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Cognitive and pragmatic factors in language production: Evidence from source-goal motion events

Monica Do[1], Anna Papafragou[2] and John Trueswell[2]

[1]Department of Linguistics, University of Chicago

[2]Department of Linguistics, University of Pennsylvania

[3]Department of Psychology, University of Pennsylvania

Corresponding Author:

Monica Do, University of Chicago

Department of Linguistics

1115 E. 58th Street

Rosenwald Hall, Room 205E

Chicago, IL 60637

E-mail: monicado@uchicago.edu

Abstract

In order to talk about an event they see in the world, speakers have to build a conceptual representation of that event and generate a message that selects pragmatically appropriate (e.g., informative) parts of that event that speakers want to talk about. To further understand the relationship between a speaker's conceptual representations and the pragmatic factors that influence message generation, this work investigates the extent to which different aspects of an event could be affected by pragmatic constraints. We focus specifically on source-goal motion events (e.g., a butterfly flying from a lamppost to a chair) because the conceptual structure of these events is well-understood, but the role that those representations play in message generation is yet unclear. In Experiment 1, we manipulated the pragmatic status of the source (e.g., the lamppost) – in particular, whether sources were or were not already known to an addressee. We found that sources were mentioned significantly more in the latter case, where they provided new, previously unknown information to the addressee. In Experiment 2, we investigated whether the same pragmatic factors could affect goals (e.g., the chair) of motion events in the same way; results showed that they could not. We conclude that conceptually peripheral elements of an event (i.e., sources) are more susceptible to communicative factors than those elements which are conceptually privileged (i.e., goals). We consider the implications of our findings for the relationship between event cognition and pragmatics and discuss how theories of event cognition can be integrated into current models of language production. We also discuss the implications of our work for open issues in the domain of event cognition.

Keywords: Source-Goal Asymmetry; Language Production; Goal Bias; Common Ground; Message Generation; Pragmatics

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The events that people see in the world are incredibly rich and dynamic. Despite that richness, speakers do not *talk* about everything they see. A simple event of a butterfly flying from a lamppost to a chair could, for instance, be described as *Flying*, *A butterfly going to a chair*, *A butterfly leaving a lamppost*, or something far more complex (e.g., *It's a beautiful butterfly taking in the light on a lovely summer night. Nearby, there's a chair on a wooden porch and…*). Given that each of these descriptions reflects a different construal of the same event, it appears that language production – and in particular, message generation (also known as *message conceptualization*) – requires speakers to decide not only what message they want to convey about the events around them, but importantly, which parts of those events to mention. Those components which are selected for mention are passed on to later production processes such as grammatical encoding, lexical retrieval, phonological encoding, and physical articulation.

Under most theories of language production (Levelt, 1989; Garrett, 1975, 1980; Bock & Levelt, 1994), speakers build their messages from their conceptual representations of the world – the things they see, hear, and know. When talking about events, specifically, speakers are believed to construct their message out of the components of events that distinguish and organize such events conceptually: These components include not only the specific event category, but also the number and types of participants, which are often characterized as thematic roles (e.g., Agent, Patient, Goal, Instrument). In addition, this conceptual representation can incorporate information about when the event occurred, where it occurred, the temporal structure of the event (i.e., whether it is ongoing vs. completed), the manner in which it occurred, and even the

aspectual perspective of the event (i.e., the timing of the event relative to another event in time). Because speakers' conceptual representations of the events around them can be so rich and detailed, speakers have to decide which parts of their conceptual representations to include and which to omit from linguistic mention.

Critically, the decision about what to mention is at least partially governed by two competing pressures: (i) the pressure to be informative enough to ensure that what is said makes an appropriate conversational contribution (Grice, 1975) and (ii) the pressure to be as efficient in speech as possible (i.e., to minimize the amount of effort required; Zipf, 1949; Sperber & Wilson, 1986). To navigate between these two pressures, speakers can model the knowledge state of their listeners and tailor their utterances to that model during real-time conversation – a process known as audience design (Clark & Murphy, 1982; Isaacs & Clark, 1987; Fussell & Krauss, 1989, 1992; Horton & Gerrig, 2002; Horton & Keysar, 1996; among others).

Indeed, there is ample evidence that once a speaker has already decided that something is worth mentioning (i.e. after they have generated a message), there are number of ways in which speakers can adapt the *form* of their utterance to meet the needs of their listener. For instance, speakers produce longer (Clark & Wilkes-Gibbs, 1986) and less phonologically-reduced (e.g., Fidelholtz, 1975, Galati & Brennan, 2010, 2014) utterances when conveying new information to an addressee. In addition, when they refer to entities, they alternate between definite, indefinite and full noun phrases (e.g. Ariel, 1990; Chafe, 1976; Grosz, Joshi, & Weinstein, 1995; Bard & Aylett, 2000; Duff, Gupta, Hengst, Tranel, & Cohen, 2006; Heller, Gorman, & Tanenhaus, 2012) depending on addressees' needs. Finally, it is well-known that discourse-pragmatic factors can affect choice of syntactic structure: Specifically, speakers tend to encode discourse-given elements as the grammatical subject, even when those entities are the conceptually less

prominent elements of an event (Bock, 1982; Bock & Irwin, 1980; Sridhar, 1988; Osgood, 1971; Prentice, 1967; Prat-Salá & Branigan, 2000; Ferreira & Yoshita, 2003; Prat-Salá & Branigan, 2000; *inter alia*).

Here, we focus on a separate, but related question: namely, how audience design affects what is necessary or worthy of mention in the first place. Work on this question has largely been done outside the domain of events, using referential communication tasks. In these tasks, speakers typically need to distinguish between two or more objects of the same basic category – for instance, between a blue star versus a yellow star (e.g., Horton & Keysar, 1996; Brown-Schmidt & Tanenhaus, 2006), or as in Tangram tasks, between a number of arbitrarily-constructed shapes (e.g., Brennan & Clark, 1996). These studies have largely centered around the precise nature and/or limits of audience design during real-time communication (for review, see Brennan, Galati, & Kuhlen, 2010). They ask, for instance, (1) whether speakers and addressees take into account the perspective of their conversational partner during the initial stages of planning or during a later 'monitoring' stage (e.g., Keysar, Barr, Balin, & Brauner, 2000; Horton & Keysar, 1996; Keysar, Barr, & Horton, 1998; Hanna, Tanenhaus, & Trueswell, 2003; Pickering & Garrod, 2004; Clark, 1992; Clark & Wilkes-Gibbs, 1986); (2) under what conditions speakers and addressees may fail to take into account their partner's informational needs (e.g. Nadig & Sedivy, 2002; Horton & Gerrig, 2002; Lane & Ferrreira, 2008); and (3) which domain-general cognitive functions may be implicated in the computation of common ground (e.g. Brown-Schmidt, 2009; Lane, 2013). These important questions are largely still under debate. However, what is clear is that speakers use pragmatic (albeit, sometimes fallible) inferences about what their listeners do and do not know in order to determine how much information to include in their utterances.

Compared to work in the domain of object reference, studies in the domain of events has been limited. Nevertheless, relevant work in this area paints the same picture. For instance, Brown and Dell (1987) showed that, when retelling stories to a confederate addressee, adults are more likely to mention instruments that are considered atypical for an event (i.e., stabbing with an icepick$_{\text{INSTRUMENT}}$) compared to instruments generally considered typical for that event (i.e., stabbing with a knife$_{\text{INSTRUMENT}}$). Later work by Lockridge and Brennan (2002) found that speakers were even more likely to mention atypical instruments when retelling stories to a naive listener with no visual access to the speakers' storyboards. More recently, in a design similar to the one used in the present work, Grigoroglou and Papafragou (2020) extended those findings to children and adults spontaneously describing short videos with typical vs. atypical instruments to an addressee with different levels of visual access to the events. Addressees in their Visual Access condition watched the clips alongside the participants; in their No Visual Access condition, addressees sat behind a barrier restricting visual access. The authors found that, while children did not adjust their utterances based on listeners' visual access, adults consistently used this information to monitor the informational needs of their addressees and adjust their utterances accordingly. Taken together, then, work in both the object and event domains has shown that when speakers go about generating a message, a powerful determinant of what they ultimately choose to mention and/or omit is, in fact, the knowledge state – and by extension, the perceived informational needs – of their listener.

Importantly, although the relationship between (discourse-)pragmatics and conceptual knowledge has been a central question for related work in language production (Jespersen, 1992 [1924]; Stein, 1979; Thompson, 1987; Prat-Salá & Branigan, 2000; Rissman, Woodward, & Goldin-Meadow, 2018), little is known about how the pragmatic considerations associated with

audience design actually *interact* with the content of a speaker's message – that is, with the conceptual representation of the events they want to talk about. This is because work focusing on the speaker's representation of their addressee's knowledge state and work on the speaker's conceptual representation of events have traditionally been investigated in separate domains. Consequently, the present work bridges this gap by examining speakers' descriptions of simple source-goal motion events (e.g., *A butterfly is flying from a lamppost*$_{\text{SOURCE}}$ *to a chair*$_{\text{GOAL}}$).

We focus on these events as a testing ground because (as we discuss further below) much is already known about how they are represented conceptually and described cross-linguistically, but little is known about how these conceptual and linguistic representations interact with the pragmatic factors that are known to play a central role in language production. Moreover, source-goal motion events freely permit the speaker to include (i) just the source, (ii) just the goal, (iii) or both source and goal in their utterances. It is precisely this kind of optionality that allows us to clearly investigate how speakers use information about their addressee as well as information about an event to jointly influence what they *choose to say* about the world. At the same time, we are able to bring what is known about audience design to bear on open issues in the domain of event cognition.

1.1 The Goal Bias in Source-Goal Motion Events

Source-goal motion events are fundamentally composed of an object (i.e., the Figure) moving from a starting point (i.e., the Source) to an endpoint (i.e., the Goal; Talmy, 1983, 1985; Jackendoff, 1983). Nevertheless, much work suggests that these event components are not treated equally. Experiments looking at language and memory for source-goal events have found a preference to mention and remember goals, respectively. This preference for the goal is known as the goal bias. In particular, when describing source-goal events, both adults (Lakusta &

Landau, 2005, 2012; Papafragou, 2010; Regier, 1996; Regier & Zheng, 2007) and children as young as 3.5 years of age (e.g., Lakusta & Landau, 2005; Papafragou, 2010; Lakusta & Landau, 2012; Lakusta, Muentener, Petrillo, Mullanaphy, & Muniz, 2016; Srinivasan & Barner, 2013) are much more likely to mention goals of motion than they are to mention sources. This is true not only for simple source-to-goal motion events like the ones discussed here, but also for other types of source-goal events like transfer-of-possession events (Lakusta & Landau, 2005; Stevenson, Crawley, & Kleinman, 1994; Tatone, Geraci, & Csibra, 2015), attachment/detachment events (Lakusta & Landau, 2005; Narasimhan, Kopecka, Bowerman, Gullberg, & Majid, 2012), and even change of state events (Lakusta & Landau, 2005).

