in these experiments. Overall, participants produced 66% PO target responses and 34% DO target responses across the experiments as a whole. This is in keeping with previous studies of PO/DO structures in British English; for example, [Pickering et al. \(2002\)](#) found in three syntactic priming experiments in monologue that participants from a similar population to those sampled here produced a mean of 62% PO responses following an unrelated (baseline) prime. This preference is likely to result in a smaller alignment effect for POs than for DOs, simply because there is less room for increase in the overall proportion of POs. The percentage of aligned PO target responses was consistently high across experiments (73–83%; note that [Branigan et al., 2000](#), obtained a comparable 75% rate in their dialogue experiment), and it seems likely that this level is close to ceiling level. A number of syntactic priming studies have shown that it is difficult to increase the production of structures that are already close to ceiling, whereas less-preferred structures are more likely to display priming effects

(e.g., Hartsuiker & Westenberg, 2000; Scheepers, 2003). Hence, it is likely that DO responses were more amenable to variations in use because they started from a lower level.

The magnitude of the alignment effect also varied between experiments; for example, Addressee → Speaker alignment varied from 32% (Experiment 1) to 33% (Experiment 2) to 23% (Experiment 3). This variation is in keeping with previous research on syntactic priming and syntactic alignment (e.g., Cleland & Pickering, 2003, found variations in Addressee → Speaker alignment for noun phrase structure varying between 27% and 41% across experiments that used the same task, many of the same experimental materials, and the same population as each other). However, some of the variation may arise from differences in the methods used in the four experiments. Experiment 1 used a picture-description and picture-selection task involving boxes of cards, whereas Experiments 2 and 3 used a picture-description and picture-matching task involving digital pictures displayed on-screen. These differences between tasks help us to demonstrate that syntactic alignment is a widespread phenomenon, but they of course make it difficult to draw direct comparisons across experiments.

Our results indicate that syntactic aspects of language production can be affected by non-syntactic context in a hitherto unexplored way. For example, many studies have shown how choice of syntactic form can be affected by factors such as discourse salience (e.g., Prat-Sala & Branigan, 2000) or semantic priming. Experiments 1 and 2 show an interaction of syntactic context and participant role in choice of syntactic form, and hence that syntactic processing in dialogue is affected by information relating to the relationship between the speaker and other participants in the dialogue. The rationale for participant role influences on lexical and semantic aspects of language production in dialogue (e.g., Brennan & Clark, 1996) is straightforward; for example, given the closer relationship between speakers and addressees than between speakers and side-participants, addressees might well have readier access to common semantic ground (e.g., lexical labels for concepts or particular conceptions of ambiguous stimuli) than side-participants. It is less obvious why participant role should also influence syntactic processing for unambiguous sentences. Nevertheless, the evidence from our experiments suggests that syntactic processing is susceptible to these high-level, non-linguistic, and context-bound influences. The results are particularly striking because syntactic alignment was not necessary for effective communication in our experiments: PO and DO structures expressed the same meaning and hence listeners were able to extract the appropriate meaning and make an appropriate response irrespective of whether the speaker syntactically aligned with a previous utterance. This contrasts with semantic alignment, where failure to use the same semantic representations as an interlocutor (e.g., using the term *teacher* to refer to different entities) can easily result in misunderstanding (e.g., selecting the wrong card).

These experiments show further that effects of participant role occur on a turn-by-turn basis; speakers are influenced by their participant role with respect to the immediately preceding turn. Previous work on participant role effects with respect to common semantic ground has contrasted conditions in which participants played a particular role in an entire dialogue (e.g., Wilkes-Gibbs & Clark, 1992). Our work shows a much more ephemeral and dynamically responsive effect, in

which participants' degree of alignment was a function of their participant role with respect to the immediately prior utterance. In Experiment 2, the same participants showed weaker or stronger alignment depending on whether they had been the addressee or a side-participant of the source utterance. Additionally, speakers' alignment was highly localized: speakers switched between alternative syntactic structures throughout the dialogue as a function of strictly local context (i.e., another participant's immediately preceding utterance). This does not of course preclude longer term effects; in our experiments, the confederate(s) switched between alternative syntactic forms throughout the course of the dialogue. But these results show that both alignment and effects of participant role on alignment can be very local.

