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The identity of the partner matters even when naming everyday objects

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Abstract

Social factors, such as partner familiarity (e.g., talking to a friend vs. stranger) may affect some conversations but not others. While researchers do not always control the partner identity when conducting interactive studies, the current empirical report of a language production experiment conducted via Zoom presents effects of partner familiarity (friends vs. strangers) on the form and content of referring expressions in the mundane task of describing everyday objects. First, speakers interacting with a friend were less disfluent than speakers interacting with a stranger, showing that more effort is invested in interactions with strangers. Second, speakers interacting with a friend showed more sensitivity to prior context. Surprisingly, these effects reveal that speakers are sensitive to the partner identity even when describing everyday objects whose labels are shared across all language users. The current findings suggest that researchers should consider social factors as part of the experimental design of interactive tasks.

Keywords: psycholinguistics; social effects; partner identity; referring expressions; lexical differentiation; priming; alignment

Introduction

Conversation always occurs in a social context. The social connection between conversational partners, such as whether they are friends or strangers, may affect some conversation topics. This is because interlocutors must reason about what information is likely – and unlikely – to be shared with the partner. Because the scope of shared information can vary widely, this is a complex task: in some cases, we expect all members of our linguistic community to share our knowledge (e.g., calling an umbrella *"umbrella"*), in other cases we expect only sub-communities to share our knowledge (e.g., researchers in the field call this conference *"Cog Sci"*), and in still other cases we expect only those with whom we have joint experience to share our knowledge (e.g., in calling our local coffee shop "the café").

When interlocutors know each other, they already have established shared knowledge and thus, they have a better representation of what their partner does and does not know. The established shared knowledge enables interlocutors to tailor language to the familiar partner. This issue has been studied with abstract images (e.g., tangrams) where referring expressions depend on the ability to model the knowledge of the partner (e.g., *a person sitting down has a bowl of soup in their hand* vs. *the soup drinker*). For example, when collaboratively establishing labels for abstract images, interlocutors interacting with their friends established shorter labels than interlocutors interacting with a stranger (Rodrigues et al., in press). In these situations, interlocutors show lower stress levels when describing abstract images to familiar partners compared to unfamiliar partners – as reflected by cortisol concentrations – reflecting lower cognitive effort when interacting with friends (Rodrigues et al., in press). Listeners, in turn, identify objects more accurately when they receive instructions from friends (Fussell & Krauss, 1989), a behavior which may also be linked to friends relying on shared experiences more, thereby making communication more efficient. Finally, speakers are more efficient in turn-taking while communicating with their spouse compared to strangers (Bortfeld et al., 2001).

Importantly, such an effect is not expected when the conversation concerns everyday objects, such as umbrellas, bottles, or flowers, that vary along standard properties, such as size, colour, or state. This is because all adult speakers of a language are expected to share the appropriate conceptualization and lexical items to the same extent. But even when the conversation concerns everyday objects, there are differences in interactions that arise from the social relationship between partners. For example, speakers show a greater extent of lexical alignment when interacting with an in-group member as compared with an out-group member (Unger, 2010). Interestingly, interacting with friends is not always advantageous: listeners may be more egocentric, leading to communicative failure (Savitsky, et al., 2011), a behavior that may be linked to lower cognitive effort.

Psycholinguistic studies have traditionally examined interlocutors' production and comprehension in a laboratory setting, and the identity of a conversational partner was not a primary interest nor a critical factor that the researchers always control. These studies have adopted different types of social relationships: a pair of naïve strangers (e.g., Yoon, Benjamin, & Brown-Schmidt, 2016), a pair of naïve friends (e.g., Brown-Schmidt & Tanenhaus, 2008; Carbary & Tanenhaus, 2011), or a naïve participant interacting with a lab confederate (e.g., Yoon & Brown-Schmidt, 2013).

However, the effect of partner identity on language use has generally not been examined directly. Further, online interactive language studies (e.g., using Zoom) have been gaining popularity, especially due to the COVID-19 pandemic, despite the fact that we do not have a firm understanding of how interlocutors may change their behavior in online social interactions. We note that the identity of the partner might have a stronger effect in online social interaction, because these settings afford fewer cues about the partner (e.g., shared space, gestures, etc.).

