Speakers use their own, privileged discourse model to determine referents' accessibility during the production of referring expressions

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Abstract

We report two experiments that investigated the widely-held assumption that speakers use the addressee's discourse model when choosing referring expressions, by manipulating whether the addressee could hear the immediately preceding linguistic context. Experiment 1 showed that speakers increased pronoun use (relative to definite NPs) when the referent was mentioned in the immediately preceding sentence compared to when it was not, but whether their addressee heard that the referent was mentioned had no effect, indicating that speakers use their own, privileged discourse model when choosing referring expressions. The same pattern of results was found in Experiment 2. Speakers produced fewer pronouns when the immediately preceding sentence mentioned a referential competitor than when it mentioned the referent, but this effect did not differ depending on whether the sentence was shared with their addressee. Thus, we conclude that choice of referring expression is determined by the referent's accessibility in the speaker's own discourse model rather than the addressee's.

Keywords: reference production; pronoun; accessibility; discourse; common ground

Introduction

Many theories of reference (e.g., Ariel, 1990; Chafe, 1994; Givón, 1983; Prince, 1985) assume that speakers choose referring expressions (e.g., pronouns, definite noun phrases) depending on how accessible they believe the referent is in the addressee's mental representation. When the referent is assumed to be highly accessible for their addressee, speakers produce less explicit referring expressions such as pronouns. In contrast, when the referent is assumed to be less accessible for the addressee, they tend to use more explicit referring expressions such as definite noun phrases or proper names to facilitate comprehension. That is, the choice of referring expressions is driven by the speaker's assumptions about the addressee's current focus of attention. According to this view, speakers determine the referent's accessibility on the basis of a discourse model that is shared with their addressee, using information that is in the *common ground* (Clark & Marshal, 1981), rather than on the basis of the speaker's own discourse model, which is not shared and belongs to the speakers' *privileged ground*.

Perhaps surprisingly, however, there has been very little evidence that speakers use their addressee's model to determine referents' accessibility during the production of referring expressions. Although there is much evidence that speakers use more reduced referring expressions when the referent is more accessible (e.g., Ariel, 1990; Arnold, 2001; Givón, 1983; Stevenson, Crawley, & Kleinman, 1994), these findings may be due to the referent's accessibility in the speaker's own model rather than in the addressee's model. Keeping track of what is shared with the addressee may pose a high demand on processing resources, so speakers may instead base their choice of referring expression on the accessibility of the referent in their own, privileged discourse model. On the other hand, a great deal of evidence does suggest that speakers take into account the addressee's perspective when avoiding referential ambiguity. For example, speakers tend to produce modified noun phrases such as *the big glass* rather bare nouns such as *the glass* when the context contains more than one glass, and this effect is more pronounced when the competitor glass is visible to both the speaker and the addressee than when it is only visible to the speaker (e.g., Horton & Keysar, 1996; Nadig & Sedivy, 2002). This indicates that speakers take into account the shared visual context in order to avoid referential ambiguity, at least during later stages of processing (Horton & Keysar, 1996). However, it is currently unclear whether speakers also take into account the addressee's discourse model when determining the accessibility of referents and whether they do this even if there is no referential ambiguity.

Thus, using a referential communication task, two experiments contrasted the use of a shared and privileged linguistic context when speakers chose pronouns or repeated noun phrases. In each trial, a speaker and an addressee sat side-by-side at a table and saw a picture such as the top panel of Figure 1 on their own computer screen. The addressee recreated the scene in the photograph on the table, using real toy characters. The speaker then read aloud a context sentence (1), which was not seen by the addressee, and subsequently listened to a pre-recorded sentence (2a-b), which contained a pronoun that referred back to either the last-mentioned character (2a) or the first-mentioned character (2b) in the context sentence (1). Finally, the

speaker produced the target utterance, describing the picture in the bottom panel of Figure 1 to their addressee. The picture showed an action carried out by the last-mentioned character (the admiral, hereafter *the referent*) in the context sentence (1). The addressee, who could not see the picture, then had to act out the speaker's description using the toys. We analyzed whether the speaker used either a pronoun or repeated noun phrase when producing the target utterance (e.g., saying *He/The admiral stands up*).

