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Contents

<i>Paul Meisenbichler</i>	
On temporal relations inside DPs and their restriction	1
<i>Margareta Berg</i>	
Attitudes towards gender-neutral language in Norwegian	26
<i>Moumita Mukherjee</i>	
Automatic activation of orthographic information during spoken word recognition in Bangla	39
<i>Anne Lützeler & Robert Voigt</i>	
Effects of evaluation and prominence on the resolution of German demonstratives	52
<i>Emma Joveneau</i>	
Lexical variants in the digital archives of the East-Belgian newspaper GrenzEcho: a pilot corpus study	69
<i>Saeedeh Salimifar</i>	
Presupposition projection: let's test again!	93
<i>Tommaso Mattiuzzi, Giacomo Presotto & Viktor Koehlich</i>	
Influential inflection: testing the role of overt morphology in the distribution of Italian colour adjectives	109
<i>Daniar Kasenov</i>	
Non-finite clauses and root modality: evidence from Russian	133
<i>Alexandra Shikunova</i>	
There is no small clause in Russian phrasal comparatives	150
<i>Niklas Alexander Pohl</i>	
'(...) Die größte, dümmste Zerstörung einer europäischen Sprache': an analysis of the Twitter discourse regarding gender sensitive language	174
<i>Shangze Li</i>	
Functional categories from a conceptual perspective: a case Study of the multifunctional morpheme <i>ge-</i> in Gaoping Jin	197
<i>Nozomi Moritake</i>	
The distribution of DPs without abstract case: a view from default case	217

<i>Sneha Ray Barman</i>	Examining learnability of grammar: a view from Kashmiri loanwords	237
<i>Maximilian Wiesner</i>	Subject sharing in Samoan: an investigation of structural properties and missing subjects	252
<i>Jun Kawamitsu</i>	On verbal compounds in Japanese	278
<i>Feras Saeed</i>	Feature-mismatches on prenominal adjectives in Standard Arabic	291
<i>Shungo Fujii</i>	Verbless directives and verbless interrogatives in German: what expresses their directive meaning?	315
<i>Walid Hafsi</i>	Indefinite determiners can still be existential quantifiers: Evidence from Algerian Arabic indefinites	330
<i>Veronica Dahlby Tveitan</i>	A diachronic case study of the exclusive markers <i>but</i> and <i>just</i> in English	350
<i>Lu Jin</i>	Dependency between pre-classifier modifiers and classifiers: a root-based analysis	363
<i>Elena Varona</i>	Grammatical gender selection in Norwegian-Spanish code-switching	374
<i>Srabasti Dey</i>	Aspect-marked copulas in Bangla	392
<i>Giuseppe Rugna</i>	On the paradigmatic morphosyntax of wh-elements	411
<i>Lisa Lubomierski</i>	Investigating German multimodal requests in instant messaging	430

Effects of evaluation and prominence on the resolution of German demonstratives

Anne Lützeler & Robert Voigt

This paper deals with German demonstratives from the *der, die, das* (DPros) and *dieser, diese, dieses* (DemPros) paradigms. We investigated the hypothesis that DPros can refer to a discourse referent that is information structurally prominent when the speaker is available as perspective-taker while DemPros are not sensitive to perspective taking. The second hypothesis is that DemPros show a stronger preference towards the last-mentioned referent than DPros. We conducted an experiment combining offline- and online-measurements. Our results suggest that perspective plays a role in pronoun resolution and that prominence gives rise to more nuanced preferences among several antecedents.

1. Introduction

German has a variety of pronouns (see Table 1). In addition to the frequently used personal pronouns, speakers of German use forms of two demonstrative paradigms, *der, die, das* (DPros) and *dieser, diese, dieses* (DemPros), to anaphorically pick up a discourse referent.¹ An example for this use is listed in (1). In this example, the two demonstratives can be used to refer back to the discourse referent *einen Hund* (a dog) just as the English personal pronoun *it* would do. In contrast to English, the German version also has a second reading available: One could also interpret the demonstrative pronouns as referring to the male referent *Marko* in this context. Based on gender and contextual cues, both interpretations are equally likely. Still, we know from psycholinguistic research (Fuchs & Schumacher 2020) that most people would prefer to interpret the demonstratives as referring to *the dog* in this context. The current study deals with linguistic factors that might guide the interpretation of referentially ambiguous demonstratives as in (1).

- (1) Marko hat einen Hund. Der/Dieser ist schön.
Marko have.3SG a.INDEF dog.ACC it.DEM be.3SG beautiful.ADJ
'Marko has a dog. It is beautiful.'

¹ For other functions of demonstratives, see Himmelmann (1997); Diessel (1999, 2019); Doran & Ward (2019), and König (2020).

When faced with an ambiguous pronoun as in (1), an addressee must resolve it by identifying a suitable referent. While, recently, more research about the differences of DPros and DemPros has been conducted (Fuchs & Schumacher 2020; Patterson & Schumacher 2021; Bader et al. 2020), it remains unclear which factors influence the resolution of these two demonstratives.