### *6.1. Accounting for effects of participant role on syntactic alignment*

An account of the effects of participant role requires us to integrate theories of alignment with theories of dialogue structure. The fact that alignment is affected by participant role rules out simple output-input coordination (Garrod & Anderson, 1987). On the other hand, the fact that alignment occurs with side-participants at all demonstrates that it is not limited to reciprocal interactions between speakers and addressees and is therefore not a consequence of the norm of reciprocity (Gouldner, 1960). Perhaps more interestingly, it is not simply the case that alignment is always reduced in interactions involving former side-participants, as two types of account would predict.

Much research shows partner-specific effects in lexical alignment in both production and comprehension (e.g., Brennan & Clark, 1996; Horton & Gerrig, 2005b; Metzinger & Brennan, 2003). Brennan and Clark argued that pairs of interlocutors tacitly set up agreements (or conceptual pacts) to conceptualize entities in the same way as each other, and therefore they lexically align (or in their terms, entrain) with each other to a greater extent than they do with new conversational partners. Horton and Gerrig (2005a, 2005b) argued that interlocutors automatically create an association between a particular expression and a particular partner, so that the presence of that partner cues the re-use of that expression. Metzinger and Brennan explained partner-specific effects in comprehension on the assumption that addressees create associations between lexical representations and tags capturing the partner's identity, or perceptual cues such as the speaker's voice or physical presence. Though these accounts differ in the extent to which partner-specificity is treated as intentional or automatic, they all predict more alignment with addressees than with side-participants. Thus they account well for the existing evidence concerning lexical alignment in comprehension and production, but they cannot explain the pattern of syntactic alignment found in our experiments. They correctly predict that people align more strongly with a previous speaker after being the addressee of the source utterance than after being a side-participant (Experiments 1 and 2). But they also predict that people should align more strongly when reciprocally addressing a former speaker than when addressing a former side-participant, in contradiction to the results of Experiment 3.

Instead, we suggest that an account that is framed in terms of depth of processing during encoding can explain why speakers are influenced by their own prior participant role, but not by the prior participant role of their current addressee. Such an account assumes that listeners tend to pay more attention to utterances when they are addressees than when they are not addressees. Both addressees and side-participants obey the principle of responsibility in that they pay attention to what is said and update their discourse representations accordingly. But only addressees are required to collaborate actively with the speaker to achieve understanding (Clark & Schaefer, 1992), and addressees may attempt to achieve fuller understanding than side-participants (Branigan, *in press*). So addressees have to process more deeply than side-participants. There is good evidence that aspects of language comprehension are affected by whether participants are required to understand an utterance deeply or not (e.g., anaphor resolution; Stewart, Pickering, & Sanford, 2000), so it is reasonable to expect that alignment – whereby comprehension of an utterance influences subsequent production – might be stronger when one has just served as addressee than when one has just served as side-participant.

Note that this difference in attention occurs in the context of correctly understanding the utterances, because side-participants overwhelmingly noticed when speakers made errors (Experiment 1). They had to attend to all trials in order to detect these errors. So the fluctuations in attention do not simply amount to side-participants “switching off” and failing to comprehend the prime utterances. Instead, these differences in attention may be comparable to the difference in priming detected by Bock et al. (1992), who found more priming of grammatical form when participants were instructed to focus on form than when they were instructed to focus on meaning (even though their ability to recall the form of the prime sentences was unaffected by this manipulation). In other words, differences in participants’ attention can influence priming, even when those participants process an utterance to a degree sufficient for comprehension.