Cross-linguistically, the bias towards mentioning the goal has been reported for a number of typologically different languages including Arabic (e.g., Regier & Zheng, 2007), Japanese (Ihara & Fujita, 2000), and Greek (Johanson, Selimis, & Papafragou, 2019). And, studies surveying the source-goal asymmetry from a typological perspective have likewise shown different trajectories for the semantic development of goal versus source markers: Goals markers tend to be more extensively grammaticalized and tend to show finer-grained distinctions than sources (Kabata, 2013; Narasimhan et al., 2012).

Importantly, the preference for goals over sources is not just a linguistic phenomenon. For instance, studies examining memory for motion events have shown that goals tend to be remembered more accurately than sources, even when verbal encoding is blocked (e.g., Papafragou, 2010; Regier & Zheng, 2007; Regier, 1996; Lakusta & Landau, 2012). Moreover, this bias for the goal has been shown in infants before they are able to speak. Along with related work showing that infants are sensitive to the intentional goals of actors (e.g., Bekkering, Wohlschläger, & Gattis, 2000; Meltzoff, 1995; Gergely, Bekkering, Király, 2002; Woodward,

1998), others have also shown that infants and very young children are more likely to notice changes to goals than to sources when observing simple source-goal motion events (e.g., Lakusta, Wagner, O'Hearn, & Landau, 2007; Lakusta & Carey, 2015; Lakusta & DiFabrizio, 2017; see also Tatone et al., 2015). Finally, the preference for goals over sources has even been observed in the event descriptions of deaf home-signers who lack exposure to conventional language (Zheng & Goldin-Meadow, 2002).

The presence of the goal bias in linguistic as well as non-linguistic domains of cognition provides compelling reason to believe that the goal bias in language is fundamentally rooted in the prominence of the goal in speakers' underlying conceptual representations of source-goal motion events (e.g., Regier, 1996, Regier & Zheng, 2007; Papafragou, 2010; Lakusta & Landau, 2005; Lakusta et al., 2007). Consistent with this possibility, Lakusta and colleagues have demonstrated that changes to the representation of sources/goals at the perceptual and conceptual levels can directly affect the strength of the goal bias in language production. Sources are mentioned or attended to more often, for instance, when they are made perceptually salient (Lakusta & DiFabrizio, 2017); when they are the causers of a motion event (Lakusta et al., 2016); and when they are construed as being related to the intentional goals of an agent (Lakusta & Landau, 2012). In all these cases, though, a preference for the goal has persisted, lending additional support for its cognitive basis.

It is important to note that the presence of the goal bias in experiments language and memory does not imply a simple mapping between the linguistic and non-linguistic representation of events; rather, a number of factors "at the conceptual, pragmatic, and grammatical level may explain the mapping of goals and sources in language" (Lakusta &

Landau, 2012, p. 538).[1] With this in mind, the goal of the present work is to examine how the linguistic biases that emerge from pre-linguistic representations of events interact with pragmatic biases rooted in linguistic communication – namely, in audience design. This question takes on greater importance when we consider, as discussed below, that traditional ways of eliciting descriptions of source-goal motion events are situated within a pragmatic context that may exacerbate the bias to mention goals but not sources.

1.2 The Current Study

Prior work with adults on linguistic aspects of the goal bias has traditionally used a paradigm in which a single speaker views and then describes a source-goal motion clip (e.g., Papafragou, 2010; Lakusta & Landau, 2012; Regier & Zheng, 2007). This paradigm has been critical for establishing a concrete link between the goal bias in language and the conceptual prominence of the goal in cognition, more generally; but a possible consequence is that it obscures a key element of language production – namely, audience design – in two ways.

First, participants describe events out loud to either no one in particular or to a physically co-present, but conversationally unengaged experimenter. From the perspective of speakers, modelling the knowledge state of an addressee is difficult when it is not clear who it is one is talking to, let alone what one's interlocutor knows about the event. From an experimenter's perspective, pinning down the role of audience design is challenging if it is not even clear whether speakers are talking to themselves or to a generic, imagined addressee.

Second, motion clips in this paradigm typically open with a scene that shows the figure

[1] This is particularly true with respect to animacy, where Lakusta and Landau (2012) have shown that the correspondence between language and memory breaks down in the context of an inanimate figure in motion. In particular, they find that for inanimate figures, the goal bias in is preserved, though severely weakened; by contrast, the goal bias in memory disappears altogether. They, therefore, suggest that the factors which "appear to affect people's memory representations of motion events do not *inevitably* affect their linguistic descriptions of those events" (Lakusta & Landau, 2012: 538). We return to the issue of animacy in the General Discussion.

already located at the source of the motion. The goal, by contrast, is present but not fully understood as the goal until after the event is completed. Although these clips reflect the natural temporal sequence of source-goal motion events, they may inadvertently introduce an additional pragmatic asymmetry in the *communicative* status of sources versus goals. Because these motion clips 'give away' the starting state of the motion event, anyone viewing these clips can reasonably consider the source to be an already-known aspect of the event while goals can be considered the novel, 'newsworthy' piece of the event.

Our work draws on findings in audience design and posits that one of the factors contributing to the goal bias in language is this pragmatic asymmetry between sources, which are given as part of the initial state of an event, versus goals, which reveal the *change* from that initial state. In particular, if the decision about what to say is tied to what speakers consider informative to say (e.g., Brown & Dell, 1987; Lockridge & Brennan, 2002; Grigoroglou & Papafragou, 2020), then a pragmatic account of the goal bias would suggest that speakers tend to omit sources from their utterances because sources are already known. Meanwhile, speakers tend to include goals in their utterances because goals provide added information about what has happened in the event. In what follows, we test this pragmatic account.

We present two experiments that depart from prior work by asking participants to describe source-goal motion events to a physically co-present, engaged confederate addressee. Importantly, the presence of this addressee allows us to incorporate theories of audience design into language production for source-goal motion events. In this paradigm speakers are able to concretely model the knowledge state of their addressee, while we are simultaneously able to control the communicative status of sources versus goals.

In Experiment 1, we varied whether sources are already known (**Common Ground**

condition) or completely unknown (**No Common Ground** condition) to the addressee and measured the proportion of resulting source mentions across conditions. We made sources known in the **Common Ground** condition by asking participants to describe events to their listener after both had *jointly* seen the opening frame (i.e., the starting state) of the motion clip. We predicted that speakers in this condition would be more willing to omit sources from their utterances because mentioning where an object came from is redundant to a listener who just saw where that object started out. We made sources completely unknown in the **No Common Ground** condition by asking participants to describe events to a listener who could not see any part of the clip at all. Here, we predicted that speakers would largely include sources in their utterances because mentioning the source in this condition adds information that the listener did not already know.

Whereas Experiment 1 investigated the effect of pragmatic factors on sources, Experiment 2, investigated the extent to which pragmatic factors could affect *goal* mentions. The design of Experiment 2 was exactly the same as Experiment 1, except that speakers and addressees jointly viewed the *last* frame of the clip in the Common Ground condition. In this way, goals became pragmatically known to addressees. We were then able to investigate the extent to which pragmatic factors could influence conceptually privileged aspects (i.e., goals) of an event.

Although not central to our research aims, we also wondered whether pragmatic factors like the informational needs of a listener may also have downstream consequences for later recall of motion events. It is well-known that verbal encoding can have a powerful effect on later memory retrieval: Recall is improved when people have an opportunity to verbally rehearse materials and correspondingly worse when verbal encoding is blocked (Baddeley & Hitch, 1974;

Allport, Antonis, & Reynolds, 1972; Antes & Kristjanson, 1993; Loftus 1972; Rowe & Rogers, 1975; Wolfe, Horowitz, & Michod, 2007; Archambault et al., 1999). Less understood, though, is what role listeners may play on the relationship between linguistic encoding and memory.

On this question, work by Pasupathi, Stallworth, & Murdoch (1998) demonstrated that the language and memory relationship can, indeed, be modulated by the listener. In that work, participants were asked to recount different films (i) to an engaged listener, (ii) to a distracted listener and (iii) to simply provide a written recount of the films. Their analyses of the retellings showed that speakers included significantly more information when speaking to an attentive versus a distracted listener. Moreover, when the same participants recalled the films three weeks later, stories that were recounted to attentive listeners were likewise remembered significantly better than those recounted both to distracted listeners and to no listener at all.

Our work does not manipulate the attentiveness of the addressee. However, to further investigate the role of the listeners on the relationship between what is mentioned and what is remembered, we likewise compared how accurately speakers remember sources in the Common Ground versus No Common Ground conditions *after describing events to an addressee*.

2. Experiment 1

2.1 Materials and Methods

2.1.1 Participants

Fifty-four native speakers of American English (mean age = 20 years; 27 Female, 27 Male) participated in the experiment for course credit or $10/hour – 27 in the Common Ground and 27 in the No Common Ground group. One participant in the Common Ground condition scored below 50% on the baseline No Change condition in the memory task and was excluded from analysis. The number of participants and exclusion criteria was determined in advance (see

https://osf.io/f2j74 for pre-registration) based on a power analysis of effect sizes reported in Lakusta and Landau (2012), Experiment 1a (a memory task) and 1b (a language production task). That analysis revealed that given α=.05 and β=.80, the projected sample sizes were n=16 and n=8, respectively, when Cohen's *d* = .8. However, given design differences between this study and that work (e.g., a between-subjects comparison, number of items, etc.), a determination of 27 participants in each group was made in advance of the study.

2.1.2 Materials

Eighteen test animations were created, each of which depicted an animate entity moving from an inanimate source landmark (i.e., the starting point of motion) to an inanimate goal landmark (i.e., the end point of motion). Clipart images were used and configured similarly to Papafragou (2010). See Figure 1 for an example clip of a butterfly (figure) moving from a lamppost (the source) to a chair (the goal).