Zifonun et al. (1997) propose that DPros can refer to the information structurally prominent (topical) referent as well as the less prominent (non-topical) referent, while DemPros can only refer to the linear closest possible referent. However, empirical research only partially supports this claim (Patil et al. 2020; Patterson et al. 2022; Patterson & Schumacher 2021; Voigt 2022a, 2022b). Other empirical work suggests that evaluation in terms of perspective taking by an abstract speaker affects the use and interpretation of DPros and DemPros. (Hinterwimmer & Bosch 2017; Hinterwimmer et al. 2020; Patil et al. 2023; Repp & Schumacher 2023). However, this has only been tested once so far by Patil et al. (2023) using an offline design. Therefore, it is not quite clear yet whether speaker perspective actually affects the use of the two demonstratives.

In the study reported here, two experimental methods – a forced-choice preference task and a measurement of reaction times – were combined to test the following two hypotheses: The first hypothesis, based on Patil et al. (2023), is that DPros can refer to a discourse referent that is information structurally prominent when the (abstract) speaker is prominent as perspective-taker whereas DemPros are not sensitive to prominence manipulations through perspective taking. The second hypothesis, based on Zifonun et al. (1997), is that DemPros show a stronger preference towards the last-mentioned referent compared to DPros.

The rest of the paper is structured as follows: In the second section, we discuss the effects of the notions of discourse prominence and speaker evaluation on the resolution of DemPros and DPros in German. The third section reports the methods, predictions, and results of our empirical study. The paper closes with a general discussion in the last section.

Grammatical gender	PPros	DPros	DemPros	Corresponding English pronoun
female	sie	die	diese	she
male	er	der	dieser	he
neuter	es	das	dieses	it

Table 1. Overview of German third person personal and demonstrative pronouns

2. The notions of prominence and evaluation

2.1. Prominence

Following Schumacher et al. (2022), we argue that anaphorically used demonstratives in German can fulfill three functions in discourse: The first function is the so-called backward-looking function of these demonstratives. This means that they are one of several referential forms that signal the cognitive accessibility of the anaphorically picked up referent. A large amount of research suggests that more accessible referents are picked up by more reduced linguistic forms (e.g. zero pronouns, personal pronouns, demonstrative pronouns), whereas less cognitively present referents are referred to with more elaborated linguistic forms (e.g., indefinite DPs, definite DPs). Thus, in a dialogue which centers around a single person the whole time, it would be likely that the two interlocutors will refer to this referent using a very reduced linguistic form (like a personal pronoun or a zero pronoun), since it is clear to both of them who is talked about.

However, in a dialogue about two persons where one person has not been mentioned in a while and one of the interlocutors wants to re-introduce this referent to the discourse, it would be more likely that this interlocutor uses a more elaborate linguistic form (like a full DP) to refer to this referent, so the other interlocutor knows who is meant (von Heusinger & Schumacher 2019, Ariel 2001). In addition to that, German demonstratives also have the potential to shift the status of their antecedent referents in upcoming discourse, which is referred to as forward-looking function. Fuchs & Schumacher (2020) show that the use of a demonstrative to anaphorically refer to a referent can boost the referents' prominence, so it will be rementioned more often in the following discourse. This effect seems to be more robust for DPros than for DemPros. Finally, they have discourse-pragmatic functions that contribute to the structuring of discourse. For example, it has been argued that the two demonstratives differ in respect to their sensibility to language register and modality; with DPros being preferred in informal spoken language and DemPros in formal written language (Schumacher et al. 2022). In the current paper, we focus on linguistic factors affecting the backward-looking functions of the two demonstratives, e.g., factors that influence which referents will become suitable antecedents for a reference with *der* or *dieser*.²

As already mentioned, the backward-looking functions of demonstratives are highly connected with the cognitive accessibility of a potential antecedent. Therefore, resolution preferences of German demonstratives have generally been discussed with regard to the concept of discourse prominence as it has been formulated in von Heusinger & Schumacher (2019). Based on the more general definition of prominence as a linguistic concept by Himmelmann & Primus (2015),³ von Heusinger & Schumacher (2019) propose three basic definitions of discourse prominence: First, prominence is a relational principle that singles out one element from a set of elements of equal type and structure. This first definition includes the higher accessibility of certain referents in discourse compared to other less accessible referents. An important aspect is that the prominence of a certain element in discourse (e.g., the prominence of a discourse referent) always must be seen in relation to the prominence of other elements in discourse (e.g., the other discourse referents). Second, the prominence status of an element shifts in time. This means, discourse prominence is not a static concept, but rather highly dynamic, because certain elements in discourse become more or less prominent as discourse unfolds. A referent can be the entity most talked about at a certain point of the dialogue and another referent can be the entity most talked about at another point of the dialogue.⁴ Third, prominent elements are structural attractors, i.e., they serve as anchors for larger structures they are constituents of, and they may license more operations than other elements in discourse. For example, it has been argued that more prominent referents allow for more variation regarding the anaphoric expressions referring to them (von Heusinger & Schumacher 2019:118–121).

In psycholinguistic literature, it has been shown that demonstrative pronouns, in contrast to personal pronouns, prefer referents as antecedents that are not the most prominent referents in

² For current research on the forward-looking functions of German demonstratives, see for example Schumacher et al. (2022), Fuchs & Schumacher (2020), and Schumacher et al. (2015). Current studies investigating discourse structuring functions of demonstratives are Patil et al. (2020), Voigt (2022a,b), or Cokal et al. (2023).