Additionally, addressees have the responsibility of acting in response to the speaker’s contribution. This response may take the form of an action, the provision of feedback, or taking the floor (Clark, 1996; Linell, 1998; Sacks et al., 1974). For example, the addressee is expected to answer a question, respond to a command, or acknowledge an assertion – that is, act in response to the addressee-directed illocutionary act – whereas a side-participant is not generally expected to. Therefore, the addressee has to comprehend an utterance in such a way that he is prepared to respond if need be. This “active” mental state contrasts with the more “passive” mental state of the side-participant, and encourages processing associated with preparing responses. In our experiments, addressees had to find a card that matched a description (Experiment 1), or make a match/mismatch decision and convey this verbally to the speaker (Experiments 2 and 3). Assuming that syntactic processing is affected by attention in this way, the form of the speaker’s utterance is more likely to affect the subsequent behavior of the addressee than of the side-participant. Of course, listeners’ requirement to act upon the speaker’s utterances – hence their depth of processing – is not fixed but may instead depend upon the communicative context. Under some circumstances, for example, side-participants may also have to act in response

to the speaker's utterances; in Experiment 1, the side-participant had an additional task that required him to comprehend the source utterance (checking the accuracy of the speaker's contribution) and if necessary, produce an utterance (correcting any inaccuracies) in response. In that experiment, the additional task of the side-participant did not enhance alignment, suggesting that alignment does not depend straightforwardly on whether or not a participant might have to act upon a speaker's utterance. But it is possible that a side-participant who was always required to respond to a speaker's utterance would process such utterances more deeply and hence align with them more strongly.

In contrast, given a range of felicitous syntactic structures to express a message, speakers simply choose a structure on the basis of the relative accessibility of the alternatives, in a manner that is independent of how they are being used. So speakers' choice of syntactic form is unaffected by the prior participant role of their current addressee. In accord with this account, Experiment 3 found no difference in alignment when the former addressee (i.e., the naïve participant) now addressed the former speaker or the former side-participant. When the naïve participant was addressed, he had to process deeply (in order to be prepared to respond). It did not then matter whether he subsequently addressed the former speaker or not. For similar reasons, it did not matter whether the former side-participant in Experiment 2 addressed the former speaker or the former addressee. Under this account, the fact that addressees align more strongly than side-participants is likely to lead to strong alignment in a dyad, because in a dyad the current speaker was always the previous addressee; but this is a consequence of depth of processing while comprehending, and not a specific way of behaving in a dyad.

Our pattern of results can be explained within the model of the production of syntax developed by Pickering and Branigan (1998) and applied to dialogue by Branigan et al. (2000); see also Cleland and Pickering (2003) and Hartsuiker et al. (2004). Comprehension of an utterance with a particular syntactic structure leads to the activation of the verb's lemma and a combinatorial node associated with that structure. This then increases the tendency to use that syntactic structure again in the next utterance. Because an addressee processes an utterance deeply, the relevant combinatorial node receives considerable activation during comprehension, and therefore there is a considerable tendency to use that structure again. In contrast, a side-participant tends to process an utterance less deeply, hence the relevant combinatorial node receives less activation, and there is a less strong tendency to use the structure again. Thus, stronger alignment effects occurred for former addressees than former side-participants. In contrast, activation is not affected by whether the speaker then addresses the former addressee, the former speaker, or the former side-participant: alignment arises from residual activation that is proportional to the initial activation of a node; hence only participant role at the point where initial activation occurs can be relevant. These manipulations therefore had no effect on the propensity for alignment in Experiments 2 and 3.

Our results can also be explained in a similar way within models of syntactic alignment that make reference to implicit learning processes (e.g., Bock & Griffin, 2000; Chang et al., 2006). In such models, prior exposure to a particular structure changes

the weights of connections within the language processing architecture. Because an addressee usually processes an utterance more deeply than a side-participant, exposure to a structure as an addressee would give rise to larger weight changes (and hence result in a stronger tendency to re-use structure) than exposure to a structure as a side-participant. Connection weights are not affected by whether the speaker then addresses the former addressee, the former speaker, or the former side-participant because alignment arises from changes in weights linked to the initial exposure to a structure; hence only participant role at the point where the structure was initially encountered by the speaker can be relevant. In sum, addressees tend to process more deeply than side-participants, with deeper processing resulting in a greater impact upon the language processor (whether through activation or changes in connection weights) than shallower processing. Thus participants' syntactic procedures and representations are influenced to a greater extent when they understand an utterance that is addressed to them than when they understand an utterance of which they are a side-participant.