1. The mermaid is waiting for a taxi with the admiral.
2. a. He is sitting in a wheelchair.
   b. She is sitting in a wheelchair.

Figure 1: Example photos

Experiment 1

We investigated whether speakers used the addressee's discourse model by testing a pair of participants; one participant taking the speaker role, while the other took the addressee role. We had three conditions. Each condition was tested in a separate block (counterbalanced for order across the experiment), but the same participants played the same speaker/addressee role in all conditions. The first condition was the *shared – referent mentioned condition*. In this condition, the second sentence referred to the target character (2a) and was presented via loudspeakers, which established a shared context because both the speaker and the addressee heard the sentence. In contrast, in the second condition, the *privileged – referent mentioned condition*, the second sentence also referred to the target character, but sentence (2a) established a privileged context, because it was presented via headphones that the speaker was wearing, so the addressee could not hear the sentence. Finally, in the third condition, the *privileged – competitor mentioned condition*, the second sentence (2b) was also presented via headphones to the speaker, but it referred to the competitor character (*the mermaid*).

If speakers adopt the addressee's model to determine the referent's accessibility, the referent should be considered more accessible if their addressee also heard the reference to the target character in the immediately preceding sentence (shared – referent mentioned) than when only the speaker heard the reference to the target character (privileged – referent mentioned). Thus, speakers should produce more pronouns (therefore, fewer repeated noun phrases) in the shared – referent mentioned than the privileged – referent mentioned condition. In fact, the percentage of pronouns in the privileged – referent mentioned condition should not differ from the privileged – competitor mentioned condition, because in neither condition the addressee heard the second sentence. In contrast, if speakers adopt their own, privileged model, it should not matter whether the addressee heard the reference to the target character in sentence (2a) or not, so the privileged – referent mentioned and shared – referent mentioned conditions should not differ. However, both conditions should result in more pronouns than the privileged – competitor mentioned condition, where reference in the immediately preceding sentence (2b) is to the competitor, which should make the referent less accessible.

Method

Participants Twenty-four pairs of participants from the University of Dundee who were native speakers of British English (aged 17-30) took part in return for payment or course credit. None of them reported to be dyslexic.

Materials We constructed 24 experimental item sets. Each item set consisted of two photographs of miniature toy characters (such as a king, a queen, a pirate, or a mermaid), a written sentence and an auditory sentence. Figure 1 presents an example photograph panel. The top half of each panel introduced two human characters of different gender (the referent and the competitor), and the bottom half depicted a simple action carried out by the referent (e.g., standing up from a wheelchair). The referent and competitor characters appeared on the left and right hand side of the pictures equally often.

Both the referent and the competitor were linguistically introduced in a written sentence, as in (1), where the referent (e.g., the admiral) was introduced as the prepositional object in a *with* phrase and the competitor (e.g., the mermaid) as the subject.

For each item, we created two auditory sentences. In the referent-mentioned condition (2a), the sentence began with a pronoun referring to the referent (the admiral), and in the

competitor-mentioned condition (2b), it began with a pronoun referring to the competitor character. In half of the items, the sentence correctly described the picture, whereas in the other half, it did not. The sentence was recorded at normal speaking rate by a female native speaker of British English, sampled at 22 kHz. The mean durations for the referent-mentioned condition (1.62 sec) and the competitor-mentioned condition (1.67 sec) did not differ significantly, $t(23) = 1.30$, $p = .208$. In addition, 12 practice and 36 filler items were constructed.