³ Himmelmann & Primus (2015) propose three criteria for prominence in grammar: (i) linguistic units of equal rank compete for the status of being in the center. (ii) their status may shift. (iii) prominent units act as structural attractors in their domain.

⁴ The forward-looking potential of German demonstratives is highly connected with this second definition, since demonstratives have been argued to shift the prominence status of their antecedent in upcoming discourse (Fuchs & Schumacher 2020).

discourse (von Heusinger & Schumacher 2019). According to Fuchs & Schumacher (2020), linguistic features boosting the prominence of a discourse referent are agentivity, subjecthood, topicality, and being a perspective holder. This means that a referent who is the semantic agent is more prominent than referents with other thematic roles such as a patient, a grammatical subject is more prominent than an object, a topic is more prominent than a non-topical referent, and the referent who is the holder of the speaker perspective is more prominent than the other referents. If a referent has one or several of these features, the referent becomes more prominent and thus it becomes more likely that it will be picked up by a personal pronoun and less likely that a demonstrative pronoun will be chosen as referential expression. This is one of the main reasons why in (1), repeated here as (2), most people would prefer to refer to the dog with the demonstratives, even though the male referent potentially would be a fitting candidate as well. The male referent *Marko* in (1) is subject, agent, and topic, which makes this referent more prominent than the dog. Thus, it will be dispreferred by the demonstratives.

- (2) Marko hat einen Hund. Der/Dieser ist schön.
 Marko have.3SG a.INDEF dog.ACC it.DEM be.3SG beautiful.ADJ
 ‘Marko has a dog. It is beautiful.’

It is well known which linguistic factors affect the prominence status of a referent and therefore determine whether it is more likely picked up by a personal pronoun (as a medium to highly prominent referent), or by a demonstrative pronoun (as not the most prominent referent). In contrast to this clear pattern, it is not well known which linguistic factors determine whether a referent will be anaphorically taken up by *der* or *dieser*. One possible factor that can be connected to the concept of discourse prominence is proposed by Zifonun et al. (1997): the linear position of the potential antecedents in the preceding sentence.

Zifonun et al. (1997) claim that anaphoric expressions like third person personal pronouns are typically used to express thematic continuity. Therefore, personal pronouns typically pick up referents that are the topic of an utterance, and therefore highly prominent, independent of their position in the sentence. Zifonun et al. (1997) classify the two types of demonstratives as anadeictic expressions which usually shift topics, and thus anaphorically refer back to less prominent referents. Because of that, demonstratives of the *der*, *die*, *das* paradigm are less flexible in their referential choice than personal pronouns. They are only able to refer to an antecedent with a smaller local distance to them. Finally, *dieser*, *diese*, *dieses* demonstratives are claimed to be the most restricted. They are only able to refer to the referent closest to them. This means, they should be unable to pick up another referent than the nearest one in the preceding sentence (Zifonun et al. 1997:544–560).

- (3) Peter will einen Benz kaufen. Der/*Dieser
 Peter.NOM want.3SG a.INDEF Benz.ACC buy.INF he.DEM
 hat wohl zu viel Geld.
 have.3SG must.3SG too.PART much.QUANT money.ACC
 ‘Peter wants to buy a Mercedes Benz. He must have too much money.’
 (German; Zifonun et al. 1997:558–559)

Zifonun et al. (1997:558–559) discuss that in an utterance as (3), the demonstrative *dieser* is not able to refer to the referent *Peter*, since the linear distance between the potential antecedent and the referential expression is too long. *Der*, in contrast, seems to be able to refer to the referent further away.

Empirical research investigating this hypothesis produced mixed results: While some investigations regarding the referential preferences of DPros and DemPros were able to find an effect of linear order, others were not. Two studies with results partly supporting the hypothesis of an effect of linear order are the empirical investigations by Patterson & Schumacher (2021), and Patterson et al. (2022). However, empirical studies by Patil et al. (2020), Voigt (2022a), and Voigt (2022b) could not find evidence for linear order effects. Thus, it is unclear whether a topicality-based linear order effect actually causes differences in the interpretative preferences of DPros and DemPros.⁵

2.2. Speaker perspective and evaluation

Another linguistic factor that might cause a difference in the referential preferences of DPros and DemPros is speaker perspective. Kaiser & Fedele (2019) assume that perspective could be a factor influencing the choice of antecedents for personal pronouns and demonstratives in several languages. On a similar line is a theoretical account that proposes speaker perspective as a major factor influencing people’s choice to choose a DPro or a DemPro in German to refer to an antecedent.

Hinterwimmer & Bosch (2018) and Hinterwimmer et al. (2020) propose a theory according to that *der*-demonstratives are not able to anaphorically pick up so-called perspectival centers. According to the authors, discourse referents are perspectival centers if the rest of the sentence can be interpreted as expressing their thoughts, utterance or perception (Hinterwimmer & Bosch 2018). In a sentence like *Peter thinks the weather is nice*, the referent *Peter* functions as the perspectival center of the rest of the sentence. The authors empirically investigated this hypothesis in Hinterwimmer et al. (2020) with two offline-rating tasks. They interpret their results in a way that DPros indeed do not seem to be able to pick up the discourse referent that is the perspectival center and that the most-prominent topical referent automatically functions as perspectival center if there is no clear center in the utterance. Therefore, they conclude, *der*-demonstratives typically avoid to pick up perspectival centers or topics in their absence.

