Alignment of discriminating properties in referential expressions

Martijn Goudbeek, Emiel Krahmer, & Marc Swerts
Department of Communication and Information Sciences, Tilburg University, The Netherlands

INTRODUCTION

Speakers often produce **referring expressions** such as "the man with the beard". Dale and Reiter's (1995) **Incremental Algorithm** automatically determines which properties to include in a "distinguishing description". The basic idea is that speakers **prefer** certain properties over others and will only use dispreferred properties when the preferred properties are not sufficient to distinguish the target. This strategy works for descriptions in **monologues**, but is it also a good model for the production of referring expressions in **interaction?** In interaction, speakers tend to **align** with each other, so that when a speaker refers to a couch with “sofa", the addressee is more likely to use "sofa" instead of "couch" later on in the dialogue (Brennan & Clark, 1996). This kind of alignment is well-established for **lexical choice**, but has not been studied in the context of **property selection**. We hypothesize that the preference list as observed in human speakers is not fixed, but varies with the properties speakers have been exposed to. To investigate this hypothesis we constructed an experiment in which speakers alternatively had to respond to a speaker describing a picture by identifying that picture and had to describe a picture so that another listener could identify that picture. The pictures were taken from the **TUNA corpus** (Gatt, van der Sluis, & van Deemter, 2007). This corpus consist of two subcorpora: **persons** and **furniture**. Participants in previous research did have a preference for certain properties (color and wearing glasses respectively) and a dislike for certain other properties (orientation and the wearing of a tie). We predict that participants will align with the speaker they have heard, even though that means using a dispreferred property.

METHOD

- 17 participants described a picture and could do this based on two properties ("the blue chair”" or "the chair from the front").
- In one condition, the **descriptions our participants heard** were all described by using the **dispreferred** property ("orientation" and "tie"), in the other condition they were described using the **preferred** property ("color" and "glasses").
- Participants were presented with one preferred and one dispreferred stimulus set (furniture preferred and persons dispreferred or furniture dispreferred and persons preferred)
- A trial consisted of four tasks: a prime, two fillers and the target description (see Figure 1)
  1. Listen to a (preferred or dispreferred) description and indicate (by button press) which picture was described
  2. Describe a filler picture (e.g., from the other corpus)
  3. Listen to a description of a filler picture and indicate which picture was described
  4. Describe the target picture, either with the preferred property, the dispreferred property, or both (overspecification).

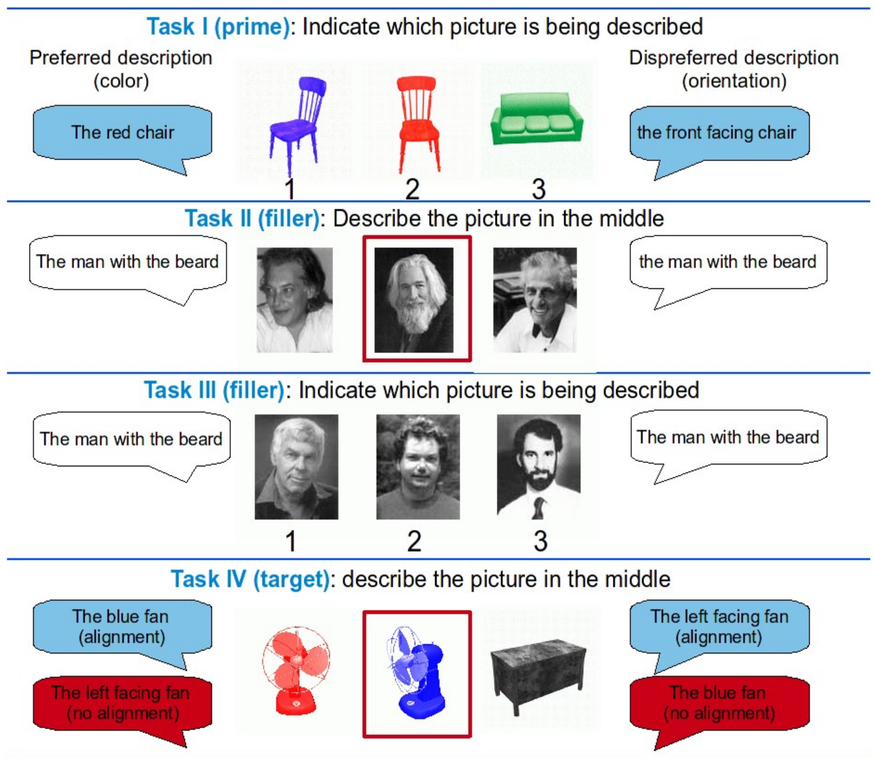

Figure 1. Experimental procedure for the four tasks in each trial. Time proceeds from top to bottom.