The current paper is an empirical report of a language production experiment conducted via Zoom, which was originally designed to address a theoretical question about referring expressions, specifically building on the effect known as *lexical differentiation* (van der Wege, 2009; Yoon & Brown-Schmidt, 2013). To our surprise, pilot data revealed systematic differences between utterances produced by speakers who gave instructions to a familiar partner (i.e., a friend) compared to speakers who interacted with an unfamiliar partner (i.e., a stranger). This difference is particularly surprising because the target objects in this study were not abstract images whose description may require conceptualization that could benefit from prior shared experiences, but instead everyday, easy-to-name objects, such as umbrellas, candles, and chairs. The results provide insights on the effect of partner identity in interactive language use during online and face-to-face interactions.

The Present Research

Referring expressions – the labels we use to talk about objects and other entities – have long been known to be influenced by a number of different sources, including earlier referring expressions, or the discourse history. For example, when referring to the same object again, speakers use the same words and concepts as the ones used earlier (Clark & Wilkes-Gibbs, 1986; Brennan & Clark, 1996). But discourse history has an effect even when speakers refer to a previously-unmentioned object. For example, speakers tend to reuse the same syntactic structures and concepts that were used earlier, and even more so if the noun overlaps (Cleland & Pickering, 2003; Carbary & Tanenhaus, 2011; Goudbeek & Kramer, 2012; Heller & Chambers, 2014).

Our focus here is the effect of lexical differentiation (van der Wege, 2009; Yoon & Brown-Schmidt, 2013). Lexical differentiation occurs when speakers include information that distinguishes the current target object from an object that was mentioned earlier, even though the earlier object is no longer visible. For example, in a context like Fig. 1. (1a), speakers normally refer to the object highlighted in red as *the umbrella*, and later in the experiment, when they see a second, different umbrella, they sometimes label it as *the open umbrella* (22-24% of the times in Yoon et al., (2016)). This linguistic behavior is somewhat unexpected, because the earlier umbrella is no longer shown in the visual local context, and so including the adjective is not necessary to uniquely identify the intended object. Thus, this finding

demonstrates that the earlier-mentioned object is still active in memory despite no longer being visible.

Our goal in designing the current study was to examine whether objects that were presented but *not* mentioned in an earlier context (e.g., the open umbrella on the entrainment trial in Fig. 1, 1b) have similar influences on later descriptions. We created two different manipulations to address the question of whether an *unmentioned* object that appeared in the visual context earlier influences the form of descriptions that are produced later, when this unmentioned object is no longer visible in the context. In other words, we ask whether unmentioned objects are still active in memory such that they will affect later language production.

We had two trial types. First, in the two-properties trial type, participants first saw either one item or a pair of items, either from a critical category (e.g., umbrella) or from a different category (e.g., bottle) and had to describe a member of this pair (e.g., closed umbrella or closed bottle) – see the entrainment trials in Figure 1. On the test trials which appeared later, participants viewed another exemplar from the critical category (e.g., a striped open umbrella). In this situation, speakers have been previously shown to sometimes include information that distinguished the second referent from the first, normally by including an adjective in the expression, as in *the open umbrella* (van der Wege, 2009; Yoon & Brown-Schmidt, 2013). Our critical case is Figure 1b, where speakers see two umbrellas on the entrainment trial, and are therefore expected to produce a modified expression. If the speaker indeed said *the closed umbrella* on the entrainment trial, what will they say on the test trial? One possibility is that they will reuse the structure and concepts from the earlier description, and say *the open umbrella*. However, note that the earlier context had a *different* open umbrella (which was not mentioned): we hypothesize that if that earlier open umbrella is still active in memory, this description should not be used for the current umbrella. Instead, because the umbrella on the test trial contrasts with the earlier umbrella on another property – stripes – speakers may choose to say *the striped umbrella* (of course, we expect that on the majority of the trials they will simply say *the umbrella*). Thus, our primary measure was the type of modifiers speakers used on test trials: whether the modifier on the test trial distinguished the current object from the images in the entrainment trial. If speakers use the distinguishing modifier (e.g., *striped*) on the test trial, this indicates that the unmentioned object is still active in memory. We note that this type of trial is more open ended, as speakers have other options in addition to the adjective *striped*, mentioning, for example, the two tones.