As we have noted, our results contrast with the findings for lexical and perhaps semantic alignment (e.g., Brennan & Clark, 1996), in which alignment is straightforwardly enhanced in reciprocal dyads. It may therefore be that the mechanisms of syntactic alignment differ in some respects at least from the mechanisms of lexical and semantic alignment. This would require some elaboration of the interactive-alignment model (Pickering & Garrod, 2004), which does not distinguish the mechanisms of alignment at different linguistic levels. Perhaps the most obvious possibility is that speakers are more likely to be aware of the lexical and semantic aspects of their contribution than its syntactic aspects, perhaps because of self-monitoring (cf. Horton & Keysar, 1996) or because of feedback from their interlocutor (see Brennan & Clark, 1996, p. 1491). They can therefore tell whether the contribution is lexically and semantically felicitous with respect to their interlocutor and produce their utterance accordingly. However, we predict that there will also be more automatic components of semantic and lexical alignment that accord more straightforwardly with the syntactic alignment investigated in our experiments.

In conclusion, we have demonstrated that both addressees and side-participants syntactically align with speakers, thereby offering support to the claim that dialogue is fundamentally a collaborative activity between all participants. Additionally, we showed that former addressees align more strongly than do former side-participants. In contrast, the prior participant role of the addressee does not influence alignment. These results suggest that alignment is sensitive to participant role during comprehension, and support accounts in which participant role plays an integral part in the processes of language production.

### **Acknowledgements**

This research was supported by ESRC Grant R000239363, a British Academy grant, and a British Academy Postdoctoral Fellowship (awarded to the first author). We thank Stuart Boutell and Alan Marshall for software assistance.

## Appendix A. Experimental items

The source descriptions for the PO condition are before the slash and the DO condition after the slash. The target picture is described in the order agent, verb, beneficiary, patient (e.g., NUN SHOW DOCTOR CAKE is designed to elicit the descriptions *the nun showing the cake to the doctor* and *the nun showing the doctor the cake*).

### A.1. Experimental items in Experiment 1

1. The teacher giving the banana to the swimmer/the swimmer the banana. NUN SHOW DOCTOR CAKE
2. The teacher giving the apple to the doctor/the doctor the apple. PIRATE HAND SAILOR CAKE
3. The chef handing the ball to the boxer/the boxer the ball. POLICEMAN THROW SWIMMER CUP
4. The chef handing the hat to the sailor/the sailor the hat. NUN SHOW MONK BANANA
5. The pirate showing the hat to the burglar/the burglar the hat. COWBOY OFFER BURGLAR BANANA
6. The pirate showing the book to the monk/the monk the book. ARTIST SELL DANCER GUN
7. The cowboy throwing the gun to the soldier/the soldier the gun. CHEF GIVE SWIMMER JUG
8. The cowboy throwing the book to the sailor/the sailor the book. CHEF HAND BOXER GUN
9. The artist selling the ball to the clown/the clown the ball. COWBOY OFFER MONK APPLE
10. The artist selling the gun to the doctor/the doctor the gun. CHEF GIVE CLOWN BALL
11. The waitress offering the cake to the dancer/the dancer the cake. POLICEMAN THROW SOLDIER HAT
12. The waitress offering the banana to the boxer/the boxer the banana. ARTIST HAND SAILOR HAT

### A.2. Experimental items in Experiments 2 and 3

1. The teacher giving the banana to the swimmer/the swimmer the banana. NUN SHOW DOCTOR CAKE
2. The teacher giving the apple to the doctor/the doctor the apple. PIRATE HAND SAILOR CAKE
3. The chef giving the gun to the doctor/the doctor the gun. COWBOY THROW DANCER BANANA
4. The chef giving the ball to the monk/the monk the ball. ARTIST SELL SAILOR BOOK