RESULTS

ALIGNMENT

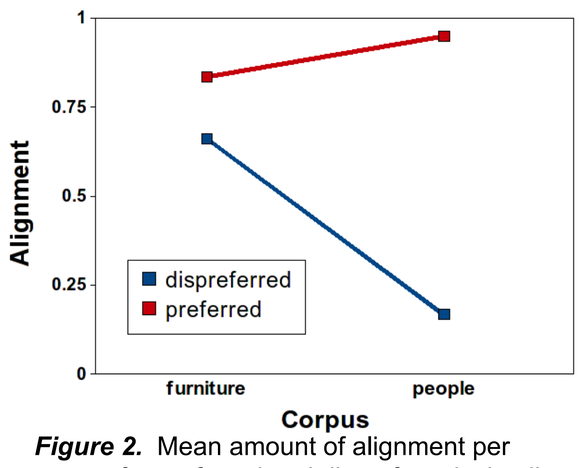

Figure 2. Mean amount of alignment per corpus for preferred and dispreferred stimuli.

Particpants **frequently aligned** on dispreferred properties when producing their descriptions. They did this more in the furniture domain than in the people domain.

We conducted a between subject anova with **corpus** (furniture versus people) and **stimulustype** (preferred versus dis-preffered) as factors.

This showed a **significant main effect of stimulustype** ($F [1,30] = 23,46$, $p < 0.001$) and a **significant interaction** between corpus and stimulustype ($F [1,30] = 3,51$, $p < 0.01$).

SPEECH ONSET TIME

We measured the time between stimulus onset and the description as speech onset time.

Based on the alignment results depicted in Figure 2, we focused on the speech onset time in the **dispreferred** stimuli from the **people** corpus.

This analysis revealed a **significant correlation** ($R^2 = 024$, $p < 0.05$) between alignment and speech onset in the **dispreffered** trials from the **people** corpus.

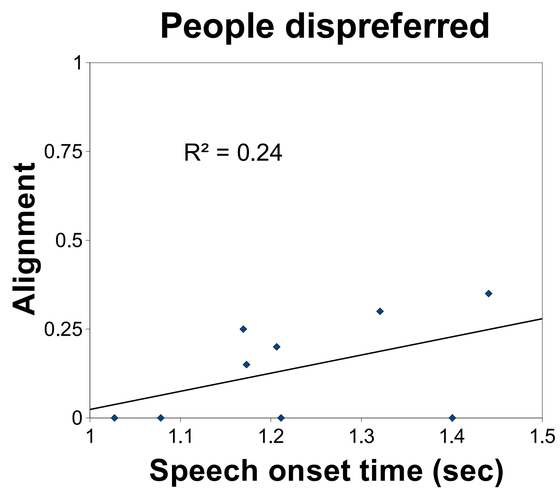

Figure 3. Scatterplot of speech onset time (x-axis) and mean amount of alignment (y-axis) for dispreferred stimuli in the people corpus.

DISCUSSION

- The results show alignment effects in the selection of distinguishing properties for referential expressions.
- Alignment effects depend both on the corpus used and whether speakers need to align with a preferred or dispreferred property.
- Speakers do align with dispreferred properties, but more in the furniture corpus than in the people corpus, this might be because the furniture corpus is more structured or because the dispreferred property in the furniture corpus (orientation) is less dispreferred than the dispreferred property in the people corpus (tie).
- When speakers align with a dispreferred property, they take longer to initiate their description (in the furniture corpus), reflecting the higher processing demands on aligning with a dispreferred property.
- The incremental algorithm can be made more psychologically realistic by implementing dynamic instead of fixed preference lists.

References

Brennan, S.E. and Clark, H.H (1996). Conceptual pacts and lexical choice in conversation. Journal of Experimental Psychology: Learning, Memory, and Cognition, 22, 1482-1493.

Dale, R. and Reiter, E. (1995), Computational Interpretations of the Gricean Maxims in the Generation of Referring Expressions. Cognitive Science 19:233-263 .

Gatt, A., van der Sluis, I., and van Deemter, K. (2007), Evaluating algorithms for the generation of referring expressions using a balanced corpus, in: Proceedings of the 11th European Workshop on Natural Language Generation, (ENLG-07), Dagstuhl, Germany.

Contact information

Martijn Goudbeek
Faculy Communication & Culture
Tilburg University
E-mail: m.b.goudbeek@uvt.nl