Our second trial type included items that differed only in size, such as the small, medium, and large flowers in the bottom panel of Figure 1. We exploited the fact that the intermediate object in a set of three is called *"medium"* (pilot: 94%), but the same object would be called "*big(ger)*" when paired with just one object (pilot: 97%). First, if speakers refer to the large flower on the entrainment trial, probably by saying *the flower*, how will they refer to the medium flower
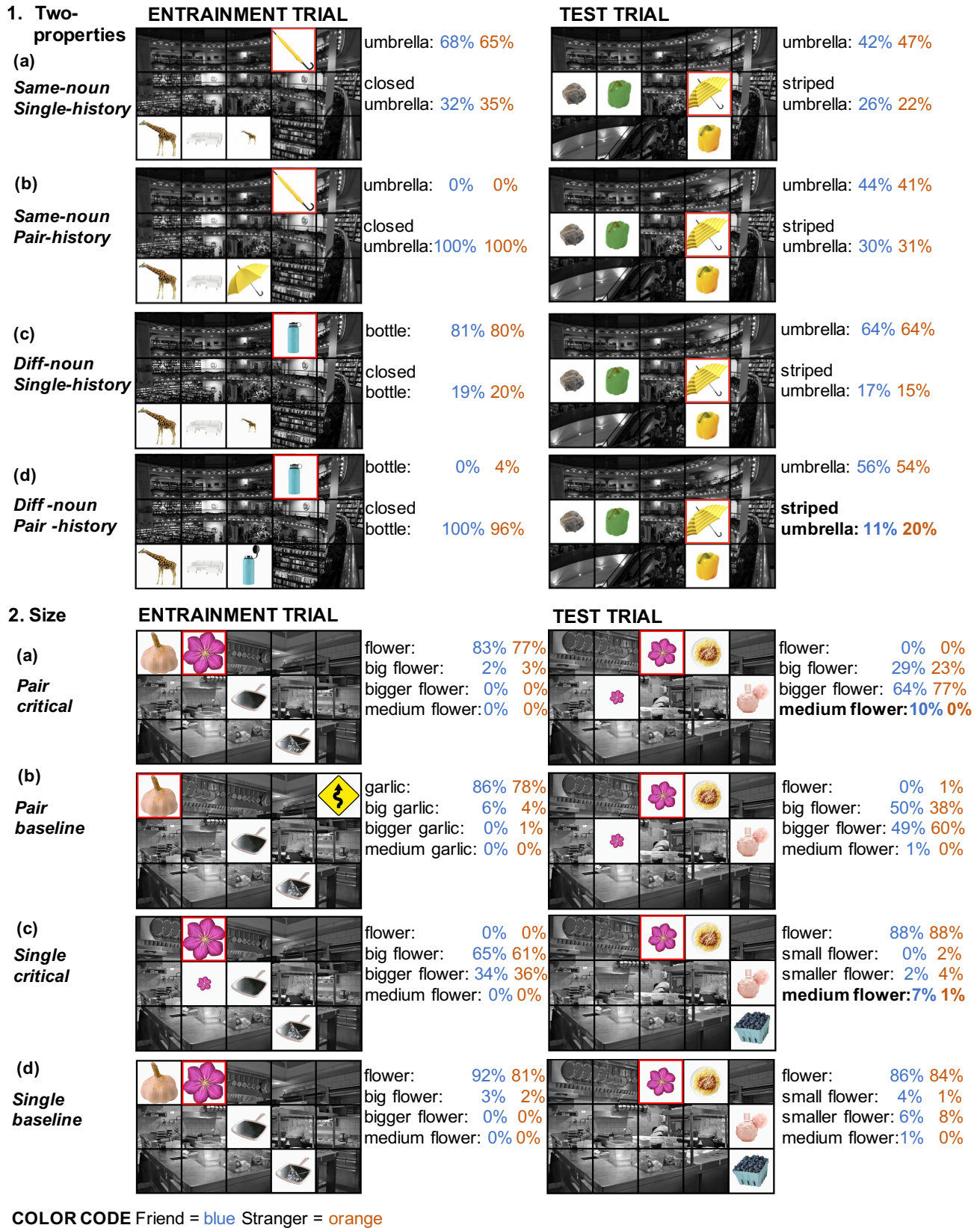
Figure 1. The example stimuli in the experiment: Two-properties trial type on the top panel and size trial type in the bottom panel.