Building on these results, Patil et al. (2020) hypothesize a difference between DemPros and DPros might lie in their ability to pick up perspectival centers. They suggest DPros avoid to

⁵ Note that of these studies only Patil et al. (2020) explicitly varied linear order as an independent variable of their experimental design. Nonetheless, the other studies did yield results that can be interpreted as speaking in favor or against a last-mentioned preference.

pick up the perspectival centers as antecedents whereas DemPros avoid the most prominent referents irrespective of their role as perspectival centers (Patil et al. 2020:17–18). If this were the case, DPros should potentially be able to pick up a prominent referent as long as there is some sort of a speaker instance available. DemPros, on the other hand, should always avoid the most prominent referent no matter whether a speaker is present or absent as perspectival center.

Some evidence for this hypothesis comes from Repp & Schumacher (2023). The authors wanted to investigate the processing of DPros and personal pronouns in more naturalistic contexts. Therefore, they played participants an audio book of the popular youth-novel *Tschick* while recording their ERPs. Prior to this experiment, they annotated the referential expressions in a text corpus. Surprisingly, they found that most DPros in their corpus appeared in subject and agent positions referring back to subject and agent referents. This behavior of the *der*, *die*, *das* demonstratives is not predicted by the discourse prominence account, since subject and agent referents are usually highly prominent. Repp & Schumacher (2023) explain their finding with the narrative structure of the novel: since there was a clear speaker perspective available throughout the text, the DPros were able to refer to the highly prominent referents in subject and agent position.

An experiment empirically investigating this hypothesis is found in Patil et al. (2023). Based on the theoretical and empirical work discussed so far, they assume that a speaker evaluation affects the use of DPros and DemPros in different ways. More concretely, they hypothesize that DPros avoid perspectival centers as antecedents, while DemPros just avoid prominent referents. Therefore, the presence of an evaluation by the speaker should increase the use of DPros, while there should be no such effect for DemPros. To test this hypothesis, they designed an acceptability rating study in a 2x2 design using a 7-point Likert scale. They varied the pronoun type (DPros vs DemPros) and the type of evaluation (evaluative vs. neutral sentences). Additionally, their items consisted of half positive and half negative evaluations. Furthermore, they varied the degree of evaluation. The statistical analysis of the results could show an interaction effect between pronoun type and evaluation. The highest ratings were given to evaluative conditions with DPros. All other conditions showed no statistically significant difference. There was no reliable effect of evaluation type (positive/negative), but they could find an interaction effect of the degree of evaluation and the pronoun type: The conditions with DPros received higher ratings when the degree of evaluation was higher. Based on these results, the authors conclude that DPros are indeed able to refer to prominent antecedents when there is a prominent speaker in the utterance while DemPros are not. Thus, the results of Patil et al. (2023) indicate an effect of evaluation on the use of DPros and DemPros. However, further research with varying methodology is needed to gain more clarity about an effect of evaluation on the resolution of German demonstratives.

3. Current Study

In the study reported here, two experimental methods – a forced-choice preference task and a measurement of reaction times – were combined to test whether evaluative expressions have an influence on the degree of prominence of a discourse referent and thus on the choice of pronoun (*der* vs. *dieser*) referring to this referent. The aim of the study was to further differentiate the discourse functions of DPros and DemPros, using the PPro as a baseline since it is the least restricted of all pronouns. In essence, we wanted to contrast the antecedent preference for the two demonstratives in evaluative and non-evaluative contexts.

We hypothesized that DPros as well as DemPros show a strong preference to refer to the last-mentioned referent. However, assuming a graded sensitivity to referent prominence for both demonstrative pronouns (see Patterson & Schumacher 2021), DPros should be less strongly influenced by a final position preference than DemPros and can refer to both referents from a set. Furthermore, compared to both types of demonstratives, PPros should not show any antecedent preference as they showed a higher degree of flexibility in their antecedent selection in previous studies (Schumacher 2016). Lastly, in an evaluative context, DPros should be processed faster than in a neutral context, as reference ambiguity is ruled out by a maximally prominent perspective taking (abstract) speaker. In contrast to this, the antecedent preference of DemPros should not be influenced by an evaluative context. This sets the study in line with Patil et al. (2023) who showed that (i) DPros can refer to a discourse referent that is information structurally prominent when the (abstract) speaker is prominent as perspective-taker while (ii) DemPros are not sensitive to prominence manipulations through perspective taking.

3.1. Method

In the experiment, participants were presented with sets of two sentences. Each set consisted of a context sentence, and a target sentence starting with either a DemPro, a DPro or a PPro. The target sentence differed in the way that it was either evaluative or non-evaluative/neutral.

After each set, participants were asked to answer a comprehension question with two response options given for each set, a forced-choice preference task. The response options were the two referents introduced in the context sentence. For each response, reaction times were measured from the time participants were shown the question by clicking on a separate button. The exact structure of the test material as well as the experimental procedure is reported in Section 3.2. of this paper.