Procedure and design The speaker and the addressee sat side-by-side at a table, facing a computer screen, and a board between them prevented them from seeing each other. The experimenter sat behind the participants. The visual stimuli (the photographs and a context sentence) were presented using DMDX software (Forster & Forster, 2003). The speaker's speech was recorded on a MiniDisk, which was later used for coding.

At the beginning of each trial, both the speaker and the addressee saw a photograph of miniature toy characters on their screen. The addressee received the toys from the experimenter and recreated the scene depicted in the photograph on the table, so that the speaker sitting on the other side of the board could also see the toys. Once the objects were laid out, the speaker pressed a key to progress, which triggered the presentation of a written sentence, appearing below the first photograph on the speaker's computer screen (the addressee did not see this sentence or the following photograph). The speaker read aloud the context sentence and pressed a key, which prompted the presentation of a pre-recorded auditory sentence (2a-b).

In the shared-referent mentioned condition, sentence (2a) was presented via loudspeakers, and both the speaker and the addressee judged whether the sentence was consistent with the photographs, by pressing a yes or no button. In the privileged-referent mentioned condition, sentence (2a) and in the privileged-competitor mentioned condition, sentence (2b) was presented via the speaker's headphone and only the speaker judged whether the sentence matched the picture.

Next, a second photograph appeared below the first picture on the speaker's screen, replacing the context sentence. The speaker then described the photograph to the addressee, who acted out the description using the toys. The speaker indicated whether the action corresponded to the one in the photograph by pressing the yes or no button.

In total, we had three conditions: shared-referent mentioned, privileged-referent mentioned, and privileged-competitor mentioned conditions. The conditions were presented in three separate blocks, and the order of blocks was rotated in six permutations, which comprised six lists, each of which contained 24 experimental items and 36 filler items. Each list had eight experimental items from each condition, with one version of each item occurring in each list, presented in a fixed quasi-random order, subject to the constraint that the same character did not occur consecutively. Four pairs of participants were randomly assigned to each list. There were four practice trials before the start of each block. The experiment took around 45 minutes.

Scoring We scored whether participants produced a pronoun or a repeated noun phrase in cases where they referred to the referent character as the subject in the first sentence they produced. We excluded trials where participants did not refer to the referent character (6 trials); they used a different noun phrase instead of a repeated noun phrase (such s *the boy* rather than *the prince*) (18 trials) or dropped the subject (1 trial). In total, 25 trials (4.3% of responses) were excluded.

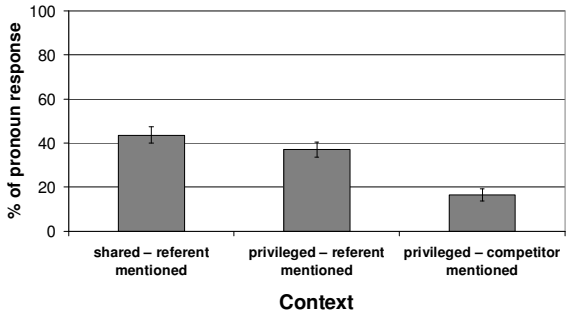

Figure 2: Means from Experiment 1

Results

Figure 2 presents the mean percentages of pronouns out of all pronoun and repeated noun phrase responses by condition. We conducted two ANOVAs on arcsin-transformed proportions of pronouns (Winer, 1971), one on the participant means with participants as the random variable ($F1$) and one on the item means with items as the random variable ($F2$). Condition was treated as within-participants and -items variables and we also included participant/item list (I-IV) as a between-participants variable in the participant analysis and item list (I-IV) as a between-items variable in the item analysis in order to eliminate variance caused by random differences between groups (Pollatsek & Well, 1995). The analyses revealed a main effect of Condition, $F1(2, 42) = 25.34$, $p < .001$, $\eta_p^2 = .547$; $F2(2, 42) = 25.34$, $p < .001$, $\eta_p^2 = .547$. Pronouns were 21% less frequent in the privileged-competitor mentioned than in the privileged-referent mentioned conditions. Planned comparisons showed that this difference was significant, $F1(1, 18) = 18.22$, $p < .001$, $\eta_p^2 = .503$; $F2(1, 21) = 21.90$, $p < .001$, $\eta_p^2 = .511$. The 7% difference between the shared-referent mentioned and privileged-referent mentioned condition did not reach significance by subjects, $F1<1$,

though it was marginally significant by items, $F2(1, 21) = 3.22$, $p = .087$, $\eta_p^2 = .133$.