on the test trial? (Fig. 1. (2a)) We reasoned that if the earlier flower is still active in memory, they may wish to inhibit the description *the big flower*, as the referent on the test trial is actually <u>smaller</u> than the earlier referent. Instead, they might say *the bigger* flower which avoids this problem, or *the medium flower* which takes the earlier flower into account. Second, if speakers saw two flowers earlier and referred to one of them as *the big(ger) flower*, how will they refer to the medium flower on the test trial? (Fig. 1. (2c)) Here they may just say *the flower*, because there is only one flower in the visual context, but like with Fig. 1. (2a), they could take the earlier flowers into account and say *the medium flower*. More generally, if speakers are sensitive to the historical discourse context, including unmentioned objects, they should produce size adjectives that distinguish the current target object from the previously mentioned and unmentioned objects. Unlike the two-properties trial type, here objects contrast only in size, and so speakers' options are limited to size information alone.

In the context of talking to friends or strangers, we examine, first, whether the social connection to the partner affects one's cognitive effort, as measured by the rate of disfluencies (e.g., *thee uh open umbrella*), which have been linked to situations where the speaker is experiencing cognitive load, and can therefore be used as a measure of planning difficulty or effort (Bortfeld et al., 2001; Clark & Fox Tree, 2002; Fraundort & Watson, 2011; Yoon & Brown-Schmidt, 2019). Prior findings lead us to expect reduced effort with friends. Second, we ask whether talking to a friend or a stranger affects one's sensitivity to the historical discourse context, measured through the effect of lexical differentiation: When partners interact with someone with whom they share more prior experiences, they may also exhibit more sensitivity to shared experience in the current conversation. This may be reflected in producing more modified expressions that are appropriate with respect to the historical context, compared to speakers interacting with a stranger. Thus, we expect to see more lexical differentiations or other reflections of considering the historical context when interacting with a friend.

Experiment

Participants
Thirty-two native speakers of North American English participated in the experiment in return for partial course credit or cash payment ($10). Participants had normal hearing and normal or corrected-to-normal vision. Participants were recruited in two groups: Strangers, with no relation to the experimenter (N=16, 9 female), and Friends, with a personal connection to the experimenter (N=16, 10 female).

Materials and Procedure
Participants performed a referential communication task (Krauss & Weinheimer, 1966) via Zoom. The experimenter informed the participant that they were assigned to the speaker role. On their own screen, participants opened a PowerPoint file containing their side of the experiment. The experimenter viewed the listener version of the PowerPoint on her screen. On their respective computer screens, the participant and experimenter each viewed a grid containing three rows and five columns, or fifteen virtual "cards" turned upside down (Figure 1). On each trial, 4 pictures were revealed to the participant and experimenter, and the participant's task was to describe the object in a highlighted red box for the experimenter to click (participants were informed that they would see the same images as the experimenter; the red box was not shown to the experimenter). After the experimenter clicked the object on her screen, the participant clicked to proceed to the next trial on theirs.

The 3x5 grids were designed such that each of the 15 squares on the grid could contain an image; however, on each trial only 4 of these images were revealed to the participant and experimenter. Trials were administered in "blocks" of 8, such that participants completed 8 trials with a given set of 15 pictures, and then moved onto a new "block" of 15 images for 8 trials, and so on.

There were two different types of trials that examined sensitivity to the historical context (see Experimental Design): Two-properties trials and Size trials. There were a total of 24 different item sets in each type, each of which included one entrainment trial, one test trial, and 6 interspersed filler trials (such that each participant saw a total of 48 entrainment trials, 48 test trials, and 336 filler trials across the entire study). Within each block, the entrainment trial always preceded the test trial. In the two-properties blocks, there were 1 to 3 filler trials between entrainment and test (mean = 1.67). In the size type blocks, the test trial immediately followed the entrainment trial. A list design cycled the items in each of the trial types through the four conditions, resulting in four presentation lists; each participant was randomly assigned to one list.