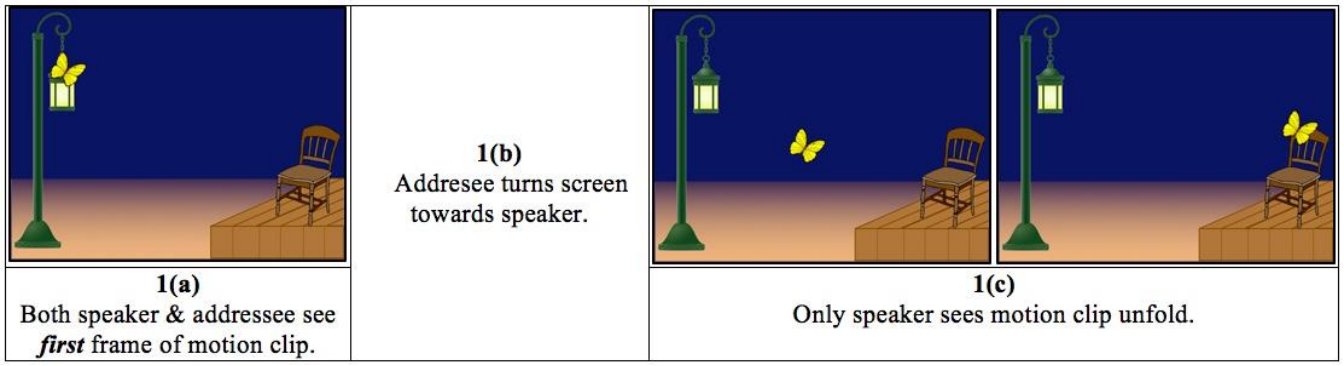

Figure 1 Sample motion clip ('butterfly flying from lamppost to chair') in the Common Ground condition. In the No Common Ground condition, the addresee does not see any portion of the motion clip.

Videos were left-right counter-balanced such that half of the videos showed a figure moving from a source on the left to a goal on the right and the other half showed a figure moving from a source on the right to a goal on the left. Source and goal landmarks were also counter-balanced across lists such that objects which were the source of motion in one list were the goals

of motion in another. This was done to ensure that our results would not be confounded by the inherent perceptual or conceptual salience of one landmark over the other (e.g., Papafragou, 2010).

Eighteen filler motion events were created in a similar manner, but did not involve motion between a source and a goal (e.g. a pig playing in mud, a weathervane spinning, etc.). In addition, the backdrop of some filler items were designed such that participants were not able to predict, based on the first frame of the video, whether the clip would eventually involve a source-to-goal motion event. For instance, rather than moving from a basketball to a basketball hoop, a child jumped in place near one of the objects.

Two additional variants of each target video were created for use in a recognition memory test (see Procedure below). One variant changed the Source object, the other variant changed the Goal object. Following Papafragou (2010), source and goal changes were always replaced with within-category variants (e.g., the chair was changed to a different exemplar of a chair) to control for the semantic distance between the original and changed object.

2.1.3 Procedure

Participants were told that they would be watching brief video clips and then describing them to their partner (in reality, a confederate addressee; 26 participants interacted with a Female addressee and 28 participants with a Male addressee). Participants were led to believe that their partners would see a simple question about the clip on a separate screen and would answer those questions based on the participant's descriptions. Participants performed two practice trials before moving on to the main experiment.

Prior work has shown that speakers will behave differently when speaking to a confederate versus a truly naïve addressee (Kuhlen & Brennan, 2013). Moreover, the level of

engagement of an addressee can affect how much information speakers choose to include in their utterances (e.g., Clark & Wilkes-Gibbs, 1986; Bavelas, Coates, & Johnson, 2000; Kuhlen & Brennan, 2010; Grigoroglou & Papafragou, 2020) and may also affect speakers' later memory for the event (e.g., Pasupathi et al, 1998). To address these concerns, participant and confederate addressee first worked together to complete a Tower of Hanoi task. This task did not bear on our research aims or predictions. The task was strictly to 'ease' participants into the collaborative experiment and establish some rapport between participant and addressees. In particular, it provided confederates with the opportunity to demonstrate that they were acting collaboratively and engaged in the experiment (and not, for instance, addressees that would rather leave the experiment as soon as possible).

During the actual experiment, confederate addressees continued demonstrating engagement with the speaker by maintaining eye-contact during event descriptions and verbally indicating when they were ready for the next trial (i.e., *mhmm, ok, yup, I'm ready*). Critically, confederates maintained the same level of engagement in all conditions and used the same verbal indicators regardless of the utterance produced by participants.

Participants and confederates were seated in one of two experimental configurations. In the Common Ground condition, both speaker and confederate addressee were seated side-by-side in front of the participant's computer screen. Each trial began with the first frame of the video clip shown on this screen. Thus, both speaker and confederate addressee saw the figure's location relative to the source and the goal landmarks; more specifically, they saw where the figure started out in each clip. After briefly inspecting the scene, the confederate addressee turned the speaker's screen toward the speaker so that only the speaker was able to watch the rest of the clip unfold (see Figure 1). In the No Common Ground condition, speaker and confederate addressee

were seated across from each other so that neither could see each other's screens. Speakers were thus led to believe that addressees in this condition were unable to see *any* part of the video clip. Clips began a soon as speakers pressed the 'space bar'. Each video was approximately three seconds in length.

In both Common Ground and No Common Ground conditions, participants received the same set of video stimuli and participants performed the same tasks. They were told in all cases that confederate addressees would be answering a simple question about each video clip based on the speakers' description of what happened in each clip.

After the description portion of the experiment was complete (i.e., after describing the 36 video clips), a surprise memory task was administered to the participant (the speaker). Participants were told that they would see a second series of video clips, and their job was to indicate whether the second set of videos was the same or different from the ones they had previously seen. Participants circled 'Yes' on their answer sheet if the second video clip was 'exactly the same' as the clip that they had originally described and 'No' otherwise. Participants were only tested for memory of target items and were not given any time limit during the memory portion of the experiment, but were instructed to only view each video once. Memory for the video clips was manipulated within-participants (6 items per condition) such that participants saw a second set of videos that involved either: (i) Changing the Source (ii) Changing the Goal; or (iii) No Change at all (i.e., participants saw a video identical to the one they had previously described). (See Materials above for an example.) Clips in the memory portion of the study were presented in the same order as in the scene description portion of the study.

2.2 Results

2.2.1 Language for Sources and Goals

Our primary measure of interest was how frequently speakers would mention sources in their linguistic description of source-to-goal motion events. We coded whether each utterance included mention of the source and/or goal of the motion event. Following prior work (e.g., Lakusta & Landau, 2012; Papafragou, 2010), all mentions of sources and goals within (i) a prepositional phrase (PP; e.g., *from the chair*; *off the chair*; *to the chair*; etc.), (ii) particle + prepositional phrase structure (PARTICLE+PP; e.g., *away+ from the tree; back + to the beehive; over + to the chair*), or (iii) within the verb + NP structure (V+NP; e.g., *left the lamppost*) were included.

Statistical analyses of the rate at which sources and goals were mentioned were done using a logistic mixed effect model in R (R core team, 2017). Ground Type (Common Ground vs. No Common Ground) and Mention Type (Source vs. Goal) were included as fixed effect factors. Mention Type was included as part of the by-subject and by-item random effects; Ground Type was only included as part of the by-item random effects. We simplified the model only if it failed to converge or if random effects did not significantly improve model fit.

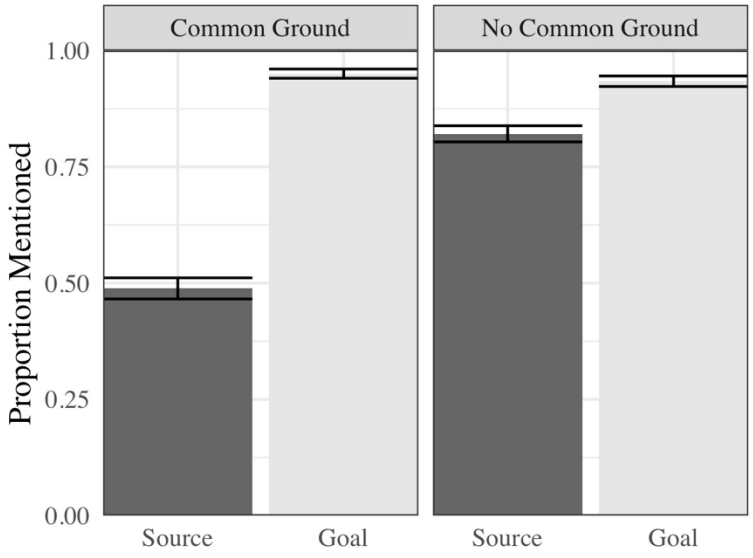

Figure 2 Proportion of Source (Dark Gray) and Goal (Light Gray) mentions in Common Ground and No Common Ground conditions. Error bars represent +/- 1 standard error.

As can be seen in Figure 2, in the Common Ground condition, we replicated the strong goal bias observed in prior work (e.g. Lakusta & Landau, 2005, 2012; Papafragou, 2010). Speakers mentioned source versus goals in 49% and 95% of utterances, respectively (SDs = .50 and .22, respectively). In the No Common Ground condition, we also found evidence of a goal bias. Crucially, though, the goal bias was weaker in this condition than in the Common Ground condition (Source Mentions: 82%, SD = .38; Goal Mentions: 93%, SD = .25). Thus, speakers were much more likely to mention sources in the No Common Ground condition than in the Common Ground condition. Statistical analyses supported these conclusions. In particular, there was a main effect of Mention Type such that overall, goals were mentioned more than sources (ß= 3.26, SE= 0.59, |z| = 5.51, $p < .01$); however, Mention Type was reliably modulated by Ground Type, resulting in a reliable Ground x Mention interaction (ß= -3.06, SE= 0.99, |z| = 3.11, $p < .01$). A main effect of Ground Type was also observed, such that more event components were mentioned in the No Common Ground condition (ß= 1.58, SE= 0.75, |z| =

2.11, $p < .05$).

We also looked at the order of mention for utterances in which both source and goal were mentioned. In the Common Ground condition, this was 47% of utterances, with source-first utterances comprising 44% of utterances and goal-first utterances comprising 3% of utterances. By contrast, speakers in the No Common ground condition mentioned sources first 80% of the time and mentioned goals first 1% of the time. (For details about syntactic frames in which sources and goals were mentioned in both conditions, see Appendix A.)

