



## Original Articles

# Having a task partner affects lexical retrieval: Spoken word production in shared task settings



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## ABSTRACT

Acting jointly with a partner is different from acting alone. In this study we investigate whether speaking with a partner is different from speaking alone. Drawing upon a well-established effect in language production we investigate the degree of cumulative semantic interference experienced when naming a sequence of pictures together with a partner. Pictures of semantically related objects were named either by participants only, or by taking turns with their partner. Naming latencies increased with each additional category member, confirming cumulative semantic interference. Crucially, naming latencies increased more sharply when in previous trials within-category pictures were named by the partner (vs. presented only visually but named by no one). This effect is not simply due to hearing additional pictures being named (Experiment 1). Even when participants merely believe their remotely located partner is naming the picture (Experiment 2), and when participants cannot hear their co-present partner naming the picture (Experiment 3), lexical processes appear to be triggered that subsequently interfere with participants' own lexical retrieval. Our results speak for a profound and lasting effect of having a partner on the language production system.

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## 1. Introduction

Many pragmatic phenomena are fundamentally embedded in social interaction (Levinson, 1983). Yet, comparatively little is known about how language is processed within a social interaction and how this may differ from language processing isolated from social context (e.g., Rohr & Abdel Rahman, 2015; Schindler, Wegrzyn, Steppacher, & Kissler, 2014). One characteristic of language use in conversational settings is that conversational partners alternate, often in quick succession, between speaking and listening (Clark, 1996; Pickering & Garrod, 2004, 2013). While one speaks, the other anticipates what is likely to be said and formulates the own response (Bögels, Magyari, & Levinson, 2015; Pickering & Garrod, 2007). The two processes, attending to the partner's speech, and preparing one's own speech, are coordinated and are likely to influence each other.

In this study we investigate how a simple language production task, picture naming, may be influenced by the language production of another individual. Studies investigating the cognitive processes underlying cooperation and social interaction more generally have shown that the task of one partner can influence

the task of the other partner (for overview see e.g., Knoblich, Butterfill, & Sebanz, 2011). For instance, when two partners perform complementary tasks in a shared setting, individual actors experience interference from the other person's task requirements (e.g., Sebanz, Knoblich, & Prinz, 2003). One explanation for this has been that the partner's task (e.g., Sebanz, Knoblich, & Prinz, 2005), or the partner's turn (e.g., Philipp & Prinz, 2010), is co-represented.

This may also apply to speaking: A recent study by Gambi and colleagues shows that picture naming latencies are delayed when participants believe their partner is about to speak (Gambi, Van de Cavey, & Pickering, 2015). In a study by Baus and colleagues (Baus et al., 2014), two participants took turns naming objects of high or low word frequency. Electroencephalographic recordings (EEG) during those trials in which the partner (but not the participant) had to name the object showed distinct signatures of electrophysiological activity in response to word frequency (that were less pronounced when nobody named the object). This suggests that participants engage in lexical processes not only when naming the object themselves, but also when the partner is naming the object.

These findings provoke the question whether simulation of the partner's language production affects the own language production system. To address this question we investigate cumulative semantic interference, a well-documented effect in single subject

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settings (e.g., Belke, 2013; Costa, Strijkers, Martin, & Thierry, 2009; Howard, Nickels, Coltheart, & Cole-Virtue, 2006; Navarrete, Mahon, & Caramazza, 2010). In this paradigm, subjects are asked to name a seemingly random sequence of pictures. Embedded in this sequence are pictures that are semantically related to each other, most often by being members of the same semantic category (e.g., types of birds; but see Rose & Abdel Rahman, 2016a, 2016b for similar findings with semantic associations). The typical finding is that naming latencies increase linearly with each newly named member of a given semantic category, resulting in cumulative semantic interference. Because of its progressive development over time this effect is particularly suited for investigating how simulating a partner's language production may subsequently influence the own language production. Indeed, a recent study investigated continuous picture naming in a two person setting and demonstrated that hearing a partner name pictures can elicit interference with own speech production (Hoedemaker, Ernst, Meyer, & Belke, 2017), as discussed in more detail later.

Different explanations have been put forward to explain cumulative semantic interference. One common account assumes increased competition on the level of semantically related lexical entries: When naming a picture the depicted object elicits the activation of its concept (e.g., raven), and in turn the activation of the corresponding lexical entry (the lemma; e.g., *raven*). At the same time, activation spreads to semantically related concepts (e.g., dove, eagle, swan) and their lexical representations. Thus, the target lexical entry needs to be selected among several co-activated, semantically related competing entries (e.g., Abdel Rahman & Melinger, 2009b; Dell, 1986; Levelt, Roelofs, & Meyer, 1999; Roelofs, 1992).