5. The chef handing the ball to the boxer/the boxer the ball. POLICEMAN THROW SWIMMER CUP
6. The chef handing the hat to the sailor/the sailor the hat. NUN SHOW MONK BANANA
7. The pirate handing the cake to the boxer/the boxer the cake. WAITRESS OFFER SOLDIER APPLE
8. The pirate handing the banana to the doctor/the doctor the banana. ARTIST SELL SAILOR HAT
9. The pirate showing the hat to the burglar/the burglar the hat. COWBOY OFFER BURGLAR BANANA
10. The pirate showing the book to the monk/the monk the book. ARTIST SELL DANCER GUN
11. The nun showing the jug to the boxer/the boxer the jug. TEACHER GIVE SOLDIER BOOK
12. The nun showing the banana to the boxer/the boxer the banana. COWBOY THROW CLOWN BALL
13. The cowboy throwing the gun to the soldier/the soldier the gun. CHEF GIVE SWIMMER JUG
14. The cowboy throwing the book to the sailor/the sailor the book. CHEF HAND BOXER GUN
15. The policeman throwing the apple to the dancer/the dancer the apple. WAITRESS OFFER SAILOR GUN
16. The policeman throwing the hat to the boxer/the boxer the hat. ARTIST SELL SOLDIER APPLE
17. The artist selling the ball to the clown/the clown the ball. COWBOY OFFER MONK APPLE
18. The artist selling the gun to the doctor/the doctor the gun. CHEF GIVE CLOWN BALL
19. The teacher selling the banana to the sailor/the sailor the banana. PIRATE SHOW BOXER JUG
20. The teacher selling the jug to the dancer/the dancer the jug. CHEF HAND MONK APPLE
21. The waitress offering the cake to the dancer/the dancer the cake. POLICEMAN THROW SOLDIER HAT
22. The waitress offering the banana to the boxer/the boxer the banana. ARTIST HAND SAILOR HAT
23. The cowboy offering the apple to the burglar/the burglar the apple. PIRATE SHOW SOLDIER CUP

The cowboy offering the cake to the boxer/the boxer the cake. TEACHER GIVE SWIMMER BOOK

## References

- Bavelas, J. B., Coates, L., & Johnson, T. (2000). Listeners as co-narrators. *Journal of Personality and Social Psychology, 79*, 941–952.
- Bock, J. K. (1986). Syntactic persistence in language production. *Cognitive Psychology, 18*, 355–387.
- Bock, J. K. (1989). Closed class immanence in sentence production. *Cognition, 31*, 163–186.
- Bock, J. K., & Griffin, Z. M. (2000). The persistence of structural priming: transient activation or implicit learning? *Journal of Experimental Psychology: General, 129*, 177–192.
- Bock, J. K., & Loebell, H. (1990). Framing sentences. *Cognition, 35*, 1–39.
- Bock, J. K., Loebell, H., & Morey, R. (1992). From conceptual roles to structural relations: bridging the syntactic cleft. *Psychological Review, 99*, 150–171.
- Bodner, G. E., & Masson, M. E. J. (2001). Prime validity affects masked repetition priming: evidence for an episodic resource account of priming. *Journal of Memory and Language, 45*, 616–647.
- Bodner, G. E., & Masson, M. E. J. (2004). Beyond binary judgments: prime validity modulates masked repetition priming in the naming task. *Memory & Cognition, 32*, 1–11.
- Bodner, G. E., Masson, M. E. J., & Richard, N. T. (in press). Repetition proportion biases masked priming of lexical decisions. *Memory & Cognition*.
- Bradac, J. J., Mulac, A., & House, A. (1988). Lexical diversity and magnitude of convergent versus divergent style shifting – perceptual and evaluative consequences. *Language & Communication, 8*, 213–228.
- Branigan, H. P. (in press). Perspectives on multi-party dialogue. *Research on Language and Computation*.
- Branigan, H. P., Pickering, M. J., & Cleland, A. A. (1999). Syntactic priming in written production: evidence for rapid decay. *Psychonomic Bulletin & Review, 6*, 635–640.
- Branigan, H. P., Pickering, M. J., & Cleland, A. A. (2000). Syntactic coordination in dialogue. *Cognition, 75*, B13–B25.
- Branigan, H. P., Pickering, M. J., Liversedge, S. P., Stewart, A. J., & Urbach, T. P. (1995). Syntactic priming: Investigating the mental representation of language. *Journal of Psycholinguistic Research, 24*, 489–506.
- Branigan, H. P., Pickering, M. J., Stewart, A. J., & McLean, J. F. (2000). Syntactic priming in spoken production: linguistic and temporal interference. *Memory & Cognition, 28*, 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*, 1482–1493.
- Brown, P., & Dell, G. S. (1987). Adapting production to comprehension: the explicit mention of instruments. *Cognitive Psychology, 19*, 441–472.
- Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: the perception-behaviour link and social interaction. *Journal of Personality and Social Psychology, 76*, 893–910.
- Chang, F., Bock, K., & Goldberg, A. E. (2003). Can thematic roles leave traces of their places? *Cognition, 90*, 29–49.
- Chang, F., Dell, G. S., & Bock, J. K. (2006). Becoming syntactic. *Psychological Review, 113*, 234–272.
- Clark, H. H. (1996). *Using language*. Cambridge: Cambridge University Press.
- Clark, H. H., & Carlson, T. B. (1982). Hearers and speech acts. *Language, 58*, 332–373.
- Clark, H. H., & Schaefer, E. F. (1992). Dealing with overhearers. In H. H. Clark (Ed.), *Arenas of language use* (pp. 248–274). Chicago: University of Chicago Press.
- Clark, H. H., & Wilkes-Gibbs, D. (1986). Referring as a collaborative process. *Cognition, 22*, 1–39.
- Cleland, A. A., & Pickering, M. J. (2003). The use of lexical and syntactic information in language production: evidence from the priming of noun phrase structure. *Journal of Memory and Language, 49*, 214–230.
- Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: automatic effects of social perception on social behavior. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 33, pp. 1–40). San Diego: Academic Press.
- Fay, N., Garrod, S., & Carletta, J. (2000). Group discussion as interactive dialogue or as serial monologue: the influence of group size. *Psychological Science, 11*, 487–492.
- Ferreira, V. S. (2003). The persistence of optional complementizer production: why saying “that” is not saying “that” at all. *Journal of Memory and Language, 48*, 379–398.
- Fussell, S. E., & Krauss, R. M. (1992). Coordination of knowledge in communication: effects of speakers’ assumptions about what others know. *Journal of Personality and Social Psychology, 62*, 378–391.