2.2.2 Memory for Sources and Goals

Accuracy in the memory task was analyzed using logistic mixed effects regressions. We included Ground Type and Change Type (Source Change versus Goal Change) as fixed effects.[2] Random effects were structured as before. The No Change condition was omitted from this analysis because it served only as an indicator of baseline performance and indeed, was similar in both Common Ground (Mean Correct = 87%, SD = .34) and No Common Ground Conditions (Mean Correct = 89%, SD=.31).

[2] The relevant comparison for our hypothesis was performance on the Source Change versus Goal Change comparisons and so, the No Change condition was excluded from analyses reported here. However, a second analysis was performed with the No Change Condition included. Results showed the same patterns as those reported here.

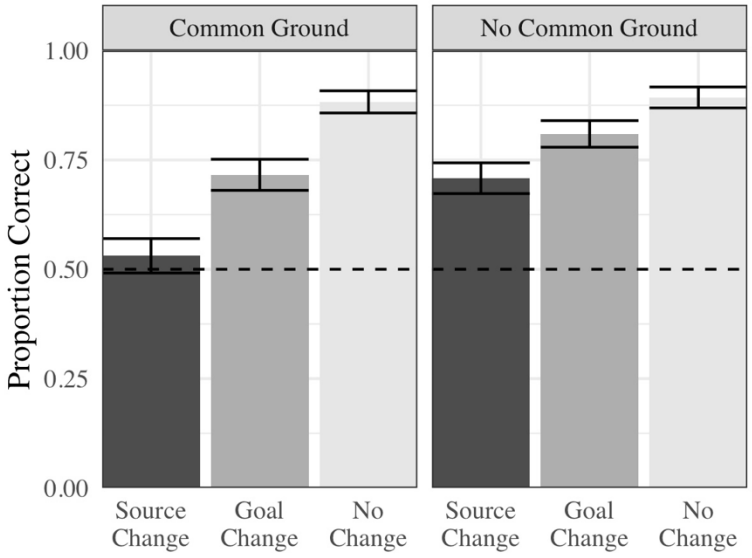

Figure 3 Proportion of Correct Responses in Memory Task in the Source Change (Dark Gray), Goal Change (Gray), and No Change Baseline (Light Gray) conditions. Error bars indicate +/- 1 standard error. Dashed horizontal line indicates chance performance in each condition.

Overall, participants were more accurate in the No Common Ground than in the Common Ground conditions, resulting in a significant main effect of Ground Type (Figure 3; ß = 1.07, SE = 0.38, |z| = 2.82, $p < 0.01$). Participants were significantly better at detecting changes to the Goal (Common Ground: Mean Correct = 71%, SD = .46; No Common Ground: Mean Correct = 81%, SD = .39) than to the Source (Common Ground: Mean Correct = 53%, SD = .50; No Common Ground: Mean Correct = 71%, SD = .46) in both the Common Ground and No Common Ground conditions (ß = 0.90, SE = 0.22, |z| = 4.19, $p < .001$).

As can be seen in Figure 3, participants in the No Common Ground conditions were numerically better at detecting changes to the source. In fact, percentage of correct responses in the Common Ground condition did not differ significantly from chance (p=.48) while correct responses in the No Common Ground condition did differ significantly ($p < .01$). Nevertheless, we did not detect a significant Ground x Change interaction (ß = -0.17, SE = 0.42, |z| = 0.39, p =

0.69), meaning that despite numerical improvements, the strength of the goal bias was similar in the Common Ground and the No Common Ground conditions.

	Source Remembered			
	Common Ground		**No Common Ground**	
Source Mentioned	**Yes**	**No**	**Yes**	**No**
Yes	54	27	102	34
No	31	44	14	12

Table 1 Frequency counts of source mentions in the description task and source accuracy in the memory task for the Common Ground and No Common Ground conditions of Experiment 1.

Inspired by Pasupathi et al. (1998), we also asked whether mentioning a source would make participants more likely to later remember that same source in the Common Ground and No Common Ground conditions. Statistically, analyses were performed using Generalized Estimating Equations – an extension of the GLM method suitable for clustered match-paired data – from the `geepack` package. Source Mention and Ground Type were included as fixed effects with family = binomial and corstr = "exch"; model comparison, done via ANOVA, showed both of these effects to contribute significantly to the model.[3] Analyses confirm what is shown in Table 1. In particular, we find a main effect of Source Mention (ß = 1.03, SE = 0.38, |W| = 7.29, $p < .01$), suggesting that participants who mentioned sources are significantly more likely to later remember the source. However, a failure to detect any significant main or interaction effects involving Ground Type ($p > .35$) suggests that the likelihood of later remembering sources did not differ across the two Ground Type conditions. In other words, the size of the 'memory boost' was the same across conditions. This is not necessarily surprising – the benefit to memory is

[3] Setting corstr = "exch" assumes that the within-subjects correlation structure is constant over time. A second model was constructed with corstr = "ar1", which assumes that within-subjects correlation diminishes over time. Both models showed the same pattern of results. Furthermore, we performed the same analyses using linear mixed effects models; though those analyses do not account for matched-pairs, they also showed the same pattern of results.

expected to depend on the speakers' *choice* to mention sources, not the underlying factors (e.g., what was or was not seen by their addressee) that ultimately motivated that choice.

2.3 Discussion

2.3.1 Language for Sources and Goals

The aim of this work was to understand how pragmatic factors in language production (i.e., audience design) can interact with a speaker's (pre-linguistic) conceptual representation of an event – two factors which are central to virtually any model of language production (Levelt, 1989; Garrett, 1975, 1980; Bock & Levelt, 1994; for discussion, see Papafragou & Grigoroglou, 2019) – to jointly influence the process of message generation. To do this, Experiment 1 investigated the role of pragmatics – in particular, informativity – on speakers' choice to include the source in their descriptions of source-goal motion events.

Our results show a clear effect of informativity. When speakers in our study were talking to someone who had already seen the source of the motion event (Common Ground condition), they largely omitted the source from their descriptions, in effect, reproducing the relatively large goal bias reported by prior work. However, when speakers were talking to someone who did not know about the source (No Common Ground condition), source mentions increased significantly, going from 49% of Common Ground utterances to 82% of No Common Ground utterances. Thus, speakers were less likely to mention sources in the Common Ground condition because they were in a communicative context that made sources less informative to talk about. But, when sources like goals were unknown, and pragmatically informative to mention to a listener, as in the No Common Ground condition, speakers were significantly more likely to mention the sources in their descriptions.

Work in the domain of audience design has predominantly focused on how sensitive

speakers are to the informational needs of the listener (but see Lane & Ferreira (2008) and Lane, Groisman, & Ferreira (2006) for related work on privileged speaker information). Our results are in line with that work. However, because questions surrounding audience design have typically been approached using the object reference paradigm, it has been difficult to separate (i) what speakers, themselves, consider to be conceptually important about an object/event from (ii) what speakers consider important to communicate to their listeners. This is not surprising because the things that are cognitively important typically make good candidates for what to talk about. Nevertheless, our results suggest that, even though these two factors are often aligned, they are dissociable and thus, separately influence what speakers decide to talk about. Specifically, while prior work (e.g., Lakusta & Landau, 2005, 2012; Regier, 1996; Regier & Zheng, 2007; Papafragou, 2010; Zheng & Goldin-Meadow, 2002) has demonstrated that the linguistic mention of privileged elements of events (e.g., goals) may primarily be attributable to their conceptual status, our results suggest that for other, more peripheral aspects of an event (e.g., sources), the main drivers of linguistic mention appear to be pragmatic factors associated with informativity.

Our work also has implications for work in event cognition, which has largely focused on what is most conceptually prominent to the person viewing the event. As a consequence, the contribution of pragmatics to the source-goal asymmetry has been discussed (Lakusta & Landau, 2012), but not yet been investigated. Here, we show that the goal bias in language is at least partially driven by the pragmatic asymmetry in the communicative status of sources and goals. Critically, though, the residual preference to mention goals over sources in the description task – even in the No Common Ground condition where both sources and goals were unknown – demonstrates that the goal bias in language cannot be reduced to *purely* communicative factors. Thus, pragmatic changes to the status of the source – just like perceptual or conceptual changes

(e.g., Lakusta & DiFabrizio, 2017; Lakusta et al., 2016; Lakusta & Landau, 2012) – can drastically *weaken* but not *eliminate* the goal bias. We consider these implications more fully in the General Discussion.

2.3.2 Memory for Sources and Goals

Numerically, participants in the No Common Ground condition remembered sources more accurately than those in the Common Ground condition. And unlike participants in the Common Ground condition, those in the No Common Ground condition performed significantly better than chance levels in the Source Change conditions. These results provide some evidence to suggest that speaking to an addressee in the No Common Ground condition did have a moderate effect of boosting speakers' memory for sources. However, unlike in the description task, we did not find evidence to suggest that it was enough to weaken the goal bias in memory.

We did, however, find evidence of a relationship between source mention and source memory: Participants who opted to mention the source on any given trial were more likely to later remember that same source object. Though we used a slightly different manipulation, our results are in line with what was reported by Pasupathi et al. (1998). Specifically, pragmatic factors like the informational needs of a listener can have an *indirect* effect on memory by motivating what speakers choose to mention about an event, which can, in turn, affect what speakers later remember from that event. Importantly, our results extend Pasupathi et al.'s (1998) work by demonstrating that memory is "socially constructed" not only by the listener themselves (Pasupathi et al., 1998, pg. 2), but also by what speakers perceive about a listener's informational needs.

3. Experiment 2

Given the results of Experiment 1, the aim of Experiment 2 was to investigate whether goal mentions would be susceptible to pragmatic constraints in the same way that source mentions were – in other words, to see whether communicative factors would affect all parts of an event equally. Specifically, of interest was whether speakers would reduce goal mentions when the goal was communicatively *uninformative*. Thus, unlike Experiment 1, which held the pragmatic status of the goal constant, Experiment 2 varied the pragmatic status of the goal.

As in Experiment 1, informativity was operationalized by varying whether the goal was known to both speaker and hearer (Common Ground condition) or known to just the speaker (i.e., unknown to the hearer; No Common Ground condition). In order to manipulate the communicative status of the goal, a 'replay' version of Experiment 1 was created. The 'replay' manipulation mainly affected participants assigned to the Common Ground condition: Rather than showing addressees the first frame of the motion event, speakers showed addressees the *last frame* (i.e., the end state) of the motion event. By essentially disrupting the temporal sequence of the motion event, we thus made the endpoint or *goal* of the motion event known to both speaker and addressee while the source of the motion became the unknown, informative element to mention. The No Common Ground condition remained pragmatically the same as in Experiment 1: both source and goal were unknown to the addressee.