Experimental Design
Two-properties trial type
This trial type involved a 2 (Category) x 2 (Pair) within-subjects manipulation on the entrainment trials, whereas the test trials remained constant across the manipulation – see Figure 1, top panel. Category of the target object that appeared on the entrainment trial was manipulated: the target was either from the *same* category as the test item, or from a *different* category. For example, if the test item was a striped open umbrella, then the target object in the entrainment trial would also be an umbrella, whereas it would be a bottle in the different-noun conditions.

The Pair manipulation targeted the number of objects that appeared on the entrainment trial. In the pair condition, the entrainment trial had a pair of items from the same category (e.g. an open and closed umbrella), and the participant had to describe one of them, which requires the use of a modifier. The pair of objects in the entrainment trial in both the same- and different-noun conditions contrasted in the same property (e.g. open vs. closed), so as to elicit the same modifier. In the

single condition, there was no contrasting item to the target image on the entrainment trial, and therefore a modifier was not expected to be produced (although it was of course still possible).

Test trials were the same across all conditions: Participants described a target object (e.g., an open striped umbrella) that was unique in the local visual context. In the same-noun condition, the target was a second or third exemplar from the same category; in the different-noun condition the target was the same (e.g. open striped umbrella) but the participants had not previously seen or described an object from this category.

Size trial type

This trial type also had four conditions. The test trial contained either a Pair of objects or a Single object. Participants always described an object of intermediate size. The entrainment trial either completed the set of 3 (Critical), or had one less object (Baseline) – see Figure 1, bottom panel.

Results

Disfluency

We examine speakers' cognitive effort on test trials by computing the rate of disfluencies. An expression was coded as disfluent if it contained a disfluent filler word (e.g., *the um umbrella*).

Speakers who interacted with a friend produced fewer disfluencies than speakers who interacted with a stranger (friend: 3% vs. stranger: 10%– see Figure 2). The rate of disfluency on test trials was analyzed using a mixed-effects logistic regression model that included Trial Type (two-properties vs. size) and Group (friend vs. stranger) as fixed effects. When the maximal model did not converge, random slopes were removed from the model one at a time until convergence was achieved. The final model revealed a significant main effect of Group (z=2.82, p=.005), indicating that speakers who interacted with a stranger invested more cognitive effort compared with speakers who interacted with a friend. This effect is consistent with prior findings, whereby speakers experience lower cognitive load when interacting with friends (Rodrigues et al., in press). Nevertheless, it is surprising to observe a measurable difference in cognitive load in what is arguably an easy and straightforward task – describing everyday objects. In addition, there was a significant Trial Type X Group interaction (z=-2.37, p=.02). Planned comparisons showed that the Group effect was not significant in the size trial type (z=1.14, p=.25) where speakers only had to choose an appropriate size adjective. This comparison was significant in the two-properties trial type (z=3.15, p=.002), where there are more options for what modifier to use – speakers have been shown in other contexts to be disfluent in the face of options (Schachter et al., 1991; Schachter et al., 1994).

To investigate the generality of this group difference, we also calculated the rate of disfluencies across all trials: test trials (as above), entrainment trials, and all filler trials. Interestingly, the group effect was again significant: Speakers interacting with their friend were less likely to be disfluent compared to speakers interacting with a stranger (3% vs. 7%, respectively, z=2.83, p=.005).
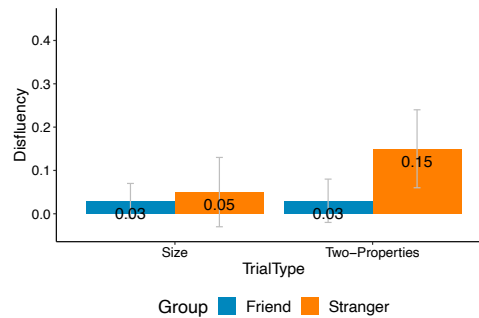

Figure 2: Proportion of disfluent referring expressions on test trials.