3.1.1. Forced-choice preference task

A forced-choice preference (FC) task was employed for the intended comparisons because – apart from offering an easy and economical way to detect qualitative differences between conditions – FC tasks increase statistical power to detect differences between conditions (see Schütze & Sprouse 2014). Moreover, as Schütze & Sprouse (2014:33) point out, “FC tasks are the only task explicitly designed for the comparison of two (or more) conditions; the other tasks compare conditions indirectly through a response scale (either yes-no, or a numerical scale)”. Nonetheless, Schütze & Sprouse (2014:33) also point to one of the limitations of a FC task by mentioning that it “provides no information about where a given sentence stands on the overall scale of acceptability”. This is another reason why our test material included sentences with a PPro instead of demonstratives, as it gave us a baseline with which to compare and indirectly infer the acceptability of sentences with DPros and DemPros (see Patil et al. 2023).

3.1.2. Reaction time measuring

Apart from investigating the referential choice by means of an offline method (i.e., the FC task), reaction times (RTs) were measured to indicate the cognitive processes involved in pronoun resolution. The use of RTs as an indicator is based on the idea that the time required for processing a linguistic stimulus reflects its degree of difficulty. That is, the more complex the stimulus and/or its processing, the longer processing time it requires (see Gillioz & Zufferey 2020: 112). This is consistent with our hypothesis that DPros should be processed faster in an evaluative context than in a neutral context because processing is easier and therefore faster when reference ambiguity is ruled out. The present experiment thus offers the possibility to shed light on the same process from different perspectives by combining the two methods.

3.2. Design and materials

Participants were shown sets of two sentences such as (4) which always contained a context sentence and a target sentence. The context sentence was the same across all conditions and consisted of a verb of action that took two animate subjects of the same gender (NP1 and NP2) as well as an object. This structure was chosen to make the two referents as equally prominent as possible. The pronoun occurred as the subject of the following target clause and was ambiguous as it could refer to both subject antecedents. Apart from the type of the pronoun, conditions differed in the way that the target sentence was either evaluative or non-evaluative/neutral. Evaluation was obtained by particles (*einfach/just*, *scheinbar/apparently*, *tota/totally* etc.) or by personal beliefs, that is, by verbs that indicate a feeling (*lieben/love*, *mögen/like*, *hassen/hate* etc.). As Patil et al. (2023) found no reliable effect of evaluation type (positive/negative), the experimental items of the current study were not counterbalanced for the type of evaluation. Furthermore, to avoid other external variables confounding the results, all sentences and words had approximately the same length and complexity and for all referents no complex noun phrases, but proper names were used.

(4) a. **Context sentence**

Lisa hat mit Anna ein Kräuterbeet angelegt.
 Lisa.NOM have.3SG with.PREP Anna.DAT a.INDEF herb bed.ACC created.
 ‘Lisa has created herb bed with Anna.’

b. **Non-evaluative/neutral**

Die/Diese/Sie will mit frischen Zutaten kochen.
 She_{DPro.F/DemPro.F/PPro.F} want.3SG with.PREP fresh.ADJ ingredients.ACC
 cook.INF
 ‘She wants to cook with fresh ingredients.’

c. **Evaluative**

Die/Diese/Sie hat einfach einen grünen Daumen.
 She_{DPro.F/DemPro.F/PPro.F} have.3SG simply.ADV a.INDEF green.ADJ thumb.ACC.
 ‘She simply has a green thumb.’

Altogether, this resulted in a 2x3-design with the factors being PRONOUN (DPro, DemPro, PPro) and EVALUATION (non-evaluative/neutral, evaluative). Crossing these factors led to six conditions which are listed in Table 2.

Condition	Column A	Column B
A	NEUT-der/die	neutral context, target sentence with DPro
B	NEUT-dieser/diese	neutral context, target sentence with DemPro
C	NEUT-er/sie	neutral context, target sentence with PPro
D	EVAL-der/die	evaluative context, target sentence with DPro
E	EVAL-dieser/diese	evaluative context, target sentence with DemPro
F	EVAL-er/sie	evaluative context, target sentence with PPro

Table 2. Overview of the six conditions tested in the experiment

In total, there were 24 experimental items randomly interspersed with 48 filler items across six lists. To align the fillers with the test material, sets of two sentences were chosen with the first sentence serving as a context sentence and the second sentence containing two animate referents. The following comprehension questions were constructed such that only one of the two response options given was correct. This care was taken so that the fillers could serve as an anchor point for checking the reliability of the data. Only participants having good accuracy on fillers (>85%) were included into the analysis. An example filler is shown in (5).

(5) a. **Filler sentence**

Im Büro klingelte das Telefon ununterbrochen.
 In the office.DAT ring.3SG the phone.NOM continuously.ADV
 Der Berater sagte der Kundin, dass sie einen Termin
 The consultant.NOM tell.3SG the client.DAT that she.NOM an.INDEF appoint
 ment
 vereinbaren müsse.
 make.INF need.3SG

‘In the office the phone rang continuously. The consultant told the client that she needed to make an appointment.’

b. **Comprehension question**

Wer muss einen Termin vereinbaren?
 Who.NOM need.3SG an.INDEF appointment.ACC make.INF?