Discussion

Speakers produced more pronouns in the privileged – referent mentioned than the privileged – competitor mentioned condition even though their addressee did not hear the second sentence in either condition. This suggests that speakers based their choice of referring expression on the referent's accessibility in their own discourse model. Furthermore, the difference between the shared – referent mentioned and the privileged – referent mentioned conditions was not significant, consistent with the idea that speakers relied on their own, privileged context.

Experiment 2

Although the shared – referent mentioned and the privileged – referent mentioned conditions did not significantly differ in Experiment 1, the direction of the means might suggest that reference to the target character in sentence (2a) increased its accessibility when the addressee could hear the sentence compared to when s/he could not. However, the non-significant difference may have occurred *not* because reference to the target character in sentence (2a) increased its accessibility in the shared condition compared to the privileged condition, but because speakers always favoured more explicit expressions than pronouns when the addressee did not hear the preceding sentence. In other words, speakers may have been somewhat more explicit in their referring expressions when the addressee did not share the same context, but this effect occurred regardless of whether the second sentence referred to the target character (and therefore makes it more accessible) or not.

To explore this possibility, Experiment 2 used four conditions by orthogonally manipulating (A) whether the referent or competitor was mentioned in sentence 2 (2a vs. 2b) and (B) whether this sentence was shared with the addressee or not (experimental block with loudspeakers vs. block with headphones). The context sentence (1) and the photographs (Figure 1) were the same as in Experiment 1. If speakers use their addressee's perspective to determine the accessibility of the target character (the admiral), this character should be considered more accessible when the addressee heard that the second sentence referred to the referent (2a) than to the competitor (2b), so speakers should produce more pronouns (fewer repeated noun phrases) in the shared – referent mentioned condition than in the shared – competitor mentioned condition. But whether the referent or competitor was mentioned (2a vs. 2b) should have no effect in the privileged conditions, because the addressee did not hear the second sentence. This should result in an interaction between referent vs. competitor mention and shared vs. privileged context. In contrast, if speakers ignore whether the addressee has heard the reference to the referent or competitor in the preceding sentence, then they should produce more pronouns in the referent – mentioned than competitor – mentioned conditions, and this effect should be the same regardless of whether the addressee heard the second sentence or not. However, there may be a main effect of sharedness, because speakers may generally be more explicit when the addressee did not hear the second sentence, both when it referred to the referent and the competitor.

Method

Participants Thirty-two pairs of participants from the same population as in Experiment 1 took part. None of them had participated in the previous experiments.

Materials We used the same twenty-four experimental items as in Experiment 1 but constructed 12 additional practice items.

Procedure and design These were the same as in Experiment 1, except for the following amendments. We created an additional condition in which the sentence mentioning the competitor (2b) was presented via loudspeakers. This resulted in a 2 × 2 repeated measures design: Context sentence (referent mentioned vs. competitor mentioned) × Sharedness (shared vs. privileged). Together with the 36 filler items, 24 items were distributed across four lists, each containing six items from each condition, and one version of each item. Sharedness was manipulated in blocks, and we counterbalanced the order of the blocks as a between participants and items variable. Thirty-two pairs of participants were randomly assigned to four lists, each containing six practice trials.