Use of modifiers: Two-properties trial type

To test speakers' sensitivity to the historical context, we coded all the modifiers used, both on the entrainment trials and on test trials. As expected, speakers almost always produced modifiers on entrainment trials when the visual context contained a pair of objects, but not when there was just a single object (e.g., Brown-Schmidt & Konopka, 2011). That is, they almost always produced modifiers in the pair-history conditions, but not frequently in the single-history condition – this pattern is summarized in Figure 1, top panel, left column.

Our primary measure is the proportion of *distinguishing* modifiers on test trials which reflects sensitivity to the historical context. Specifically, we coded whether the modifier used on the test trial distinguishes the referent from the unmentioned contrasting object that was present on the entrainment trial. For example, *the open umbrella* or *the yellow umbrella* do not distinguish the target item on the test trial from the unmentioned umbrella on the entrainment trial, whereas *the striped umbrella* or *the umbrella with two colors* does distinguish the two. Figure 3 plots this measure across the four conditions, for each of the groups – friends and strangers.
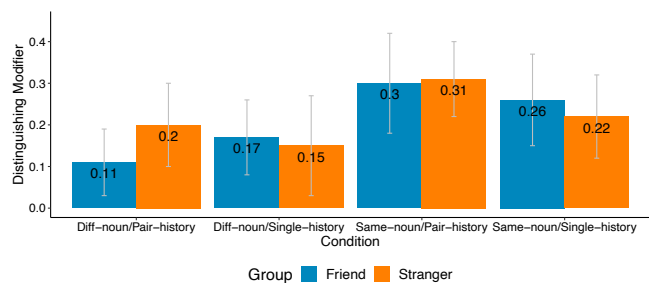

Figure 3: Proportion of distinguishing modifiers produced on test trials.

These data were analyzed using a mixed-effects logistic regression model that included Category (same- vs. different-

noun, within-subjects), Pair (single- vs. pair- history, within-subjects), and Group (friend vs. stranger, between-subjects) as fixed effects. The model revealed a significant main effect of Category (z=4.70, p<.001), indicating that all speakers were more likely to produce distinguishing modifiers when the noun was repeated (i.e., seeing an umbrella after seeing umbrellas earlier) ; The main effects of Pair (z=-1.18, p=.24) and Group (z=-0.03, p=.97) were not significant. However, the Pair X Group interaction was marginal (z=-1.83, p=.07): In a planned comparison analysis, the effect of Pair was significant in the Stranger group (z=-2.13, p=.03), but not in the Friend group (z=0.14, p=.89). This means that speakers who interacted with their friend were more likely than speakers who interacted with a stranger to produce distinguishing modifiers that clearly differentiated the referent on the test trial from referents that appeared in an earlier context, regardless of how many similar images they had seen before.

Use of modifiers: Size trial type
We coded the type of modifier on test trials as one of three: plain (e.g., *big/small*), comparative (e.g., *bigger/smaller*), and *medium*. The descriptive pattern is summarized in Figure 1, bottom panel. The strongest influence on the size adjective produced comes from the local context of the test trial: both groups usually produced bare noun phrases (e.g., *the flower*) in the single conditions (over 80%), but avoided such description in the pair conditions (1% or less).

Of most interest for our purposes here is the modifier *medium*: because it is only appropriate in a context with three objects of different sizes, and our experiment contained no such context, the use of this modifier acts as a clear reflection of speakers' consideration of the historical context: this situation occurs in the Pair-Critical and in the Single-critical conditions. For this modifier, there was a striking difference between speakers who interacted with a friend and who sometimes produced *the medium flower*, and those interacting with a stranger who produced *medium* very rarely (9% vs. 1%, respectively; Figure 4). This finding reveals an unexpected effect, whereby friends consider the historical context more than strangers when choosing referring expressions.