- Garrod, S., & Anderson, A. (1987). Saying what you mean in dialogue: a study in conceptual and semantic co-ordination. *Cognition*, *27*, 181–218.
- Garrod, S., & Clark, A. (1993). The development of dialogue co-ordination skills in schoolchildren. *Language and Cognitive Processes*, *8*, 101–126.
- Garrod, S., & Doherty, G. (1994). Conversation, co-ordination and convention: an empirical investigation of how groups establish linguistic conventions. *Cognition*, *53*, 181–215.
- Giles, H., & Powesland, P. (1975). *Speech style and social evaluation*. San Diego: Academic Press.
- Giles, H., & Smith, P. M. (1979). Accommodation theory: optimal levels of convergence. In H. Giles & R. St. Clair (Eds.), *Language and social psychology*. Oxford: Blackwell.
- Goodwin, C. (1981). *Conversational organization: Interaction between speakers and hearers*. New York: Academic Press.
- Gouldner, A. W. (1960). The norm of reciprocity: a preliminary statement. *American Sociological Review*, *25*, 161–178.
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*, 4–27.
- Gries, S. T. (2005). Syntactic priming: a corpus-based approach. *Journal of Psycholinguistic Research*, *34*, 365–399.
- Hartsuiker, R. J., & Kolk, H. H. J. (1998). Syntactic persistence in Dutch. *Language and Speech*, *41*, 143–184.
- Hartsuiker, R. J., Pickering, M. J., & Veltkamp, E. (2004). Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish-English bilinguals. *Psychological Science*, *15*, 409–414.
- Hartsuiker, R. J., & Westenberg, C. (2000). Persistence of word order in written and spoken sentence production. *Cognition*, *75*, B27–B39.
- Haywood, S., Pickering, M. J., & Branigan, H. P. (2005). Do speakers avoid ambiguity in dialogue? *Psychological Science*, *16*, 362–366.
- Horton, W. S., & Keysar, B. (1996). When do speakers take into account common ground? *Cognition*, *59*, 91–117.
- Horton, W. S., & Gerrig, R. J. (2002). Speakers' experiences and audience design: knowing when and knowing how to adjust utterances to addressees. *Journal of Memory and Language*, *47*, 589–606.
- Horton, W. S., & Gerrig, R. J. (2005a). Conversational common ground and memory processes in language production. *Discourse Processes*, *40*, 1–35.
- Horton, W. S., & Gerrig, R. J. (2005b). The impact of memory demands on audience design during language production. *Cognition*, *96*, 127–142.
- Huxley, C., Pickering, M. J., Branigan, H. P., & McLean, J. F. (2005). An investigation of word order effects on syntactic priming. Poster presented at the Architectures and Mechanisms of Language Processing Conference (AMLaP-2005), Ghent, September 2005.
- Isaacs, E. A., & Clark, H. H. (1987). References in conversations between experts and novices. *Journal of Experimental Psychology: General*, *116*, 26–37.
- Krauss, R. M. (1987). The role of the listener: addressee influences on message formulation. *Journal of Language and Social Psychology*, *6*, 81–97.
- Krauss, R. M., & Weinheimer, S. (1964). Changes in reference phrases as a function of usage in social interaction: a preliminary study. *Psychonomic Science*, *1*, 113–114.
- Krauss, R. M., & Weinheimer, S. (1966). Concurrent feedback, confirmation, and the encoding of referents in verbal communication. *Journal of Personality and Social Psychology*, *4*, 343–346.
- Lakin, J. L., & Chartrand, T. L. (2003). Using nonconscious behavioral mimicry to create affiliation and rapport. *Psychological Science*, *14*, 334–339.
- Levelt, W. J. M., & Kelter, S. (1982). Surface form and memory in question answering. *Cognitive Psychology*, *14*, 78–106.
- Levelt, W. J. M., Roelofs, A., & Meyer, A. (1999). A theory of lexical access in speech production. *Behavioral and Brain Sciences*, *22*, 1–75.
- Linell, P. (1998). *Approaching dialogue: talk, interaction and contexts in dialogical perspectives*. Amsterdam: John Benjamins.
- Metzing, C., & Brennan, S. E. (2003). When conceptual pacts are broken: Partner-specific effects on the comprehension of referring expressions. *Journal of Memory and Language*, *49*, 201–213.

- Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: evidence from syntactic persistence in language production. *Journal of Memory and Language, 39*, 633–651.
- Pickering, M. J., & Branigan, H. P. (1999). Syntactic priming in language production. *Trends in Cognitive Sciences, 3*, 136–141.
- Pickering, M. J., Branigan, H. P., & McLean, J. F. (2002). Constituent structure is formulated in one stage. *Journal of Memory and Language, 46*, 586–605.
- Pickering, M. J., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences, 27*, 169–225.
- Potter, M. C., & Lombardi, L. (1998). Syntactic priming in immediate recall of sentences. *Journal of Memory and Language, 38*, 265–282.
- Prat-Sala, M., & Branigan, H. P. (2000). Discourse constraints of syntactic processing in language production: a cross-linguistic study in English and Spanish. *Journal of Memory and Language, 42*, 168–182.
- Sacks, H. (1974). An analysis of the course of a joke's telling in conversation. In R. Bauman & J. Scherzer (Eds.), *Explorations in the ethnography of speaking* (pp. 337–353). Cambridge: Cambridge University Press.
- Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A simplest systematics for the organization of turn-taking in conversation. *Language, 50*, 696–735.
- Schober, M. F., & Clark, H. H. (1989). Understanding by addressees and overhearers. *Cognitive Psychology, 21*, 211–232.
- Stewart, A. J., Pickering, M. J., & Sanford, A. J. (2000). The timecourse of the influence of implicit causality information: Focusing versus integration accounts. *Journal of Memory and Language, 42*, 423–443.
- Szmrecsanyi, B. (2005). Creatures of habit: a corpus linguistic analysis of persistence in spoken English. *Corpus Linguistics and Linguistic Theory, 1*, 113–149.
- van Baaren, R. B., Horgan, T. G., Chartrand, T. L., & Dijkmans, M. (2004). The forest, the trees, and the chameleon: context dependence and mimicry. *Journal of Personality and Social Psychology, 86*, 453–459.
- Wilkes-Gibbs, D., & Clark, H. H. (1992). Coordinating beliefs in conversation. *Journal of Memory and Language, 31*, 183–194.