Scoring Scoring was done in the same way as in Experiment 1. We excluded one trial that was due to a technical error and two trials in which addressees inadvertently manipulated the objects in response to the first sentence before the speaker produced the target description. We also excluded one trial in which a participant referred to both characters as *they* and 15 trials in which participants used a different noun phrase instead of a repeated noun phrase. In total, 19 trials (2.5% of all responses) were excluded.

Results

Figure 3 presents the means. We conducted ANOVAs on the arcsine-transformed proportions of pronoun responses with Context sentence and Sharedness as within-participants and -items variables and participant/item list (I-IV) as a between-participants and -items variable.

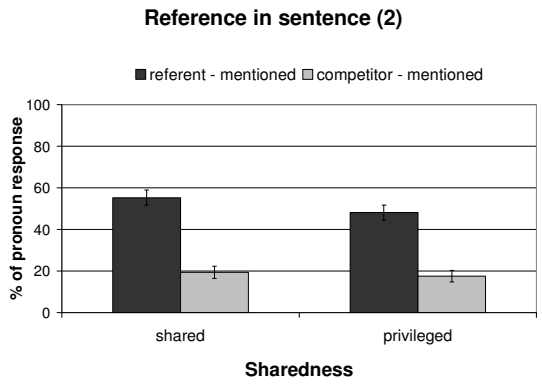

Figure 3: Means for Experiment 2

The analyses revealed a main effect of Context sentence, $F1(1, 28) = 46.28$, $p < .001$, $\eta_p^2 = .623$, $F2(1, 20) = 151.77$, $p < .001$, $\eta_p^2 = .884$, indicating that participants used more pronouns when the preceding sentence mentioned the referent (52%) than the competitor (19%). The main effect of Sharedness was not significant by participants, $F1(1, 28) = 1.98$, $p = .171$, $\eta_p^2 = .066$, but very close to significance by items, $F2(1, 20) = 4.19$, $p = .054$, $\eta_p^2 = .173$, which indicated a tendency for fewer pronouns in the privileged than in the shared condition. Importantly, there was no significant interaction between Context sentence and Sharedness, Fs < 1. Planned comparisons revealed that the effect of context sentence was significant in both the shared $F1(1, 28) = 42.94$, $p < .001$, $\eta_p^2 = .605$; $F2(1, 20) = 73.26$, $p < .001$, $\eta_p^2 = .786$ and privileged conditions, $F1(1, 28) = 31.30$, $p < .001$, $\eta_p^2 = .528$; $F2(1, 20) = 100.79$, $p < .001$, $\eta_p^2 = .834$.

Discussion

Pronouns were more frequent when the second sentence mentioned the referent (2a) than the competitor (2b), indicating that the referent was more accessible when it was mentioned in the immediately preceding sentence than when the competitor was mentioned. Crucially, this effect was not modulated by whether the sentence was shared or privileged, and speakers significantly increased pronoun use when the immediately preceding sentence mentioned the referent rather than the competitor even if it was not shared with their addressee. In addition, there was a marginally significant tendency for fewer pronouns when the addressee did not listen to the second sentence than when s/he did. This may suggest that speakers are inclined to reduce pronoun use whenever their addressee did not share the same linguistic context.

General Discussion

Our results provide evidence that the referent's accessibility in the speaker's own, privileged discourse model affects the choice of referring expressions. The results support the view that the referent's accessibility in the speaker's own discourse model is the driving force behind the choice between pronouns and definite noun phrases. Although Experiment 2 showed some weak evidence that speakers may be more explicit when the addressee did not share the same linguistic context, there was no evidence that speakers took into account the referent's accessibility in the addressee's discourse model. That is, speakers did not take into account whether the second sentence made the referent more accessible to the addressee or only to themselves. This provides evidence against suggestions that speakers use the referent's accessibility in the addressee's discourse model when they choose referring expressions (e.g., Ariel, 1990; Chafe, 1994; Givón, 1983; Prince, 1985).