The use of the modifier *"medium"* was analyzed using a mixed-effects logistic regression model[1]. The model revealed that speakers produced *medium* more often when three critical objects had been presented than when two of them had been presented (Pair-Baseline vs. Pair-Critical: z=2.48, p<.05; Single-Baseline vs. Single-Critical: z=2.18, p<.05): this is expected from the fact that only the critical conditions had three objects of the same type. More importantly, the main effect of Group was significant (z=-1.98, p<.05), revealing that friends are more likely to reflect the representations of discourse history in their referential expressions, compared to strangers.

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[1] The mixed-effects model including the interaction term did not converge. We used a model that only included the main effect of Group and the main effects of Condition (coded with Contrast 1:
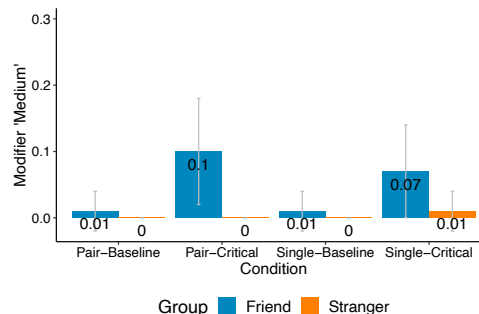

Figure 4: Proportion of the modifier *"medium"* produced on test trials.

General Discussion

While our theoretical motivation for this study was to explore new effects of the historical context on referring expressions, our analysis revealed a significant effect of the social connection to the partner, even when the language concerned everyday objects whose labels are expected to be shared widely across the linguistic community. We examined two aspects of language production: the cognitive effort speaker invested in referential design as reflected in disfluencies, and speakers' sensitivity of the historical context as reflected in the use of modifiers.

Results showed that speakers who interacted with a friend were less disfluent than speakers who interacted with a stranger. In addition, their use of modifiers, across two types of manipulations, revealed that speakers who interacted with a friend considered the earlier context to a larger extent. It is striking that these differences are observed even when speakers engage in a simple and straightforward task of describing easy-to-name everyday objects.

The finding whereby speakers invested more cognitive effort for strangers than for their friend is consistent with previous physiological findings that have shown higher cortical concentrations when interacting with strangers compared to with friends (Rodrigues et al., in press). This effect of partner familiarity in cognitive effort was more robust in the two-properties trial type compared to the size trial type. One explanation is that the effect of partner familiarity can manifest in various measures depending on the types of referring expressions. To illustrate, in the two-properties trial type, the choice of an appropriate modifier was more open-ended, whereas in the size trial type the appropriate set of modifiers was much more restricted, as objects contrasted only in size. When speakers choose one modifier among many possible options, partner familiarity modulates cognitive effort (see also Schachter et al., 1991; Schachter et al., 1994). It is possible that speakers who interact with a stranger spend more cognitive effort to use an appropriate modifier in order to ensure that their partner understands their message. But when the options are limited,

Pair vs. Single, Contrast 2: Pair-Critical vs. Pair-Baseline, Contrast 3: Single-Critical vs. Single-Baseline).

speakers may choose a different strategy to ensure communicative success. In the size trial type, speakers who interacted with a stranger focused on the local context, potentially suppressing any effects of the historical context which do not directly contribute to the partner's ability to identify the correct referent. Specifically, if there are just one or two critical items in the local context, the modifier *medium* may confuse their partners, even though it is perfectly suitable for the discourse history.

This account is related to the claim that conversational partners collaborate to minimize joint effort (Clark & Wilkes-Gibbs, 1986). While speakers and listeners distribute their effort in conversation, friends (or other familiar interlocutors) may divide the effort more equally than unfamiliar interlocutors. In contrast, strangers are willing to take on more effort in order to minimize the risk of miscommunication. In other words, friends are more likely to take the risk of failing communication and shift some work onto their familiar partner.

In conclusion, despite its post-hoc nature, this empirical report reveals a small but significant effect of speakers' sensitivity to the social connection with their partner, strikingly in a mundane interaction of describing everyday objects. Partner familiarity modulated speakers' cognitive effort and the consideration of discourse history. While being surprising in this particular task, the results are nevertheless consistent with previous findings about differences between speakers who interact with familiar and unfamiliar partners. More generally, the current findings suggest that researchers should always consider social factors as part of the experimental design of interactive tasks.

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