‘Who needs to make an appointment?’

der Berater die Kundin
 ‘the consultant’ ‘the client’

3.3. Procedure

The experiment was run on the online survey platform PCIBex through a single participation data collection link (<https://farm.pcibex.net/p/AFLPpX/>). Participants received this link and ran the experiment from home on their laptops. In this way, it was possible to quickly find test subjects. However, it was thus not possible to check exactly where and when the participants

carried out the survey. Before the start of the experiment, participants were given written instructions and then had to perform three test trials to get familiar with the design of the experiment as well as with the interface of PCIBex. Once the trial runs were completed, the experiment got started. Participants were automatically and randomly assigned to one of the six lists of the experiment.

In total, nineteen native speakers of German were recruited in the experiment by the students that took part in the project (7 male, 11 female, 1 with unspecified gender, mean age = 32.53 years, age range = 21–63 years). All of them had normal or corrected-to-normal visual acuity and were not diagnosed with a reading disability by their own report. None of the participants had to be excluded as all of them had good accuracy on fillers (> 85%).

3.4. Predictions

For the experimental factor PRONOUN, our main predictions regarding the referential choice are: (i) The first referent (NP1) is most likely to be referred to with the PPro, (ii) DemPros are strongly influenced by a final position preference and are therefore most likely to refer to NP2 compared to PPros and DPros, and (iii) assuming a graded sensitivity to referent prominence, DPros are less strongly influenced by a final position preference than DemPros but less likely to refer to NP1 than PPros.

Additionally, our main predictions regarding the response times are: (i) The longest RTs are expected for DPros in a neutral context, while (ii) the shortest RTs are expected for DPros in an evaluative context. Moreover, (iii) the RTs for DemPros should not differ with regards to the type of context (evaluative vs. non-evaluative) and should be shorter than for DPros in a neutral context but longer than for DPros in an evaluative context. Lastly, (iv) the RTs for PPros should also not differ depending on the type of context and should be approximately located between the reading times of DPros in a neutral context but longer than for DPros in an evaluative context. To visualize our predictions, we put them the formulas listed under (6) where the term ‘P(referent|condition)’ represents the pronoun interpretation bias, i.e., upon hearing a pronoun in a particular type of context, the probability that the addressee will resolve it to a particular referent (e.g., NP2). The capital letters A–F represent the different conditions (see Table 1). For response times, the term RT(condition) simply represents the RTs of a condition (e.g., A). The symbols ‘>’ and ‘<’ are used to arrange both the probability with which a given pronoun refers to a referent and the RTs on a scale, placing them in a hierarchy that approximates the prominence hierarchy. (see Patterson & Schumacher 2021; Tomaszewicz-Özakın & Schumacher 2022)

- (6) Predictions for referential choice: $P(\text{NP1}|\text{C}, \text{F}) > P(\text{NP1}|\text{A}, \text{D}) > P(\text{NP1}|\text{B}, \text{E})$
 Predictions for response times: $\text{RT}(\text{A}) > \text{RT}(\text{C}, \text{D}) ? \text{RT}(\text{B}, \text{E}) > \text{RT}(\text{D})$

3.5. Results

The response percentages for each option (NP1 vs. NP2) across all conditions are displayed in Figure 1. Additionally, Figure 2 shows the mean response times across all conditions. Within the next section, the results are discussed while referring to these two figures.

The results plotted in Figure 1 reveal that DemPros are clearly influenced by a final-position preference. That is, participants interpreted them to refer to NP2 in 77.6% (condition B) respectively in 80.3% (condition E) of the cases. On top of that, there seems to be no effect of the type of context (evaluative vs. non-evaluative/neutral) on DemPros. Thus, our predictions for DemPros regarding the referential choice are fully matched.

PPros, on the other hand, are most likely to refer to NP1 in 69.7% (condition C) and in 84.2% (condition F) of the cases. There also is a reliable effect of evaluation on PPros as NP1 is less likely to be chosen in the evaluative condition. This only partially matched our predictions because we did not expect the context type to influence the referential choice of the PPro.

Finally, DPros also show a clear preference to being resolved towards the last-mentioned referent. Thus, the prediction that DPros are less strongly influenced by a final position preference than DemPros could not be matched. However, there seems to be a slight effect of context type on the referential choice of DPros: They are more likely to refer to NP1 within an evaluative context (82.9%) compared to a neutral context (71.1%).

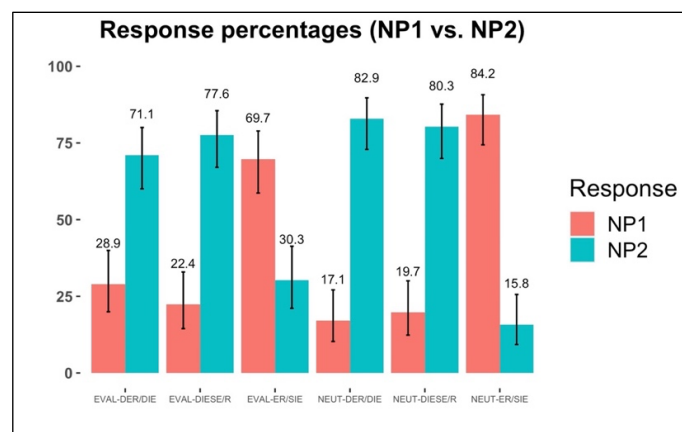


Figure 1. Response percentages of referential choice across all conditions

If we now look at the mean response times across all conditions, it becomes clear that a well-defined hierarchy of RTs like it is assumed in the predictions could not be confirmed. However, there are some numerical trends that give further insights into the resolution of the different types of pronouns in different types of contexts. First, we can again observe a clear final position preference of DemPros: When participants chose NP1 as referent of the DemPro, RTs were longer compared to when NP2 was chosen. Again, no influence of context type on the referential choice of DemPros could be observed. This fully matches the predictions.