Unlike Experiment 1, the condition of interest in Experiment 2 was the Common Ground condition, where the communicative status of the goal was changed. If pragmatic constraints on informativity affect goals in the same way that they affect sources, then results in the Common Ground condition of Experiment 2 should be similar to those of Experiment 1, except now operating on goal mentions rather than source mentions. Specifically, speakers should be more

willing to omit *goals* from their utterances when goals are mutually known and thus redundant to mention to their addressee. Alternatively, goals may be too central to a speaker's representation of motion events to be affected by the present pragmatic manipulation. In this case, speakers might continue to mention goals in their utterances even when goals were uninformative to communicate. Finally, if goal mentions can be reduced as a function of informativity in Experiment 2, then it may also be possible to reduce accuracy for goals in the memory task.

3.1 Materials and Methods

3.1.1 Participants

Fifty-four native speakers of American English (Mean age = 22 years; 33 Female, 20 Male, 1 GNC) who did not participate in Experiment 1 were given course credit or $10/hour for their participation. As before, 27 of those participants were assigned to the Common Ground and 27 to the No Common Ground group. Three participants performed below chance (two in the Common Ground condition, one in the No Common Ground condition) in the baseline No Change condition of the memory task and were excluded from analysis.

3.1.2 Materials

The same materials were used as in Experiment 1, except for two changes. First, each trial began with the last frame of the video clip. Second, to make clear to participants that the initial image that they saw was actually the *last frame* of the video clip, each video clip was preceded by a 'begin replay' screen (Figure 4).

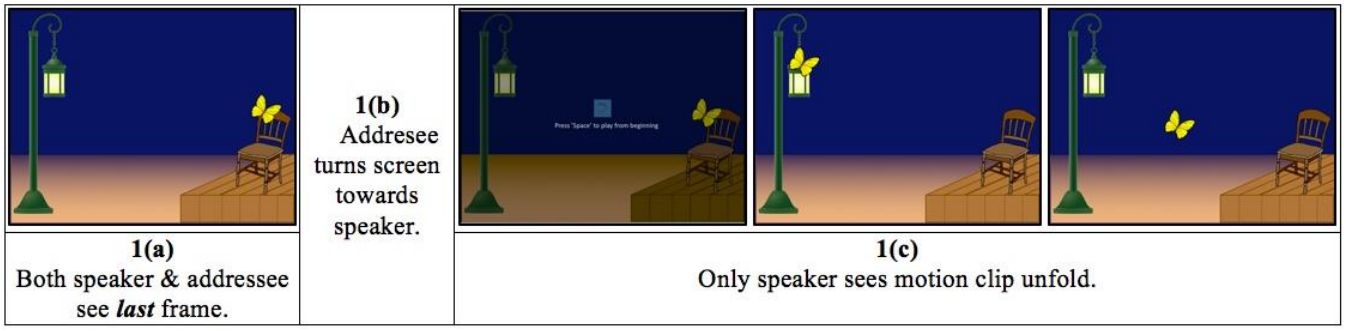

Figure 4 Sample replay version of 'butterfly flying from lamppost to chair' clip in the Common Ground condition. In the No Common Ground condition, the addressee does not see any portion of the motion clip.

3.1.3 Procedure

Participants again described events to a confederate addressee (35 participants performed the experiment with a Female addressee, 19 with a Male) before performing a memory task. The procedure in Experiment 2 was identical to Experiment 1, with the following exceptions. At the start of each trial of the description task, the final frame rather than the initial frame was previewed. Participants were told that they would watch a replay of a video clip that they should describe to their partner. Thus, in the Common Ground condition, both the participant and the addressee jointly viewed the last frame of the video clip. This last frame of the clip showed the figure located on/at the goal of the motion event. As in Experiment 1, the addressee turned the screen back to the speaker. The participant then pressed the ‘space bar’ to advance to the ‘begin replay’ screen. Only after participants pressed the space bar a second time did the video clip begin. Critically, as in Experiment 1, the addressee in this condition did not see the video clip play. The No Common Ground condition also followed the procedure of previewing the final frame, but here only the speaker could see this initial preview. Thus, the No Common Ground condition was similar to Experiment 1 in that neither source nor goal were in common ground between speaker and hearer.

3.2 Results

3.2.1 Language for Sources and Goals

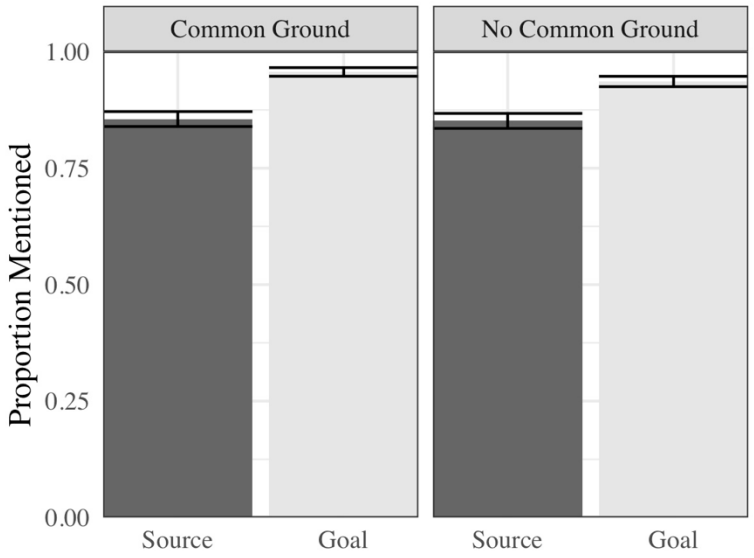

Figure 5 Proportion of Source (Dark Gray) and Goal (Light Gray) mentions in Common Ground and No Common Ground conditions of Experiment 2 (Replay version). Error bars represent +/- 1 standard error.

Data from Experiment 2 was coded and analyzed using the same criteria as in Experiment 1. As expected, results (Figure 5) in the No Common Ground condition resembled the pattern that was seen in Experiment 1. When neither source nor goal were in common ground, speakers tended to mention both sources and goals in nearly all of their event descriptions (Source Mentions: Mean = 85%, SD = .35; Goal Mentions: Mean = 94%, SD = .24), although, as before, we still found evidence of a small goal bias. In the Common Ground condition, sources behaved as expected given the results of Experiment 1. When describing events to an addressee who did not know the starting point of the motion event, speakers mentioned the source in a vast majority of utterances (Source Mentions: Mean = 86%, SD = .35).

The critical question was whether speakers would be more likely to *omit the goal* from their descriptions when the goal was in common ground and completely known to both speaker and

hearer. Strikingly, we found that even when mentioning the goal would seemingly provide no 'added information', speakers nevertheless continued to mention it in nearly all of their descriptions (Goal Mentions: 96%, SD = .24). In fact, in (the relatively infrequent) cases when speakers did omit either the source or the goal, it was more common to omit sources than goals (10%: Goal Only productions versus < 1%: Source Only productions).

Statistically, these conclusions were confirmed. A mixed effect model revealed a small but significant main effect of Mention Type (ß = 2.12, SE = 0.26, $|z| = 8.23$, $p < 0.01$), meaning that a goal bias was observed. However, we detected no significant main effect of Ground Type (ß = -1.23, SE = 0.91, $|z| = 1.35$, $p = .18$) and no interaction between Mention Type and Ground Type (ß = -0.74, SE = 0.49, $|z| = 1.51$, $p = .13$). In other words, we did not detect any differences in the rate of source mentions or goal mentions across the Common Ground and No Common Ground conditions. For responses in both the Common Ground and No Common Ground conditions that include both source and goal mentions, we again found that speakers tended to mention sources first (roughly 84% source-first mentions in both conditions). (We report the syntactic frames in which sources and goals were mentioned in Appendix B.)

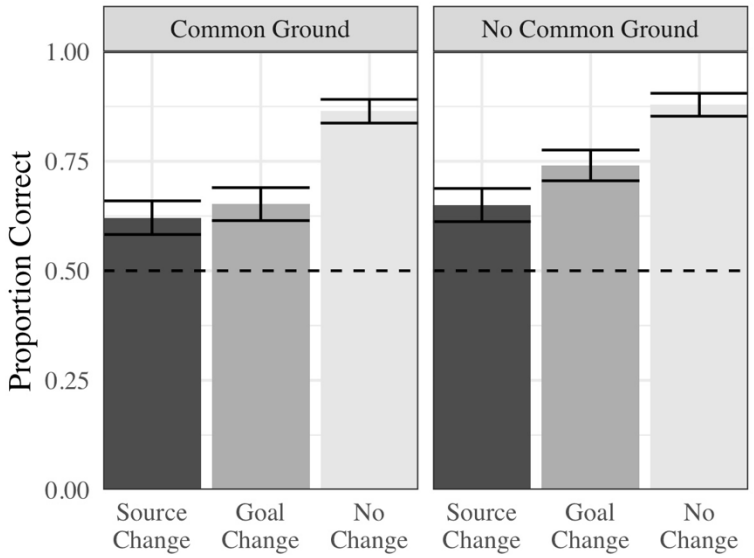

Figure 6 Proportion of Correct Responses in the Experiment 2 Memory Task for the Source Change (Dark Gray), Goal Change (Gray) and No Change Baseline (Light Gray) conditions. Error bars indicate +/- 1 standard error. Dashed horizontal line indicates chance performance in each condition.

3.2.2 Memory for Sources and Goals

Analysis of results from the post-description memory task was done as in Experiment 1. Again, participants' performance in the No Change condition suggested that the task was neither too easy nor too difficult for participants (Common Ground: Mean Correct = 88%, SD = .33; No Common Ground: Mean Correct = 89%, SD = .31). The result in the memory task largely mirror the results obtained in speakers' linguistic productions. As can be seen in Figure 8, we find a significant main effect of Change Type (ß = 0.49, SE = 0.21, $|z| = 3.32$, $p < .05$), indicating that participants were significantly more accurate in the Goal Change (Common Ground: Mean Correct = 64%, SD = .48; No Common Ground: Mean Correct = 75%, SD = .43) than in the Source Change (Common Ground: Mean Correct = 61%, SD = .49; No Common Ground: Mean Correct = 65%, SD = .48) condition. This was not reliably modulated by Ground Type (ß = .45,

SE = 0.42, |z| = 1.08, p = .28), meaning that better memory for the goal than the source (i.e., the goal bias) was similar across conditions. Finally, we did not detect a main effect of Ground Type (ß = 0.46, SE = 0.35, |z| = 1.33, p = .18), indicating that overall accuracy was similar across conditions.[4] Participants performed above chance in the Source Change condition in both the Common Ground (p < .01) and No Common ground conditions (p < .01).