Once the target lexical entry has been selected the connection between the entry and its concept is strengthened. When subsequently a new, semantically related object is named, the prior named concept is co-activated along with an enhanced activation level of its lexical entry. The resulting increased competition causes the new target lexical entry to be selected later. As the number of strongly active competitors steadily increases with each additional category member named, interference between semantically related items also increases (Howard et al., 2006). A variant of this competitive account assumes the origin of competition at the conceptual level elicited by a strengthened connection between concepts and their semantic features, which in turn impedes selection at the level of lexical entries (Belke, 2013). A different explanation for cumulative semantic interference argues that lexical access must not be competitive in order to account for the effect (Navarrete et al., 2010; Oppenheim, Dell, & Schwartz, 2010). A word is selected once its activation level exceeds a certain threshold. This selection not only reinforces the connection between a concept and its lexical entry, but additionally weakens the connection of co-activated non-target lexical entries. When later a picture with a weakened connection needs to be named, the target lexical entry has a lower activation level and hence takes longer to be selected.

In a shared task setting in which two partners take turns naming pictures, we predict that cumulative semantic interference can be elicited not only by naming pictures oneself, but also by pictures that are named by a partner. This would be in line with previous work (Baus et al., 2014) suggesting that a partner's naming of pictures is simulated and thereby elicits lexical processes comparable to the ones elicited when naming the picture oneself. Going beyond previous work, we furthermore expect that simulating a partner's lexical access will induce lexical competition or inhibitory mechanisms as described above. Specifically, simulated lexical retrieval (like real lexical retrieval) may impede subsequent lexical retrieval by creating highly active competitors through strengthened connections between concepts and their lexical entries

(Howard et al., 2006), or between concepts and their semantic features (Belke, 2013), or, alternatively, by weakening non-target lexical entries (Oppenheim et al., 2010). In either case, partner-elicited semantic interference would provide evidence that the language production requirements of a task partner are not only co-represented but also exert a lasting influence on one's own language production.

### 1.1. Present experiments

In three experiments participants successively named pictures, some of which were semantically related (e.g., several types of birds), in turns together with a partner. Within some semantic categories, half of the exemplars were named by the partner (Joint Naming condition); within other semantic categories half of the exemplars were named by neither partner nor participant (Single Naming condition). Thus, in both conditions participants named in close succession an equal number of semantically related pictures; what differed was whether, interspersed, additional pictures of the same category were named by the partner, or whether they were presented visually but were not named by anyone. This manipulation was imposed in a within-subject design. In Experiment 1 participants named pictures sitting immediately next to their task partner; in Experiment 2 participants merely believed they were naming pictures together with a physically remote partner; in Experiment 3 participants sat next to their partner but wore headphones that prevented them from hearing their partner name the pictures.

We hypothesize that having a partner will lead participants to co-represent their partner's task, hence activating the lexical representation of the object named by the partner in a fashion similar to naming it oneself. We therefore expect a steeper increase in naming latencies for those categories co-named with a partner compared to those categories named by the participant only.

## 2. Experiment 1

In Experiment 1 we tested the strength of cumulative semantic inhibition experienced when previous semantically related pictures are named by a co-present task partner compared to when they are presented only visually. Participants and their task partner (an experimental confederate) sat next to each other. Hence, participants directly witnessed their partner naming pictures.

### 2.1. Methods

#### 2.1.1. Participants

Twenty-four native speakers of German (6 male, 18 female) between the ages 19–34 (mean 26.5) were included in the data analyses. Two participants had to be excluded and replaced due to technical failure. Participants gave informed consent and were compensated with €8 per hour or received credit towards their curriculum requirements. The experiment (as well as Experiment 2 and 3) was approved by the local ethics committee of the Psychology Department of the Humboldt University of Berlin and complies with the Declaration of Helsinki on ethical principles for research involving human subjects (Version 2013).

#### 2.1.2. Materials

Three hundred and twenty colored pictures (photographs) of man-made or natural objects were collected. The objects mapped onto 32 different semantic categories (e.g., birds, beverages, flowers; please see Appendix A for complete list of objects). Most of the categories were taken from previous work (Belke, 2013; Howard et al., 2006; Rose & Abdel Rahman, 2016a, 2016b). Each

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