In contrast, when comparing the RTs for the conditions containing a DPro, it becomes evident that there is an effect of context type on the referential choice: That is, in a neutral context, RTs were significantly longer when referring to NP2, while in an evaluative context, the RTs were roughly the same for the two responses (i.e., NP1 and NP2). Additionally, DPros in an evaluative context yielded the shortest RTs across all conditions. Hence, the predictions made for the RTs of DPros were fully matched.

For PPros, RTs were longer when NP2 was chosen as a referent. Additionally, RTs for the PPro were shorter in an evaluative context compared to in a neutral context. Thus, there again seems to be an effect of context type on PPros which was not expected. The overall results and their implications on a theory of pronoun resolution and prominence are now considered within a general discussion.

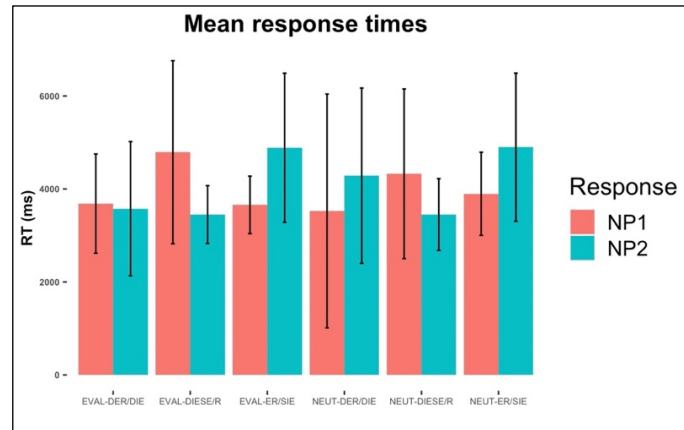


Figure 2. Mean response times (RTs) of referential choice across all conditions

4. General Discussion

In this section, we discuss the results of the experiment regarding their implications for a prominence-based theory of pronoun resolution. The results of the experiment support the hypothesis of a graded sensitivity to referent prominence across the different types of pronouns. That is, the preference to refer to the last-mentioned (less prominent) entity is stronger for DemPros compared to DPros and PPros, regardless of the type of context (evaluative vs. non-evaluative/neutral). Thus, DemPros are not sensitive to prominence manipulations through perspective taking by means of an evaluative context. DPros and PPros, in contrast, seem to be sensitive to perspective taking.

Furthermore, the finding that DPros are processed faster in an evaluative context can be accounted for with the fact that reference ambiguity is ruled out by a maximally prominent perspective-taking speaker. That is, when expressing an evaluation by the narrator, an external perspective is made salient whereby the discourse topic becomes available as an antecedent for the DPro. Previously, Hinterwimmer & Bosch (2016, 2018) proposed that DPros are “anti-logophoric pronouns avoiding (maximally prominent) perspective takers”. Patil et al. (2020) claim that it is not subject- or topic-avoidance but perspective-taking that matters, i.e., DPros can indeed refer to the most prominent discourse referent in the presence of a prominent external perspective taker. Therefore, one can conclude that, like DemPros, DPros avoid the most prominent discourse referents as antecedents, but for them perspective-taking plays a role in calculating prominence. This again is in line with the findings of Patil et al. (2023) who found that an evaluative-DPro condition is rated higher than a neutral-DPro condition. We thus also claim that DPros can refer to a discourse referent that is information structurally prominent when the (abstract) speaker is prominent as perspective-taker.

Furthermore, our results might indicate that the presence of a speaker evaluation does not only affect the referential choice of DPros, but also the referential choice of personal pronouns.

Interestingly, with personal pronouns the effect seems to go into the reverse direction: While evaluation seems to increase references by DPros to the first mentioned referent, it seems to decrease them for personal pronouns. This was neither predicted by us nor by Bosch & Hinterwimmer (2018) and Hinterwimmer et al. (2020). The unexpected result that the type of context influences the referential choice of the PPro – which should have a high degree of flexibility in antecedent selection – confirms the general claim that prominence in terms of perspective taking can be influenced by evaluative expressions expressed by particles and/or personal beliefs, and also be modulated by the degree of evaluation (see Patil et al. 2023).

However, it should be taken into account that the notion of evaluation partly overlaps with the notion of informality. Patil et al. (2020) showed that language formality is a distinguishing feature such that DPros prefer informal whereas DemPros prefer formal language. The fact that, in an evaluative context, response times when referring to NP1 were longer for DPros than for DemPros might simply be accounted for by the fact that particles (*einfach/just, scheinbar/apparently, tota/totally* etc.) or verbs of personal beliefs (*lieben/love, mögen/like, hassen/hate* etc.), automatically render a sentence more informal. Hence, DemPros might be dispreferred due to language formality and not only due to prominence modulation resulting from evaluation of the discourse referents. All in all, it seems conceivable that the demonstratives from both paradigms (DemPros, DPros) behave similarly as far as avoiding the most prominent discourse referent is concerned, but they diverge along the dimensions of language formality and logophoricity.