	Source Remembered			
	Common Ground		**No Common Ground**	
Source Mentioned	**Yes**	**No**	**Yes**	**No**
Yes	87	49	93	42
No	8	10	8	13

Table 2 Frequency counts of source mentions and sources remembered in Common Ground and No Common Ground conditions of Experiment 2 (Replay).

We turn our attention now to the relationship between sources that were mentioned and sources which were later remembered. As in Experiment 1, this was done using generalized estimating equations with Source Mention and Ground Type both included as fixed effects, family = binomial, and corstr = "exch".[5] However, unlike in Experiment 1, model comparison showed that Ground Type did not contribute significantly, so it was excluded from the final model. In line with what is shown in Table 2, we found a main effect of Source Mention (ß = 1.01, SE = 0.32, |W| = 10.10, p < .01), meaning that participants who mentioned the source on any given trial were more likely to remember that same source. This is the same pattern of results that was found in Experiment 1.

3.2.3 Comparison of Experiment 1 to Experiment 2

To statistically test whether pragmatic factors could affect sources and goals in the same

[4] A separate analysis was performed with the No Change condition included. That analysis showed the same pattern of results as those reported here.

[5] Additional analyses were also performed with corstr = "ar1" and with linear mixed effects models. Both showed the same pattern reported here.

way, we compared source and goal mentions across Experiments 1 and 2. This was done via a mixed effect logistic regression model where Mention Type (Source vs. Goal), Experiment (1 vs. 2), and Ground Type (Common Ground vs. No Common Ground) were included as fixed effect predictors. Random effects were structured such that only Mention Type was included as part of the by-subject random effects term (Experiment and Ground Type were between-subject manipulations); by-item random effects were fully specified for Mention Type, Ground Type, and Experiment. Models were reduced as before.

This analysis yielded a main effect of Mention Type (ß = 2.32, SE = 0.38, |z| = 6.19, $p < .01$) and Experiment (ß = 1.44, SE = 0.53, |z| = 2.72, $p < .01$); there was no significant main effect of Ground Type (ß = .46, SE = 0.55, |z| = .84, $p = .40$). However, these were modulated by significant Mention Type x Ground Type (ß = -1.61, SE = 0.48, |z| = 3.39, $p < .01$), Mention Type x Experiment (ß = -1.35, SE = 0.48, |z| = 2.79, $p < .01$), Ground Type x Experiment (ß = 2.09, SE = 1.05, |z| = 1.99, $p < .05$) two-way interactions, and crucially, by a significant three-way interaction involving Mention Type x Ground Type x Experiment (ß = 3.09, SE = 0.96, |z| = 3.24, $p < .01$). These results confirm what we see in Figures 2 and 5 – namely, that the proportion of goal mentions did not appear to differ across conditions or experiments, but the proportion of source mentions in the Common Ground condition of Experiment 1 was significantly lower than in any other condition of Experiment 1 or 2.

For completeness, we also compared the performance of participants across Experiments in the memory task. Experiment, Ground Type, and Change Type (as before, the No Match condition was excluded) were included as fixed effect predictors in a linear mixed effect regression. Random effects were specified as before. These results were as expected: We found only main effects of Ground Type (ß = 1.15, SE = 0.36, |z| = 3.18, $p < .01$) and Change Type (ß

= 0.76, SE = 0.15, |z| = 4.95, p < .001). These suggested that across experiments, participants were more accurate in the No Common Ground conditions and that they remembered goals more accurately. No other main or interaction effects reached significance (p's > .09).

3.3 Discussion

3.3.1 Language for Sources and Goals

The aim of Experiment 2 was to investigate the extent to which goal mentions, like source mentions (Experiment 1), could be affected by pragmatic factors such as informativity. We did this by using a 'replay' version of Experiment 1 and measuring how often speakers would include the goal in their utterances when goals were mutually known to both speakers and addressees (and by extension, *uninformative* for speakers to mention; Common Ground condition) compared to when goals were completely unknown to addressees (No Common Ground condition). The results were striking: Goal mentions did not appear to be affected by pragmatic factors related to audience design. In particular, even though goals were already fully known to addressees, they were rarely omitted – even in the Common Ground condition. This result is in sharp contrast to what was shown in Experiment 1, where source mentions were dramatically affected by what speakers considered informative for their interlocutor. In that experiment, the proportion of source mentions went from 49% to 82% once sources were in a communicative context that made them informative to an addressee (i.e., the No Common Ground condition). By contrast, the same Common Ground manipulation in Experiment 2 showed that goal mentions were largely impervious to communicative status. Overall, speakers mentioned the goal of a motion event roughly 95% of the time, regardless of whether the goal was already known or completely unknown to their interlocutor.

These results further distinguish between biases that arise from pragmatics and those that

arise from cognition in a rather striking way. For instance, it was just as plausible for pragmatic factors like informativity to influence both source and goal mentions alike. That is, if goals are no longer necessary to mention to an addressee, it is reasonable to expect that speakers would – in the interest of efficiency (Zipf, 1949; Sperber & Wilson, 1986) – simply omit the goal. It is, after all, not difficult to imagine cases where it is perfectly felicitous to omit the goal when describing an event (*They just left.; The cats are descending from the tower.; Step away from the donuts.; Where did you come from?*). Yet, despite this observation, our results show that communicative factors such as informativity do not appear to affect *all* parts of an event equally. Rather, the role that informativity played during message generation largely depended on which aspect of the event speakers were considering: In the case of source-goal motion events, the choice to mention the source is susceptible to pragmatic considerations, but the choice to mention goals appears far more resilient. Thus, the results of Experiment 2 raise interesting questions about the contexts that might motivate a speaker to omit something that is conceptually more privileged and more broadly, about the relationship between pragmatic constraints on speaking and the structure of the events people are speaking about. We discuss this issue further below.

3.3.2 Memory for Sources and Goals

Data from the Memory task correspond to the patterns we observe in the description task. In both the Common Ground and No Common Ground conditions, the goal bias persists. In particular, participants detected changes to the goal more accurately than they detected changes to the source. Our findings with respect to the relationship between source mention and source memory also mirror those in Experiment 1. Regardless of Ground Type, we observe a memory 'boost' for sources in those cases where participants had previously mentioned that same source.

We thus replicate the relationship between what is mentioned and what is remembered.

4. General Discussion

In order to talk about an event that they see in the world, speakers have to build a conceptual representation of that event and decide which parts of that event they want to talk about. In the case of source-goal motion events (such as the event of a butterfly flying from a lamppost to a chair), in particular, the conceptual representation that speakers construct for these events is already well-understood: There is ample evidence that for the person viewing the event, goals are considered conceptually more important than sources (e.g., Lakusta & Landau, 2005, 2012; Papafragou, 2010; Regier, 1996; Regier & Zheng, 2007; Zheng & Goldin-Meadow, 2002; Lakusta et al., 2007; Lakusta & Carey, 2015; Lakusta & DiFabrizio, 2017). At the same time, it is well-known that pragmatic factors in communication can govern what speakers include in their utterances: Speakers mention enough to ensure that their message is conveyed successfully but, to minimize effort, they omit what is already known to their listener (Grice, 1975; Sperber & Wilson, 1986; Clark & Murphy, 1982; Clark & Wilkes-Gibbs, 1986; Lockridge & Brennan, 2002; Brown & Dell, 1987; Grigoroglou & Papafragou, 2019, 2020). Thus, thanks to work in the domain of event cognition, much is already known about what speakers consider *conceptually* important about an event; likewise, thanks to work in the domain of audience design, what speakers consider *pragmatically* important to communicate to their listener is also well-understood.

However, because these two strands of research have historically been pursued independently, what is unknown is how a speaker's own conceptual representations and their pragmatic considerations about their listener *interact* when speakers are deciding what to talk about. The present work bridges the gap between event cognition and audience design by

investigating how the pragmatic status of different aspects of source-goal events can affect what speakers choose to say about such events. In Experiment 1, we manipulated whether sources were informative (No Common Ground condition) or uninformative (Common Ground condition) to mention to an addressee. In Experiment 2, we investigated how that same pragmatic manipulation affected the mention of goals.

The results of our experiments showed that the same pragmatic constraints on language production do not affect all event components equally. In Experiment 1, we found that speakers mentioned sources much more frequently when source-mention provided new information about the event to their listener (No Common Ground condition). When the source was already known to the listener (Common Ground condition), speakers tended to omit it from their utterance. In Experiment 2, though, we found that the communicative status of the goal did not affect goal mentions. When describing motion events, goals were mentioned to the same extent (and at high rates) regardless of whether goal paths were informative or uninformative to the listener. Below we discuss implications of our work for the nature of the goal bias in event cognition, as well as for theories of language production.

4.1 Cognitive and Pragmatic Contributions to the Goal Bias in Language

Results from both Experiments 1 and 2 comport with prior work on the goal bias in source-goal motion events. Even though the goal bias was significantly attenuated in both Experiments 1 and 2, it nevertheless persisted in each of our language and our memory experiments. These results lend support to the large body of prior work that has argued for a rather intuitive connection between thinking and speaking – namely, that the parts of an event which we consider cognitively important are also good candidates for what we end up talking about.

At a theoretical level, our results also point to an important distinction between the factors contributing to the goal bias in language versus memory. Importantly, the fact that we are able to significantly attenuate the goal bias via our pragmatic manipulation suggests that, in addition to the cognitive factors identified by prior work (Lakusta et al., 2016; Lakusta et al., 2017; Lakusta & Landau, 2012), the goal bias in language is also driven by pragmatic factors in language production that generally influence what speakers mention or omit from their utterances. However, the fact that we did not completely eliminate the goal bias in language or in our post-description memory task provides reason to believe that the goal bias in language, as others have suggested, is not purely pragmatically based. Thus, our results suggest that the preference to mention goals in language is rooted the cognitive prominence of the goal, but strengthened by a different type of universal – namely, the overarching pressure to simultaneously maximize informativity and efficiency during language production. In this sense, our data complement other recent evidence pointing towards a cognitive basis for some of the thematic roles in linguistic event representations (Hafri, Papafragou, & Trueswell, 2013; Wilson, Papafragou, Bunger & Trueswell, 2011). Our data also suggest, though, that when we fail to find straight-forward correspondences between conceptual representations and linguistic ones, this may be due to pragmatic factors that modulate how those thematic roles are encoded during language production.