Our results contrast with research that has shown that the effect of a same-category competitor (the presence of another glass when speakers refer to a glass) on the frequency of use of modified versus bare unmodified phrases (*the big glass* vs. *the glass*) is larger when the competitor is visible to both the speaker and the addressee than when it is only visible to the speaker (Horton & Keysar, 1996; Nadig & Sedivy, 2002), which suggests that speakers *are* sensitive to the knowledge of their addressee.

Importantly, however, Horton and Keysar (1996) also found that speakers produced modified noun phrases even when the competitor was not shared with their addressee (i.e. they used overspecified expressions). This indicated that speakers are not always sensitive to the needs of their addressee, and they also use their own perspective for choosing referring expressions. Furthermore, when the speakers were under time pressure, they produced more modified noun phrases when the competitor was present than absent, regardless of whether the competitor was shared with their addressee. Horton and Keysar argued that taking into account the addressee's knowledge is resource-demanding, and hence speakers initially base the choice of referring expressions on their own perspective and then later adjust to their addressee's.

It is important to note that in Horton and Keysar (1996) and Nadig and Sedivy (2002), when the competitor was present in the shared context, the use of unmodified noun phrases was ambiguous to their addressee, because they could refer to either the referent or the competitor, so speakers presumably produced modified noun phrases to avoid ambiguity. But when the addressee could not see the competitor, unmodified noun phrases were not ambiguous for their addressee, so they did not need to use modified noun phrases in order to avoid ambiguity. In contrast, in our experiments, the competitor always had a different gender, so using a pronoun was unambiguous, regardless of whether the addressee heard the competitor or not. Therefore, the speakers in our experiments may not have changed the frequency of pronoun use depending on whether the competitor was mentioned in the shared or

privileged ground, unlike the speakers in Horton and Keysar's (1996) and Nadig and Sedivy's (2002) studies. In other words, speakers may take into account the addressee's perspective when not doing so would result in ambiguity to the addressee, but when there is no ambiguity, speakers do not take the addressee's perspective into account.

Although our experiments show that speakers use their own discourse model to determine the referent's accessibility, their choice of referring expression does not appear to be entirely driven by speaker-internal factors. In particular, if choice of referring expression was entirely driven by how easily speakers can produce the expression, they would always choose reduced referring expressions such as pronouns, which are presumably much easier to produce than more explicit referring expressions (Ariel, 1990; Almor, 1999). Nevertheless, pronouns are infrequent when the referent's saliency is low (e.g., because a competitor was mentioned in the preceding discourse). In fact, if speakers were completely insensitive to the addressee's needs for comprehension, one might expect that they are more likely to produce explicit referring expressions such as definite noun phrases when their referent is high rather than low in saliency. When the referent's saliency is high, it should be relatively easy to access a noun describing it, because the semantic information needed for lexical retrieval is highly activated (e.g., there is no interference from other competing information). Furthermore, if the referent is salient in the linguistic context, its phonological form may also be easily accessible (repeating a recently mentioned word is easier than producing a word that has not been mentioned). But when the referent's saliency is low, accessing a noun that describes it should be harder. Therefore, the choice of more explicit referring expressions over simpler referring expressions cannot be explained by speaker-internal factors only.

We assume that speakers *are* sensitive to the addressee's need for comprehension, and this may be why speakers use more explicit referring expressions when they believe that more information is needed for the addressee. But importantly, the information they can take into account to help comprehension for the addressee may be restricted. Taking into account the addressee's perspective poses a high demand on memory resources, and slows down language production (Horton & Keysar, 1996), and therefore would not necessarily benefit the addressee either. Using the speaker's own perspective is much simpler and may be more efficient for both the speaker and the addressee. Indeed, many researchers have suggested that as discourse progresses, the speaker's perspective often corresponds to that of the addressee's (e.g., Brown & Dell, 1987; Pickering & Garrod, 2004). Thus, using one's own perspective as a proxy to their addressee's perspective may suffice for successful communication, especially when there is no ambiguity involved.

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