In the experiment reported in this paper, we have tested the behavior of DemPros, DPros and PPros in evaluative and non-evaluative contexts. The following hypotheses could be confirmed: (i) DPros as well as DemPros show a strong preference to refer to the last-mentioned referent, (ii) assuming a graded sensitivity to referent prominence for both demonstrative pronouns, DPros are less strongly influenced by a final position preference than DemPros and can refer to both referents from a set, (iii) in an evaluative context, DPros are processed faster than in a neutral context, as reference ambiguity is ruled out by a maximally prominent perspective taking (abstract) speaker and (iv) the antecedent preference of DemPros is not influenced by an evaluative context. On a more methodological level, these findings support the idea that it might be beneficial for empirical research to combine offline- and online-methods in the same experiment to gain a more fine-grained picture about a language phenomenon. The diverging results in prior studies about linear order and reference might be due to the different designs of the studies. In our experiment, the difference in reference resolution of the demonstratives based on linear order were only visible when combining the offline and online results. In contrast, it could not be confirmed that, compared to both types of demonstratives, PPros do not show any antecedent preference as they showed a higher degree of flexibility in their antecedent selection in previous studies (Schumacher 2016). In fact, PPros were also influenced by the type of context, which was not predicted by us. This might indicate that the chosen construction was not completely equal in terms of prominence (topicality, order of mention).

On the whole, our results are compatible with the stronger version of the anti-logophoricity account by Hinterwimmer & Bosch (2017: 105) who claim that “if the speaker makes her own perspective particularly prominent by using an evaluative expression in referring to the subject of a propositional attitude verb α , a DPro contained in the complement clause of α can at least for some speakers be interpreted as bound by the subject of α ”. Alternatively, a strictly prominence-based account is also compatible with the experimental results reported in this paper. In this account, DPros generally avoid the most prominent discourse referents as antecedents or binders. Thus, one must assume that while speakers automatically introduce discourse referents

(Hunter 2013), narrators (i.e., external speakers) only introduce discourse referents when there is an indication of them being present as perspectival centers. Moreover, one would have to assume that discourse referents introduced by narrators are more prominent than topical discourse referents (see Hinterwimmer et al. 2020: 124). Since the empirical predictions of the prominence-based account do not differ from those of the strong version of the anti-logophoricity account, teasing apart their predictions remains a topic for future research.

To further investigate the graded sensitivity to referent prominence across the different types of pronouns, one might claim that further studies with more participants are needed. As the experiment was part of study project with limited time, the sample was relatively small and possibly too small to generate general claims.⁶ However, Sprouse & Almeida (2011) found that the FC task is substantially more powerful than other tasks at detecting differences between conditions, especially for small and medium-sized effects. Therefore, they ran re-sampling simulations to empirically estimate the number of phenomena in *Linguistic Inquiry* (2001-2010) that would be detected with 80% power. Their results show that the FC task would be well-powered (i.e., reach 80% power) for the detection of 70% of the phenomena published in *Linguistic Inquiry* (2001-2010) with only 10 participants each providing only one judgment per phenomenon.

Nonetheless, when replicating the study, it would be ideal to not only include more participants but to also narrow down the age range in order to achieve a more homogeneous test group. The subjects of the current study were between 21 and 63 years old, which can lead to differences in reaction times. Older subjects might be slower to respond than younger subjects – especially when using online tools. Furthermore, older participants might show differences in their use of demonstratives as compared to younger participants based on the factor formality. Since the study was carried out via the PCIBex online platform, there was no guarantee as to how well the test subjects coped with the interface of the experiment. Additionally, the construction selected for the experiment must be reworked towards an even more equal construction in terms of prominence such that order of mention and topicality are aligned.

On a final note, we can conclude that the current study contributed to investigate the interaction of (referent/perspectival) prominence and evaluation in greater detail. Thus, it became clear that the two types of demonstratives differ in terms of their sensitivity to referent prominence interaction which is in line with the findings of Patterson et al. (2022). Additionally, experimental evidence was provided that evaluative expressions have an influence on the prominence of a discourse referent (see Patil et al. 2023). We were able to replicate the findings of Patil et al. (2023) in a design which combines offline and online measurements. Thus, our results further speak in favor of their hypothesis. Furthermore, we found unexpected effects of speaker perspective on the reference resolution of personal pronouns. These results yield interesting new insights and questions for further research on the effect of discourse prominence and speaker perspective on reference resolution. Still, a more nuanced notion of prominence is needed, especially when it comes to the resolution of pronouns.

⁶ Because of the small number of participants, we were not able to run inferential statistics. Thus, we can only report the numerical results, but are unable to tell whether these results are statistically significant.

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Abbreviations

3SG	third person singular	M	masculine
ACC	accusative	NP1	first mentioned referent
DEMPRO	<i>dieser/diese</i> demonstrative	NP2	second/last mentioned referent
DPRO	<i>der/die</i> demonstrative	P	pronoun interpretation bias
F	feminine	PPRO	personal pronoun
FC	forced choice	RT	response time (in ms)
INDEF	indefinite		

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