At a methodological level, the work presented here also highlights the importance of the communicative contexts in which events are studied. While language production can certainly provide a window into the underlying conceptual representations that people build for the world around them, it is important to interpret those insights within the context of a linguistic task that is subject to its own domain-specific and importantly, language-specific constraints. In other

words, language production is an important tool for understanding the correspondence between language and thought – it can provide a first look into the conceptual structures that people build to represent the world. But, the picture that has begun to emerge from this and other related work is that the relationship between the content of thoughts and the content of linguistic utterances is not necessarily straightforward (see Lakusta & Landau, 2012; Papafragou & Grigoroglou, 2019, for similar discussion). In order to properly understand such a nuanced relationship, care should be taken to acknowledge the separate contributions of cognitive and communicative-pragmatic factors to the processes and outcomes of language production.

4.2 Beyond Animate Agents: The Representation of Sources and Goals in Language vs. Event Cognition

The results of our work also bear on an important open question in motion event cognition. Although the goal bias has been robustly observed in both language and memory for motion events involving animate figures, it appears that the picture is much more complicated for *inanimate* figures in motion. For events involving an inanimate figure in motion (e.g., a leaf being blown from one place to another by the wind), the goal bias in memory has only been sporadically detected, even when the goal bias in language production for the same kind of events is preserved and even when experiments have used the same materials across production and memory tasks (Lakusta & Landau, 2012). This lack of correspondence has complicated the argument in favor of a simple homology between the representation of events in non-linguistic versus linguistic cognition (Lakusta & Landau, 2012).

The aim of the present work was not to investigate the role of animacy, and so our results cannot speak to the question of how events are represented for inanimate figures in motion. They do, however, suggest that one way to potentially reconcile the differences between language and

memory is by accounting for the pragmatic factors unique to the task of communicating that can *additionally* affect whether speakers mention the source and/or goal of a motion event. In particular, our results show that the linguistic goal bias for prototypical *animate* figures appears to be multi-factorial: It is driven by the way that people represent that class of source-goal events but also by a pragmatic bias to not mention what is already known. It is possible that the factors associated with inanimate agents (i.e., lack of intentionality, non-volitional movement, etc.) change what is considered to be the cognitively important part of the event. Perhaps when motion is non-volitional, sources may become more important because sources can provide some information about the cause of the motion (Lakusta et al., 2016). Regardless of what underlies the inconsistent goal bias in memory for motion events with inanimate figures, the sources of motion in these events are still typically presented as known entities while goals are typically unknown entities. Given this, our results suggest that the goal bias in linguistic descriptions of inanimate events may be predominantly driven by the *pragmatic* asymmetry between fully known sources versus unknown goals and not necessarily by a cognitive one. If this is correct, then it should be comparatively easier to eliminate, or perhaps reverse, the linguistic goal bias for motion events with inanimate compared to animate agents when the source is unknown to an addressee. Future work will be needed to assess this possibility.

4.3 The Goal Bias and Message Planning During Language Production

An open question in language production is how speakers generate a message for speaking – i.e., how they decide what it is they want to talk about. Our work suggests that asymmetries in event representations are among the many things that can directly influence what speakers decide to say about an event. Specifically, when preparing to say something about a motion event that they have just perceived, people have to segment and represent that event in

some way, create an intended message about that event, and craft an utterance to communicate that event. In the case of a butterfly flying from a lamppost to a chair, they may segment that percept into (i) an initial state of affairs (i.e., on (butterfly, lamppost)) that is followed by (ii) an event of change of location (i.e., flying (butterfly, to-chair)). When they decide to talk about what they have seen, people compose a message that draws directly from this representation. This message, thus, reflects not only the way that a speaker has segmented the world around them, but also the conceptual asymmetries, such as the salience of the goal, which underlie their representations of the event itself.

In particular, our work sheds light on how those asymmetries in event representation can be integrated with previously identified constraints on message generation – specifically, with pragmatic constraints on audience design that are known to influence which parts of a message actually get explicitly mentioned. If a speaker believes that their addressee has some knowledge of the event and, moreover, has segmented an event in the same way that they have (i.e., an initial state of affairs + action), they can omit what is shared from their utterance. In the Common Ground condition of Experiment 1, this is precisely what happened: Speakers and addressees shared knowledge about the initial state of affairs, but not about the motion itself. Because the initial state of affairs was represented in the same way for both speaker and addressee, speakers often omitted the source from their utterances. If a speaker believes, however, that their addressee does not know anything about the source-goal motion event (No Common Ground condition, Experiment 1 and 2), then there is no opportunity to drop what is mutually known.

Surprisingly, the same pragmatic manipulations to goals in Experiment 2 had no apparent effect on the mention of goals. Specifically, addressees in Experiment 2 already knew about the

end state of the motion event. So, it would have been sufficient for speakers to simply describe the event as *The butterfly came from the lamppost*. Yet, they overwhelmingly preferred not to do this. Rather, speakers opted to mention both source and goal in order to communicate to their addressee the initial state of affairs and the change of location.

Taken together, these findings suggest that it may be easier to promote a peripheral event component than it is to demote a conceptually 'core' element of an event representation (see also Grigoroglou & Papafragou, 2020 for a similar discussion). On the one hand, the results of our pragmatic manipulation with sources (Experiment 1) largely comport with findings of related work on the selective encoding of similarly 'peripheral' event components, such as instruments, in both language and memory (Brown & Dell, 1987; Lockridge & Brennan, 2002; Grigoroglou & Papafragou, 2019, 2020). That work found that the mention of instruments was susceptible to constraints on addressee need and speaker informativity that are similar to what we observe here for the mention of sources. Goals, on the other hand, appear largely impervious to exactly the same communicative factors that affected sources. Regardless of informativity, speakers in our work overwhelmingly chose to mention conceptually 'core' aspects of the event, like the goal. Our results, therefore, demonstrate that, although pragmatic factors play a central role in theories of how language connects to event cognition, the pragmatic effects of audience design do not constitute a simple, across-the-board phenomenon (see also Papafragou & Grigoroglou, 2019; and, Rodhe et al., 2006 for similar claims in comprehension).

We can see at least two possible reasons why pragmatic factors were less able to influence conceptually 'core' aspects of events such as goals. One possibility is that mentioning the goal of a motion event does not just provide information about its end point (see Lakusta & Carey, 2015). In addition to a change of location, mentioning the goal also conveys information

about the telicity of an event. For instance, saying The butterfly flew conveys an unbounded, atelic event with no endpoint, but saying The butterfly flew to the chair turns that unbounded event into a bounded, telic one. Goal mention can also convey some information about the intentionality of the figure in motion. Intentionality was not manipulated in this work, but an utterance such as *The butterfly flew to the flower,* for instance, can implicitly motivate the act of flying. In order to communicate both, speakers may deem it necessary to mention the goal, especially because the motion is unknown to the listener. An interesting avenue for future work is, therefore, to investigate whether those parts of a speaker's message – namely, telicity and intentionality – might also be subject to pragmatic constraints in communication. Would speakers be more willing to omit the goal when the telicity and/or intentionality of the event has already been communicated (visually or linguistically) to their addressee?

A different possibility is that the temporal structure of source-goal events is inherently tied to the status of sources and goals as the event is represented in observers' minds. In order to interpret source-goal motion events (or, for that matter, other goal-biased events like change-of-state events), it is necessary for the observer to construe sources as part of the initial state of the event and goals as changes to the state of the event. It is possible that when these events are then packaged for communication, sources – considered the initial state – are packaged as old information that can be omitted while goals – considered the change – are presented as new information in the discourse. Indeed, the order in which sources and goals were mentioned in both Experiments 1 and 2 reflects this tight coupling between the temporal structure of source-goal events and how they are packaged for communication. Specifically, when both sources and goals were mentioned, speakers overwhelmingly mentioned sources first and goals later. This was true even when we had disrupted the natural temporal order of source-goal motion events as

part of Experiment 2's replay manipulation. There speakers could have (re)structured the event as an end state + preceding action, ostensibly allowing them to drop the goal. Yet they preferred to convey the event in a more natural order – namely, as an initial state + following event. In doing so, they first provided their addressee with the critical reference point from which to evaluate the later change in location/state. If this is the case, then changing the pragmatic status of the goal (as we did here) may not have been sufficient to eliminate or reverse the goal bias in language. Rather, doing so may require something much more powerful: Reversing the goal bias may require a context that ultimately breaks the very tight coupling between the temporal and pragmatic structure of an event. One way to do this may simply be to manipulate the temporal dynamics of the event directly. It is worth noting, for instance, that participants in our study watched the entire event before speaking and even in Experiment 2's replay manipulation, events were played forward in time. An interesting question is whether the goal bias would persist if participants were encouraged to describe the event as it unfolded. In the case of Experiment 2, it would be particularly interesting to see whether the order of source and goal mentions would be reversed if events were also played backwards (i.e., rewound as opposed to replayed).

4.4 Future Directions

The work presented here investigated the integration of pragmatics in *one* language into *one* aspect of *one* type of event that is known to be cognitively important. Even within the domain of source-goal events, it is not clear that the pragmatic effects observed here would surface uniformly. For instance, in transfer of possession events, the conceptual prominence of the goal is linguistically encoded not only via explicit goal mention (e.g., *Emily*$_{SOURCE}$ *sold the book to Chris*$_{GOAL}$), but also in the choice of verb – *sold* versus *bought*, *throw* versus *catch*. Importantly, that choice of verb reflects the perspective through which the event has been

encoded. An interesting question is whether that choice of perspective is also permeable to pragmatic factors like what is already known to the listener – e.g., whether the source was already previously introduced or, in the case of change of state events (e.g. *The banana was red$_{SOURCE}$, but then went back to yellow$_{GOAL}$*), what is taken to be the default state of the object undergoing a change (see Prat-Sala & Branigan, 2000 for related work).

Although this work focuses on source-goal motion events as a specific testing ground, our results can nevertheless motivate broader questions about the relationship between pragmatics and event structure in theories of language production. Notably, participants in our study were very reluctant to omit goals from their utterances – even when goals did not appear to serve a clear communicative purpose. By contrast, it is well-known that in the case of passives (e.g. *The cat$_{PATIENT}$ was chased (by the dog$_{AGENT}$))*, agents – which are likewise considered to be conceptually prominent – are actually omitted more often than not (Svartvik, 1966; Weiner & Labov, 1983; Jespersen, 1992 [1924]; Thompson, 1987; Stein, 1979; Rissman et al., 2018). Furthermore, that literature has suggested that pragmatic factors, albeit distinct from the ones investigated here, can play a key role in the speakers' decision to omit the agent. Given the surprisingly different patterns observed for goals versus agents, then, an interesting question is why speakers may have such a strong preference against omitting what is conceptually prominent for one type of event (i.e., the goal in source-goal events), but do not appear to have the same dispreference for omitting prominent elements of another type of event (i.e., the passivized agent of agent-patient events). It is possible that different types of pragmatic factors (see Jespersen, 1992 [1924] for discussion) – and by consequence, different types of constraints that emerge from them –affect the same conceptual structures in different ways.

At the same time, this work also opens up new questions about the extent to which

pragmatics can influence the tendency to encode other elements of event structure, such as paths versus manners of motion. Although paths are considered more central to the conceptual representation of motion events (Talmy, 1991; Skordos, Bunger, Richards, Selimis, Trueswell, & Papafragou, 2020), the path-manner distinction is encoded differently across languages. For instance, languages like Greek, Spanish, and Hebrew preferentially encode paths of motion on the verb (e.g., *exited, entered*) as well as prepositional phrases; languages like English and German typically encode manners of motion on verbs (e.g., *flew, ran*) while path information is encoded in prepositional phrases and particles (Papafragou, Massey & Gleitman, 2006). Given these cross-linguistic differences, an open question is whether pragmatic factors are able to affect *both* paths and manners of motion (rather than, for instance, just manners) and if so, how those pragmatic factors might interact with language-specific ways of encoding paths and manners of motion (see Papafragou et al., 2006 for relevant evidence). More broadly, our results raise additional questions about how pragmatic pressures might surface in the context of more complex (e.g., causal) event representations.

5. Concluding Thoughts

This work investigated the role of pragmatic factors on language production, focusing on the case of source-goal motion events. Our results lend support to the presence of a homology between speakers' linguistic and conceptual representations of events but suggest that this homology is influenced by pragmatic-communicative factors. From a broader perspective, our results argue for the importance of jointly considering cognitive and pragmatic (audience design) contributions to message planning in current models of language production – two types of contributions that have been traditionally studied separately. This integrated approach to message planning is important because, as our results demonstrate, pragmatic constraints on language

production are not incorporated into message planning in a simple across-the-board fashion; rather, they interact with the way that events are cognitively structured. We suggest that fruitful avenues for future work may be to further investigate the extent to which pragmatic constraints on communication influence a broader range of events, event components, and/or different construals of the same event.

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Appendix A

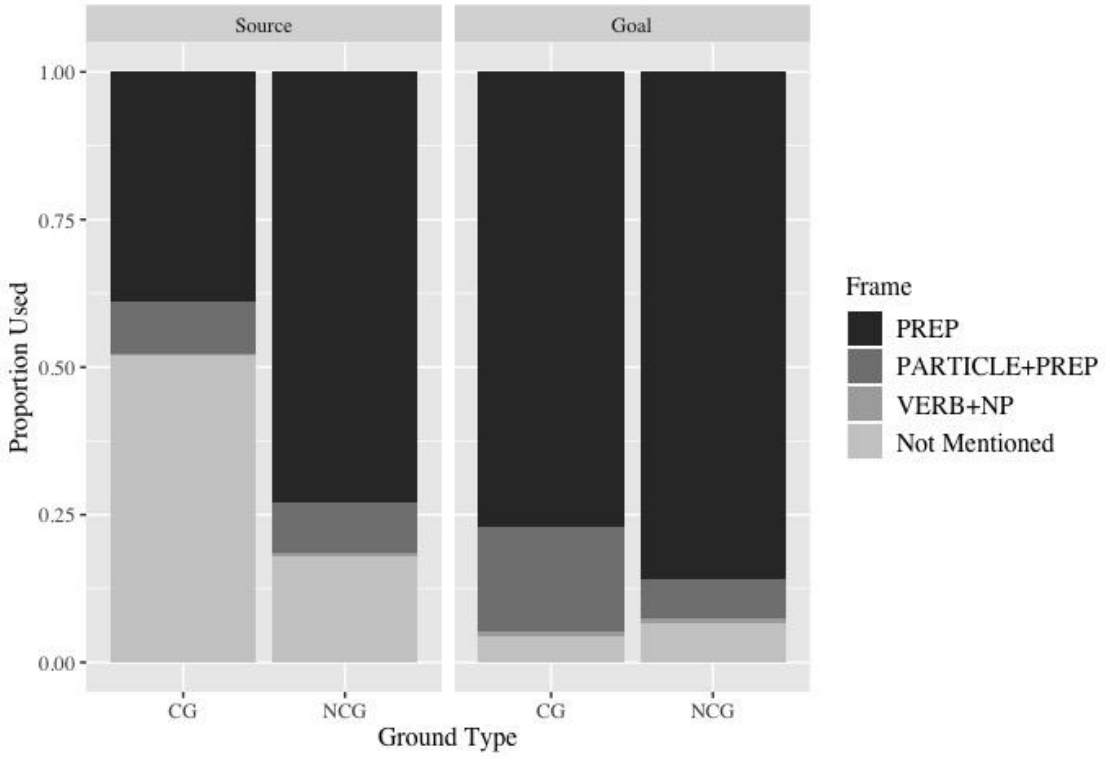

Figure A.1 (a) Proportion of Source mentions in Common Ground and No Common Ground conditions split by syntactic frame. **(b)** Proportion of Goal mentions in Common Ground and No Common Ground conditions split by syntactic frame.

Figure A.1 shows the syntactic frames for source mentions (Panel a) and goal mentions (Panel b) in the Common Ground (CG) and No Common Ground (NCG) conditions of Experiment 1. As seen above, when sources were mentioned, they were occurred primarily in the PREP frame ('*from the lamppost*', '*off the lamppost'*) in the Common Ground (40%) and No Common Ground (73%) conditions. This was followed by the related PARTICLE+PREP frame (*over to the shipwreck, from under the slide*), which was used at similar rates across both conditions (roughly 8% in both). Cases in which speakers used the VERB+NP constructions *(left the lamppost*) were very infrequent in both conditions (CG = .2% and NCG = .4%) and

commonly occurred as part of a multi-clause utterance.

Goal mentions in both the CG (77%) and NCG (86%) conditions most frequently occurred in the PREP (*to the chair, on the chair*) frame. This was followed by the PARTICLE+PREP frame. Interestingly, the PARTICLE + PREP frame seems to appear more frequently in the Common Ground (18%) than in the No Common Ground (7%) condition. It is not clear why this pattern occurred, but it is possible that speakers chose to be more additionally informative with respect to goals in the Common Ground condition because only goals were newsworthy to mention. As with sources, the VERB+NP frame *(explored the cave*) occurred only rarely in both conditions (.7% in both). When it did occur, though, it was most often as part of a multi-clause utterance.

Appendix B

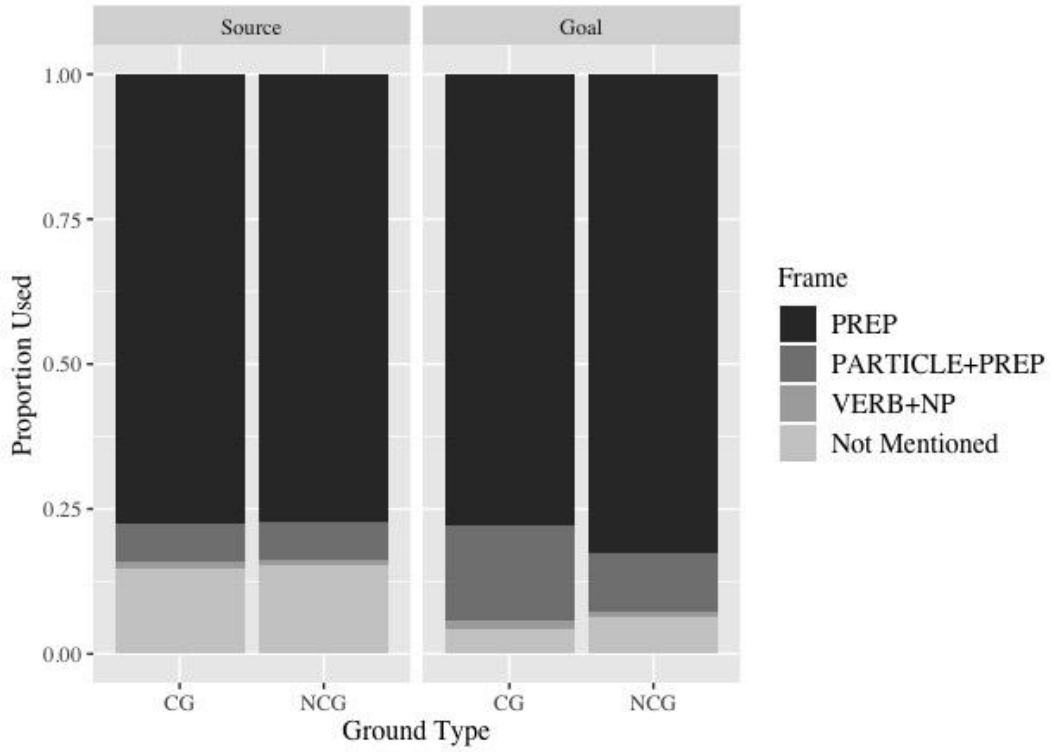

Figure B.1 (a) Proportion of Source mentions and **(b)** Proportion of Goal mentions in Common Ground and No Common Ground conditions of Experiment 2, broken down by syntactic frame.

Figure B.1 shows the frames in which sources (Panel a) and goals (Panel b) were mentioned in the Common Ground (CG) and No Common Ground (NCG) conditions of Experiment 2. In general, Common Ground and No Common Ground conditions show the same general pattern for source mentions. In most cases, speakers primarily mention the source using the PREP (about 77.5% in both), followed by the PARTICLE+PREP frames (7% in both). Only in rare instances were sources were mentioned using a VERB+NP (CG = 1.3%, NCG = .8%).

Goal mentions also showed the same general patterns across the Common Ground and No Common Ground conditions. Overwhelmingly, speakers preferred to mention goals using the PREP frame; this occurred roughly 78% of the time in the CG condition and 83% of the time in

the NCG condition. This was followed by the PARTICLE+PREP frame, which appeared 16% and 10% of the time in the CG and NCG conditions, respectively. As before, the VERB+NP construction was rare in both conditions (roughly 1% in both conditions).

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